

PRODUCTIVE SPECIALIZATION, EMPLOYMENT AND TRADE STRUCTURE: AN ANALYSIS FOR COLOMBIAN DEPARTMENTS IN THE LAST THREE DECADES OF GLOBALIZATION

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Abstract

Trade liberalization has been used extensively to promote regional competitiveness, productive specialization and employment. However, despite more than three decades of globalization and economic reforms, Colombia continues to experience significant regional disparities and a commercial system that is marked by the heavy reliance on the exportation of primary commodities. Hence, it makes one wonder whether the process of trade liberalization has truly fostered productive specialization and employment creation throughout Colombia's 32 departments. Consequently, this paper aims at establishing the connection between productive specialization, commercial system and employment creation within Colombia's 32 departments over the years 2002, 2012 and 2018. The study uses secondary data from the National Administrative Department of Statistics (DANE-GEIH) and employs the Location Quotient (LQ), Geographic Association Coefficient (GAC) and Employment Multiplier (EM). Also, regions that were very specialized were not necessarily those generating more employment, which suggests that the quality of specialization rather than the quantity matters. This paper makes an addition to the body of knowledge by bringing together the concepts of productive specialization, economic structure, and employment in a coherent regional framework, thus presenting findings on the differential territorial effects of globalization and policy implications for productive diversification and competitiveness in Colombia.

Keywords: *Location quotient; employment multiplier; productive specialization; Colombian departments; regional development; exports and imports.*

1. INTRODUCTION

Globalization has brought considerable changes in production organization, international trade, and regional development during the past three decades. Liberalization of trade, technological advances, and development of global value chains have encouraged countries to increase their participation in international markets with the expectation of improving productivity, competitiveness and creating employment opportunities (OECD, 2024). The impact of these changes, has been varied between countries and even regions, especially in developing countries, which have diverse productive structures. It has been shown recently that the impacts of globalization depend not only on openness but also on the ability of regions to diversify production and develop productive capacities.

Since the beginning of the 1990s, Colombia has implemented a broad process of economic liberalization through tariff reductions, deregulation, privatization, and the negotiation of numerous bilateral and multilateral trade agreements. These reforms sought to increase international competitiveness, attract foreign investment, and promote export-led economic growth. Although Colombia has achieved greater integration into global markets, important regional disparities continue to characterize its productive system, raising questions regarding the effectiveness of these

policies in promoting balanced territorial development.

Despite sustained trade openness, the productive structure in Colombia still has a high level of reliance on primary goods and limited diversification of manufacturing activities. According to Figure 1 in this research, Colombian exports consist of petroleum, coal, gold, coffee, bananas, and other agricultural goods, while the country's imports include manufactured and capital goods. These structural characteristics raise important questions regarding whether trade liberalization has generated productive specialization capable of strengthening regional employment and reducing territorial disparities.

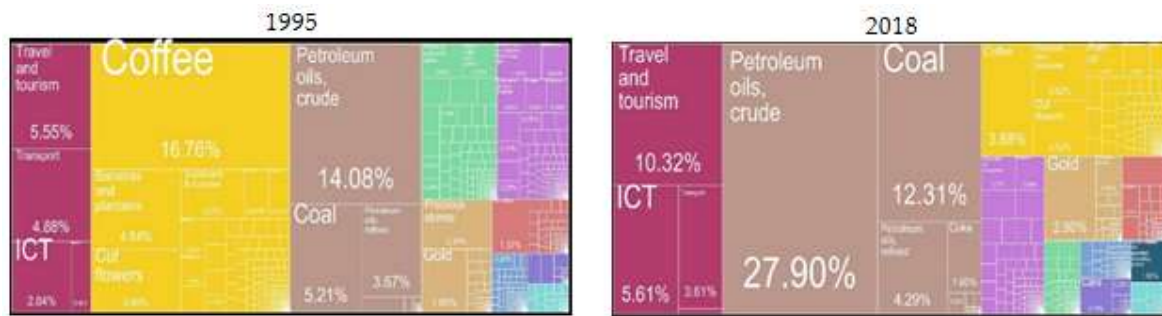


Figure 1 - Sectoral composition of exports 1995 and 2018

Productive specialization has long been recognized as a key determinant of regional economic performance because it reflects the concentration of economic activities in sectors where territories possess comparative or competitive advantages. At the same time, specialization influences industrial linkages, productivity, labour demand, and regional competitiveness. However, recent studies suggest that specialization in itself cannot ensure economic development. Instead, what really matters is the quality of specialization, productive capacities, and the potential for diversification towards advanced economic activities. In other words, productive specialization can be seen as an indication of economic development only when it leads to increased productivity and employment (Hidalgo, 2023; Stojkoski et al., 2023). It follows that the issue of productive specialization and employment has gained relevance.

The Colombian case is particularly relevant because important territorial differences persist in productive structures. The empirical evidence presented in this study indicates that agriculture, mining, construction, and commerce remain the principal specialized activities across many departments, whereas manufacturing specialization is concentrated in only a limited number of regions. In addition to this, while past researchers examined specialization, competitiveness, export performance and the labour market in Colombia, these have been analyzed either in isolation or sector/region-specific (Boschma, 2024; Coveri & Zanfei, 2023; Castro-Fajardo et al., 2025). Very little empirical information is available on the interconnection between the evolution of productive specialization, employment creation and the business structure in Colombia's 32 departments, after three decades of economic liberalization. This gap is particularly important because regional disparities remain one of key barriers to the productivity and economic growth in Colombia (OECD, 2024).

This study addresses this gap by examining productive specialization, job creation, and business structure among Colombia's 32 departments based on data from the National Administrative Department of Statistics (DANE) in 2002, 2012, and 2018. The indicators used include the Location Quotient, Geographic Association Coefficient, and Employment Multiplier in order to assess the productive structures and employment dynamics in light of globalization. Unlike previous studies, the paper integrates these complementary indicators to examine whether trade liberalization has helped diversify production and improve regional employment performance.

The paper has three important contributions. First, it provides a comprehensive regional assessment of

productive specialization and employment in all the departments of Colombia over a long period of economic liberalization. Second, it integrates commercial structure, productive specialization, and employment dynamics within a single analytical framework, which makes it a more comprehensive analysis of regional competitiveness. Finally, the results presented in the paper may be useful for designing policies to promote productive diversification and upgrading, and regional development. These contributions are especially important for developing countries in terms of globalization.

2. LITERATURE REVIEW

2.1 Globalization, Trade Liberalization and Regional Development

Globalization and liberalization of trade have been extensively advocated as tools for enhancing productivity and competitiveness through market integration and specialization. According to the classical theory of trade, trade barriers should be reduced to allow efficient use of resources based on countries' comparative advantage, leading to higher welfare (Luo, 2024). However, recent empirical literature has shown that the effects of globalization depend heavily on the productive capacities, institutions, and industrial structure of countries and regions, rather than being dependent only on the level of trade openness (OECD, 2024; UNCTAD, 2024). Recent empirical research increasingly question the traditional belief that trade liberalization is an inherent driver for regional development (Bsoul et al., 2025). Even though trade liberalization can encourage export and investment flows, regions that engage in resource-based industries see less of technology upgrade, industrial linkage, and job creation when compared with regions with diverse manufacturing industries (OECD, 2024).

Colombia serves as a relevant example in which these interactions can be explored. The country introduced wide-ranging trade reforms from the beginning of the 1990s, including reductions in tariffs and many Free Trade Agreements (FTA) such as: Andean Trade Preference Act (ATPA), subsequently Andean Tariff Preference Act and Drug Eradication Act in 2002 referred to as ATPDEA, some FTA of limited scope, for instance: CAN (1973, 1994), Panama and Chile (1993), Caricom and Mexico (1995), Cuba (2001), Mercosur (2005), Northern Triangle (2009), EFTA and Canada (2011), USA to increase international competitiveness and promote faster economic growth. However, the country's export structure remains specialized on petroleum products, mining products, and agricultural products and the imports are dominated by manufactures, showing that there has been no progress made in terms of structural transformation. This commercial structure brings up many questions about the efficiency of trade reforms concerning productive specialization and employment generation. Thus, the study of these interactions is vital to assess the country's development model (CEPAL, 2023; OECD, 2024).

2.2 Productive Specialization, Commercial Structure and Employment

The importance of specialization has long been regarded as a key determinant as one of the major drivers of the region's economic development, as it allows regions to focus their resources on sectors in which they have comparative or competitive advantage. According to traditional theories, the benefits from the development of specialization are provided by economies of scale, clustering of industries, and knowledge spillovers (Bekele & Jackson, 2006). Nevertheless, the results showed that the mere development of specialization is not enough for maintaining the region's competitiveness. The effectiveness of specialization in terms of regional development is defined by the type of specialized activities and their capacity to produce innovation, value creation and jobs (Boschma, 2021; Avila & Oliveira, 2024).

Previous studies showing that regions that specialize in technology-oriented manufacturing and knowledge-intensive industries have better rates of productivity growth and labor market performance (Boschma, 2021; Balland et al., 2022). Although specialization in mining and agriculture can result in a rise in exports in the short run, they tend to be characterized by weaker production linkages, spillovers and employment compared to the diversified manufacturing sector (OECD, 2024; UNCTAD, 2024). Commercial structure further influences this relationship because the composition of exports and imports reflects the productive capacity and competitiveness of an economy (Ahmad,

Haider, & Saed, 2025). Exports consisting primarily of primary goods tend to indicate low levels of development and susceptibility to outside shocks. Economies that tend to have higher levels of manufactured and value-added products in their exports tend to have higher productivity growth (Lopes et al., 2024; Stojkoski et al., 2023).

These structural problems are evident in the Colombian economy. According to the findings of this research, even after 30 years of trade liberalization, exports have continued to be dominated by oil, mining, coffee, banana, and other agricultural products, whereas the bulk of imports have been made up of industrial products. It implies that trade liberalization has not significantly altered the productive structure of Colombia. Another thing worth mentioning is that there are significant differences in specialization between departments; it implies that job creation is determined not only by the presence of specialized activities but also by the nature of their productive and commercial structure.

2.3 Evidence from Colombia and Latin America

Studies on the relationship between trade liberalization and regional development in Latin America demonstrate contradictory results as to the impact of trade liberalization on productive specialization and employment in the region. On the one hand, empirical literature has found that trade liberalization has positively affected export success and attracted FDI in the region (Lopes et al., 2024; OECD, 2024); on the other hand, the gains from trade liberalization have been unequally shared among regions due to differences in productive capacity, industry, and institutions in place (Lopes et al., 2024; OECD, 2024). It is argued that diverse productive economies tend to experience better economic and labour market results compared to economies specialized in primary production (Coveri & Zanfei, 2023; Balland et al., 2022).

However, in Colombia, the existing literature has mainly analyzed the themes of trade liberalization, competitiveness, exports, and labor markets independently from each other. For instance, Gallo et al. (2020) discovered that regional economic activity in Colombia is largely dependent on institutions and differences between regions, whereas Campi et al. (2024) proved that knowledge-based and creative industries promote the employment increase in territories. Additionally, Castro-Fajardo et al. (2025) suggested that the productivity specialization depending on factor endowments within regions may boost territorial competitiveness; however, the influence differs widely between departments.

Despite these contributions, however, there are various shortcomings in the literature. First, the majority of the studies concentrate either on the country's exports in general or certain industries in particular without giving a broad comparison between the departments of Colombia. Second, productive specialization is studied without taking into account the commercial structure and labor market effects associated with it. Third, relatively little research exists that analyzes the consequences of over 30 years of trade liberalization for productive specialization and labor markets.

2.4 Research Gap

Although previous studies have improved our understanding regarding globalization, trade liberalization, and regional development, several important gaps remain. First, although productive specialization, business structure, and employment have already been studied extensively separately, there is still little information about how they are interrelated to affect the economic performance of regions (Boschma, 2024; Coveri & Zanfei, 2023). Second, the few empirical works dedicated to Colombia are predominantly concerned with export performance or regional competitiveness or individual sectors, with very few being conducted from the regional point of view covering all 32 departments of the country (Castro-Fajardo et al., 2025). Third, with three decades of trade liberalization behind Colombia, the question of the effects of the shift in its business structure on productive specialization and employment has not yet been answered. The current research bridges these two gaps by bringing productive specialization, commercial structure, and employment

generation under one analytical umbrella. By applying LQ, GAC, and EM, it analyses changes in productive specialization of Colombia's 32 departments in the years 2002, 2012, and 2018.

3. METHODOLOGY

3.1 Research design

The research is conducted using a quantitative and longitudinal design which includes the following two elements. The first one involves an assessment of the structure of Colombia's foreign trade relations between 1995 and 2018, while the second consists in a regional science approach to the assessment of productive specialization and employment creation in 32 departments of Colombia in three comparable cross-sections that correspond to 2002, 2012 and 2018 years.

3.2 Data sources and sampling

Data on national-level trade flows (export and import structure by sector and product, 1995 and 2018) was provided by The Atlas of Economic Complexity, Growth Lab at Harvard University (www.atlas.cid.harvard.edu). Employment by department was acquired from the National Administrative Department of Statistics (DANE), specifically from Great Integrated Household Survey (Gran Encuesta Integrada de Hogares, GEIH) for the years 2002, 2012 and 2018 (Jawabreh, Masa'deh and Al-Fahmawee, 2025). Department (Capital District of Bogota is included with the department of Cundinamarca for the sake of comparability) is the unit of analysis, which consists of the full list of 32 Colombian departments: Amazonas, Antioquia, Arauca, Atlántico, Bolívar, Boyacá, Caldas, Caquetá, Casanare, Cauca, Cesar, Chocó, Córdoba, Cundinamarca, Guainía, Guaviare, Huila, La Guajira, Magdalena, Meta, Nariño, Norte de Santander, Putumayo, Quindío, Risaralda, Santander, Sucre, Tolima, Valle del Cauca, Vaupés and Vichada. Economy is structured into ten sectors: (1) Agriculture, hunting and raising of forestry and fishery products; (2) Mining and quarrying; (3) Manufacturing; (4) Electricity, gas and water supply; (5) Construction; (6) Wholesale and retail trade, restaurants and hotels; (7) Transport, storage; (9) Real estate, business and rental activities; and (10) Community, social and personal services.

3.3 Data Analysis

Three different but complementary ratios were computed based on the economic base approach method (Isserman, 1977; Hoover & Giarratani, 1984; Regional Studies, 2023; Morrissey, 2016).

Location Quotient (LQ). The location quotient is computed for all departments i and all sectors j by:

$$LQ_{ij} = (e_{ij} / e_i) \div (E_j / E)$$

where e_{ij} = employment in sector j in department i ; e_i = total employment in department i ; E_j = national employment in sector j ; and E = total national employment. If $LQ_{ij} \geq 1$, then sector j is classified as a basic (export-oriented) activity for department i , which means the department is more specialized in sector j than the country as a whole; and $LQ_{ij} < 1$ for non-basic (local) activities.

Geographic Association Coefficient (GAC). In order to calculate the level of resemblance in terms of the sectoral employment structure of department pair (department and national structure), the coefficient equals half the sum of absolute differences in percentages of sectoral employment structures:

$$GAC = \frac{1}{2} \sum |p_{ij} - p_{kj}|$$

where p_{ij} and p_{kj} are the percentage share of sector j in the productive structure of departments i and k , respectively. The higher the closeness to 0, the more similar the productive structures are; conversely, the closer the number is to 100, the more dissimilar they are.

Employment Multiplier (EM). Departmental employment is classified as basic employment (from sectors that have an LQ of 1 or above) and non-basic employment (balance). The formula for

calculating the Employment Multiplier is:

$$\text{EM} = \text{Total employment} / \text{Basic employment}$$

which is equal algebraically to the quotient of total and basic employment and tells us how many total employment (both basic and non-basic) is created per basic employment in the department. EM value shows that a higher EM means greater employment externalities within the department due to exports.

4. RESULTS

4.1 Colombia's Export and Import Composition, 1995–2018

Table 1 - Sectoral composition of exports 1995 and 2018 Source: The Atlas of Economic Complexity (www.atlas.cid.harvard.edu).

Sector	1995 (USD bn)	1995 Share (%)	2018 (USD bn)	2018 Share (%)	Variation (p.p.)
Agriculture	4.24	35.80	7.65	14.04	-21.75
Chemicals	0.88	7.47	3.61	6.63	-0.84
Electronics	0.09	0.79	0.43	0.79	0.00
Machinery	0.17	1.40	0.69	1.26	-0.13
Rails	0.33	2.77	1.43	2.62	-0.15
Minerals	2.79	23.57	25.38	46.59	+23.01
Other	-	-	0.57	1.05	+1.05
Services	1.68	14.17	10.73	19.69	+5.53
Precious stones	0.63	5.32	2.37	4.35	-0.97
Textiles	0.93	7.88	0.95	1.75	-6.13
Vehicles	0.10	0.83	0.66	1.22	+0.38
Grand Total	11.84	100.00	54.49	100.00	-

The growth between 1995 and 2018 in the Colombian exports is about 4.6 times; it increased from USD 11.8 billion in 1995 to USD 54.5 billion in 2018. However, there was a notable change in the structure of the export. For instance, the extractives sector (oil crude, oil products, coal and coke) saw an increase in its export share of more than 27 percentage points, services by 5.5 points, and agriculture decreased by 21.7 points and textiles by 6.1 points. Those sectors that require greater technology sophistication, for example, machinery, chemicals, and electronics have not increased their exports share and even seen a decline in some instances despite the trade liberalization agenda. On the other hand, Imports have grown almost five-fold from 1995 to 2018 from USD 15.7 billion to USD 64.0 billion, shown in table below.

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Table 2 - Sectoral composition of Imports 1995 and 2018 Source: The Atlas of Economic Complexity
(www.atlas.cid.harvard.edu).

Sector	1995 (USD bn)	1995 Share (%)	2018 (USD bn)	2018 Share (%)	Variation (p.p.)
Agriculture	1.80	11.49	7.60	11.87	+0.38
Chemicals	2.59	16.51	10.19	15.92	-0.59
Electronics	1.24	7.90	4.89	7.65	-0.25
Machinery	2.62	16.69	7.50	11.72	-4.97
Rails	1.27	8.09	3.67	5.73	-2.36
Minerals	0.52	3.33	4.34	6.79	+3.45
Other	-	-	1.65	2.58	+2.58
Services	2.86	18.21	14.89	23.27	+5.06
Stone	0.20	1.26	0.59	0.93	-0.34
Textiles	0.75	4.78	3.24	5.07	+0.29
Vehicles	1.84	11.73	5.43	8.49	-3.25
Grand Total	15.70	100.00	64.00	100.00	-

The net impact of these trends is structural worsening of the trade balance deficit: exports accounted for 11% of GDP in 1995 and just 13% in 2018.

Table 3 - Location Quotient (CL) of Colombian departments 2002 vs. 2012 and 2018 - based on Avila and Oliveira (2024)

Cuentas Nacionales de Productos y Servicios (2021)																																																												
Sectores económicos	1. Agricultura, ganadería, caza, silvicultura y pesca						2. Explotación de minas y canteras						3. Industria manufacturera						4. Construcción de Edificios y Obras de Ingeniería y Agua						5. Construcción						6. Comercio, hoteles y restaurantes						7. Transportación, almacenamiento y comunicaciones						8. Información y comunicaciones						9. Actividades financieras, inmobiliarias y de seguros						10. Otros servicios					
Departamento	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018	2002	2012	2018																					
AGUAFUERA	1.06	1.66	1.82	0.00	0.00	0.00	0.32	0.36	0.32	1.40	1.45	1.84	1.10	0.88	1.23	1.21	1.20	1.06	1.22	1.12	1.34	0.55	0.56	0.51	0.70	0.49	0.34	1.22	1.41	1.48																														
AMAZONAS	0.68	0.82	0.78	0.24	0.43	0.27	1.29	1.35	1.26	1.24	1.17	1.15	1.05	1.01	1.12	0.92	0.93	0.97	0.94	0.83	0.84	0.97	0.94	1.02	0.91	0.97	1.03	0.92	0.93																															
ANTIOQUIA	2.93	4.61	3.07	3.14	4.55	6.20	0.25	0.23	0.25	1.00	1.11	2.67	1.73	1.40	1.35	1.09	1.03	1.12	1.19	1.01	0.74	0.33	0.33	0.74	0.98	0.69	0.54	1.08	1.25	1.30																														
ARMENIA	0.32	0.43	0.33	0.67	0.15	0.47	1.01	1.00	0.99	1.75	1.30	1.00	1.07	1.19	1.16	1.11	1.05	1.07	0.95	1.13	1.17	0.70	0.92	0.30	0.33	0.73	0.74	0.94	0.95	0.97																														
BOYACA	1.23	0.55	0.66	0.41	2.79	0.91	0.70	0.70	0.79	1.79	1.70	1.11	1.33	1.31	1.21	1.08	1.00	0.98	1.24	1.46	1.70	0.74	0.53	0.93	0.66	0.72	0.76	1.05	1.06	1.03																														
BRAVITA	0.94	1.17	1.49	1.80	0.95	1.70	0.56	0.35	0.40	2.12	2.17	1.30	1.43	1.21	1.26	1.00	1.00	0.95	1.17	0.39	0.93	0.95	0.93	0.94	0.72	0.77	1.22	1.51	1.47																															
BUNO	1.92	1.27	1.21	0.73	0.90	0.82	1.02	0.99	1.10	2.16	2.31	1.68	1.03	0.96	1.11	0.95	0.93	0.97	0.91	0.36	0.79	0.70	0.81	0.69	0.94	1.07	1.17	1.06	1.12	1.08																														
BUNO	1.63	1.40	1.62	0.60	0.07	0.08	0.44	0.31	0.47	1.61	1.47	1.48	1.15	1.26	1.12	1.15	1.14	1.13	1.20	1.16	1.22	0.33	0.32	0.70	0.74	0.58	0.59	1.17	1.22	1.24																														
BUNO	1.41	2.23	3.31	7.58	6.76	7.15	0.23	0.37	0.34	1.20	1.22	2.27	2.16	1.79	1.11	1.15	1.14	1.22	1.10	0.98	0.81	0.31	0.31	0.70	1.24	0.87	0.68	0.68	1.02	1.04																														
BUNO	1.22	1.81	1.64	0.57	0.50	0.50	0.46	0.46	0.46	1.30	1.39	1.27	1.42	1.05	1.00	1.07	1.07	1.08	1.21	1.13	1.04	0.54	0.67	0.79	0.94	0.79	0.79	1.21	1.23	1.31																														
BUNO	1.48	1.64	1.40	3.33	1.41	1.24	0.46	0.70	0.69	1.14	1.11	1.01	1.33	1.06	1.06	1.10	1.20	1.13	1.47	1.21	1.17	0.70	0.68	0.68	0.74	0.55	0.56	1.07	1.06	1.17																														
BUNO	2.42	0.84	1.22	0.48	7.38	5.75	0.31	0.36	0.35	1.61	1.57	1.23	2.10	1.42	1.55	0.90	1.02	0.90	1.12	1.47	1.36	0.70	0.68	0.68	0.74	0.55	0.56	1.07	1.06	1.17																														
BUNO	1.79	1.27	1.31	0.83	0.78	0.80	0.60	0.70	0.71	1.14	1.24	1.06	1.13	1.00	1.07	1.12	1.08	1.07	1.04	1.10	1.10	0.45	0.78	0.85	0.85	0.85	1.19	1.26	1.24																															
BUNO	0.74	0.71	0.69	1.07	1.09	1.05	1.03	0.99	1.01	0.94	0.96	0.76	0.87	0.92	0.83	0.91	0.99	0.91	0.91	0.97	0.97	1.39	1.36	1.37	1.33	1.29	1.31	1.04	1.01	1.00																														
BUNO	4.94	7.29	68.73	1.95	1.64	1.63	0.21	0.31	0.34	1.57	1.61	1.79	1.41	1.13	1.32	0.81	0.81	0.84	1.04	0.89	1.15	0.54	0.55	0.55	0.51	0.51	0.51	1.53	1.77	1.53	1.77	1.51																												
BUNO	3.27	5.45	731	0.54	0.43	2.30	0.33	0.33	0.47	2.13	2.13	0.90	0.90	1.16	1.24	1.20	0.80	0.75	0.59	0.59	0.68	0.41	0.64	0.45	0.34	0.64	0.45	0.34	1.20	1.30	1.30																													
BUNO	1.17	1.05	1.19	2.42	1.21	1.76	1.10	0.98	1.08	0.31	1.21	1.30	0.91	0.93	0.93	1.21	1.24	1.22	0.94	1.12	0.94	0.55	0.71	0.66	0.50	0.53	0.64	0.87	0.83	0.80																														
BUNO	2.90	4.57	0.83	2.97	2.62	1.08	0.20	0.23	0.27	1.82	1.85	0.67	1.42	1.15	1.00	0.99	0.68	0.70	1.32	1.12	1.11	0.27	0.27	0.44	0.35	0.25	0.13	1.81	2.00	2.31																														
BUNO	2.13	2.97	2.74	0.50	0.54	0.11	0.67	0.67	0.73	1.83	1.82	1.84	1.00	1.05	1.10	0.98	1.11	1.14	1.11	0.83	0.89	0.75	0.87	0.79	1.12	1.01	0.89	1.12	1.04	1.00																														
BUNO	2.00	1.63	2.43	0.50	0.33	0.30	1.09	1.11	1.00	0.97	0.79	0.90	1.16	0.87	1.00	1.06	1.08	1.04	0.84	0.86	0.82	0.86	0.67	0.64	0.97	0.95	0.91	0.94	0.94	0.96																														
BUNO	1.47	1.94	1.63	1.16	1.08	1.13	1.21	1.19	1.15	0.75	1.07	0.86	0.73	0.95	0.90	1.02	1.00	1.02	1.07	1.04	1.05	0.99	0.83	0.71	0.75	0.90	0.91	0.90	0.87	0.93																														
BUNO	1.03	1.60	1.55	0.10	0.23	0.35	0.51	0.70	0.76	1.31	1.27	1.18	1.12	1.02	1.13	1.21	1.16	1.13	1.62	1.36	1.32	0.44	0.58	0.60	0.65	0.74	0.74	1.01	1.10	1.11																														
BUNO	2.25	2.01	2.29	0.26	0.66	1.00	0.99	0.88	0.90	1.05	1.12	1.33	0.82	1.00	1.00	1.11	1.13	1.06	0.95	0.95	0.89	0.69	0.75	0.84	0.68	0.81	0.83	0.96	0.96	1.04																														
BUNO	0.59	0.79	0.77	0.22	0.14	0.37	1.03	1.10	1.13	0.83	1.06	0.89	0.96	0.87	0.90	1.03	1.04	1.04	0.98	0.96	0.85	0.95	0.91	0.90	0.93	0.95	0.96	0.97	0.95	0.98																														
BUNO	1.35	2.12	1.49	3.17	2.30	0.63	0.31	0.35	0.25	1.25	1.28	2.48	1.73	1.38	1.40	1.00	1.00	1.00	0.70	0.60	0.46	0.46	0.47	0.58	1.05	0.74	0.69	1.40	1.61	1.56																														
BUNO	5.87	9.26	6.48	0.59	0.52	0.00	0.28	0.32	0.25	2.13	2.17	2.13	1.67	1.33	0.95	0.94	0.83	1.10	1.05	0.90	0.76	0.31	0.31	0.61	0.69	0.49	0.34	1.36	1.56	1.64																														

4.3 Sectoral specialization across Colombian departments (Location Quotient)

Location Quotient was computed for each of the ten sectors of economic activity in all 32 departments for the years 2002, 2012 and 2018. An economic sector with $LQ \geq 1$ is said to be a basic (specialized/export-oriented) economic activity of the department (Darwish et al., 2025).

Agriculture, Livestock, Hunting, Forestry and Fishing. The Agricultural Sector has been an essential economic activity in 25 departments in both 2002 and 2012; they were Amazonas, Arauca, Boyaca,

Caldas, Caqueta, Casanare, Cauca, Cesar, Cordoba, Guainia, Guaviare, Huila, La Guajira, Magdalena, Meta, Nariño, Norte de Santander, Putumayo, Quindio, Risaralda, Santander, Sucre, Tolima, Vaupes, and Vichada. The highest location coefficient was obtained for Guainia, which was 7.79 in 2012 and increased to 10.73 in 2018.

Mining and quarrying. In 2002, fourteen departments had $LQ \geq 1$, and in 2012 fifteen departments, namely Arauca, Bolivar, Casanare, Cesar, Choco, Cundinamarca, Guainia, Huila, La Guajira, Magdalena, Meta, Norte de Santander, Putumayo, Santander, and Vaupes. In 2018, mining emerged as a basic activity in Boyaca, Cordoba, Guaviare and Tolima but no longer remained a basic activity in Bolivar and Vaupes. The LQs of highest values for the years 2012 and 2018 were observed in La Guajira and Casanare (values 5.99 and 7.47, respectively in 2012; 6.7 and 7.15, respectively in 2018). This was due to royalty system applied to coal and oil. Manufacturing. In the years 2002, 2012, and 2018, manufacturing was a basic activity in only eight out of thirty-two departments in Colombia, i.e., Antioquia, Atlantic, Caldas, Cundinamarca, Norte de Santander, Risaralda, Santander and Valle del.

Overall pattern across sectors. In 2018, the Construction sector was a basic activity in 27 out of the total 32 departments, which made it the most broadly-based specialization engine, with Financial Intermediation and Real Estate, Business and Rental Activities as basic activities in 2 and 3 departments, respectively. Departments specialized in the maximum number of industries (Cesar, Córdoba, Huila and La Guajira (specialization in 7 out of 10 industries)) exhibited low employment generation capacity (refer to section 4.4), but Valle del Cauca specialized in the minimum number of industries (3 out of 10) showed the second highest employment multiplier in the country. Among the eight newly formed departments post 1991 (Amazonas, Arauca, Casanare, Guainia, Guaviare, Putumayo, Vaupes and Vichada), Casanare was specialized in the maximum number of industries (6 out of 10), whereas Putumayo and Vichada were specialized in the minimum number of industries (4 out of 10).

4.4 Employment Multiplier across departments

Table 4 - Employment multiplier for the departments of Colombia 2002 vs. 2012 and 2018.

Cod. DANE	Departamento	Multiplicador de empleo		
		2002	2012	2018
91	AMAZONAS	4,52	4,30	4,23
5	ANTIOQUIA	15,90	14,95	16,98
81	ARAUCA	4,89	4,87	4,36
8	ATLÁNTICO	22,50	21,42	5,02
13	BOLÍVAR	4,78	4,78	4,97
15	BOYACÁ	4,55	4,99	5,11
17	CALDAS	4,94	4,88	14,73
18	CAQUETÁ	4,74	4,63	4,96
85	CASANARE	6,33	5,25	4,80
19	CAUCA	5,68	5,23	5,44
20	CESAR	4,36	4,75	4,87
27	CHOCÓ	4,00	4,00	4,00
23	CÓRDOBA	4,72	4,61	5,01
25	CUNDINAMARCA	6,67	4,87	18,98
94	GUAINÍA	3,53	3,29	3,33
95	GUAVIARE	3,69	3,73	3,63
41	HUILA	5,31	5,49	5,75
44	LA GUAJIRA	4,47	4,42	4,29
47	MAGDALENA	5,21	5,07	5,43
50	META	4,48	4,87	5,62
52	NARIÑO	4,36	4,54	5,45
54	NORTE DE SANTANDER	4,04	4,04	11,74
86	PUTUMAYO	2,79	2,87	2,76
63	QUINDÍO	5,62	5,50	5,39
66	RISARALDA	20,46	20,37	21,90
68	SANTANDER	21,59	22,01	26,28
70	SUCRE	4,32	4,35	4,52
73	TOLIMA	5,03	5,03	5,56
76	VALLE DEL CAUCA	18,35	19,03	20,98
97	VAUPÉS	5,93	4,19	4,16
99	VICHADA	3,16	3,40	3,66

Table 4 contains values of Employment Multiplier in selected departments for years 2002, 2012, and 2018. The highest values of Employment Multiplier belong to the Santander department in all considered periods, starting with 21.69 in 2002 to reach 26.28 in 2018, which means that in 2018 each unit of basic employment in Santander generates twenty-six units of non-basic employment (the percentage of basic employment constitutes about 27%, while the non-basic one constitutes 73% in total). Santander is followed by Risaralda, Valle del Cauca, and Antioquia departments with relatively high values of Employment Multiplier in all three considered periods. The most significant increase in Employment Multiplier was seen in the Cundinamarca department (Capital District, Bogotá) from 4.87 in 2012 to 18.98 in 2018, while the second place is taken by Caldas and Norte de Santander. On the other hand, Atlántico experienced the biggest decrease in Employment Multiplier from 22.5 in 2002 to 5.02 in 2018. The last 23 departments had multipliers below 5, while the 8 departments after 1991 had the worst record of job creation; Putumayo had the smallest multiplier for all years in Colombia (2.79 in 2002, 2.87 in 2012, and 2.76 in 2018), meaning that each basic job created less than three new jobs.

5. DISCUSSION

The study sought to determine whether three decades of trade liberalization has promoted productive specialization and employment generation in Colombia's 32 states based on productive specialization based on the Location Quotient (LQ), employment generation based on the Employment Multiplier (EM) and changes in the commercial structure of the country. The results reveal that although there was considerable economic liberalization, structural change did not occur significantly in Colombia. While trade liberalization led to greater international integration, the country's commercial structure is still characterized by primary commodity exports and imported goods that are manufactured and technology-based. It can therefore be concluded that trade liberalization has not been enough to promote productive diversification or industrial upgrading in line with recent literature that highlights that benefits of globalization hinge on productive capabilities (Brondino et al., 2023; Bustos, 2025; OECD, 2025).

Sectoral analysis also shows that productive specialization is mainly found in agriculture, mining, and construction, but manufacturing was a specialized industry in only a few departments during the study period. The results are consistent with other studies that argue specialization in resource-based industries causes less technological spillover and value addition compared to specialization in manufacturing and knowledge-based industries (Freitas et al., 2025; Brondino et al., 2023).

On the other hand, the employment multiplier analysis shows significant differences among regions. Santander, Valle del Cauca, Risaralda, and Antioquia are some of the departments that recorded high employment multipliers, while many resource-based departments had low employment multipliers in spite of their high specialization. Cesar, Córdoba, Huila, and La Guajira are some of the departments with specialization in many industries but low employment effects. On the other hand, Valle del Cauca recorded one of the highest employment multipliers in spite of its specialization in relatively few sectors.

The main contribution of the paper to the existing literature is that it analyzes the impact of trade liberalization on the region from the perspective of productive specialization, business organization, and employment generation. Contrary to earlier studies on Colombia that have focused on analyzing each of these aspects in isolation, the present research proves that there were no similar impacts of trade liberalization on regional development across regions

6. CONCLUSION

In this paper, the process of development of productive specialization, business organization, and job creation in Colombia's departments through the past three decades of globalization has been examined. The study demonstrates that trade liberalization has led to higher levels of economic integration; however, trade liberalization did not lead to changes in the structure of production in

Colombia. The export sector still relies on primary products, manufacturing specialization is present in just some departments, and employment creation varies across regions. It was shown that the effectiveness of employment creation in the regions is influenced not only by the presence of productive specialization but also by the structure of productive activities and their competitiveness.

7. POLICY RECOMMENDATIONS

There are several policy implications of the findings of this study. To begin with, there is need for the adoption of an industrial policy that will emphasize the importance of productive diversification in industries such as manufacturing, and technology that have a lot of employment opportunities. Secondly, there is need for region-specific development policies since every department has different productive features and comparative advantage from the others. Lastly, there is need for the export promotion policies to be directed towards increasing the proportion of value-added manufactured goods.

8. LIMITATIONS

The research has multiple limitations. Firstly, the research uses only three cross-sectional periods, namely 2002, 2012, and 2018, which might be inadequate to trace the annual dynamics of productive specialization and employment. Secondly, the research uses mainly Location Quotient and Employment Multipliers measures that identify the patterns of regional specialization but cannot prove any causality (Alzu'bi et al., 2024). Thirdly, the research examines the data only at departmental level and does not take into account the firms' behavior, institutions, innovation capabilities, and technology adoption.

9. FUTURE RESEARCH

Further research could expand on this paper through the use of panel data econometrics to analyze the impact of productive specialization and trade liberalization on employment within Colombian departments. Further research could also utilize variables such as innovation, human capital, institutional quality, foreign direct investments, and infrastructure as factors that help explain the productive performance within regions. Comparative research using Latin American nations would increase knowledge about how globalization and productive specialization impact regional employment and economic development.

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