

Economic impact of shrimp sector exports in Ecuador

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ABSTRACT

This study focused on analyzing the economic impact of the shrimp farming sector in Ecuador during the period 2020–2024, based on the premise that this industry has consolidated itself as one of the country's main drivers of non-oil exports, even in a context marked by price volatility, trade dependence, and climate pressures. With this in mind, the study's main objective was to examine the evolution of production, exports, prices, economic contribution, employment, and the factors that influenced the sector's profitability. The research methodology employed a mixed-methods approach, primarily documentary in nature, with a descriptive, non-experimental, and exploratory design. This approach was based on the review and analysis of secondary information from official sources, technical reports, and specialized literature. Specifically, a descriptive approach was used to compare trends and annual variations. The main results showed sustained growth in shrimp production and its share of non-oil exports, but also revealed a decline in profitability starting in 2023 due to lower international prices, increased production costs, and the persistent concentration of sales in the Chinese market. The study also determined that the sector generated a moderate increase in employment and contributed to regional economic growth, although progress varied across provinces. Finally, it concluded that the sector's competitiveness depended on both its production capacity and its resilience to external risks, highlighting the need to diversify markets, optimize costs, and strengthen climate adaptation strategies. Indeed, this study provided a comprehensive overview of the sector's economic performance and identified priority areas for further research.

Keywords: aquaculture; foreign trade; agricultural economics; regional development.

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INTRODUCTION

1.1 Contextualization

In recent decades, the shrimp sector has been one of the main export engines in Ecuador, contributing significantly to the generation of foreign exchange and employment in coastal areas (Rimbardo et al., 2024). However, various studies have highlighted the importance of aquaculture in the national economy and its ability to promote local production chains (Álvarez, 2024). However, the sector faces and has faced structural challenges such as international price volatility, dependence on few markets and vulnerabilities to climatic events and logistical problems that affect the income stability of producers.

In recent times, the Ecuadorian shrimp sector has faced some conjectures characterized by the interaction of economic, commercial and productive factors, to name a few; the high exposure to international price volatility, the concentration of exports in a few markets, the sustained increase in input costs and the impacts of climatic phenomena such as El Niño have limited the stability of the sector between 2020 and 2024. Indeed, these conditions have caused fluctuations in revenues, pressure on profit margins and risks in productive sustainability in Ecuador, which shows the need to analyze in detail how these elements have affected its economic contribution and its capacity for resilience in the face of a changing international environment.

From this context, the main objective of this study was to analyze the economic impact of exports from the shrimp sector in Ecuador between 2020 and 2024, focusing on the main economic variables of the sector such as production volume, value of exports, average price and participation in GDP, effects of the shrimp sector on job creation, territorial distribution of income, profitability and economic stability. In this sense, this approach makes it possible to identify not only the magnitude of the sector's economic contribution, but also the factors that condition its performance and the public policy opportunities to strengthen its resilience.

1.2 State of the art

In a global context, the literature on national and international research coincided in recognizing shrimp as an export engine and a sector with a high capacity to generate foreign exchange and employment, however, these critics move considerably away from the analytical emphasis, that is, while macroeconomic studies have quantified its contribution to foreign trade and aggregate indicators; The microeconomic and territorial literature examines local contributions and the effects on the well-being of producing communities.

At the international level, work on the competitiveness of aquaculture has highlighted the importance of input costs, structuring value chains and access to external markets (Cruz, 2017), in turn, these analyses tend to focus on the experiences of countries with different production structures such as India, Vietnam, Thailand, among others; which makes it difficult to directly transfer lessons to the Ecuadorian context.

In Ecuador, recent studies have documented increases in production and exports, as well as vulnerabilities related to market concentration and price volatility, but they often remain in aggregate descriptions without delving into causal mechanisms or the interaction between climatic

factors, production costs, and regulatory measures (Rimbaldo et al., 2024). In addition, existing evidence tends to under-represent two key dimensions:

- There is a scarcity of longitudinal studies that integrate homogeneous series of production, prices and employment to assess resilience dynamics and recovery trajectories after health, climate or market shocks.
- Lack of robust evaluations of distributional effects, i.e., there is little evidence of studies that analyze how the gains from the shrimp boom translate into formal vs. informal employment, job quality, and territorial development in producing provinces.

From an institutional perspective, the literature has examined traceability reforms and environmental standards from the perspective of compliance, but offers little evidence on their real economic impact on small and medium-scale producers or on the costs of technological and financial adaptation.

From a context of the available literature, methodological gaps emerge that limit the usefulness of the literature to design other studies based on documentary analysis. In summary, while the available knowledge establishes the strategic importance of the sector and its overall risks, gaps persist on the territorial distribution of economic benefit, resilience to shocks and the cost-benefit balance and the identification of priority areas for future research.

1.3 Justification

The analysis of the economic impact of the shrimp sector in Ecuador between 2020 and 2024 is necessary due to the gaps identified in the current literature. Although there are studies that describe the productive and export growth of the sector, there is still limited evidence that systematically integrates variables such as production, international prices, employment, territorial distribution of income and external factors that affect profitability, in fact, most of the available works present partial approaches, focused on health, productive or commercial aspects without articulating these elements within an economic framework integral. Considering the above, this research provides an analytical synthesis that organizes and compares dispersed information, allowing a more complete understanding of the economic evolution of the sector during a period marked by global problems such as pandemic, price volatility, trade tensions and climatic phenomena.

In the practical aspect, this study is pertinent because the shrimp sector is the main export item in the country, so any variation in its performance has a direct impact on the national economy, employment and territorial finances. Between 2020 and 2024, companies, producers, and coastal areas faced significant fluctuations in international prices, increases in operating costs, and the effects of climatic phenomena that affected income stability, therefore, having an updated and comparative analysis of these variables allows public and private actors to identify risks, anticipate trends, and formulate management strategies more adjusted to recent reality. In addition, by organizing information from official sources and specialized organizations, the study offers a useful evidence base for decision-making in productive planning, market diversification, technological investment, and public policies aimed at strengthening the competitiveness and economic sustainability of the Ecuadorian shrimp sector.

With all of the above, this work aims to analyze the economic impact of exports of the shrimp sector in Ecuador during the period 2020–2024, in this sense, the evolution of production, exports, prices and participation in GDP between 2020–2024 of the shrimp sector is investigated; the effects

on the generation of employment and territorial distribution of the shrimp sector, and the factors that have affected the profitability and economic stability of the sector between 2020 and 2024.

MATERIALS AND METHODS

2.1 Research Design

Qualitative: this study was qualitative because it is based on the interpretative analysis of documentary and bibliographic information, without widely resorting to statistical measurements or the collection of numerical data, that is, its purpose was to understand trends, meanings and relationships present in the sources consulted to explain the economic dynamics of the shrimp sector.

Quantitative: despite not having directly made statistical and mathematical calculations, this study had a quantitative approach because it worked with numerical data from official sources, allowing to compare and describe the evolution of economic variables of the shrimp sector, in that sense, this approach made it possible to analyze trends, annual variations and relationships between production, exports, prices and employment. offering an objective and verifiable view of the sector's behavior.

Exploratory: the study was exploratory in nature because it sought to obtain a first approximation to the economic dynamics of the shrimp sector during 2020–2024, identifying trends, influencing factors and possible relationships between variables, with this, what was sought was to generate an initial basis of understanding that would serve for future research.

2.2 Type of study

The research was descriptive, non-experimental and bibliographic, aimed at identifying economic trends, variations in production, export behavior and external factors that influenced the profitability of the sector.

Descriptive: with respect to the type of study, this research was descriptive because it focused on detailing and characterizing the main economic variables of the shrimp sector, such as production, exports, prices and employment, therefore, the analysis was limited to observing and presenting how these variables behaved during the period 2020–2024, without manipulating them or establishing causal relationships.

Non-Experimental: in turn, the study was non-experimental because no variables were manipulated or controlled interventions applied, therefore, only existing data from official and bibliographic sources were analyzed in accordance with the natural evolution of the shrimp sector during 2020–2024 as it occurred in its real context.

Bibliographic: the research was bibliographic because it was based exclusively on the collection, review and analysis of information from documents, official reports, scientific articles and specialized databases, in other words, all the content was prepared from secondary sources already published, that is, without generating data or calculations of its own.

2.3 Population and sample

From the perspective that this study was carried out from bibliographic sources, the population and sample of the study was made up of the set of documents, official reports, economic statistics and scientific literature related to the shrimp sector in Ecuador during the period 2020–2024.

2.4 Inclusion criteria

The factors that allowed the research to participate in this study are presented below.

- ECB Macroeconomic Reports - Central Bank of Ecuador
- MPCEIP Productive and Trade Statistics - Ministry of Production, Foreign Trade and Investment
- Bulletins of the National Chamber of Aquaculture
- International reports from organizations such as FAO, Globefish, TradeMap and World Bank Data
- Scientific articles published between 2020 and 2024 in databases such as Scopus, Google Scholar and SciELO related to the shrimp sector industry

2.5 Exclusion Criteria

On the other hand, all sources that did not correspond to the 2020–2024 study period were excluded, as well as documents without institutional support, unverifiable data or publications with outdated or inconsistent information, in the same sense, studies that did not address economic variables of the shrimp sector or that focused exclusively on other aspects such as biological, unrelated to the objective of the analysis or to the shrimp sector itself.

2.6 Data collection tools

In this analysis, the data collection instruments were limited to tools that allowed to locate, select and organize secondary information useful for this study. In this context, the data collection instrument was a documentary analysis matrix, in which the information obtained from official sources, technical reports, and scientific literature on the shrimp sector during the period 2020–2024 was recorded, organized, and compared.

2.7 Procedure

The methodological development followed three stages:

- Systematic literature search using keywords such as: shrimp farming Ecuador, shrimp export economy, aquaculture economics, Ecuadorian shrimp sector 2020–2024, in Spanish and English.
- Classification and analysis of information, organizing data by categories: production, exports, international prices, employment, production costs and external factors such as climate, markets, regulations.
- Synthesis and comparison of trends, highlighting annual variations and relationships between economic variables related to the objectives of this study.

2.8 Data analysis

The analysis was purely descriptive and documentary, in this sense, figures and trends from official sources were compared without using statistical tests, in turn, tables and explanatory texts were prepared to interpret the economic evolution of the shrimp sector.

2.9 Ethical considerations

As it was a documentary study, no human subjects were involved and no primary data were collected, however, ethical principles of academic integrity, adequate citation and responsible use of information were respected, applying the editorial rules for the elaboration of references.

RESULTS

The results were organized according to the specific objectives set and only the relevant data obtained from the official sources consulted are presented.

3.1 Evolution of production, exports, prices, share of GDP

Table 1. Economic indicators of the shrimp sector in Ecuador – 2020- 2024

Age	Production (tn)	Value exported (USD million)	Average price (USD/pound)	Share of non-oil exports (%)
2020	650.000	3.650	\$3.60	33 %
2021	800.000	5.080	\$4.10	36 %
2022	1.050.000	6.698	\$4.25	39 %
2023	1.200.000	6.450	\$3.40	40 %
2024	1.250.000	6.100	\$3.10	41 %

Note. In 2024, the figures were estimated based on official trends published
Taken from: BCE, CNA AND MPCEIP

In the period 2020–2024, the shrimp sector showed sustained growth despite international volatility (Azuero et al., 2021). According to the table above, the behavior during the 5 years of study of the shrimp sector was presented as follows:

- The production volume went from approximately 650 thousand tons in 2020 to more than 1.25 million tons in 2024. This represented an increase of close to 92% in five years
- The total value of exports increased from USD 3.65 billion in 2020 to approximately USD 6.45 billion in 2023. In the following year there was a slight contraction due to the fall in international prices
- The average price per pound showed a fluctuating trend; reached peaks in 2021–2022 due to high demand from China and the US, but fell by about 18% in 2023–2024, affecting the profitability margin
- Share of non-oil exports; Shrimp went from representing 33% in 2020 to 41% in 2024, consolidating itself as the country's main export item.

In summary, these indicators confirm that the sector remained a strategic axis of Ecuadorian foreign trade, even under changing market conditions. In the period analyzed, production increased from approximately 650 thousand tons in 2020 to around 1.25 million in 2024. Export value increased between 2020 and 2022, followed by slight reductions in 2023–2024. The average price per pound showed fluctuations, with increases in 2021–2022 and subsequent decreases. The share of non-oil exports remained on the rise.

3.2 Job creation and the territorial distribution of the sector

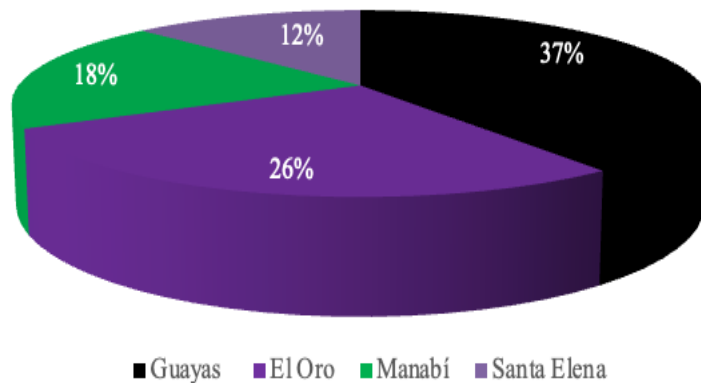
Table 2. Direct and indirect employment generated by the shrimp sector

Age	Total employment
2020	270,000 people
2021	285,000 people
2022	300,000 people
2023	307,000 people
2024	310,000 people

Note. The table shows the evolution of data on direct and indirect employment
 Source: data taken from CNA and MPCEIP

In 2020, the sector generated about 270 thousand direct and indirect jobs; by 2024, the figure exceeds 310 thousand, an increase of approximately 15%. However, direct employment was mainly concentrated in the following provinces: Guayas - 37%, El Oro - 26%, Manabí - 18% and Santa Elena - 12% (Chancay et al., 2021).

Figure 1. Graphical representation of the concentration of employment by provinces



Source: data taken from CNA and MPCEIP

- The expansion of swimming pools, collection centers and processing plants contributed to increasing the demand for operators, aquaculture technicians and logistics personnel.
- The increase in private investment in rural areas has had positive effects on the partial reduction of unemployment and local economic revitalization, especially in cantons such as Balao, Naranjal, Santa Rosa and Arenillas.

This shows that the sector not only provides foreign exchange, but also job stability in areas with limited economic alternatives.

3.3 Factors that affected the profitability and economic stability of the sector

Table 3. Main factors that affected the shrimp sector

Category	Reported Factor	Period
International prices	Decrease due to global oversupply	2023–2024
Markets	High dependence on the Chinese market	2020–2024
Production costs	Increase in the cost of feeding; up to 25%	2021–2023
Climatic factors	Impacts associated with El Niño	2023–2024
Regulations	Greater demand for traceability and environmental standards	2022–2024

Note. The table exposes the various factors that influenced the economic dynamics of the shrimp sector during the period 2020 – 2024

Source: *FAO, CNA, Globefish and ECB*

The analysis indicates that the profitability of the shrimp sector in 2020–2024 was influenced by external and internal factors (Vélez, 2025).

- Fall in international prices between 2023–2024; global oversupply, mainly from India and Vietnam, pushed prices down, reducing profit margins by up to 22% in Ecuadorian exporters
- Dependence on markets; China has concentrated between 52% and 60% of Ecuadorian exports, however, sanitary restrictions, stricter inspections and the slow *post-pandemic* economic recovery affected the trade flow
- Increase in production costs; The cost of feed, which represents between 50%–60% of costs, increased by up to 25% in some periods, putting pressure on profitability
- Climatic events; the presence of El Niño 2023–2024 increased larval mortality, reduced feed conversion, and raised management and biosecurity costs.
- Regulations and certifications; New traceability standards and environmental requirements increased operating costs, especially in small and medium-sized shrimp farms.

In summary, these results show that, although the sector maintains a high competitiveness, its stability depends on its ability to diversify markets, improve technification and reduce vulnerabilities to external factors.

DISCUSSION

The results obtained in this study show a complex economic evolution of the Ecuadorian shrimp sector between 2020 and 2024, marked by sustained growth in production and export participation, but accompanied by vulnerable profitability in the face of external factors such as the fall in international prices, increases in production costs and the climatic effects associated with El Niño. Indeed, this behavior evidences a duality that has also been described in previous research, that is, Ecuadorian shrimp continues to consolidate itself as a structural axis of the national economy, but at the same time operates in a highly volatile and competitive environment, where small global imbalances generate significant impacts at the domestic level.

With respect to the first objective investigated, the almost continuous growth in production and in the weight of the sector within non-oil exports is in line with what has been reported by previous studies that highlight the technical and productive expansion of the Ecuadorian aquaculture industry. Indeed, research such as that of (Cruz, 2017) y (Tumbaco and Ruiz, 2024) They have documented the sector's ability to increase productivity through improvements in infrastructure, biosecurity, and density management. This is in line with the trend observed in this study, where production almost doubled in five years. However, this production increase did not always translate proportionally into higher exported value, due to the fall in international prices between 2023 and 2024. This behavior contrasts with what was reported by (Solano & Suárez, 2025), who argued that Ecuadorian productive growth generated relatively stable economic benefits. Recent evidence shows that this stability was not maintained in the face of a global scenario of oversupply, especially due to the aggressive productive expansion of countries such as India and Vietnam, which partially displaced Ecuadorian competitiveness through lower price strategies.

This diversity with respect to previous literature suggests that the relationship between production and profitability is not linear or automatic; on the contrary, it depends on the capacity of the international market to absorb larger volumes without affecting prices. In this sense, the fall in the average price between 2023 and 2024 represents a contradiction with the traditional assumption that an increase in Ecuadorian production always generates higher revenues. On the contrary, here there was evidence of an unfavorable price elasticity, consistent with what was reported by (Chimba, 2024), which warned that global oversupply would put downward pressure on prices.

With regard to the second objective investigated, the employment data confirm trends pointed out by national organizations such as the MPCEIP, which highlight the shrimp sector as one of the main generators of rural and coastal employment. In fact, the increase of approximately 40 thousand jobs in four years coincides with the reports of the National Chamber of Aquaculture, which identify a progressive territorial expansion of the sector. At the same time, it should be noted that, although employment increased, this growth was proportionally lower than the increase in production, therefore, this gap coincides and has been previously analyzed by (Ramíre et al., 2025), who argues that the progressive technification of the sector partially reduces the need for direct labor, especially in phases such as food, environmental control and harvesting. In this sense, the results of this study reinforce the hypothesis that the Ecuadorian shrimp sector is in a techno-productive transition, as a consequence: it produces more, generates more foreign exchange, but employment grows at a more moderate rate, which could reconfigure the socioeconomic structure of shrimp areas in the future.

Another crucial element in this analysis is the commercial dependence of the Chinese market. As the results indicate, between 52% and 60% of Ecuadorian shrimp exports during 2020 and 2024 went to that country. This concentration is consistent with previous research, such as that of (Ganchozo, 2023), who pointed out that China had become the main destination due to its enormous demand and preference for large shrimp, a characteristic in which Ecuador excels. However, this same pattern represents a structural vulnerability, as evidenced during the years 2023–2024, when health restrictions and economic slowdowns in China temporarily reduced demand. In this sense, the results coincide with previous warnings from organizations such as the FAO, which highlight the risk of over-reliance on a single market.

When comparing these findings with research from other producing countries, a significant similarity is observed. Such is the case of the study of Figueroa (2025) on India, here it is shown that dependence on few buyers also generated instability when the U.S. market reduced its imports

in 2023, in other words, this suggests that volatility due to commercial concentration is a global phenomenon within aquaculture, but in the Ecuadorian case it intensifies due to the relative weight that China has on the total exported. In summary, in this case the results of this study provide additional evidence to sustain that market diversification is not only a strategic recommendation, but a structural necessity for the economic stability of the sector.

Regarding the increase in production costs, especially the increase in the price of feed by up to 25%, this finding fully coincides with other studies such as that of Jumbo et al., (2023) and technical reports from other agencies that identify that inflation in food inputs responds to international factors, such as the increase in the cost of corn and soybeans, the increase in the cost of maritime transport and logistical interruptions after the pandemic. Indeed, this shows that the profitability of the sector depends not only on the international sales price, but also on internal variables that can erode profit margins. However, the coincidence between these results and previous studies reinforces the importance of analyzing the shrimp sector under a comprehensive cost approach, rather than a vision focused exclusively on exports.

Another point of special relevance is the impact of climate events, particularly the El Niño phenomenon between 2023 and 2024. In this case, research work in aquaculture such as that of Rodriguez & Orellana (2024) They have highlighted that sudden changes in temperature, salinity and oxygenation impact larval mortality and feed conversion, in fact, the results of this study are consistent with this evidence, confirming that climatic phenomena continue to be one of the main risk factors for productive stability. However, a notable difference from previous research is the magnitude of the recent economic impact, as today's larger production scale means that losses due to declines in feed efficiency are much higher in absolute terms than in previous decades. Ultimately, this suggests that climate risks have intensified in economic terms, even if the biological effects are similar to those documented historically.

Regarding environmental regulations and requirements, the findings coincide with studies such as that of (Kusactay & Avila, 2024), which warned that compliance with traceability, biosecurity and environmental sustainability standards implies additional costs for producers, especially for small and medium-sized producers. However, the present study adds an important nuance that states that the increase in these requirements occurred in parallel with a fall in the international price, which amplified the economic pressure on companies, although it is true that this phenomenon is not widely documented in previous studies, which makes this finding a pertinent contribution to the current discussion on competitiveness and sustainability.

From a theoretical perspective, all these results support the idea that the Ecuadorian shrimp sector operates under a model of high competitiveness but also high vulnerability, where resilience depends on factors such as commercial diversification, technification, cost optimization and ability to adapt to climatic phenomena, in short, this interpretation coincides with recent approaches to aquaculture economics that state that sustained growth requires a Integrated risk management, not just technological innovation.

CONCLUSIONS

- The general analysis carried out allows us to conclude that the Ecuadorian shrimp sector maintained a decisive role in the national economy during the period analyzed, having consolidated itself as the main generator of non-oil foreign exchange and as an engine of employment in coastal areas.

- It is determined that the evolution of production, exports and participation in foreign trade was marked by sustained growth supported by productive improvements and territorial expansion, although this growth did not always translate into equivalent increases in income due to the volatility of international prices.
- This sector contributed significantly to job dynamization and local development, especially in provinces highly dependent on aquaculture. It is also important to note that the rate of employment growth was lower than the rate of productive expansion, which indicates a gradual process of technification that transforms the labor structure and poses new challenges for the inclusion of local labor.
- In this period of study, the profitability of the sector was strongly conditioned by external factors such as global oversupply, dependence on the Chinese market, the increase in production costs and the climatic impacts associated with the El Niño phenomenon, in fact, these elements show that the competitiveness of the sector does not depend solely on its productive capacity, but of its resilience to commercial, environmental and logistical risks.
- Based on the results obtained from this analysis, the need to strengthen market diversification strategies, improve cost management and promote climate adaptation practices is highlighted. With respect to future research, it is recommended to deepen the analysis of profitability by productive segments, evaluate the social effects of the employment generated and develop econometric studies that allow a more robust understanding of the relationship between external factors and the economic performance of the sector.

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