

EMPLOYMENT TRAJECTORIES AND ECONOMIC SPECIALIZATION IN THE COMMUNES OF THE ÑUBLE REGION IN 1982, 1992, 2002, AND 2017¹

TRAYECTORIAS DE EMPLEO Y ESPECIALIZACIÓN ECONÓMICA EN LAS COMUNAS DE LA REGIÓN DEL ÑUBLE EN 1982, 1992, 2002 Y 2017

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El objetivo de este estudio es analizar los cambios en los sectores económicos ocurridos durante 1982, 1992, 2002 y 2017 en el sistema de ciudades, junto con comprender la evolución y trayectoria funcional del empleo en la Región de Ñuble. La investigación posee un enfoque cuantitativo y aplica un diseño correlacional. La base de datos fue extraída de los censos del Instituto Nacional de Estadística (INE) de los años mencionados a través del programa REDATAM. A partir de lo anterior, se realizó un análisis de componentes principales (ACP) mediante el software R, visualizado a través de tablas, gráficos y cartografías. Los resultados señalan que existe una tendencia que diversifica las ramas económicas en la región, las cuales evolucionan desde la agricultura hacia el comercio, servicios, enseñanza y construcción. Los índices de especialización demuestran que existe una trayectoria hacia la homogeneización de los sectores terciarios y que, en una cantidad reducida de comunas, el sector primario representa una parte importante de la actividad local. Además de la disminución del empleo agrícola e industrial, se concluye que las diferentes comunas de la región presentan una vocación primaria y terciaria, reconociéndose una coevolución entre las diferentes ramas económicas.

Palabras clave: trayectorias de empleo, especialización económica, evolución cofuncional, sistema de ciudades.

The goal of this study was to analyze the changes that have taken place in the economic sectors in the system of cities between 1982, 1992, 2002, and 2017, alongside understanding the evolution and functional trajectory of employment in the Ñuble Region. The research approach is quantitative and applies a correlational design. The database was extracted from the 1982, 1992, 2002, and 2017 censuses of the National Institute of Statistics (INE, in Spanish) using the REDATAM program. Then, a principal component analysis (PCA) was performed using R software, shown through tables, graphs, and cartographies. The results indicate a trend that diversifies the region's economic branches, evolving from agriculture toward commerce, services, education, and construction. The specialization indexes show a trajectory towards the homogenization of tertiary sectors and that, in a small number of communes, the primary sector represents a relevant part of local activity. In addition, from the decrease in agricultural and industrial employment, it can be concluded that the different communes of the region have a primary and tertiary vocation, recognizing a co-evolution between the different economic branches.

Keywords: employment trajectories, economic specialization, co-functional evolution, system of cities.

I. INTRODUCTION

Urbanization is progressing steadily over time. It is estimated that currently, 56% of people live in cities and that this proportion will increase by 13% by 2050 (United Nations, 2021). Part of the cause behind this phenomenon lies in the fact that the world's population will move its place of residence from rural to urban areas.

In the Latin American context, this phenomenon has also been clear. The continent's cities concentrate the economic, political, and administrative power, and it is estimated that more than 80% of the region's population is urban (Montero & García, 2017). This implies profound transformations derived from socio-economic restructuring processes, as part of the phenomenon of globalization, which have a significant impact on the growth dynamics of cities (de Mattos, 2002).

In Chile, about 87% of the population is urban, which has fostered the development of the export sector and generated changes in the employment and production structure. This urbanization process is expressed through the transition of the agricultural sector towards that of services (Rehner & Rodríguez, 2017; Pérez, 2019; UN, 2021).

The Ñuble Region is immersed in the national extractivist and exporting economy of minerals, forest, fruit, and wine products. Thus, the region is a space that has a great diversity of landscapes (mountain ranges, valleys, rivers, lakes, and sea) and a wealth of natural systems, which constitutes the basis of its economy given the agricultural activities, with a strong presence of the traditional agricultural sector, agribusiness, tourism and, recently, the forestry industry. Together, these give a cultural and territorial identity to the inhabitants of the area (Acuña *et al.*, 2015).

In the context of the Ñuble Region's administrative start-up, it is interesting to use it as a study territory to contribute with analysis that aims at developing territorial policies for the equity and well-being of the region's inhabitants. In addition, this type of study allows contributing to a better design of public policies for the territory's organization, based on the diagnosis and territorial analysis, in view of the preparation of the first Regional Territorial Organization Plan (PROT) for the Ñuble region.

From the geography and economics area, it is important to understand the development processes linked to a new region, recognizing the changes and transformations that exist in the economic structure of a territory.

This research seeks, in short, to deepen the understanding of the dynamics of the regional space, from the analysis of the functional employment trajectory, to reveal the relationships and behaviors of the cities in the Ñuble Region over time, considering that researching this topic makes it possible to propose public policies based on updated empirical information and, thus, project territorial development models. In this way, the intention is to answer questions at a territorial level, such as what has been the behavior of the labor market in the Ñuble Region? Are there any changes in the economic structure of the Ñuble Region? And, which communes have a labor market specialization over time?

City systems

The economic, social, political, or cultural interactions between communes can be understood within the framework of the theory of city systems (Picard & Zenou, 2018; Pumain, 2018). In this sense, Pred (1977) argues that urban centers are interdependent and interconnected with each other, to the extent that a significant change in an urban area will affect the rest of the centers that make up the system to which they belong.

It is proposed, from a theoretical level, that the study of the city system emerges as a tool capable of analyzing the behavior of cities, which contributes to the preparation of diagnoses of regional spaces aimed at the design and implementation of more effective public policies, particularly those aimed at a territorial organization (Lindón, Aguilar & Hiernaux, 2006).

There are two relevant notions for the analysis of city systems. One that refers to the hierarchy of the city, which is expressed in the connection of the amount of population, the inequalities in the weight, and the size of the cities considering their interactions; and one that relates the functional aspects (Pumain & Saint-Julien, 2001). Regarding the latter, the analysis of the notion of "specialization" arises, which associates the spatial division of production and labor with the idea of functional interdependence.

The specialization of a spatial unit defines its specificity within a geographical system and its contribution to the particular form that this system acquires. The functional specialization of places results from the trend manifested by certain activities or functions to concentrate on some sites (Pumain & Saint-Julien, 2001). Geographically, specialization is appreciated through the activities it encompasses, produces, and the modes of work organization. Thus, for example, at a

regional level, wine and cereal regions can be identified in an agricultural system. And, in the communal environment, tourist and service cities.

In Chile, the city system is characterized by an early macrocephaly, accentuated from the 1940s by the process of industrialization and expansion of the central state (Maturana, Peña-Cortés, Gasic & Sepúlveda, 2021). An important factor is the functional coevolution of the city system, characterized by the tendency towards the homogenization of certain tertiary sector activities, specifically, the areas of trade, real estate, and construction (Maturana, Sepúlveda, Prada, Fuenzalida & Stafolleri, 2019).

Such processes unfold in a context of changes, explained, in part, by the transformations from the economic restructuring of the country, based on free market strategies, which have had an impact on the structure of urban labor markets in cities, generating a change in their functional profile (Hidalgo, de Mattos & Arenas, 2019; Pumain, 2018). In this way, the evolution and behavior of city systems are characterized by the hierarchical stability they present and a certain tendency to the homogenization and outsourcing of the economic employment branches of the cities' inhabitants, for which it is necessary to delve into the factors that affect the deepening of relations between urbanization and economic production. This evidences a positioning of the aforementioned cities together with small cities, as a relevant factor for the articulation of the respective urban systems and the dynamization of the contiguous territories, particularly rural ones.

II. METHODOLOGY

This work was structured in 2 stages. The first one was the selection of the study area, focusing on the communes of the Ñuble Region (created in 2018). The analysis covered the 21 communes that this territorial unit comprises. Given the creation of Chillán Viejo in 1996 and, based on the forming of the conurbation with Chillán, this area was established as a unit for information analysis. Four study periods were used. These are related to the information available in each of the national censuses (Figure 1): 1982, 1992, 2002, and 2017. For each census (provided by the National Institute of Statistics of Chile (INE, 2017), and through the REDATAM program, the "line of business" variable was used, through which it was possible to obtain the economic area where a person works under the United Nations' International Standard Industrial Classification (ISIC).

The second stage comprised building databases. A specific base was made for the different periods of analysis, using the census information of the different years. In the 2017 census, the number of jobs linked to certain economic areas had to be merged, since they were presented in an aggregated or disaggregated way in different cases. In the last stage, a specialization index of the communes of the Ñuble Region was built.

The first analysis was related to the evolution and percentage changes experienced by the commune and in specific years, the result of the new categorization expressed in participation percentages in each branch based on the total employees per commune. Subsequently, a principal component analysis (PCA) was made using the R program and the FactoMineR package, which allowed describing the trajectories of the economic structures of the communes, interpreting the first two components of the factorial plane (Paulus, 2004; Pumain & Saint-Julien, 2001) through the coordinates of the first and second factorial plane obtained from the PCA. The linking of the coordinates of each spatial unit, through a line, makes it possible to show the employment trajectories in the 21 communes of the region, through the interpretation of the correlation circle.

Finally, the specialization coefficient was calculated by comparing the economic structure of the commune against the region, using an interval of between 0 and 1, where, close to 0, it is considered a very diversified structure and, close to 1, a very specialized economic structure. The specialization of the communes was represented through maps built in the ESRI software for the census years of 1982, 1992, 2002, and 2017.

The limits of the research are related to the economic-labor aspect of the data used in making the study; information where social dimensions or public policies are not applied to generate new approaches. It is also recognized that the unit of study at a communal level could delve deeper by using a smaller scale of approximation to the object of analysis. Ultimately, the study is quantitative, leaving aside the possibility of mixed research that describes and interprets the historical processes of transition to an economic structure of the Ñuble Region.

III. RESULTS

The results of the research are presented in three sections, which describe the evolution of the economic branches in the Ñuble Region, the presentation of the functional employment trajectories of the different communes, and

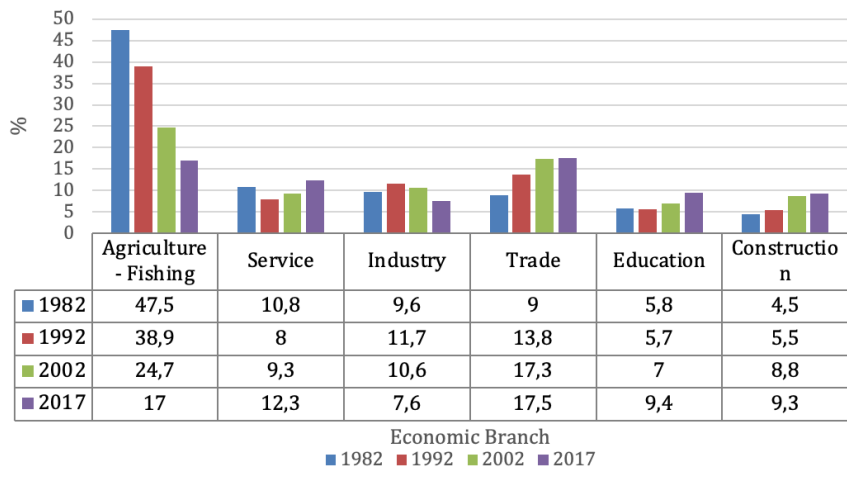


Figure 1. Evolution of the main economic branches in the Ñuble Region in 1982, 1992, 2002, and 2017. Source: Preparation by the authors using data from the censuses of 1982, 1992, 2002, and 2017.

the later visualization and explanation of the economic specialization charts of 1982, 1992, 2002 and 2017 of the communes.

Evolution of the economic branches in the Ñuble region in 1982, 1992, 2002, and 2017

As a first element and to contextualize the specialization analysis, the data of the 5 main economic branches that generate the most jobs, according to the censuses of 1982, 1992, 2002, and 2017, are presented. The description is developed here in conjunction with the presentation of the specialization statistics for the different censuses.

Figure 1 contains information on the percentage of employment generated by each of the economic branches in the study area. The variables involved are the number of employees in the activity, measured in percentages and represented in the different periods. In global terms, the table shows the employment behavior at four points over 35 years, which reveals significant decreases in agricultural activity and increases in the tertiary sector, such as trade and education.

Figure 1 shows that in 1982, the agricultural sector predominated as an economic branch, with 47.49%, a trend that decreased in 1992 by 8.6%, registering 38.9%. The services activity reached 10.7% in the first stage, and then showed a slight decrease in 1992 when it reached 8%. Among the branches that have upward trends, is

the industry that in 1982 represented 9.6%, before rising to 11.7% in the 1990s. On the other hand, trade, which initially had 8.9%, increased to 13.8%, being the branch with the greatest increase in the first period of analysis (4.9%). In global terms, a fall in the agricultural sector can be seen in contrast to the increase in tertiary and secondary activities.

For the analysis period corresponding to 1992 and 2002, the agricultural sector showed a significant decrease, falling from 38.9% to 24.7%. Another activity that decreases here is industry, which starts at 11.7% and decreases to 10.6%. Trade, meanwhile, showed a 3.5% increase, rising from 13.8% to 17.3%, consolidating itself as the second most important economic branch in the study area for this interval. In general, the contraction trend in agriculture as an employment-generating economic branch is confirmed and a slight decline in the industrial sector is observed. In contrast, trade confirms its upward trend.

Between 2002 and 2017, several changes occurred in the labor market structure of the analyzed area. The trade sector does not show a significant increase in its growth but comes out top, as the economic branch that generates the largest number of jobs. In the case of agriculture, its fall is confirmed, from 24.7% to 17%. Industry decreases from 10.6% to 7.6%. On the other hand, some increases demonstrate outsourcing of the regional economy, for example, it is observed that the service sector is the third most important branch. In global terms, it is evident that the labor market structure

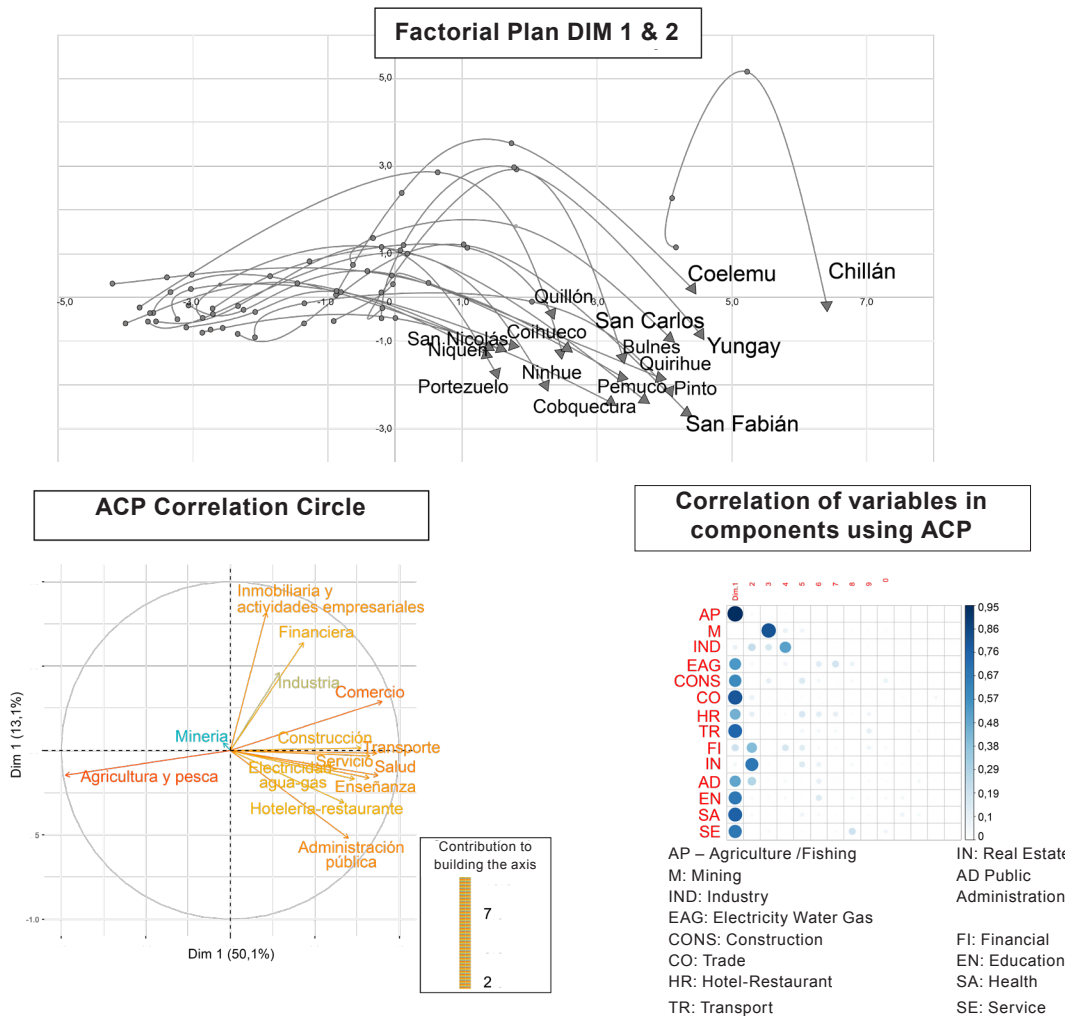


Figure 2. Functional trajectories of cities in the Ñuble region between 1982 and 2017, according to the analysis of the main components between economic sectors.

has notable changes, the downward trend of agriculture is consolidated, and the branches of the tertiary sector rise in most of its activities.

Functional trajectories of the Ñuble Region in 1982, 1992, 2002, and 2017

The results obtained from the functional trajectories of the region’s cities can be appreciated, based on two aspects. The first is the functional co-evolution from primary activities to tertiary sectors. The second is that as the general population increases, cities tend to become less specialized.

It is acknowledged that in the first two components there is a significant cumulative variance of around 63% (Figure

2). The highest correlation in component 1 corresponds to agriculture and fishing, which is on the negative axis (this can be seen in the correlation circle in Figure 2). Then, the other activities are linked to the tertiary sector, such as trade, service, health, education, transport, and, to a lesser extent, public administration and hotels and restaurants. These activities are on the positive axis of component 1. On the contrary, in component 2, activities such as real estate, finance, and industries are identified.

In Figure 2, the functional trajectories according to the censuses of 1982, 1992, 2002, and 2017 can be seen, observing that the economic profile in the cities has been linked from the beginning to agriculture-related activities, as has generally happened throughout the country’s regional urban system (Maturana *et al.*, 2021).

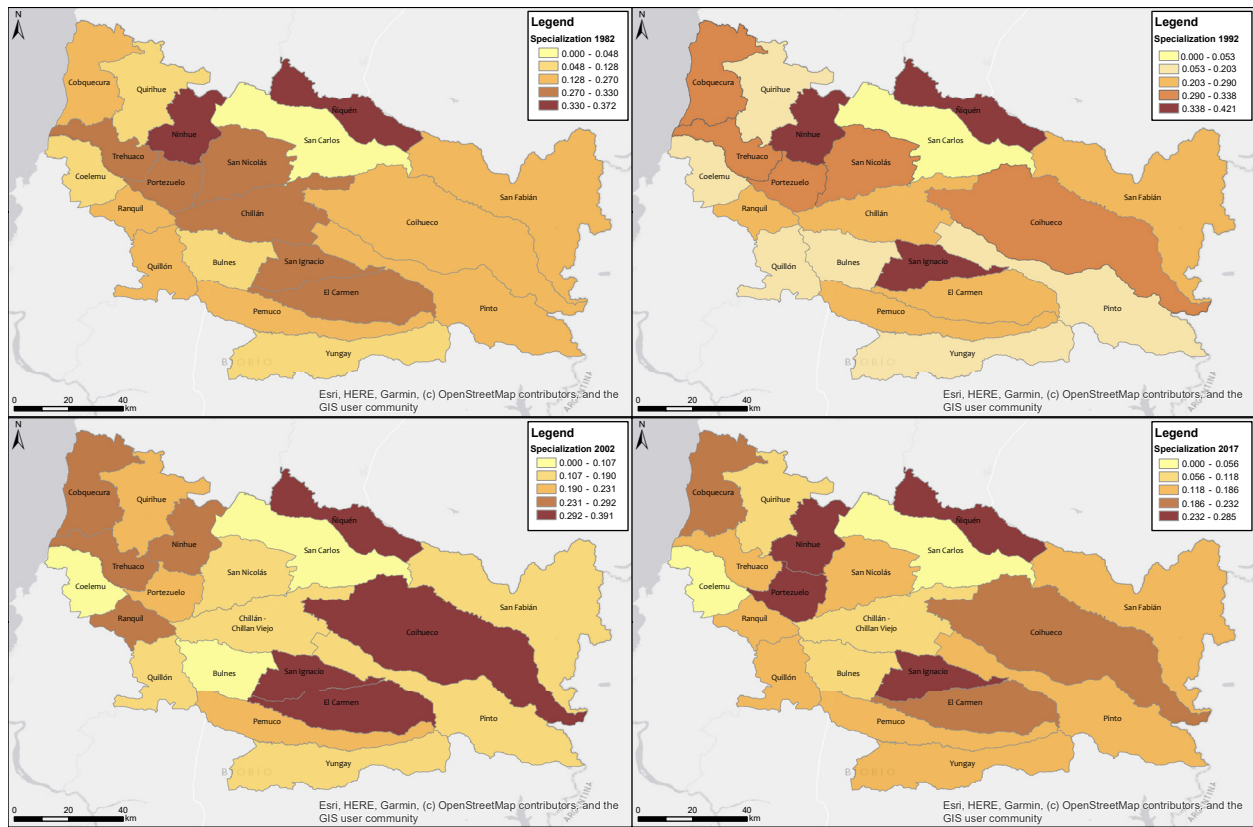


Figure 3. Specialization of the communes of the Ñuble region, according to censuses of 1982, 1992, 2002, and 2017. Source: Preparation by the authors, based on the censuses of 1982, 1992, 2002, and 2017.

That is, there is a coevolution that allows an economic diversification towards tertiary sector activities, where services in advanced areas of knowledge are not present, as is the case in the United States or some European countries (Bretagnolle, 2021; Paulus & Vacchiani-Marcuzzo, 2015), but rather being circumscribed to retail, hospitality and catering, education and, with a high participation, construction.

Agriculture has lost importance within the Ñuble region in terms of specialization and job generation. However, the relevance of the process is that it is in line with what urban and economic theory expects from the dynamics of cities as they grow in terms of population (Duranton & Puga, 2000; Markusen & Schrock, 2006).

These dynamics are contextualized and intensified with the economic liberalization policies in the 1970s and 80s in Chile, which were implemented in the context of insertion into globalization, which sought to use resources with a high level of efficiency (de Mattos, 2016;

Pino, 2006). In this sense, there was a liberalization of imports, promoting the development of foreign investment and, in turn, encouraging the export of raw materials (Turmo & Moslares, 2007).

In the Ñuble Region, it is observed that a large part of the communes that specialized in traditional agriculture, over the years evolved into ones with agro-industrial characteristics, which is evidenced in the transition of many of these territories towards services and transport branches, the result of the outsourcing process of urban economies (Figure 2). However, not all communes show a similar evolution. The diversification of Chillán is characterized, in this framework, by developing in its same quadrant, which does not happen with other communes whose transit is much more noticeable (Figure 2). In addition, these particularities of Chillán are expressed in the curve between 2002 and 2017, due to the fall in real estate and business activities, an aspect that is more attenuated in all other communes.

Specialization of the communes in the Ñuble Region

Figure 3 contains information on specialization data in the Ñuble Region for the periods of 1982, 1992, 2002, and 2017. Broadly speaking, Figure 3 shows the behavior of economic activities at four moments over a range of 35 years, making the changes of a time of profound economic transformations in the country visible.

The data for the 1982 census reveal that the agriculture branch is the one that generates the largest number of jobs in the then province of Ñuble, which is followed by the service branch with a lower percentage. Regarding the specialization results, in part 1 of Figure 3, it is observed that Ninhue and Ñiquen are located as cities with very high specialization. In both cases, the importance of agricultural activity positions them as the economic branch that generates the largest number of jobs, with a high participation in the economic system.

For the 1992 period, the branches that produced the largest number of jobs were the agricultural sector and trade. Regarding specialization, it is noted that Ninhue and Ñiquen continue with a very high level of specialization, to which the commune of San Ignacio is added, during this period. In this way, they are consolidated as labor market territories that support small-scale agricultural and trade functions. There are followed in high specialization, by Portezuelo, Coihueco, San Nicolás, Trehuaco, and Cobquecura.

In the 2002 to 2017 period, a trend towards a decrease in agricultural and industrial activity was identified, explainable by an acceleration of modernization, which is seen in the fall in employment in the primary and secondary sectors. On the other hand, a functional co-evolution of this set of cities of the Ñuble Region is recognized, characterized by a homogenization of the process towards the construction, transport, service, health, education, and public administration sectors.

IV. DISCUSSION

The city system of the Ñuble Region shows an employment trajectory between 1982, 1992, 2002, and 2017, that is prone to a functional co-evolution, characterized by the tendency towards the homogenization of certain activities of the tertiary sector, specifically, in the areas of transport, service, health, education, hotel-restaurants, and public administration.

This trajectory is distinguished by a significant drop in the agricultural sector in terms of its employment-generating

capacity, since it went from being the main branch, in 1982, and generating 47% of jobs in the study area, to producing only 17% in 2017. From this information, it follows that Ñuble transitions from being a "traditional" rural sector to one where the agro-export model predominates; a transformation that brought with it a decrease in jobs in the territory. According to Montero and García (2017), this sector is undergoing important restructuring derived, directly or indirectly, from the modernization process and the impact of globalization and insertion into global markets. In fact, the rural sector of Ñuble has been undergoing relevant mutations that imply changes in the traditional rurality, in the productive structure (Fawaz & Vallejos, 2012), and in the employability of the agricultural sector.

From this, there is an occupational profile that is transforming from the economy's primary sector to the tertiary, which can be verified through the growth of economic branches such as trade, service, and education. In addition, the trajectory of the communes of the Ñuble Region is similar, in terms of co-evolution, to what has happened in other city-systems of the world, each with its own particularities (Paulus, 2004). However, this transition is towards a simplified branch of the aforementioned activities and not towards one oriented to financial, scientific, or technological services (Pérez, 2019; Rehner & Rodríguez, 2017).

Finally, it is evident that the co-evolution of cities is different both in terms of scale and their displacement towards the service sector, observing, on one hand, the loss of economic areas linked to the production of goods (agriculture and industry) and, on the other, the approximation of other sectors, such as commerce and public-private services, to a post-Fordist city model or urban tertiary (Manero, 1998; Díaz & Lourés, 2003).

V. CONCLUSIONS

This work serves, first of all, as an input for the generation of plans, policies, and programs in the Ñuble Region. In the context of the start-up of the new territorial unit, the analysis and processing of information becomes more relevant because the policies that will be implemented in the territory in the coming years are beginning.

In particular, work behavior has important changes in its structure. For the study period, the predominance of the agricultural sector is identified as the activity that, in the beginning, generates the greatest amount of employment in Ñuble. However, it ends up projecting downward. On the contrary, the branches of the tertiary sector are consolidated as those that generate the greatest amount of employment.

The specialization processes, within the transition, have concentrated toward the outsourcing of the economy, where the preponderance of activities linked to sales, teaching, and construction services is recognized (Maturana *et al.*, 2019). This has generated a movement of workers towards the city, through a modification of the production systems and forms of employment organization (Pumain & Saint-Julien, 2001).

The transformation of the economic structure has implied that labor, social, political, and cultural interactions differ in each of the study's censuses (Picard & Zenou, 2018; Pumain, 2018), whereby the need to build and implement public policies at different territorial scales is manifested (Lindón, Aguilar & Hiernaux, 2006).

Regarding the specialization of the labor market, it is observed that, in principle, it was linked to the agricultural sector, located in inland rainfed communes, and that, in the following periods of analysis, the economic unit was registering a lower specialization of the labor market. Such behavior reveals profound changes in the Ñuble Region, as it transitions from the primary sector of the economy to outsourcing employment in the communes of the territorial unit.

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