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Gravitational determinants and competitiveness of traditional Peruvian agroexports (1999-2024)

Determinantes gravitacionales y competitividad de las agroexportaciones no tradicionales peruanas (1999-2024)

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Bruno Paolo Algalobo Távara
https://orcid.org/0000-0001-8563-0391
brunoalgalobo531@gmail.com
Universidad Nacional Pedro Ruiz Gallo. Trujillo, Peru

Teodoro Martínez Inoñán
https://orcid.org/0000-0002-8919-1522
tmartinez@unprg.edu.pe
Universidad Nacional Pedro Ruiz Gallo. Trujillo, Peru

Virginia Efigenia Mendoza Pescorán
https://orcid.org/0000-0002-3469-5969
vmendoza@unprg.edu.pe
Universidad Nacional Pedro Ruiz Gallo. Trujillo, Peru

Abstract
The objective of this article is to analyze the gravitational determinants and competitiveness of Peru's non-traditional agricultural exports (blueberries, avocados, mangoes, and grapes) between 1999 and 2024. From a strategic management perspective, the research adopts a quantitative, explanatory, and longitudinal approach. A bilateral macroeconomic data panel was constructed and analyzed using the Pseudo Poisson Maximum Likelihood (PPML) structural estimator, ensuring consistent inferences in the presence of zero trade flows and heteroscedasticity. The results of the baseline model show that the size of the destination market (GDP) significantly drives exports with an elasticity of 0.528, while physical distance exerts a severe structural friction with a penalty coefficient of -0.767. Likewise, the existence of Free Trade Agreements (FTAs) constitutes the main institutional catalyst with a coefficient of 1.444, which robustly stabilizes at 0.618 when controlling for fixed effects of year and product. Conversely, a significant negative effect was identified at the level of value added (-2.915), empirically demonstrating that the sector's competitive advantage remains anchored in fresh exports due to low industrial upgrading.

Keywords: strategic management, gravity model, market competitiveness, agricultural exports, competitive advantages.

Resumen
El objetivo de este artículo es analizar los determinantes gravitacionales y la competitividad de las agroexportaciones no tradicionales peruanas (arándano, palta, mango y uva) entre 1999 y 2024. Desde la gerencia estratégica, la investigación adopta un enfoque cuantitativo, explicativo y longitudinal. Se construyó un panel de datos macroeconómico bilateral, procesado mediante el estimador estructural Pseudo Poisson Maximum Likelihood (PPML), garantizando inferencias consistentes ante flujos comerciales nulos y heterocedasticidad. Los resultados del modelo base demuestran que el tamaño del mercado de destino (PBI) impulsa significativamente las exportaciones con una elasticidad de 0.528, mientras que la distancia física ejerce una severa fricción estructural con un coeficiente penalizador de -0.767. Asimismo, la vigencia de los Tratados de Libre Comercio (TLC) constituye el principal catalizador institucional con un coeficiente de 1.444, el cual se estabiliza de forma robusta en 0.618 al controlar por efectos fijos de año y producto. Por el contrario, se identificó una profunda

penalización en el nivel de valor agregado (-2.915), evidenciando empíricamente que la ventaja competitiva del sector permanece anclada en la exportación en fresco debido al bajo escalonamiento industrial.

Palabras clave: gerencia estratégica, modelo de gravedad, competitividad comercial, agroexportaciones, ventajas competitivas.

Introduction

Over the past two decades, Peru has undergone an unprecedented structural transformation, establishing itself as a global reference point in high-value agroexports. Malca et al. (2025) highlight how relational flexibility (RF) operates as an intangible asset that enhances the capabilities and resources of exporting SMEs, enabling them to generate competitive advantages and improve export performance (EP). This dynamism, often referred to as the "agroexport miracle," has been driven by sustained gains in Total Factor Productivity (TFP) and aggressive trade liberalization that have significantly narrowed economic gaps (Banco Mundial, 2017). Against this backdrop, non-traditional agroexports have emerged as a resilient growth engine, registering positive impacts on national GDP in both the short and long term (Navarro-Soto et al., 2023; Mandujano-Allpocc et al., 2025; Rodríguez Abraham, 2025).

Within this ecosystem, Peru has positioned itself as a strategic hub for superfood production (blueberries, avocados, mangoes, and grapes), capturing an expanding share of international demand. Nevertheless, the sustainability of this regional leadership faces structural challenges in terms of logistics infrastructure and access to modern technologies, factors that constrain the competitiveness of local producers (Zapata Sánchez et al., 2024). Salas-Canales (2020) notes that Peruvian agroexport dynamism responds not only to the growth of non-traditional products but also to the need to analyze competitiveness determinants across strategic regions. Tintinapón et al. (2025) observe that although Peru constitutes a strategic superfood hub, its competitiveness remains vulnerable to logistics gaps and climate shocks that elevate business delinquency rates. Sustaining this leadership demands an urgent managerial reconversion aimed at transforming natural advantages into sustainable competitive advantages. In this regard, understanding and optimizing trade determinants through the gravity approach is fundamental for enhancing the direct competitiveness of small and medium-sized agroindustrial producers relative to international market giants (Alarcón et al., 2021). The management of these environmental variables is critical, since the country's agroexport performance not only energizes regional economies but also requires a managerial reconversion to move from natural comparative advantages toward sustainable competitive ones (Escalante Yaulilahua et al., 2023; Morán-Santamaría et al., 2026).

From a strategic management perspective, the sector's systemic competitiveness no longer depends exclusively on farm-level efficiency, but rather on optimizing the global value chain. In Peru, this entails the unavoidable adoption of green logistics strategies to mitigate environmental externalities and reduce transaction costs (Candiotti Viera et al., 2023). Likewise, in response to increasingly stringent destination-market demands for ethical standards, integrating sustainability certifications such as Fairtrade emerges as an opportunity to differentiate the offering and capture intangible added value in a highly commoditized environment. As Merbah and Benito-Hernández (2024) contend, sustainability labels such as Fairtrade and UTZ significantly impact the competitiveness of agricultural products by enabling consumers to make informed choices, thereby increasing willingness to pay a premium for more sustainable products. Complementary to this, certifications offer a pathway for product differentiation and value capture (Ríos Ccama et al., 2024; Lozano Paredes et al., 2025).

Despite progress in the literature, prior studies in the field of trade management have often focused on descriptive analyses or individual products. Along these lines, notable efforts have modeled specific flows such as cocoa using gravity approaches. However, an urgent need remains to employ market intelligence tools and structural gravity models capable of identifying unexploited potential markets for Peru's diversified export basket (Altamirano-Gonzales & Morán-Santamaría, 2026). As recent literature in high-value strategic sectors

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demonstrates, the use of such econometric models precisely enables the measurement and strengthening of competitive advantage from a corporate perspective (Kuik et al., 2019).

Under this premise, the present article aims to analyze the gravitational determinants of Peru's non-traditional agroexports for the period 1999–2024. To ensure robust inferences at an explanatory level (Supo, 2025), the Pseudo Poisson Maximum Likelihood (PPML) estimator is employed. This technical specification overcomes the limitations of Ordinary Least Squares in log-linear models, yielding consistent estimates in the presence of heteroscedasticity and zero trade flows (Santos Silva & Tenreyro, 2006; Tonon Ordóñez et al., 2022; Ayuda et al., 2022).

Theoretical Framework and Literature Review

Building a sustainable competitive advantage in Peru's agroindustrial sector requires analysis that transcends natural resource endowments. From the strategic management perspective, systemic competitiveness emerges through the interaction of structural determinants, infrastructure variables, and technological capabilities that facilitate insertion into global markets.

The analytical foundation of this research rests on Gravity Model Theory, which posits that trade flows between nations are directly proportional to their economic size and inversely proportional to physical and institutional distance (Grandez-Alberca et al., 2025). Historically, foundational studies on economic integration among developing nations have validated the robustness of this model for assessing how trade agreements generate trade creation or diversion effects (Ekanayake et al., 2010). Contemporary literature has moved toward structural gravity models that parameterize the trade "friction" generated by transport costs and lack of connectivity (Santos Silva & Tenreyro, 2006; Tonon Ordóñez et al., 2022). These models enable the parameterization of the friction caused by physical distance and institutional barriers in corporate decision-making, recognizing that proper management of the regulatory environment and institutional variables directly affects international positioning and commercial success (Andrade Rojas, 2020).

For the Peruvian case, employing advanced estimators such as PPML is imperative for managing heteroscedasticity and zero flows, thereby providing a robust foundation for managerial decision-making in export markets that are highly sensitive to distance factors (Caravaggio & Conigliani, 2026; Hong Tsui et al., 2025).

The dynamism of Peruvian agroexports results from a modernization process that has allowed the sector to "gain momentum" through increases in Total Factor Productivity (TFP). According to the Banco Mundial (2017), Peruvian agriculture has achieved notable growth rates on the coast; however, a significant technological gap persists that limits value upgrading and the sector's structural sustainability. For strategic management, the adoption of technological innovations and process digitalization are not merely operational options but critical assets necessary to mitigate terms-of-trade volatility and ensure efficient insertion into global value chains (Rodríguez Abraham, 2024; Altamirano-Gonzales & Morán-Santamaría, 2026).

Within the framework of New Economic Geography, transport and connectivity infrastructure define a country's trade possibility frontier. In Peru, the competitiveness of non-traditional agroexports is constrained by structural deficiencies in ports, airports, and road networks, which raise transaction costs and reduce firms' operating margins (Zapata Sánchez et al., 2024). This vulnerability requires organizations to develop green logistics capabilities and supply chain optimization to compensate for geographic friction (Candiotti Viera et al., 2023). Port infrastructure and efficient cold-chain management act as gravitational determinants that, together with trade agreements, define the viability of shipments of highly perishable products or superfoods (Hong Tsui et al., 2025; Ríos Ccama et al., 2024).

Finally, systemic competitiveness in Peru depends on the alignment between firms' internal capabilities and institutional support from the state. Regional evidence demonstrates that export performance is not only constrained by external factors but is often severely restricted by domestic factors, such as inefficient policies, poor management of public institutions, and excessive bureaucracy (Quiñónez Cabeza et al., 2021). In contrast, the legal certainty

provided by Free Trade Agreements (FTAs) functions as a catalyst that reduces institutional uncertainty, enabling small and medium-sized enterprises (SMEs) to develop organizational resources oriented toward exporting (Aparicio et al., 2024; Malca et al., 2025). Additionally, Liu (2025) observes that the entry into force of trade agreements marks the birth of the world's largest free trade agreement, and agricultural products from the region will be able to achieve tariff-free trade in the future, which will also bring substantial growth to export trade. Castillero (2020) underscores the importance of intensifying production to ensure competitiveness in global markets, a concept that also applies to the competitiveness of Peru's agroexports in the international marketplace. Successful management of these agroexports thus requires a comprehensive vision that combines trade intelligence with investments in agricultural technology and logistics infrastructure, moving beyond traditional approaches that merely exploit comparative advantages (Escalante Yaulilahua et al., 2023; Morán-Santamaría et al., 2026).

Methodology

This study adopts a quantitative approach with an explanatory scope and a non-experimental longitudinal design. To capture the dynamics of Peruvian agroexports, a macroeconomic panel dataset was constructed covering the period 1999–2024. The unit of analysis was defined at the level of aggregate trade flows by year, destination country, product type, and level of value added. The product basket under study focused on the main non-traditional export superfoods: mango, avocado, blueberry, and grape. To assess the impact of agroindustrial transformation, each product was categorized using a dichotomous value-added variable, distinguishing between fresh presentations and processed iterations (frozen or dried). Consolidation of the master database required integrating three secondary information sources:

- Foreign Trade: Bilateral export flows (FOB value in USD and Net Weight) were extracted from customs records consolidated by Infotrade.

- Economic Mass: Gross Domestic Product (GDP) data for destination countries were obtained from the World Bank's World Development Indicators.

- Geographic and Institutional Friction: Structural gravity variables, including weighted physical distance, contiguity, and shared official language, were drawn from the Centre d'Études Prospectives et d'Informations Internationales (CEPII) database. A dichotomous trade policy variable was also constructed to capture the existence of Free Trade Agreements (FTAs) between Peru and recipient economies.

To estimate the determinants of agricultural exports, the structural form of the gravity model was adopted. Given that the traditional Ordinary Least Squares (OLS) estimator in its log-linear form generates inconsistent estimates in the presence of zero trade flows and heteroscedasticity, the Pseudo Poisson Maximum Likelihood (PPML) estimator was employed. As Navarro-Soto et al. (2023) note, PPML ensures robust inferences at an explanatory level. This technical specification is considered the gold standard in contemporary international economics, as it overcomes the limitations of OLS by delivering consistent estimates in the face of heteroscedasticity and zero trade flows. The main econometric specification is defined by the following equation:

$$FOBjpt = \exp(\beta 0 + \beta 1 \ln(GDPjt) + \beta 2 \ln(Distj) + \beta 3\, FTAjt + \beta 4\, VAp + \beta 5\, Contigj + \beta 6\, Comlangj + \lambda t + \eta p) + \varepsilon jpt$$

- Agroindustrial Exports (FOB_{jpt}): This is the dependent variable, representing the total annual FOB value in dollars of shipments of mangoes, blueberries, grapes, and avocados to destination market j in year t. This variable results from the consolidation and collapsing of customs microdata, capturing aggregate trade flow by product type.

- Economic Mass (GPD_{jt}): This variable acts as a proxy for market size and demand absorption capacity in the destination. Gross Domestic Product (GDP) of partner countries was transformed from a cross-sectional to a longitudinal structure and linked via ISO-3 international codes.

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- Geographic Friction ($Dist_j$): Represents physical distance in kilometers between the port of origin (Peru) and the economic center of the importing country. This is a fundamental gravity-theory variable for parameterizing transport costs and international logistics.

- Free Trade Agreement (FTA_{jt}): A dichotomous institutional variable (1 if agreement exists, 0 otherwise). Construction required specific programming to identify the entry into force of treaties, including treatment of complex economic blocs such as the European Union starting in 2013.

- Level of Value Added (VA_p): A control variable categorizing product sophistication. It takes the value 1 if the export corresponds to processed products (frozen or dried) and 0 if fresh products. This variable allows analysis of whether agroindustrialization helps overcome distance barriers.

- Geocultural Control Variables ($Contig_j$ y $Comlang_j$): Binary variables capturing whether the destination country shares a physical border (contiguity) or official language with Peru. These variables isolate the effect of cultural and geographic proximity on transaction cost reduction.

- Time Fixed Effects (λ_t): A set of year binary variables included to capture external shocks, global crises, or changes in terms of trade that commonly affect agroexports in a given period.

- Product Fixed Effects (η_p): Control for structural differences inherent to each product, such as perishability, cold-chain requirements, logistics complexity, and specific marketing conditions.

- Error Term (ε_{jpt}): Captures unobserved factors affecting the exported value of product p to country j in year t that are not directly explained by variables included in the specification.

To mitigate omitted variable bias and enhance the robustness of the gravity specification, the model incorporates year fixed effects λ_t and product fixed effects η_p. Year fixed effects control for common macroeconomic shocks, international crises, or global changes in terms of trade that simultaneously affect agroexports in a given period. Product fixed effects, in turn, control for structural differences among blueberries, avocados, mangoes, and grapes, such as perishability, cold-chain requirements, logistics complexity, and specific marketing conditions. For destination-country heterogeneity, observable gravity controls such as distance, contiguity, and common language are employed as proxies, since the simultaneous inclusion of full country fixed effects would absorb time-invariant variables, particularly geographic distance. This approach reduces unobserved heterogeneity bias without losing identification of the model's main trade frictions.

Structuring the multidimensional panel required an exhaustive data engineering and cleaning process, given that primary customs sources presented a microdata structure at the individual transaction level that had to be systematically aggregated into bilateral macroeconomic flows. This intensive processing was executed via programmed routines in Stata, while part of the exploratory analysis was developed in the RStudio environment, addressing the following technical challenges: Attribute Automation and Parameterization: To process fragmented export records, an iterative algorithm (loop) was designed that automatically consolidated files scattered by product type (mango, avocado, blueberry, grape) and presentation. During this phase, text strings (strings) were extracted from file nomenclature to dynamically generate the dichotomous value-added variable (VA_p), algorithmically discriminating processed presentations (frozen and dried) from fresh shipments.

Temporal Harmonization and Macro Aggregation: Primary shipping dates, recorded in irregular text string formats, were computationally transformed to extract the numeric annual component. Based on this clean temporal base, a collapse algorithm was applied to move from the firm-level unit of analysis to total bilateral aggregation, summing FOB value and net weight by year, destination country, product, and value added.

Geographic Key Standardization: The most significant integration challenge lay in the heterogeneity of destination-country nomenclature. A comprehensive harmonization routine was programmed to translate irregular commercial designations and synonyms (e.g., reconciling "Netherlands" and "Netherlands (Holland)," or "South Korea" and "Korea, Republic of") to the international standard of ISO 3166-1 alpha-3 alphanumeric codes. This

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standardization constituted the indispensable relational key for exact merging with institutional and geographic databases.

Integration of Covariates and Structural Frictions: Global economic mass indicators (GDP) required topological transformation from a wide cross-sectional structure to a long longitudinal format (reshape long) prior to merging with the base panel. Similarly, construction of the institutional variable for Free Trade Agreements required complex conditional imputation capturing the staggered entry into force of agreements by year and country, necessitating specific vectorized treatment to group European Union bloc economies.

Results and discussion

Table 1. Gravity Model Results Using PPML Estimator for Agroexports

Variable	B	SE	Z	P	95% CI
GDP (log)	0.528	0.057	9.23	< .001	[0.416, 0.640]
Distance (log)	-0.767	0.141	-5.45	< .001	[-1.043, -0.491]
FTA	1.444	0.116	12.43	< .001	[1.216, 1.671]
Value added	-2.915	0.101	-28.74	< .001	[-3.114, -2.716]
Common language	-0.143	0.212	-0.68	0.5	[-0.559, 0.273]
Contiguity	-0.961	0.219	-4.38	< .001	[-1.391, -0.531]
Constant	7.915	1.574	5.03	< .001	[4.830, 11.000]

Note: N = 3,627. Pseudo R^2 = .484. B denotes coefficients from the Poisson regression model. SE indicates robust standard errors. CI = confidence interval. The dependent variable is FOB value in USD. Estimates obtained using Stata 16.

The baseline model results confirm the relevance of the gravity framework for explaining Peruvian non-traditional agroexports. The economic size of the destination market acts as an expanding force on trade, while geographical distance maintains a constraining effect, consistent with transport costs and logistical demands. Free trade agreements (FTAs) exhibit a favorable institutional effect on export flows. By contrast, the negative coefficient for value added reveals that processed product categories continue to face market positioning challenges relative to fresh goods. Common language lacks statistical significance, suggesting that the insertion of these products responds more to market conditions, logistics, and international demand than to cultural affinities.

Table 2. Gravity Model Estimates Using PPML Estimator for Agroexports: Comparison with Year and Product Fixed Effects

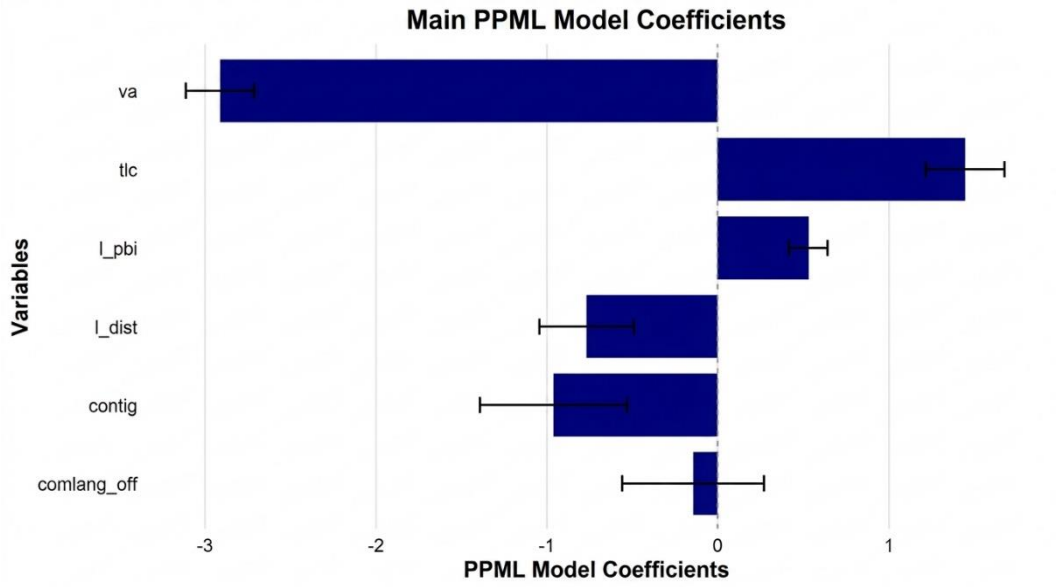
Variable	**Baseline PPML**	**PPML + Year FE**	**PPML + Year and Product FE**
Destination GDP (log)	0.528*** (0.057)	0.572*** (0.056)	0.578*** (0.052)

Distance (log)	-0.767*** (0.141)	-0.883*** (0.139)	-0.871*** (0.120)
FTA	1.444*** (0.116)	0.607*** (0.153)	0.618*** (0.153)
Value added	-2.915*** (0.101)	-2.896*** (0.094)	-2.861*** (0.098)
Contiguity	-0.961*** (0.219)	-1.248*** (0.240)	-1.289*** (0.236)
Common language	-0.143 (0.212)	-0.360 (0.239)	-0.313 (0.231)
Constant	7.915*** (1.574)	5.809*** (1.843)	5.993*** (1.862)
Year FE	No	Yes	Yes
Product FE	No	No	Yes
Observations	3,627	3,627	3,627
Pseudo R^2	0.484	0.557	0.592

*Note: Robust standard errors in parentheses. *** p < .01. FE = fixed effects. The dependent variable is FOB value in US dollars. The table presents coefficient estimates with 95% confidence intervals across three models. Results indicate significant effects of GDP, FTAs, and distance on agroexports, while value added and contiguity exhibit consistent negative effects.*

The robustness analysis shows that the signs and significance levels of the main determinants remain stable when year and product fixed effects are introduced. The FTA coefficient falls from 1.444 to 0.618, suggesting that part of its initial effect had been driven by common temporal shocks. Still, its impact persists as positive and significant. Likewise, distance and value added retain negative coefficients across all specifications, reinforcing the notion that logistical constraints and the weak positioning of processed goods constitute structural barriers to agroexport competitiveness.

Figure 1. Coefficient Estimates from the Structural Gravity Model (PPML Estimator)



Note: The figure presents coefficient estimates from the baseline PPML model with robust standard errors and 95% confidence intervals. The vertical line at zero allows identification of the direction and statistical significance of effects. Coefficients to the right indicate positive effects on exported FOB value, while those to the left reflect restrictive effects.

Figure 1 synthesizes the direction of the main gravitational determinants of Peru's non-traditional agroexports. Destination-market GDP and FTAs show positive effects, confirming the importance of economic size and institutional support for export expansion. In contrast, distance, value added, and contiguity exhibit negative coefficients, reflecting logistical constraints, positioning limitations of processed products, and a stronger commercial orientation toward high-income global markets rather than neighboring economies. Common language shows no statistically conclusive effect.

Table 3. *Gravity Model Results by Product*

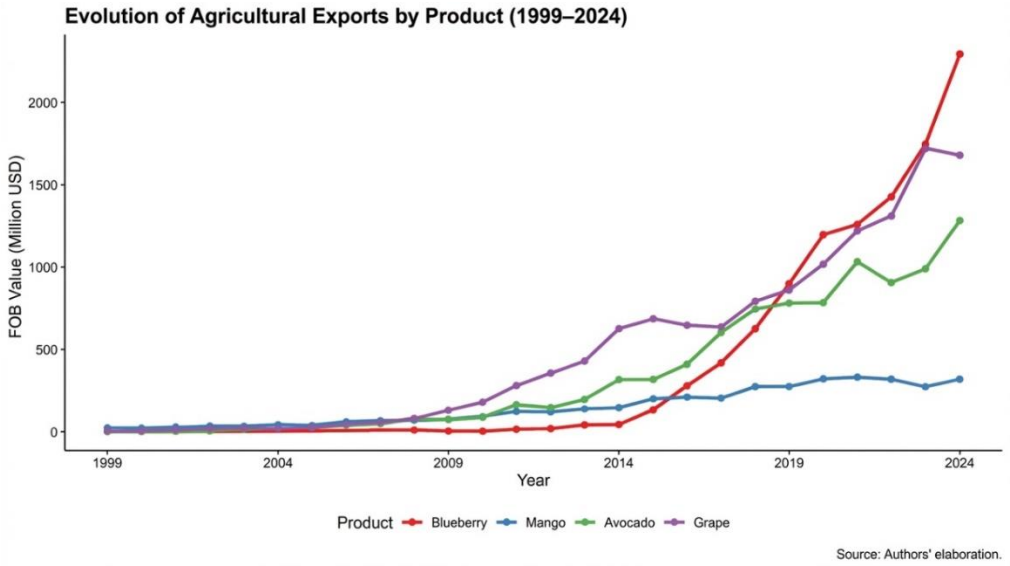
Variable	**(1) Blueberry**	**(2) Mango**	**(3) Avocado**	**(4) Grape**
Destination GDP (log)	0.786*** (0.128)	0.463*** (0.065)	0.258*** (0.075)	0.679*** (0.074)
Distance (log)	-0.597*** (0.225)	-0.395*** (0.115)	-0.314** (0.155)	-0.564*** (0.158)
FTA	1.088*** (0.374)	1.351*** (0.197)	2.087*** (0.230)	1.089*** (0.158)
Value added	-2.497*** (0.189)	-2.633*** (0.129)	-3.441*** (0.182)	-4.711*** (0.357)
Constant	-0.526 (2.545)	5.471*** (1.326)	10.950*** (1.463)	2.208* (1.239)
Observations	736	1,023	1,007	861
Pseudo R^2	0.556	0.467	0.475	0.522

*Note: Robust standard errors in parentheses. *** p < .01, ** p < .05, * p < .10.*

The product-level estimates uncover meaningful heterogeneity in how each crop responds to gravitational determinants. Blueberries and grapes exhibit higher income elasticities with respect to destination GDP, underscoring their orientation toward high-purchasing-power markets. Distance exerts a negative effect across all four products, though with varying magnitudes, reflecting differences in logistical requirements and cold-chain dependence. FTAs maintain a consistently positive influence throughout, with particularly pronounced effects in the case of avocados. Lastly, the persistent negative coefficient on value-added across all product lines confirms that the current competitive edge of Peru’s agro-export basket remains anchored in fresh produce rather than in processed presentations.

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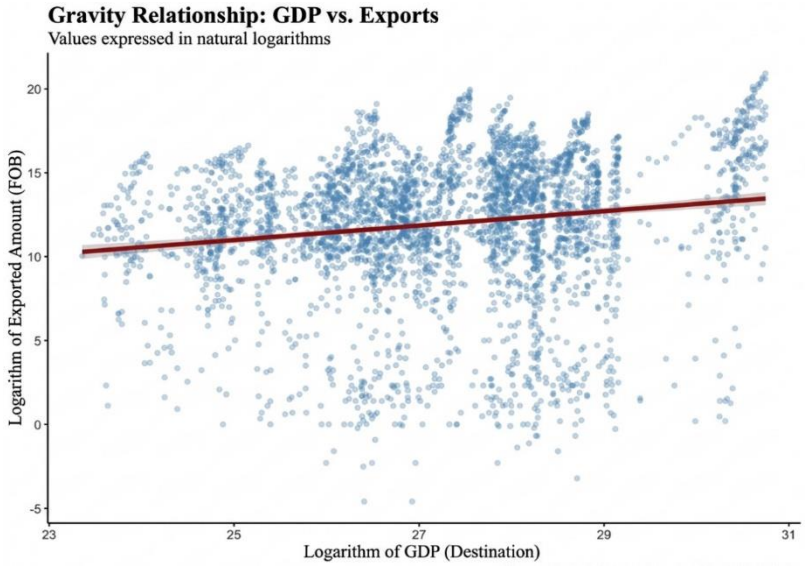
Figure 2. *Product-Level Evolution*



Note: Values expressed in millions of FOB dollars. The historical series reflects the performance of the main superfoods in Peru's export basket: blueberries, mangoes, avocados, and grapes. Own elaboration based on Infotrade customs records, processed entirely in the RStudio 2026 environment.

Figure 2 shows sustained expansion in the analyzed agroexport basket, though with differentiated trajectories across products. Grapes, avocados, and blueberries concentrate the most recent dynamism, especially during the post-2010 period associated with greater trade openness and consolidation of external markets. Mango exhibits more moderate growth, suggesting a more stable but less accelerated international insertion. Overall, the evolution confirms that Peruvian agroexport competitiveness has strengthened primarily in fresh products with high international demand.

Figure 3. *Gravitational Relationship between Destination GDP and Agroexports*

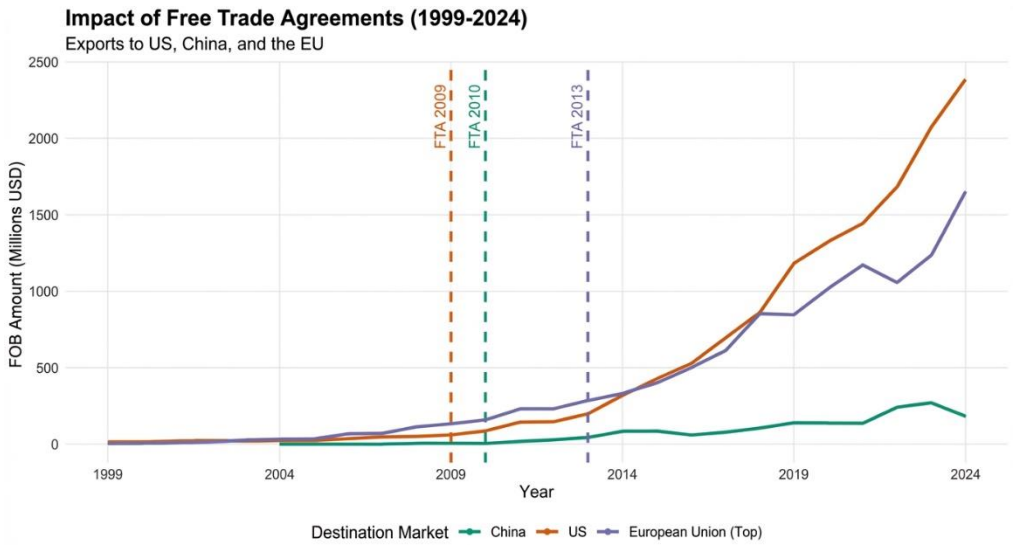


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Note: *Authors' own elaboration using RStudio 2026 software.*

Figure 3 visually supports the positive relationship predicted by the gravity model: larger economies tend to absorb greater values of Peruvian agroexports. However, observation dispersion indicates that GDP alone does not fully explain export performance. This variability reinforces the need to incorporate other determinants, such as distance, trade agreements, logistical conditions, and product characteristics, for a more complete understanding of the international competitiveness of the analyzed basket.

Figure 4. *Impact of Free Trade Agreement (FTA) Entry into Force*



Source: Authors' own elaboration. Dotted lines indicate the entry into force of Free Trade Agreements (FTAs) with the U.S. (2009), China (2010), and the European Union (2013).

Figure 4 allows observation of export growth toward strategic markets following the entry into force of major FTAs. China and the United States exhibit the most dynamic trajectories, evidencing the relevance of trade agreements as mechanisms for market access and international consolidation. In the case of the European Union, growth is more gradual, though it maintains a positive post-agreement trend. These patterns complement the econometric results, where the FTA maintains a positive effect even after controlling for year and product fixed effects.

Conclusions

The research findings demonstrate that Peru's non-traditional agroexports are conditioned by gravitational determinants that directly affect their trade competitiveness. The economic size of the destination market exerts a positive and significant effect on export flows, confirming that countries with greater absorption capacity represent strategic spaces for the international expansion of products such as blueberries, avocados, mangoes, and grapes. In contrast, geographic distance continues to act as a structural barrier, associated with higher logistics costs, cold-chain requirements, transit times, and operational complexity in international market management.

Similarly, Free Trade Agreements consolidate as relevant institutional instruments for strengthening the international insertion of Peruvian agroexports. Their positive effect demonstrates that trade openness not only reduces tariff restrictions but also favors firms' strategic planning by providing better access conditions, regulatory stability, and opportunities for market diversification. In this sense, agroexport management must incorporate trade intelligence as a key tool for effectively leveraging the benefits derived from these agreements.

One of the study's most relevant findings is the negative effect of value added on analyzed exports. This result does not imply that agroindustrial transformation lacks importance, but rather that processed presentations of the studied products have not yet achieved competitive positioning relative to fresh exports. Consequently, managerial strategy should not be limited to increasing conventional processing but rather to building value through differentiating attributes such as traceability, sustainability certifications, green logistics, premium quality, technological innovation, and adaptation to specific international demand niches.

In terms of trade competitiveness, results show that Peru's agroexport advantage is sustained primarily through insertion into larger economies and institutional exploitation of Free Trade Agreements. The positive elasticity of destination GDP, reaching 0.578 in the model with year and product fixed effects, confirms that international expansion depends on orienting supply toward economies with greater absorption capacity. Likewise, the positive FTA coefficient, stabilized at 0.618 in the robust specification, demonstrates that trade openness strengthens external competitiveness. However, the persistent penalty of distance (-0.871) and value added (-2.861) reveals that the sector's competitiveness still faces logistical and industrial constraints, so the strategic challenge consists of strengthening cold-chain infrastructure, differentiation, certifications, and agroindustrial upgrading.

Consequently, this study provides empirical evidence for decision-making in Peruvian agroindustrial management, demonstrating that export competitiveness depends not only on productive growth but also on firms' capacity to select strategic markets, reduce logistical frictions, leverage trade agreements, and generate genuine differentiation in increasingly demanding global markets. Thus, Peru's non-traditional agroexports can sustain their international expansion if they articulate operational efficiency, innovation, sustainability, and market-oriented strategic management.

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AUTHORSHIP CONTRIBUTION

1. Conceptualization: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán
2. Data curation: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán
3. Formal analysis: Bruno Paolo Algalobo Távara, Teodoro Martínez Inoñán, and Virginia Efigenia Mendoza Pescorán
4. Funding acquisition: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán
5. Research: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán
6. Methodology: Bruno Paolo Algalobo Távara, Teodoro Martínez Inoñán, and Virginia Efigenia Mendoza Pescorán
7. Project administration: Bruno Paolo Algalobo Távara, Teodoro Martínez Inoñán, and Virginia Efigenia Mendoza Pescorán
8. Resources: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán
9. Software: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán
10. Supervision: Bruno Paolo Algalobo Távara, Teodoro Martínez Inoñán, and Virginia Efigenia Mendoza Pescorán
11. Validation: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán
12. Visualization: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán
13. Writing – original draft: Bruno Paolo Algalobo Távara and Teodoro Martínez Inoñán

14. Writing – proofreading and editing: Bruno Paolo Algalobo Távara, Teodoro Martínez Inoñán, and Virginia Efigenia Mendoza Pescorán