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ALEXANDER BLANDÓN LÓPEZ
GUSTAVO ADOLFO RUBIO-RODRÍGUEZ
GERARDO PEDRAZA VEGA

Competitive insertion of the citrus-lemon chain in global value chains in Colombia

Alexander Blandón López, Ph.D.,
Faculty of Economics and Administrative Sciences, University of Tolima, Colombia,
ORCID: 0000-0002-3998-337X.

Gustavo Adolfo Rubio-Rodriguez, Ph.D.,
Public Accounting Program,
University Corporation Minute of God, Colombia,
ORCID: 0000-0002-6582-2481.

Gerardo Pedraza Vega
Research coordinator,
University Corporation Minute of God, Colombia,
ORCID: 0000-0001-8691-5890.

1. Introduction

Public policy to promote the achievement of sustainable development objectives, particularly those related to the significant reduction of poverty and the productive and social inclusion of vulnerable sectors of the population, many of which are located in rural areas, in the context of systemic competitiveness and global value chains (GVCs), goes beyond the local level and becomes a network task that integrates the efforts of local, national and international agents and actions at different levels (Partida and Meza, 2017). An important starting point for improving the potential for insertion of small and medium agricultural producers in the GVC is sub-national regional integration based on strategies such as the Special Administrative Planning Region (SAPR).

A SAPR is an associative scheme of Territorial Planning, normatively recognized in Article 325 of the Political Constitution of Colombia and Law 114 of 2011 (Organic Law of Territorial Planning -LOOT-) as a planning instrument at regional level, since it allows the

integration of a region with other departmental territorial entities. A few years ago, Law 1962 of June 28, 2019 was issued, which strengthens the administrative planning regions (RAP) and establishes the conditions for their conversion into a territorial entity region. Among its functions, the RAPs will be able to manage co-financing resources from the different levels of government, international cooperation and promote public-private partnerships for the development of strategic projects of the Administrative and Planning Region.

The SAPR Central Region is made up of the departments of Boyacá, Cundinamarca, Meta, Tolima and the central administration of Bogotá. In the context of the opening of markets and the internationalization efforts of the Colombian economy, this subregion is crucial because of the large size of its market, the magnitude of its agricultural sector, as well as the potential for productive linkages and the possibilities for commercial, financial and tourism exchanges of the different departments that are part of it. This research aims to identify the synergies that exist between the linkage of the department of Tolima in the Special Administrative and Planning Region of Colombia, from a meso-economic perspective, and the potential for the insertion of the citrus-lemon crop of Tolima in the GVC, leveraged on the opportunities offered institutionally by this associative model.

The results show that the potential for competitive insertion of the lemon produced in the department of Tolima in the GVC, through scaling up to larger and more complex territorial units such as those offered by the SAPR regional associativity model, is quite broad in terms of the presence of economies of scale and greater institutional density. Thus, this regional integration facilitates more focused technical support from institutions such as the Colombian Agricultural Institute (ICA), the attraction of national demand for lemons, such as the Family Welfare and the country's prisons through public procurement law projects.

In conclusion, potential international markets have been identified, such as Canada and Russia, which are prospectively a great opportunity for improvement for lemon producers. However, it is first necessary to overcome major threats and weaknesses that currently hinder such insertion, such as the lack of knowledge of farmers about the SAPR figure in relation to sources of financing for the crop, among other determining aspects that are detailed in the model.

2. Literature review

From the literature review on the inclusion of small and medium-sized producers in GVCs, authors have identified the disadvantages and limitations

of local producers in joining GVCs (Arias and Suárez, 2016). These studies generally highlight that insertion in the GVC has allowed the inclusion of some small and medium-sized producers, while generating the exclusion of those with lower financial, technical, technological and productive capacities. The latter, on the margins of the GVCs, manage to sell their product in other channels under unfavorable conditions (Meyer-Stamer, 1998). The limitations of local producers in their attempt to link up with GVCs are explained by aspects such as low volumes and heterogeneity in the quality of production among the different farming units, financing difficulties, and lack of specialized marketing companies, which are necessary to the extent that exports demand investments in different areas, which is hardly within the reach of small producers as individual units (Perea, 2015).

In relation to the particular case of studies in the lemon-citrus area, Aguilar *et al*. (2012) show the panorama of citrus in Colombia, through an analysis of the citrus sector in the international and national market. They identify limitations to the development and competitiveness of the chain, such as the lack of strong international partners, the high dispersion of production, and the low degree of associativity among producers, which, together with the absence of an agribusiness culture, limit access to credit and technical assistance. In addition, there is no integration between industry and agriculture; research and technology transfer (development of varieties and qualities) is insufficient; and greater efforts are needed to prevent pests and diseases. It is also considered that citrus producers in Colombia are at an underdeveloped stage that limits the possibility of competing with other producers in Latin America.

Fernández-Lambert *et al*. (2015) identify the problems of supply, operation and distribution of the Persian lemon supply chain in the districts that make up the state of Veracruz (Mexico). The results of the study show the structural problems of the Persian lemon supply chain, which are centered on the low productivity of the orchards, the excessive level of intermediation between farmers and export centers, the low adoption of technology or the use of rudimentary technology in the processes of harvesting and packing of the citrus fruit. In general, the background information consulted reveals that the insertion of traditional production systems in GVCs often takes place from business organizations, particularly through cooperative organizations and producer associations that focus on overcoming the factors that limit their access to more demanding markets in the international context.

Regarding the latest trends related to the development of supply chains, it was found that the fourth industrial revolution strengthens the management of

communication between all areas of the company, without leaving behind the management of the supply chain that acquires the ability to adapt to changes in the consumer environment in real time, by seamlessly fostering the exchange of information not only from the manufacturer, but also from the machine through artificial intelligence (Bustamante, 2021). Faced with this imposing reality, companies will be forced to make a quantum leap in enterprise resource planning systems, in relation to the way they have been doing things inside and outside the value chain of the company, so that they must redesign their business models or at least the strategies to follow framed in an omnichannel e-business model that facilitates interaction and collaboration between man and machine.

Likewise, the arrival of the fourth industrial revolution gives rise to the transformation of organizational and control models, as the product life cycle and manufacturing systems are supported by information technologies, which modifies supply chain management practices within the framework of the global economy of the 21st century (Maruri-Avidal and Torres-Rivera, 2019). When making a change in the way of selling, buying, managing, producing and transporting, it is also necessary to make a shift according to the channel of processes. Different researches have examined several independent topics in supply chain management related to sustainability such as: green logistics strategies, green purchasing, management systems and green material, demonstrating the continuous cyclical changes for the supply chain (Cruz-Mejía and Bustamante-Delgadillo, 2023).

In addition, trade disruption as a result of difficulties in supply chains has deepened the conflicts of economic globalization: borders closed due to the pandemic (Locke *et al.,* 2022); ships stopped due to the accident in the Suez Canal, trade war between the United States and China, the cessation of supplies in Eastern Europe due to the Russian invasion of Ukraine, among others, where geopolitics has been the triggering factor of these supply complications that have affected consumers and workers around the world (Hernández-Leal *et al.,* 2022). Rowsell (2022) explains that due to Russia's war against Ukraine, global supply chains collapsed over access to commodities. Before Russia invaded Ukraine, the latter was accused of aggravating Europe's energy crisis, but with the COVID-19 disruptions this crisis worsened, so much so that energy decisions and food supplies drove up prices.

On the other hand, the theoretical perspective of the research is based on two fields of literature, systemic competitiveness and GVCs. The two theoretical approaches are related and complementary for the development of studies that explore policy initiatives that promote poverty reduction and social inclusion

through the insertion of the most vulnerable agricultural producers into the formal circuits of the value chain in the international context.

It is also important to point out that the local and regional levels represent the territory in which agroindustrial GVCs, whose governors are located in the most developed countries, connect with agricultural producers in developing countries. Thus, attracting the governors of the value chain, encouraging market relations to give way to long-term relationships based on trust, taking advantage of the opportunities offered by trade and ensuring significant improvements in quality of life, is a task that involves different actors not only at the regional level but also at the national and international levels, whether they are large buyers, public sector entities, NGOs or international organizations.

The expected impacts on development because of the inclusion of small agricultural producers in agro-industrial GVCs depend specifically on two aspects: the terms of participation in the inclusion process and the degree of alignment of value chain logics with the capacities of actors and institutions integrated into territorial business systems (Helmsing and Vellema, 2011; Muñoz and Viaña, 2012). Indeed, the access of agricultural producers in developing countries, particularly small producers to world markets, in the context of the GVC, is conditioned by an accumulation of entry barriers derived from existing standards and other regulations that can sometimes, but not always, derail aspirations to be included in the value chain circuit with negative implications for the employment of unskilled labor (Kaplinsky and Morris, 2018).

With regard to the systemic competitiveness approach, it should be noted, as stated by Esser *et al.* (1996), that competitiveness is not a purpose or task that is the sole responsibility of companies, but that it is achieved through the dynamic interaction of various actors and levels. First, the meta level associated with the quality of the institutional framework, the coordination capacity of society and the collective vision or image of the shared future to be achieved. Second, the macro level, which has to do with the achievement of a stable and predictable performance of the large economic aggregates that reduces the levels of uncertainty faced by the different economic actors throughout the national geography (prudent monetary, fiscal, exchange rate and foreign trade management). Third, the meso level, associated with the sectoral and regional level, where competitiveness is promoted through policies and institutions such as education, technology, infrastructure, technological development centers, local development agencies, the generation of a favorable environment for companies, and finally at the micro level with an important impact on business productivity, through schemes such as business networking, and

from actions that impact on the organization of three fundamental aspects of the company: production, product development and supply relationships (Meyer-Stamer, 2002).

The main dimensions of the GVC are considered in the study, starting with the value chain geography, the input-output structure, governance, and institutions. At the same time, important elements such as barriers to entry, rents and upgrading are incorporated (Gereffi et al., 1994). The main conceptual pillars of the GVC analytical framework, are the governance structure and the trajectories of upgrading or economic upgrading (Gereffi, 2019). The former describes the authority and power relations established during the coordination process along the value chain, which affect the way in which human, material and technical resources are allocated, and the way in which value added is distributed among its members during the process (Gereffi, 1994).). Economic upgrading in GVCs embodies the outcome of efforts undertaken by businesses, countries, or regions to improve their economic performance by changing to higher value-added activities in their participation in global production processes (Fernandez-Stark and Gereffi, 2019).

The value chain as defined by Kaplinsky and Morris (2001, p.4) is related to "the full range of activities required to take a product or service from conception, through the different phases of production, delivery to final consumers and final disposal after use". In other words, both agricultural producers, industrialists and marketers and their associations, as well as those responsible for public policy, must overcome the compartmentalized sectoral vision and approach to economic activity and give way to a value chain vision, which includes the different links involved in the production of a final good from the idea, through the supply of inputs and services such as seeds, fertilizers, technical assistance for agricultural production, its procurement and industrial transformation, its marketing and consumption. These processes involve adding value at each stage to the final product, resulting from the use of factorial services and logistical activities that promote linkages.

The value chain, conceived at the local-regional, national and global levels, is an important space for small and medium-sized agricultural producers in chains such as the citrus chain, in order to improve their economic conditions through the technical, economic and governance relationships that exist between the links throughout its geography. The GVC has a predominant role for the governors, the large buyers, whom the agricultural producers should ideally identify and reach, in order to know, implement and adequately comply with the standards set directly by them, or through organizations that represent them, as well as

to benefit from the incentives associated with their compliance, including the establishment of lasting relationships over time with the possibility of updating or improving products or processes. (Kaplinsky and Morris, 2018).

In short, public policies oriented through the systemic competitiveness approach find in the GVC framework an important complement to, from the multiple coordinated actions at the different levels of competitiveness, promote the insertion of small and medium agricultural producers from their regions in the GVC, sponsoring and facilitating the attraction and permanence of large global buyers in the territory. The pending task is to help overcome the problems encountered by small and medium-sized producers, such as citrus producers in the case of Tolima, in linking up with and sustaining themselves in the GVC.

3. Materials and methods

This research is developed from a mixed approach (qualitative-quantitative); it incorporates the collection of documentary information and literature review, as well as the use of field instruments to determine the main factors that characterize the fundamental opportunities for the consolidation of a profitable and sustainable value chain of the citrus-lemon sector in Tolima, through the institutional context of the associativity model region SAPR plan. In turn, the research is exploratory, descriptive and correlational, given that it is useful "when the objective is to examine a little studied or novel topic" (Hernández *et al.,* 2014, p.91), where the researcher's interpretation with the use of the state of the art and theoretical references provide support for the construction of knowledge.

3.1. Sample size

The research uses a stratified sampling by fixed proportions to the population under study (152 lemon producers in the municipalities of Flandes, Coello, Guamo, San Luis and Saldaña, which are part of the department of Tolima, Colombia), taking into account a confidence level of 95% and a margin of error of 8%, explained by the difficulties in terms of access to the areas and meeting points with each of the farmers. Thus, Table 1 shows a total sample size of 76 farmers located in each of the municipalities with a participation for each of the strata of 50%.

A pilot test was also conducted with twelve producers to determine the reliability of the structured questionnaire. For this purpose, Cronbach's Alpha was calculated in the SPSS statistical software, which indicates the degree of

reliability of the questionnaire analyzed (numerical coefficient between 0 and 1); the closer Cronbach's Alpha is to 1, the greater the reliability of the questionnaire. The coefficient was 0.683, so it is concluded that the questionnaire is reliable and the results obtained will be consistent in different applications.

Table 1. Sample for each of the defined municipalities

Municipality	Number of farmers producing lemons	Stratified sample
Flandes	23	12
Coello	5	3
Guamo	51	26
San Luis	58	29
Saldaña	15	6
Total	**152**	**76**

Source: own study

3.2. Analysis and presentation of the information

The statistical analysis was based on the identification, characterization and analysis of the lemon producers of Tolima, by means of an Exploratory Data Analysis (EDA), which made it possible to characterize the population studied in terms of frequencies of response to the questions of the instrument and other descriptive and correlation statistics, with the purpose of knowing in a few dimensions the state of the problem investigated (Martin *et al.*, 2007); that is, the degree of perception of the actors in the Tolima lemon chain regarding the potential for competitive insertion in the GVC, through insertion in the SAPR.

4. Results

The database contains 112 variables. It is important to specify that the following results correspond to the survey applied to 76 producers in the municipalities of Flandes (12), San Luis (29), Guamo (26), Saldaña (6) and Coello (3). In terms of educational level, as can be seen in table 2, farmers have a low level of education,

which affects the capacities of local producers in the short and medium term for their competitive insertion in international markets, and their social inclusion in the value chain; 79.4% do not exceed the level of primary education.

Table 2. Educational level farmers

	Frequency	Percentage
Elementary	44	57,9
Secondary	16	21,1
Technical	1	1,3
None	15	19,7
Total	**76**	**100,0**

Source: own study

Lemon production in the department is characterized as small-scale with a predominance of leased farms. The average size of the farms in the selected sample is 3.12 hectares.

Table 3. Contingency table of land tenure type by municipality

Municipality	Type of land tenure			
	Own		Leased	
	Count	%	Count	%
San Luis	6	20.70	23	79.30
Guamo	2	7.70	24	92.30
Saldaña	0	0.00	6	100.00
Coello	0	0.00	3	100.00
Flandes	0	0.00	12	100.00
Total	**8**	**10.53**	**68**	**89.47**

*Count: Number of farmers surveyed by municipality and their fixation by type of land tenure.
*%: Participation of farmers surveyed by municipality according to their land tenure type.

Source: own study

As shown in Table 3, 89.5% of farmers do not own land, which hinders their productive insertion in the GVC, as they assume extra costs and their technological innovation processes (upgrading) cannot be achieved. This is complemented by a low level of associativity. In fact, only 43% of producers belong to an agricultural association.

Farmers' quality of life. Regarding the question: How would you rate the following variables that define your quality of life as a farmer? It is evident that the quality of life of farmers is low. They consider that their available income, after the harvesting and marketing period, is not enough to cover costs. In addition, farmers consider that the precarious access to public and social services, as well as the means of transportation and the state of housing have a negative impact on their activity. By and large, these issues hinder their proper development as farmers, their social inclusion, and their potential for competitive insertion in national and international markets (table 4).

Table 4. Rating of the surveyed farmers on the variables that define their quality of life

	Very Low	Low	Medium	Good
Housing status	60	14	15	11
Education level	80	5	10	5
Health	30	40	25	5
Access to public services	65	20	15	-
Infrastructure of the area	75	15	10	-
Access to transportation	65	20	10	-
Production	55	20	25	-
Use of ICT	74	20	6	-
Disposable income	75	5	20	-
Position in the labor market	62	25	10	3

Source: own study

In the correlation matrix by the Principal Component Analysis (PCA) method, it can be seen that the variables described in table 5 are significant at 0.01 and indicate the existence of a strong correlation between them. It is also observed that the value of the determinant is very low (0.000), which corroborates the magnitude of the variables analyzed.

Table 5. Correlation matrix between size per hectare (Ha), product quality and harvested area

	Size in hectares	Quality	Harvested area
Size in hectares	1	-0.765**	0.583**
Quality	-0.765**	1	-0.701**
Harvested area	0.583**	-0.701**	1

** The correlation is significant at the 0.01 level (bilateral).
Determinant = 0.000

Source: own study

The correlations between the original variables of the questionnaire "Size in hectares", "Final quality of the product" and "Area harvested", present negative values, showing that the size per hectare of the cultivated lot influences the final quality of the product; that is to say, the greater the extension in hectares of the planting land, the lower the quality of the final product. At the same time, the larger the area harvested, the lower the quality of the product. Not having sufficient economic means, the farmer does not have the capacity to ensure the quality of the product as the cultivated area increases. It is important to note that most of the farmers have low levels of education, the mode of tenure is leasing, they do not have significant incentives to invest in technological improvements and, in general terms, they have low levels of quality of life.

The above, allows identifying the variables mentioned above as determinants for a crop renewal and the qualitative leap from traditional production systems oriented to satisfy local demand, towards agri-food production systems with international scope (Magaña *et al.,* 2010; Soleno, 2014; Kyungmin and Sun Hyung, 2019). Thus, it is necessary to gradually improve the accompaniment and technical assistance to small producers, including associative schemes that promote their social inclusion, to generate planting plans according to the characteristics of the main lemon-producing municipalities (Guamo, Natagaima

and Flandes), and with appropriate lemon varieties. In addition, in light of the previous result, it should be considered necessary to consolidate the processes of updating production practices, supply certified seeds and support the planting and post-harvest processes, because the farmer believes that the higher the planting level, the higher the product harvested and consequently the higher the sales levels, but in reality, what is being harvested is a product with insufficient quality standards.

It is also evident that none of the farmers surveyed believe that the final destination of their product is international. However, they expressed interest in joining associations and certifying their crop in good agricultural practices as a strategy to someday negotiate under better conditions within the GVC. In this regard, the Technical Director of the CAPR (Central Administrative Planning Region) points out that the lemon marketing chain for Tolima has two ways to connect the local farmer:

1. The first is where the exporter allies itself with local producers and provides them with sufficient knowledge of the international market to negotiate with international clients, thus ensuring that their participation adds significant value to the chain.
2. The second way, where the value chain is saturated with intermediaries; this is a scenario where the farmer has no information beyond the first sale of his produce. Given what is known about this market, the second route is more likely than the first. From this, it can be said that there are information asymmetries, since information does not flow to the producer in the marketing chain, once the product is sold to a local, regional or national distributor, who does not specify the destination or buyer of the product.

5. Discussion

In the research context, the findings are that most of the farmers have low educational levels, the form of ownership is leasing, they do not have significant resources to invest in technological advances and, in general, they have a low quality of life. In this regard Haque *et al*. (2022), state that developing regions of the world should follow the smarter and more efficient system of citrus production and distribution as practiced in the United States and the European Union, as well as China. However, developing countries such as Colombia need to promote and attract a business link of local transformation or close to the associative model. This type of strategy aims to strengthen the lemon chain in Tolima, integrating a business vision of local productive units into the global

insertion model, whether they are new or attract the interest of companies that provide a minimum degree of transformation to the raw material.

Similarly, in a study conducted by Watnakornbuncha *et al.* (2021), the results show that there are opportunities for farmers and new companies that are interested in lemon cultivation through the use of strategic planning analysis as a guideline and plan to develop the lemon supply chain. Under this purpose, it is additionally necessary to promote the formulation and execution of technical, economic and/or academic projects and research that demonstrate the great potential for insertion that the Tolima lemon farmer-producer has in the GVC. It is also imperative to plan and implement training sessions on the international market and the need for certification of farms and crops, with a view to exporting lemons.

Likewise, the results show a citrus chain in Tolima with limitations, which in the process of regional integration that is taking place in Colombia through the administrative planning regions, can be faced in such a way that its export potential can be developed. This is based on scaling up from the local-regional level to integration in planning schemes involving several of the country's departments, which, through the development of economies of scale and scope and greater institutional density, improves the capacity of small and medium-sized producers to reach international markets.

The pending task is to help overcome the problems encountered by small and medium-sized citrus producers in Tolima in joining the GVC, which include: the low level of education and generally low quality of life of producers, forms of land tenure with a predominance of leasing that do not facilitate the business exploitation of the land, high presence of intermediaries in the market, insufficient working capital and limitations on access to the formal financial market, lack of associativity, little experience in marketing, and deficient information on markets and prices.

The above issues coincide with the constraints to the competitive insertion of small and medium producers in GVCs detected in other studies such as Fernández-Lambert *et al.* (2015) and the Food and Agriculture Organization of the United Nations (2019), aimed at identifying the problems of supply, operation and distribution of the Persian lemon supply chain in the districts that make up the state of Veracruz (Mexico); The study describes among the constraints, the low productivity of the plots and particularly the insufficient capacity for the production of citrus that meet international standards that demand exportable characteristics as fresh fruit, the excessive level of intermediation between farmers and export centers, and the low adoption of technology or

the use of rudimentary technology in the processes of harvesting and packing of citrus.

In the same sense, the lack of training and education, and its influence on exporting capabilities, as well as the present study, are emphasized in other studies such as the one conducted by Ahmad *et al.,* (2018) who advanced an evaluation and measurement of the determinants of citrus exports from Pakistan, a leading exporter of these products in the world. They found that the lack of a more integrated value chain conception in citrus production leads to significant post-harvest losses that affect the country's export capacity. They also established that there is a direct relationship between higher levels of education and training of exporters and producers and the total amount of exports. Consequently, these authors recommend training for exporters and those who participate directly or indirectly in the value chain, in order to comply adequately with the standards of certification agencies, importers and other regulations established for the activity.

Finally, it is important to point out that this research contributes to increasing the evidence on the main constraints faced by small and medium-scale producers in their competitive insertion into global value chains; however, it is now essential to review the different experiences and studies, as well as to conduct new research that will contribute to knowledge about the different policies being implemented in different developing countries to overcome the above constraints, and thus promote the competitive insertion and social inclusion of small and medium-scale agricultural producers in international markets.

6. Conclusions

Based on the results, the strategies to be implemented to enhance the competitive insertion of Tolima's lemon growers in the GVC through the current model of regional association SAPR, are the following:

1. Improve and/or replace the method of dissemination and approach of the SAPR towards farmers. This study shows that none of the local lemon farmers surveyed in the fieldwork have heard or know about the SAPR and its competitive insertion model.
2. Establish alliances with institutions that, unlike most governmental organizations, have a greater and better perception of proximity to lemon growers, such as universities or agricultural benefit institutes such as the Colombian Agricultural Institute (ICA).

3. Incentivize the production of a "greener and more uniform" lemon that is more valued in the international market. This strategy should be promoted mainly by the technical management of the SAPR, but instructed through an institution with authority and capacity to provide guidance on good agricultural practices, such as the ICA.
4. Strengthen alliances with the Ministry of Agriculture and Rural Development, Banco Agrario, and/or agricultural development funds for fruits and vegetables, to design subsidy and/or credit policies to promote small and medium-sized lemon growers in Tolima, to distance them from informal loans and make investment in the sector attractive.

***Authors' Contribution Statements*:** The authors declare that they have contributed to the article in a similar proportion.

Abstract

This research delves into the identification of opportunities for the consolidation of the lemon value chain in the department of Tolima, Colombia, through the associativity model called: Special Administrative Planning Region. This model is a land-use planning system, officially recognized in Article 325 of the Political Constitution of Colombia and in Law 114 of 2011, which functions as a planning tool at the regional level. Its main objective is to integrate a given region with other territorial entities at the departmental level. The study is framed within exploratory research that employs qualitative and quantitative methodologies for its development, in addition to using data collection instruments, in order to identify the main elements that define the possibilities of establishing a profitable and sustainable value chain in the citrus-lime sector in Tolima. The results show that the potential for competitive insertion of lemon in global value chains reaches likely international markets such as Russia, Germany, France, Poland, Canada and Saudi Arabia, and the support of different government institutions. However, it is necessary to overcome major threats and weaknesses that currently hinder this insertion.

Keywords: *Global Value Chain, Inclusion, Regional Competitiveness, Lemon.*

JEL Classification: D46; K21.

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