Regional Science Policy & Practice 16 (2024) 100068

Contents lists available at ScienceDirect

Regional Science Policy & Practice

journal homepage: www.sciencedirect.com/journal/regional-science-policy-and-practice

Regional structural change in Argentina (1996–2019): Concepts, measurements and unequal trajectories over the business cycle

Andrés Niembro[a,b,*], Carla Daniela Calá[c]

[a] Universidad Nacional de Río Negro. Instituto de Estudios en Ciencia, Tecnología, Cultura y Desarrollo (CITECDE), Villegas 360, Bariloche, Argentina
[b] Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina
[c] Universidad Nacional de Mar del Plata. Facultad de Ciencias Económicas y Sociales, Deán Funes 3250, Mar del Plata, Argentina

ARTICLE INFO

JEL classification:
E32
J21
L16
O18
R11

Keywords:
Regional structural change
productivity
technological intensity
value added
regional diversification

ABSTRACT

Although multiple studies on structural change can be found at the national level, the definition of structural change is far from univocal and its subnational manifestations remain underexplored. This paper empirically examines the patterns of regional structural change in Argentina according to the four main definitions used in the literature (not only productive diversification, predominant in the economic geography field), highlighting the differences that arise when applying these concepts. Based on employment data for 85 labor market areas (LMAs) throughout the 1996–2019 period, we propose different criteria to apply and measure the four definitions and to classify the heterogeneous trajectories of structural change in LMAs, including cluster analysis. As the business cycle is a critical dimension in such an unstable economy, we examine the entire period and compare two sub-periods with very different economic dynamics. The results show that the identification of structural change depends on the concepts and measures used, the unit of analysis (national versus regional) and the type of economic cycle. These findings call for context- and place-based policies.

1. Introduction

There is a long tradition in the economic development literature devoted to the study of structural change, which is considered, depending on the author, as a cause, consequence or manifestation of development (Foster-McGregor et al., 2021). Thus, the debate on structural change becomes particularly relevant to developing countries and specifically to Latin America (ECLAC, 2012), considering the profound economic, social and regional inequalities that affect the countries of the region (Quintana et al., 2020; Ribeiro et al., 2020; Niembro and Sarmiento, 2021; Trejo Nieto, 2021). Although in the last decades different authors have contributed with new international comparative analyses (Katz, 2006; Rada and Taylor, 2006; McMillan et al., 2014; Oyelaran-Oyeyinka and Lal, 2016; Sen, 2019), it is still necessary to deepen the study of developing economies, through quantitative studies that broaden the knowledge on the dynamics or trajectories of structural change (Herrendorf et al., 2014).

Another relevant aspect of the heterogeneous literature on the subject is that the very definition of structural change is far from univocal. This tradition includes studies on changes in the specialization profile, the sectoral composition of economic aggregates, the degree and type of productive diversity, among other issues. Therefore, questions such as what is or what is meant by structural change, how is it measured, and what are its main quantitative and qualitative elements have not yet received a satisfactory answer, despite their relevance (Yoguel, 2014). In a stylized way, it is possible to identify at least four definitions of this process, with fuzzy boundaries: i) the relocation of workers to activities with higher productivity; ii) the relocation of workers to sectors with higher technological intensity; iii) changes in the activities carried out within value chains (upgrading); and iv) changes in the degree (and sometimes type) of productive diversity.

This is connected to the fact that structural change can be seen from both a positive and a normative perspective (UNIDO, 2013). While the first one refers to any change in the composition of an aggregate, typically employment or value added, the normative perspective highlights how attractive or desirable a particular direction of that change is. Thus, changes in specialization patterns towards sectors of higher productivity, dynamism or technological opportunities may be more desirable than those towards primary activities. In this sense, note the negative connotation that

* Corresponding author at: Universidad Nacional de Río Negro. Instituto de Estudios en Ciencia, Tecnología, Cultura y Desarrollo (CITECDE), Villegas 360, Bariloche, Argentina.
E-mail address: aniembro@unrn.edu.ar (A. Niembro).

https://doi.org/10.1016/j.rspp.2024.100068
Received 12 December 2023; Received in revised form 22 March 2024; Accepted 1 May 2024
Available online 24 May 2024

deindustrialization or *primarization* usually has in Latin America (Pereira and Cario, 2018; Martínez Sidón et al., 2022).

It is worth considering that structural change at the national level, or the absence thereof, can coexist with more or less virtuous regional transformations within countries. Regarding Argentina, several studies have documented the scarcity of structural change in the last decades, as the country's specialization is still concentrated in activities of relatively low complexity and technological content (Fernandez Bugna and Porta, 2008; Coatz et al., 2011; Santarcángelo et al., 2011; Roitter et al., 2013; Coatz et al., 2018; Wainer and Belloni, 2019; Barletta et al., 2022). Moreover, some marginal changes detected in specific sectors have not persisted because of the macroeconomic instability since the early 2010 s (Rivas and Robert, 2015).

Given the high geographic concentration of productive activity in the central part of the country (mainly in the metropolitan areas of Buenos Aires, Córdoba and Rosario), it is likely that the national dynamics largely reflect what happens in these territories. However, different structural changes could occur in the rest of the country, due to the discovery of natural resources, a boom or downturn in demand for specific products, changes in regulations or incentive regimes, improvements in the supply of education and training in key fields, among other factors. Therefore, regional structural change is a phenomenon of interest in its own right, although it has received comparatively less attention, even in developed countries (Silva and Teixeira, 2008; Tyler et al., 2017; Neffke et al., 2018; Boschma, 2021).

In particular, a geographic perspective on structural change provides a more comprehensive view of this process by exploring in which regions the growth or decline of certain activities is taking place, as well as the relationship between structural change and other widely studied issues, such as regional growth, geography of innovation, smart specialization strategies or geography of discontent (Tyler et al., 2017; Dijkstra et al., 2020; Boschma, 2021; Corradini et al., 2023). Moreover, many phenomena associated with structural change, such as changes in the specialization profile or the increase in productive diversity, are easier to identify at the regional scale than at the national or continental level (Capello, 2007; Krieger-Boden et al., 2008). Therefore, ignoring the regional dimension limits the impact that the research on structural change can have in terms of public policy.

The objective of the article is to empirically analyze the patterns of regional structural change in Argentina, according to the four main definitions used in the literature (changes in the workforce towards sectors of higher productivity, towards sectors of greater technological intensity, towards activities with higher value added and changes in the degree of productive diversity). Additionally, by highlighting the differences that arise from applying these different criteria, we offer a more comprehensive picture of regional structural change than merely productive diversification, on which economic geography studies have usually focused (Boschma, 2021).

We use data on total salaried employment in the private sector (for 56 sectors, at 2 digits of ISIC Rev. 3) in the main 85 labor market areas (LMAs) of Argentina throughout the period for which data are available (1996–2019). Moreover, to place regional results in context, we briefly examine the dynamics of structural change at the national level. As the business cycle is an unavoidable variable in such an unstable developing economy, in addition to examining regional structural change for the entire period (between extreme years), we contrast two sub-periods with very different economic dynamics. In this way, the article shows that the identification of structural change depends on the concepts and measures used, the unit of analysis (national versus regional) and the type of economic cycle. Lastly, in addition to offering novel evidence on regional structural change in Argentina, we provide some analytical and methodological foundations for extending the exercise to other (developing) countries.

After this introduction, the following section presents the literature review, including the theoretical conceptions of structural change and some empirical studies, both at the regional or national level. In Section 3, the database and the methodology applied are described in detail, with an emphasis on the operationalization of the four definitions of structural change used. The results are discussed in Section 4, while the main conclusions are summarized in Section 5.

2. Literature review

Given the relevance of this topic, there are several literature reviews on structural change (Krüger, 2008; Silva and Teixeira, 2008; Herrendorf et al., 2014), and some of them also review the recent empirical evidence for Argentina (Fernández Bugna and Peirano, 2011; Roitter et al., 2013; Barletta and Yoguel, 2017). In general, these authors agree that the concept of structural change is often used in a vague and ambiguous way, sometimes with circumstantial or *ad hoc* definitions. In this sense, "the [empirical] discussion on the occurrence or not of structural change processes can be an empty dialogue if the conceptual framework under which the concept is being used is not made explicit" (Fernández Bugna and Peirano, 2011: 112).

Based on the different approaches identified by Fernández Bugna and Peirano (2011), we consider four definitions of structural change (and ways of measuring it), with different points of contact with each other. One of the most traditional ones –a narrow definition, according to Martins (2015) or Timmer et al. (2016)– refers to the relocation of workers and other resources to higher productivity activities. This increases the total or aggregate productivity of the economy and, with it, the rate of economic growth and the income level (Fernández Bugna and Peirano, 2011; UNIDO, 2013; Martins, 2015; UN-Habitat, 2016). Concerning this last dimension, it should be noted that although the dispersion between sectoral productivities is usually higher than the one observed between wages by sector, the correlation between them is high: sectors with higher-than-average productivity also tend to have higher wages (ECLAC, 2012).

The second definition refers to the relocation of workers and other factors to activities of higher technological content or intensity, both in manufacturing and, increasingly, in service sectors (knowledge-intensive services or KIS). Given that for some authors "technological change is at the heart of structural change" (UNIDO, 2013: 82), there is a strong relationship with Schumpeter's ideas and the evolutionary and neo-Schumpeterian literature (Silva and Teixeira, 2008; Fernández Bugna and Peirano, 2011; Barletta and Yoguel, 2017). A possible connection between the first definition and the second one arises from the fact that sectoral productivity differences and their evolution over time depend, to a large extent, on the dynamics of technological change in those sectors (Krüger, 2008; Timmer et al., 2016; Tyler et al., 2017).

The third definition of structural change, the upgrading to activities with higher value added or level of processing along the supply chain (Sztulwark, 2005; Fernández Bugna and Peirano, 2011; Barletta and Yoguel, 2017), also has points of contact with the previous ones. In particular, high productivity activities were traditionally associated with *industrialization* (the shift from agriculture to manufacturing), and in recent decades they have been extended to the idea of modern sectors of the economy, which includes both some manufacturing and service activities (UN-Habitat, 2016; Foster-McGregor et al., 2021). In other words, the transition from primary to manufacturing (or modern) activities may imply both productivity and value added gains.

Finally, Boschma (2021) reviews the geographic dimension of structural change, focusing on what we take here as the fourth definition: productive diversification. In line with other authors (Saviotti and Pyka, 2004; Saviotti and Frenken, 2008; Fernández Bugna and Peirano, 2011; Barletta and Yoguel, 2017; Neffke et al., 2018), he highlights that diversification, understood as the emergence of new activities, is a key aspect of structural change. Similarly, UNIDO (2013:108) notes that "structural change and diversification are strongly interconnected." This literature usually distinguishes between related variety (the emergence of new activities linked to existing ones) and unrelated variety. Boschma (2021) concludes that the first phenomenon is much more frequent, since new activities tend to build on the capabilities and resources already available. In contrast, unrelated diversification requires a radical transformation of existing capabilities and thus entails higher costs, efforts, risks and time.

The links between this fourth definition and the previous ones are not so clear. On the one hand, diversification studies do not usually focus on the technological content or the level of productivity of new emerging activities. On the other hand, the regional diversification literature has not been linked to upgrading in value chains. Boschma (2021:175) highlights that the disconnection between these two literatures is a little surprising, since "it might be as important for regions to upgrade their economies and move into new value chains or higher segments within the same value chain as to move into new growing sectors or technologies."

In short, even though there are different approaches and definitions of structural change, they have fuzzy boundaries and several points of contact, or they are even used indistinctly. For example, UNIDO (2013: 22) mentions that "shifts in the economy from low-productivity activities with limited opportunities for technological change and value-added gains towards high-productivity activities with larger opportunities for innovation and value-added expansion would thus become the core of structural change and –more broadly– economic development." Similarly, according to ECLAC (2012: 26), virtuous structural change "is characterized by an increase in the contribution of knowledge-intensive sectors or activities to output and trade and a denser and more diversified production matrix, with higher productivity growth paths and technology spillovers and externalities that benefit the entire system."

However, as Fernández Bugna and Peirano (2011) point out, each of these approaches requires specific analytical or methodological categories and measures. Thus, depending on the dimensions stressed, different results can be obtained regarding the presence, magnitude and direction of structural change. These aspects will be discussed in more detail in the following sections.

Another issue that emerges from the aforementioned reviews is the national or macroeconomic bias of the discussion on structural change and, as highlighted by some authors, the lesser attention that the geographic dimension of this process has received (Krieger-Boden and Traistaru-Siedschlag, 2008; Silva and Teixeira, 2008; Tyler et al., 2017; Boschma, 2021). This is surprising, since country-level results tend to differ from those of subnational regions and some manifestations of structural change are more clearly observed at the local level (Krieger-Boden and Traistaru-Siedschlag, 2008).

Beyond this general background, different studies show the importance of addressing regional structural change in Europe (Krieger-Boden et al., 2008; Meliciani, 2016; Neffke et al. 2018; Sardadvar and Reiner, 2021), Asia (Handayani, 2013; Abdulla, 2021; Andriansyah et al., 2023) and in a large part of Latin America (Bonnet, 2006; Pereira and Cario, 2018; Bustillo Carrasco, 2019; Rodríguez Miranda and Menéndez, 2020; Martínez Sidón et al., 2022). In the case of Argentina, there is a long tradition of national (or macro) studies on this topic as well as several analyses of regional specialization and productive diversity over time (Borello et al., 2016; Jaramillo et al., 2016; Belmartino and Calá, 2020; Keogan et al., 2020; Niembro et al., 2021; Mancini et al., 2022). However, specific research on regional structural change is still incipient.

The most direct antecedent of our study is a brief paper by Barletta et al. (2022). The authors analyze the changes between 1996 and 2020 in the 24 Argentine provinces, based on the first two definitions of structural change: improvements in aggregate productivity (approximated by provincial wage levels) and in the share of knowledge-intensive (manufacturing and services) sectors. Our article contributes with a more detailed geographical, temporal and conceptual perspective, considering the main 85 labor market areas of the country, different sub-periods according to the business cycle and the four definitions of structural change.

3. Data and methodology

The analysis of structural change usually focuses on the evolution of the sectoral composition of economic aggregates, mainly GDP or value added and employment. Like Velthuis et al. (2022), we work with employment data, rather than product data. Unfortunately, in Argentina there are no value-added statistics available at the level of labor market areas, but as Tyler et al. (2017:430) point out, "patterns for output and employment are closely correlated."[1]; Moreover, in our database, employment is counted in the region where people work and not where they live, which allows us to describe the sectoral composition of the production structure of each region.

Data come from the Observatory of Employment and Business Dynamics (OEDE in Spanish), under the Ministry of Labor, Employment and Social Security. This database covers all formal salaried employees in the private sector, disaggregated into 56 sectors (at 2 digits of ISIC Rev. 3), for the main 85 labor market areas (LMAs) of the country. LMAs represent portions of the territory defined by workers' commuting between their place of work and their home and are composed of a central city or node and a set of other linked localities (Borello, 2002; OEDE, 2020). In this sense, they resemble the 85 cities or travel-to-work areas (TTWAs) studied by Tyler et al. (2017) in the case of Great Britain. It is worth noting that these 85 LMAs in Argentina account for 86% of the total national population and 95% of formal employment in private companies (OEDE, 2020).

We analyze the period between 1996 and 2019 (first and last year available). As mentioned above, in addition to evaluating the changes between extreme years, we study two sub-periods according to the national business cycle (Fig. 1). To avoid the results being affected by occasional issues, we take the average of three-year windows. Thus, changes between extreme years refer to 1996–1998 versus 2017–2019. Additionally, we identify the peaks prior to three economic recessions in that period (1996–1998, 2006–2008, 2016–2018),[2] which coincidentally are separated by ten years. From these peaks, we define two sub-periods (between a peak and the next one) that have very different economic dynamics. The first sub-period contains the prolonged recession of 1998–2002, followed by a pronounced recovery until 2008. The second one begins with the downturn in 2009, which was quickly overcome, but since then, the Argentine economy has been stagnant.

These sub-periods, and particularly the identification of the peaks in 1998 and 2008, are consistent with recent studies of the Argentine macroeconomy (for example, Perrotti, 2021; Blanco et al., 2022). Throughout the period under analysis, the longest cycles identified by Perrotti (2021), based on quarterly GDP data, are precisely in line with these peaks.[3] In the last decade of stagnation, both studies show a series of short-term political cycles, with slight peaks in election years (2011, 2013 and 2015). Additionally, it is worth noting that our results are consistent and do not show significant changes if, instead of taking the averages for 1996–1998, 2006–2008 and 2016–2018 (the peak years and the two previous ones), we take the averages for 1998–2000, 2008–2010 and 2017–2019 (the peak years and the following two, and the last three years available).

Regarding the operationalization of the first definition of structural change, we use sectoral statistics at the national level to identify the activities with higher productivity. In this way, we select a group of sectors (18 out of 56, one-third) that, between 2004 and 2019, present the highest salaries in the country (OEDE) and that are also in the first positions in terms of value added per worker (INDEC).[4] This is in line with evidence from ECLAC (2012), which shows the high correlation between these variables in Latin American countries.

[1] While it is true that this correlation may be lower in some sectors (for example, the industrial sector could adopt more or better technologies and increase production with the same or fewer personnel), it does not seem to be the case of Argentina throughout the period under analysis. Both at the aggregate level (Fig. 1) and, in particular, for manufacturing, employment and value added data follow very similar dynamics.

[2] It should be noted that the peak in 2018 corresponds to private employment, as GDP has remained relatively stagnant since 2011.

[3] Although Perrotti (2021) identifies another short-term intermediate cycle around 2000, this is almost negligible from annual GDP data, while employment continues falling, as Fig. 1 shows. On the other hand, Blanco et al. (2022) do not separate this mini-cycle from the general downturn between 1998 and 2002.

[4] The sectoral classifications are exposed in Appendix A.

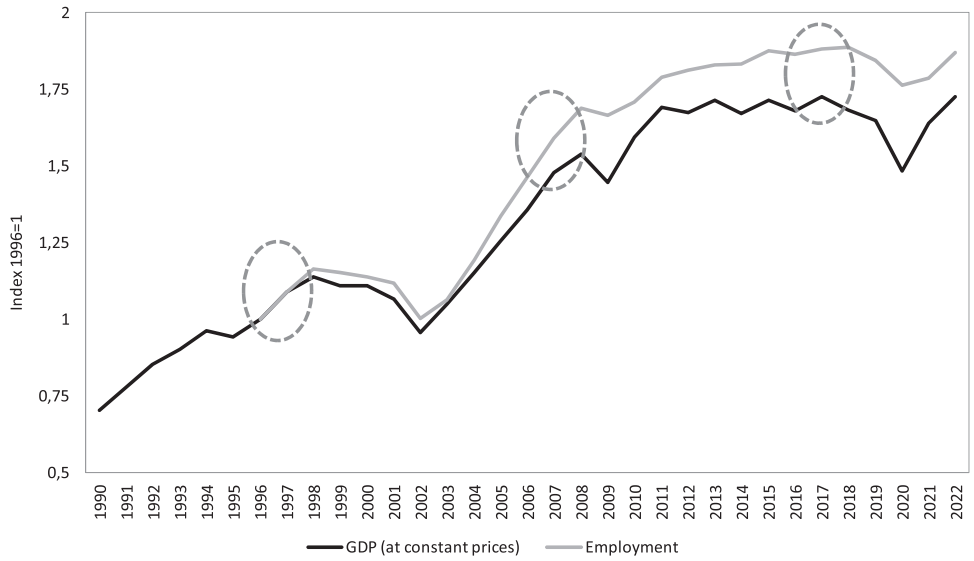

Fig. 1. Evolution of GDP at constant prices and private salaried employment in Argentina (1996–2022).
Source: own elaboration based on the National Institute of Statistics and Census (INDEC in Spanish) and OEDE.

Second, to identify the most knowledge-intensive activities, we use two criteria. For manufacturing, we include medium-high and high-tech sectors from the traditional OECD taxonomy, which has been widely used both internationally and in Argentina (UNIDO, 2013; Rivas and Robert, 2015; Barletta et al., 2022). In the case of services, we take those considered by López et al. (2014) in their analysis of Latin American countries, which are largely in line with the high-tech KIS and KIBS (B for business) defined by Eurostat (2011), leaving aside financial services and other personal KIS.

It should be noted that some authors suggest industrial classifications slightly different from the OECD taxonomy to reflect the particularities of Latin America (Katz and Stumpo, 2001; Katz and Bernat, 2011). In other cases, based on data from Argentine firms, some studies generate their own taxonomies of sectors according to their technological opportunities (Cassini and Robert, 2017; Marin and Petralia, 2018), the intensity of R&D expenditure (CEP, 2007) or of innovation activities (Bernat, 2020). Together with the study by Aboal et al. (2017) in the neighboring country of Uruguay, these contributions present a much more positive perspective than the OECD classification concerning, for example, the production of food and beverages, commonly considered as low-tech activities in developed countries.

Although this discussion is not considered in our identification of medium-high and high-tech sectors, it can be partially reflected in the third definition of structural change, the relocation of resources towards sectors of higher value added or higher level of processing from natural resources. Since much of the production of Latin American countries and regions is still concentrated in raw materials with little or no elaboration, there is an emphasis on the possibility of adding value and climbing positions in different supply chains (agriculture, livestock, forestry, minerals or hydrocarbons). Thus, to apply the third conception of structural change, we select both manufacturing sectors based on the transformation of natural resources (which are not usually considered high-tech activities in the OECD taxonomy) and some transversal and higher value-added activities, such as the provision of machinery, equipment and professional and technical services (see Appendix A).[5]

Regarding the fourth dimension of structural change, productive diversification, we take the inverse of the Herfindhal-Hirschman Index (1/HHI), a synthetic measure usually adopted in the literature that considers the relative share of all sectors (Belmartino and Calá, 2020). It should be noted that, although there are multiple alternative indices, the results are generally consistent (Krieger-Boden et al., 2008). Unfortunately, the distinction between related and unrelated variety requires data (at 4 digits) not available at the LMAs level for the period under analysis, while the study of the evolution of regional specializations represents another different contribution (for example, Jaramillo et al., 2016; Keogan et al., 2020; Niembro et al., 2021). Both issues are interesting lines to explore in future research.

Based on the above definitions, we calculate the annual percentage of total employment in i) sectors with higher productivity, ii) knowledge-intensive sectors, and iii) sectors with higher value-added or level of processing in supply chains based on natural resources (Appendix A). Likewise, we obtain the diversity index (1/HHI) for each year. We then average these values for the three-year windows and calculate different ratios: for the whole period (mean 2017–2019 / mean 1996–1998), for the first sub-period (mean 2006–2008 / mean 1996–1998) and for the second one (mean 2016–2018 / mean 2006–2008).

In line with previous studies (Handayani, 2013; Tyler et al., 2017; Buccellato and Corò, 2020; Velthuis et al., 2022), we propose different ways of classifying the LMAs according to the patterns of structural change identified. Firstly, we group the 85 LMAs based on the (combinations of) dimensions with virtuous structural change for the whole period. In a stylized form, we suggest that ratios above 1.10 could reflect situations of positive or virtuous structural change.[6] Secondly, following the regionalization defined by the OEDE, we study the geographic distribution of the LMAs with virtuous structural change, both in the whole period and in the two sub-periods.

[5] When assessing the upgrading towards higher value-added activities or functions, standard sectoral classifications present some limitations (Hicks, 2011), especially if these dynamics can only be detected with higher disaggregation (at more digits) or they consist in qualitative changes within the same sector. In other words, we are unfortunately dealing with some intra-sectoral heterogeneity that we cannot isolate with the available data.

[6] We recognize that the definition of this threshold is somewhat arbitrary, since the literature on structural change does not have clear standards or cut-off criteria. However, we consider that a 10% increase may be a reasonable and, at the same time, broad criterion to capture manifestations of positive structural change. In any case, given that several of the following tables show the specific values of the ratios, it is possible to evaluate how the results would change by moving the threshold. Conversely, ratios below 0.90 could represent negative or regressive structural change, while ratios between 0.90 and 1.10 could reflect situations of very low or no structural change.

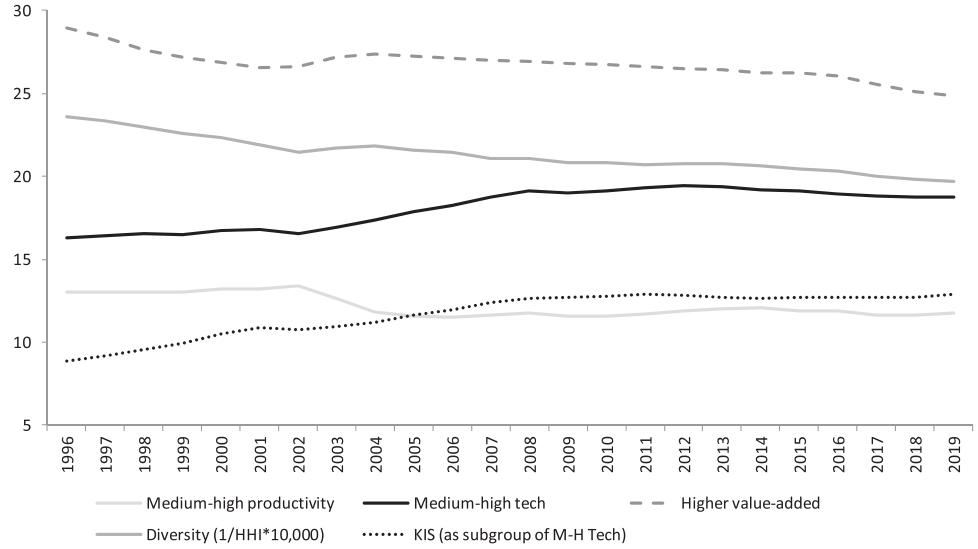

Fig. 2. Evolution of productive diversity and share of employment in medium-high productivity, medium-high tech and higher value-added sectors in Argentina (1996–2019).
Source: own elaboration based on data from OEDE.

Thirdly, based on a broader set of information and a cluster analysis (Handayani, 2013; Velthuis et al., 2022; Nordlund, 2023), we obtain an empirical typology of LMAs according to the intensity of structural change (both positive and negative ratios) in the two sub-periods. In particular, we use Ward's hierarchical technique, which is widely used in regional studies (Quadrado et al., 2001; Kronthaler, 2005; Yang and Hu, 2008; Handayani, 2013; Alberdi et al., 2016; Borello et al., 2016; Hedlund, 2016; Niembro et al., 2021), but we also check the consistency of the results against the non-hierarchical K-means technique (Del Campo et al., 2008; Hair et al., 2010; Hollanders et al., 2012; Argüelles et al., 2014). Through this exercise, we analyze 12 indicators: the ratios of the four dimensions of structural change in the two sub-periods (eight ratios in total) and the four initial values of these dimensions (average 1996–1998), that is, the percentages of the three sectoral aggregates and the diversity index, which are standardized as Z scores. The latter variables allow us to consider the influence of the starting point on the subsequent dynamics. For example, LMAs starting from low shares of employment in knowledge-intensive activities may find it easier to improve in this dimension than those LMAs with a higher initial proportion of employment in these sectors.

4. Results

In order to frame our regional results in the national context, Fig. 2 shows the evolution of the four dimensions of structural change for the whole country. First, we note that the only manifestation of virtuous structural change between extreme years is a slight increase in the share of employment in medium-high technology-intensive sectors. This is mainly explained by the 2002–2008 period of economic recovery and, within these sectors, by the growth of knowledge-intensive services. In contrast, there is evidence of a regressive trend in the remaining dimensions of structural change that is interrupted only between 2002 and 2004 (in the case of medium or high productivity sectors, it deepens in those years).

In line with the national level, the analysis between extreme years for the 85 LMAs (Table 1) also shows that the main manifestations of virtuous structural change (ratios above 1.10)[7] consist in an increase in the weight of knowledge-intensive sectors (this occurs in 49 LMAs, 58% of the total). However, as might be expected, there is a high heterogeneity. The weight of these sectors almost doubles in some LMAs, while it is reduced by about half in others. The second most frequent manifestation of regional structural change is the increase in productive diversity (in 40 LMAs, 47%), which was not observed at the national level. The other dimensions, productivity and value added, are barely present in 11 and 14 LMAs, respectively.

Based on the number of manifestations and combinations of positive structural change, we propose a first classification of the LMAs for the entire period (Table 1, last column): group I) 11 LMAs with multiple (3 or 4) manifestations of virtuous structural change, II) 13 with positive changes in technological intensity and diversity, III) 8 with other combinations of changes in two dimensions, IV) 20 with only an increase in technological intensity, V) 13 where only productive diversity improves, VI) 5 with structural change in another dimension, and VII) 15 without virtuous change in any dimension.

In short, depending on the definitions or dimensions of (regional) structural change used, quite different results can be obtained regarding the characteristics, direction and magnitude of this process. Another relevant result is that there are types of structural change at the regional level that are not observed at the national scale (especially, productive diversification). At last, we also show that higher productive diversity does not necessarily imply higher technological intensity or value added.

A first analysis of the two sub-periods (Table 2) shows that the first one has a higher influence on the results for the whole period, since the occurrence of structural change falls considerably after 2006–2008 (except in the productivity dimension). In other words, when economic growth slows or stagnates in Argentina, the manifestations of regional structural change are also reduced. The procyclical nature of this phenomenon, at least regarding productive diversity, has also been observed at the provincial level (Belmartino and Calá, 2020).

However, at the macro-regional level (according to the groups used by OEDE), the situation described above is mainly explained by the metropolitan region, the provinces of Buenos Aires and La Pampa and the rest of the central regions of the country. In contrast, the manifestations of virtuous structural change in the northwest and Patagonia (the south) are more balanced between sub-periods, and they are even higher in the second sub-period in the latter macro-

[7] As an example in the vein of the previous note, if we adopted stricter thresholds, such as 1.20 or 1.25 (usual values for specialization indexes or location quotients), the number of positive manifestations would drop considerably (in total, from 114 with the 1.10 criterion to 78 with 1.20 and 61 with 1.25) and we could not speak of any positive structural change at the national level (see the values in Table 1).

Table 1
Structural change between extreme years by LMA. (ratio 2017–2019 / 1996–1998).
Source: own elaboration.

	Productivity (PR)	Technological Intensity (TI)	Value Added (VA)	Diversity (DI)	PR	TI	VA	DI	Total	Group
ARGENTINA (COUNTRY)	0.90	1.14	0.89	0.85	14	49	11	40	114	
ELDORADO	1.27	1.54	1.18	1.51	X	X	X	X	4	I
SAENZ PEÑA	1.36	1.89	0.71	1.86	X	X		X	3	
SUNCHALES	2.65	1.50	0.70	1.69	X	X		X	3	
ARMSTRONG	1.17	1.39	1.03	1.14	X	X		X	3	
IGUAZU	2.05	1.35	0.68	1.27	X	X		X	3	
RECONQUISTA	1.34	1.24	0.87	1.30	X	X		X	3	
VENADO TUERTO	1.71	1.20	0.74	1.23	X	X		X	3	
VILLA GENERAL BELGRANO	0.65	1.58	1.34	1.25		X	X	X	3	
SALTA	0.98	1.47	1.18	1.21		X	X	X	3	
TRES ARROYOS	0.89	1.14	1.20	1.14		X	X	X	3	
MARCOS JUAREZ	0.89	1.13	1.17	1.23		X	X	X	3	
CORONEL SUAREZ	1.01	1.75	0.69	1.83		X		X	2	II
SAN RAFAEL	0.37	1.48	0.86	1.23		X		X	2	
ALTO VALLE DEL RIO NEGRO	1.08	1.40	1.06	1.19		X		X	2	
OBERÁ	0.70	1.38	0.80	1.34		X		X	2	
SAN NICOLAS	0.61	1.35	0.81	1.53		X		X	2	
OLAVARRIA	0.92	1.34	0.79	1.29		X		X	2	
SAN SALVADOR DE JUJUY	0.53	1.34	0.70	1.11		X		X	2	
JUNIN	1.08	1.24	1.06	1.16		X		X	2	
SAN FRANCISCO	0.75	1.22	0.93	1.13		X		X	2	
GOBERNADOR VIRASORO	0.61	1.20	0.72	1.44		X		X	2	
CHIVILCOY	0.87	1.17	1.03	1.22		X		X	2	
ESCOBAR	1.08	1.13	0.69	1.45		X		X	2	
ORAN	1.02	1.12	0.79	1.28		X		X	2	
RAFAELA	1.28	1.08	0.81	1.11	X			X	2	III
VILLAGUAY	2.02	0.93	0.93	1.28	X			X	2	
SAN PEDRO DE JUJUY	1.53	1.12	0.95	1.07	X	X			2	
PINAMAR - VILLA GESELL	0.59	2.12	1.41	1.06		X	X		2	
RESISTENCIA-CORRIENTES	0.64	1.99	1.15	0.84		X	X		2	
CORDOBA	0.62	1.28	1.23	0.75		X	X		2	
RIO GRANDE	0.84	1.25	1.55	0.88		X	X		2	
GENERAL PICO	0.80	0.88	1.20	1.17			X	X	2	
LIBERTADOR GENERAL SAN MARTIN	0.82	2.71	1.03	1.05		X			1	IV
ESQUEL	0.92	2.12	0.60	1.09		X			1	
SAN MIGUEL DE TUCUMAN	0.64	1.72	0.87	0.75		X			1	
SANTA ROSA	0.95	1.70	0.90	0.91		X			1	
MERLO	0.85	1.63	0.47	0.81		X			1	
SANTIAGO DEL ESTERO	0.74	1.38	0.94	0.79		X			1	
PERGAMINO	0.97	1.37	0.93	0.90		X			1	
MAR DEL PLATA	0.88	1.36	0.93	0.93		X			1	
CARLOS PAZ	0.61	1.30	0.92	0.77		X			1	
SAN JUAN	0.59	1.27	0.85	0.99		X			1	
MENDOZA	0.71	1.25	0.87	1.00		X			1	
CATAMARCA	0.81	1.21	0.66	0.90		X			1	
GRAN BUENOS AIRES	0.89	1.17	0.89	0.80		X			1	
ZARATE-CAMPANA	0.95	1.16	0.64	1.09		X			1	
POSADAS	0.52	1.15	0.70	0.80		X			1	
RIO CUARTO	0.72	1.14	1.03	0.97		X			1	
SANTA FE - PARANA	0.76	1.14	0.83	0.91		X			1	
BARILOCHE	0.68	1.11	0.88	0.87		X			1	
GUALEGUAYCHU	1.08	1.11	0.97	1.00		X			1	
NECOCHEA	0.81	1.11	0.62	0.95		X			1	
VILLA MARIA	0.85	1.08	0.87	1.17				X	1	V
PILAR	0.86	1.04	0.74	1.34				X	1	
TANDIL	0.68	1.04	0.64	1.21				X	1	
SAN PEDRO	0.87	1.01	0.84	1.14				X	1	
PASO DE LOS LIBRES	0.79	0.95	0.86	1.14				X	1	
TRENQUE LAUQUEN	0.68	0.95	0.92	1.49				X	1	
ARROYITO	0.59	0.94	0.93	1.28				X	1	
TRELEW-RAWSON	1.04	0.93	0.62	1.15				X	1	
LOBOS	0.98	0.91	0.79	1.13				X	1	
RIO TERCERO	0.93	0.85	0.97	1.11				X	1	
USHUAIA	0.78	0.85	0.71	1.24				X	1	
9 DEJULIO	1.07	0.81	0.87	1.49				X	1	
CHAJARI	0.51	0.81	0.90	1.42				X	1	
LUJAN	1.13	0.96	0.90	0.92	X				1	VI
GOLFO SAN JORGE	1.39	0.85	0.68	0.76	X				1	
GUALEGUAY	1.47	0.80	1.08	1.07	X				1	
METAN	1.48	0.56	0.63	0.48	X				1	
SAN ANTONIO DE ARECO	0.86	0.80	1.22	0.91			X		1	
ROSARIO	0.77	1.10	0.92	0.90					0	VII
FORMOSA	1.00	1.07	0.69	0.84					0	
LA RIOJA	0.78	1.06	0.71	0.93					0	
BAHIA BLANCA	0.70	1.02	0.80	0.88					0	
RIO GALLEGOS	0.88	0.99	0.98	0.99					0	
LA FALDA	0.85	0.98	0.52	0.77					0	
LA PLATA	0.74	0.97	0.92	0.81					0	
CONCEPCION DEL URUGUAY	0.70	0.95	0.91	0.93					0	
VIEDMA	0.68	0.88	1.07	0.96					0	
CONCORDIA	0.90	0.84	0.84	0.99					0	
SAN LUIS	0.69	0.75	0.59	0.87					0	
PUERTO MADRYN	0.88	0.70	0.83	0.93					0	
MERCEDES	0.69	0.67	0.78	0.66					0	
TERMAS DE RIO HONDO	0.47	0.66	1.00	0.78					0	
TARTAGAL-MOSCONI	0.62	0.50	0.77	1.10					0	

Table 2
Number of manifestations of positive structural change between extreme years and in the two sub-periods, by macro-regions.
Source: own elaboration. Note: the colors are applied to each macro-region separately, given that they include a variable number of LMAs (in parentheses in the first column), and they range from the highest value (intense green) to the lowest (intense red).

		Productivity	Technological Intensity	Value Added	Diversity	Total
TOTAL (85 LMAs)	Entire period	14	49	11	40	114
	Sub-period 1	13	51	11	29	104
	Sub-period 2	22	16	12	14	64
METROPOLITAN REGION (6)	Entire period	1	3	0	2	6
	Sub-period 1	0	2	0	2	4
	Sub-period 2	2	0	0	0	2
INTERIOR OF BS. AS. AND LA PAMPA (19)	Entire period	0	11	4	12	27
	Sub-period 1	1	11	2	9	23
	Sub-period 2	7	1	4	1	13
CENTER (23)	Entire period	7	12	3	13	35
	Sub-period 1	6	14	4	7	31
	Sub-period 2	4	2	2	4	12
CUYO (6)	Entire period	0	4	0	1	5
	Sub-period 1	0	4	0	1	5
	Sub-period 2	0	2	0	0	2
NORTHWEST (12)	Entire period	2	8	1	3	14
	Sub-period 1	2	7	2	3	14
	Sub-period 2	2	5	2	3	12
PATAGONIA (10)	Entire period	1	4	1	3	9
	Sub-period 1	2	5	2	1	10
	Sub-period 2	4	3	2	4	13
NORTHEAST (9)	Entire period	3	7	2	6	18
	Sub-period 1	2	8	1	6	17
	Sub-period 2	3	3	2	2	10

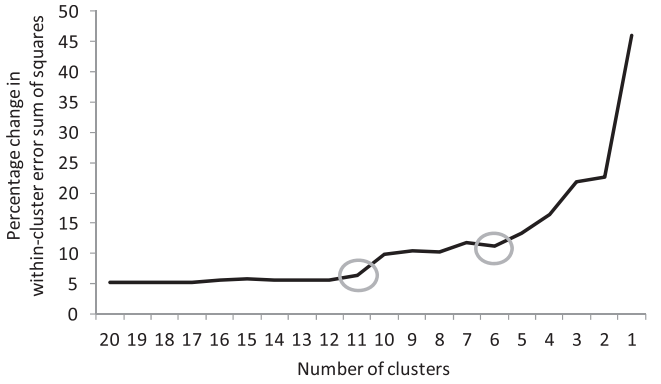

Fig. 3. Change in within-cluster heterogeneity through the agglomeration process (Ward's method).
Source: own elaboration.

region. This result could serve as a starting point for future research to investigate what has happened in those regions, identifying in detail the productive activities that have contributed to the observed changes.

Instead of this dichotomous analysis (manifestation or not of positive structural change), we propose below an alternative classification of the LMAs based on the values of the ratios (and thus the intensity of positive or negative changes) in the four dimensions of analysis for the two sub-periods, together with four indicators that reflect the starting point of the LMAs in each dimension. To handle this volume of information (12 variables for 85 LMAs), we performed a cluster analysis using Ward's method, which indicates the convenience of forming eleven or six clusters (Fig. 3) according to the points at which a break or jump in heterogeneity occurs (Hair et al., 2010). An advantage of hierarchical techniques is that the different solutions can be related and examined as a whole. In this case, some of the 6 clusters are formed as combinations of two or three of the 11 groups (first and second columns of Table 3).[8]

Cluster 1 (or A) includes several of the largest and most diversified LMAs (Buenos Aires, Rosario, Córdoba, La Plata, Bahía Blanca).[9] They have good starting conditions (compared to the average of the 85 LMAs) and, presumably, a structural change

[8] When compared with the 11 clusters obtained by the K-means technique, there is a high coincidence in the way in which most of the LMAs are grouped. As we have seen in previous studies, Ward's method usually offers more balanced solutions. For example, only one of the 11 clusters reflected in Table 3 is composed of a single LMA, while there are three in the K-means solution. As a counterpart to this higher presence of individual clusters, one of the 11 clusters obtained by K-means is similar to cluster D of the 6-cluster solution by Ward (as if clusters 7 and 8 in Table 3 were merged). If we set aside this difference, more than 90% of the LMAs are similarly grouped by one method or the other, which shows the robustness of our results.

[9] Appendix B provides a detailed description of the LMAs included in each cluster, as well as their productive profile according to Niembro et al. (2021).

Table 3
Classification of the LMAs into 6 and 11 clusters (average values for each dimension of analysis).
Source: own elaboration. Notes: PR: productivity, TI: technological intensity, VA: value added, DI: diversity. First 4 columns with decimals (and 96 in the label) show initial values (average 1996–1998), expressed as Z scores (they can be interpreted as above or below the mean, which is 0). The last 8 columns are the ratios in the first (1) and second (2) sub-period (interpreted as above or below one).

6	11	LMAs	PR96	TI96	VA96	DI96	PR1	TI1	VA1	DI1	PR2	TI2	VA2	DI2
A	1	5	0.66	1.17	-0.12	2.08	0.79	1.09	0.99	0.89	0.95	1.02	0.97	0.94
B	2	5	0.45	1.83	2.04	0.78	0.83	0.94	0.80	1.13	0.96	0.97	0.95	0.97
	3	6	-0.04	1.38	0.47	0.14	1.10	1.15	0.93	1.10	1.01	0.99	1.00	1.05
C	4	2	2.82	0.91	1.40	0.23	0.81	1.31	0.80	1.27	0.97	0.99	0.93	1.04
	5	4	2.22	0.06	-0.59	-0.25	0.94	0.95	0.89	0.87	0.97	1.05	1.09	1.22
	6	2	2.82	2.83	-0.99	0.37	0.81	0.85	1.10	1.11	1.07	1.33	1.01	0.91
D	7	19	-0.17	-0.27	0.06	0.61	0.81	1.23	0.92	0.98	1.02	1.04	0.92	0.99
	8	18	-0.12	-0.46	-0.91	0.00	0.78	1.30	0.98	1.00	1.04	0.97	0.95	1.03
E	9	10	-0.70	-0.93	0.96	-1.16	1.12	1.52	0.91	1.28	0.98	0.88	0.96	1.07
	10	1	-1.21	-1.42	3.43	-2.34	1.00	1.19	1.04	0.95	0.90	2.07	1.00	1.07
F	11	13	-0.91	-0.53	-0.66	-1.01	1.03	1.01	0.91	1.15	1.06	0.96	0.98	1.02

dynamic very similar to the one observed at the national level, with a slight improvement only in technological intensity in the first sub-period. The three following clusters also have relatively good starting points and industrial-manufacturing profiles (agro-industrial in cluster 3), but the trajectories of structural change in the first sub-period are different. While there is only a slight improvement in productive diversity in cluster 2, cluster 3 shows moderate progress in three of the four dimensions, and cluster 4 presents significant improvements in technological intensity and diversity. Clusters 5 and 6 complete the spectrum of LMAs with good initial conditions, especially in terms of productivity, since they include several Patagonian cities with an extractive or industrial profile (capital-intensive activities). In contrast to the previous clusters and the national level, the main manifestations of structural change are seen in the second sub-period, in terms of productive diversity in cluster 5 and technological intensity in cluster 6 (composed of two LMAs of Tierra del Fuego province, which are under a promotion regime for the electronics industry).

With a few exceptions, the remaining five clusters start from a more disadvantaged situation in 1996–1998. The broader space for accumulating improvements may be a relevant factor to explain why four of these clusters show progress in terms of technological intensity in the first sub-period. Within this pattern, groups 7 and 8 are the most numerous, representing almost 44% of the LMAs. They include many of the provincial capitals and the productive profiles linked to service activities. Cluster 9 and the particular case in cluster 10 include LMAs from the center and north of the country, which have a clear agri-food orientation (of production and transformation), so they are in a good position in terms of value added to primary production. Cluster 9 shows improvements in the other three dimensions of structural change in the first sub-period, while the special case makes progress in technological intensity in both sub-periods. Finally, in cluster 11 (also composed of agricultural LMAs from the center and some tourist cities from the north), there is a slight improvement in productive diversity in the first sub-period. In sum, one of the main results of this analysis is the identification of relatively homogeneous groups of LMAs with different dynamics of structural change, both in terms of the dimensions considered and the sub-period in which the changes occurred.

As can be seen in Fig. 4, the picture is heterogeneous within some of the largest and most diverse provinces in the central part of the country, such as Buenos Aires and Córdoba. However, in other ones, such as Santa Fe and Entre Ríos, most of the LMAs are located in the same cluster (3 and 11, respectively). In other provinces of intermediate development, such as San Luis, Río Negro and Tierra del Fuego, there is also a marked homogeneity in their LMAs. Practically all the provincial capitals of the north of the country are in clusters 7 and 8, and something similar is observed in La Pampa and a large part of Patagonia (the south).

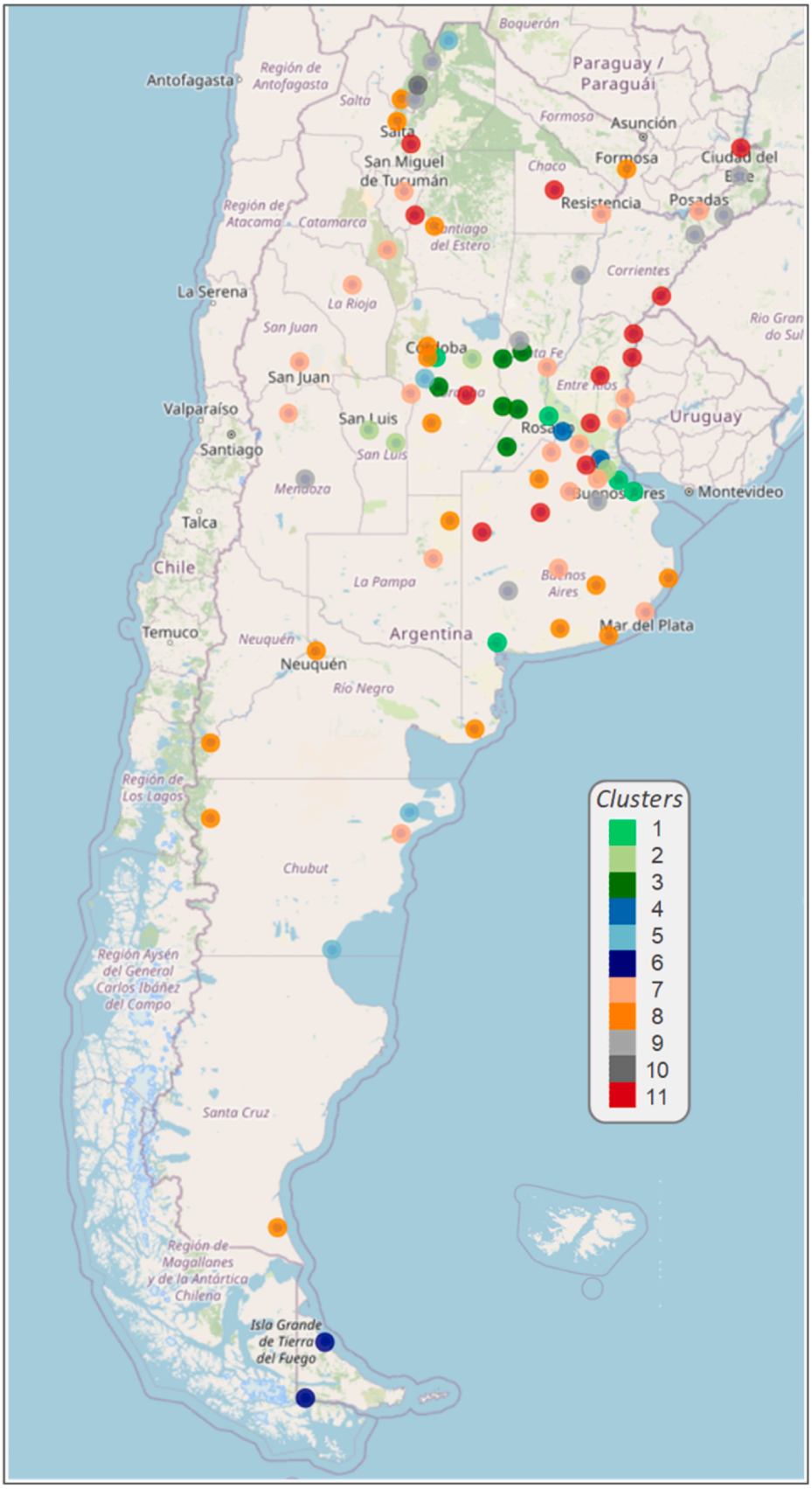

Fig. 4. Map of LMAs by cluster.
Source: own elaboration. Note: the point does not reflect the full extension of the LMAs, but the location of the central node. In green and blue, we show the LMAs with better initial conditions; in grey, those with lower initial conditions but positive structural change; and in red tones, those with lower initial conditions and positive structural change in one dimension but negative in others.

5. Conclusions

In line with the previous literature, in this article we stress that structural change is an ambiguous concept. Explicitly, we show that the different definitions adopted (or, at least, the four notions we review here) and their forms of measurement can lead to contrasting results regarding the existence of structural change and the direction and intensity of this process. Therefore, one of the main contributions and implications of this article is to highlight the need to make explicit which definitions are adopted and which measures or methodologies are used. We also emphasize the importance of taking a regional perspective of structural change, beyond or complementary to the broader tradition of national and international analysis. Finally, we show the relevance of examining the trajectories of national and regional structural change in light of the different dynamics of the economic cycle.

At the country level, there is evidence of a mild structural change only in terms of the weight of medium and high-tech sectors, mainly in the 1996–2008 period, while the dynamics have been slightly regressive in the other three dimensions. We show that this national dynamic is largely explained by some of the main LMAs from the metropolitan and central regions, which is consistent with the high concentration of economic activity in these areas. Similarly to the national level, the manifestations of virtuous structural change in the central part of the country are concentrated in the first sub-period and practically disappear in the second one. And in general, among all the LMAs, the progress in technological intensity is also the most common manifestation of positive structural change in the entire period, reaching almost 60%.

However, the different classifications of LMAs proposed show that the regional scene is highly heterogeneous and that the conclusions obtained at the national level can hardly be extrapolated to what happened throughout the territory. For example, productive diversity improves in almost half of the LMAs for the entire period, while Argentina as a whole exhibits a declining trend in this dimension. Interestingly, higher productive diversity at the regional level does not necessarily imply higher technological intensity or value added. Moreover, although the advances in productivity and value added are less frequent in the analysis between extreme years, they are still present in almost 30% of the LMAs. Another interesting detail is that productivity progress is the most numerous manifestation of virtuous structural change in the second sub-period (22 LMAs). When examining by macro-regions, we show that the processes of positive structural change do not necessarily stop or disappear in the second sub-period in the north and south of the country. None of this could have been appreciated from an aggregate view based on national data, which revalues the study of the regional dynamics of structural change.

Beyond the last few exceptions, we highlight the procyclical nature of structural change in Argentina. At the national level and in most regions, there is a marked exhaustion or absence of virtuous changes during the second sub-period signed by economic stagnation (or stagflation). As it is a new 'lost decade' for Argentina in terms of economic growth and other economic variables (Wainer, 2021), the same is verified from the point of view of structural change. Breaking these vicious circles in which the Argentine economy is trapped requires structural transformations in public policies. In particular, this article illustrates the importance of adopting a territorial perspective for the design and implementation of productive development policies, in line with the literature on place-based policy (Beer et al., 2021).

As noted by Velthuis et al. (2022: 13), "to determine the exact needs of different regions, a more comprehensive analysis of their challenges, as well as assets and opportunities, is needed." We can add the need for a more detailed study of what has happened in the regions with virtuous dynamics to recognize the factors that have promoted structural change. This article helps to identify such regions and lays the foundations for future analyses that could contribute to understanding the supply or demand factors that may have initiated or supported these processes. Regarding the more general dynamics of structural change over the business cycle in Argentina, we suggest, as a hypothesis, that there could have been a positive combination of both types of factors in the first sub-period, while in the second one the magnitude and continuity of the macroeconomic volatility and uncertainty could have acted as a significant blocking factor.

Finally, some of the potential limitations of this study, such as the use of sectoral classifications (Hicks, 2011) or the lack of consideration of informal employment in our source of information (something relevant in the context of developing countries and regions), call for the search and exploration of other databases to complement the results obtained.

CRediT authorship contribution statement

Carla Daniela Calá: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing. **Andrés Niembro:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The authors appreciate the helpful comments of the participants at the 6th. virtual meeting of the Interuniversity Seminar on Argentine Productive Development (SIDPA), 2023-09-21, and the XXVIII Annual Meeting of the Red PyMEs Mercosur, 2023-09-27, Córdoba, Argentina (where shorter draft versions in Spanish were discussed), as well as the support of the Agencia I+D+i (project PICT 2019-02729). We also thank the Employment and Business Dynamics Observatory (OEDE) from Argentina for kindly providing the dataset. Finally, we are grateful to two anonymous reviewers for their valuable suggestions and contributions.

Appendix A. Sectoral classifications used (2 digit of ISIC Rev. 3)

Sector (ISIC Rev. 3)	2 dig	Medium-high productivity	Medium-high technological intensity	Higher value added (to NR)
Agriculture and livestock	1			
Forestry, wood extraction	2			
Fishing and fishing-related activities	5	■		
Extraction of crude oil and natural gas	11	■		
Extraction of metalliferous minerals	13	■		
Exploitation of other mines and quarries	14	■		
Food and beverages	15			■
Tobacco	16	■		■
Textile products	17			■
Apparel	18			■
Leather and footwear	19			■
Wood	20			■
Paper	21			■
Edition	22			
Petroleum products	23	■		■
Chemicals	24	■	■	■
Rubber and plastic products	25			■
Other non-metallic minerals	26			■
Base metals	27	■		■
Other metal products	28		■	■
Machinery and equipment	29		■	■
Office machinery	30		■	
Electrical appliances	31		■	
Radio and television	32	■	■	
Medical instruments	33		■	
Automotive	34	■	■	
Other transport equipment	35		■	
Furniture	36			■
Recycling of waste and scrap	37			
Electricity, gas and water	40	■		
Water collection, treatment and distribution	41			
Construction	45			
Sale and repair of vehicles, fuel retailing	50			
Wholesale trade	51			
Retail trade	52			
Hotel and restaurant services	55			
Railway, railcar and pipeline transport	60			
Maritime and river transport	61	■		
Cargo and passenger air transport	62	■		
Cargo handling, storage and warehousing	63			
Post and telecommunications	64	■		
Financial intermediation and other financial services	65	■		
Insurance and retirement and pension funds	66	■		
Services auxiliary to the financial activity	67			
Real estate services	70			
Rental of transport equipment and machinery	71			
IT activities	72	■	■	
Research and development	73	■	■	
Legal, accounting and other business services	74		■	■
Temporary employment agencies	75			
Education	80			
Health and social services	85			
Waste disposal	90			
Business organization services	91			
Film, radio and television	92		■	
Other services	93			

Appendix B. Detail of the LMAs by cluster, productive profile and geographic location

LMA	6 clusters	11 clusters	Productive Profile (Author/s, 2021)	Macro-region according to OEDE
GRAN BUENOS AIRES	A	1	KIS and heavy industry	METROPOLITAN REGION OF BUENOS AIRES
LA PLATA	A	1	KIS and heavy industry	METROPOLITAN REGION OF BUENOS AIRES
BAHIA BLANCA	A	1	KIS and heavy industry	INTERIOR OF BS. AS. AND LA PAMPA
CORDOBA	A	1	KIS and heavy industry	CENTER
ROSARIO	A	1	KIS and heavy industry	CENTER
PILAR	B	2	Heavy and light industry and services	METROPOLITAN REGION OF BUENOS AIRES
ESCOBAR	B	2	Heavy and light industry and services	METROPOLITAN REGION OF BUENOS AIRES
ARROYITO	B	2	Highly specialized in machinery and equipment	CENTER
SAN LUIS	B	2	Heavy and light industry and services	CUYO
MERCEDES	B	2	Textile industry and social services	CUYO
VENADO TUERTO	B	3	Agriculture, supporting industries and urban services	CENTER
SAN FRANCISCO	B	3	Agriculture, supporting industries and urban services	CENTER
ARMSTRONG	B	3	Highly specialized in machinery and equipment	CENTER
RAFAELA	B	3	Agriculture, supporting industries and urban services	CENTER
RIO TERCERO	B	3	Agriculture, supporting industries and urban services	CENTER
MARCOS JUAREZ	B	3	Agriculture, supporting industries and urban services	CENTER
ZARATE-CAMPANA	C	4	Specialized in metallurgical industry	METROPOLITAN REGION OF BUENOS AIRES
SAN NICOLAS	C	4	Specialized in metallurgical industry	INTERIOR OF BS. AS. AND LA PAMPA
VILLA GENERAL BELGRANO	C	5	Not classified	CENTER
TARTAGAL-MOSCONI	C	5	Diversified in services and extractive activity	NORTHWEST
GOLFO SAN JORGE	C	5	Specialized in oil or radio & TV	PATAGONIA
PUERTO MADRYN	C	5	Specialized in metallurgical industry	PATAGONIA
RIO GRANDE	C	6	Specialized in oil or radio & TV	PATAGONIA
USHUAIA	C	6	Specialized in oil or radio & TV	PATAGONIA
LUJAN	D	7	Textile industry and social services	METROPOLITAN REGION OF BUENOS AIRES
MAR DEL PLATA	D	7	Specialized in tourism	INTERIOR OF BS. AS. AND LA PAMPA
PERGAMINO	D	7	Textile industry and social services	INTERIOR OF BS. AS. AND LA PAMPA
OLAVARRIA	D	7	Diversified in services and extractive activity	INTERIOR OF BS. AS. AND LA PAMPA
SANTA ROSA	D	7	Urban and related services	INTERIOR OF BS. AS. AND LA PAMPA
CHIVILCOY	D	7	Agriculture, supporting industries and urban services	INTERIOR OF BS. AS. AND LA PAMPA
SAN PEDRO	D	7	Specialized in agri-food	INTERIOR OF BS. AS. AND LA PAMPA
SANTA FE - PARANA	D	7	KIS and heavy industry	CENTER
CONCEPCION DEL URUGUAY	D	7	Specialized in agri-food	CENTER
GUALEGUAYCHU	D	7	Specialized in agri-food	CENTER
MENDOZA	D	7	KIS and heavy industry	CUYO
SAN JUAN	D	7	Textile industry and social services	CUYO
MERLO	D	7	Specialized in tourism	CUYO
SAN MIGUEL DE TUCUMAN	D	7	Diversified in services and extractive activity	NORTHWEST
LA RIOJA	D	7	Textile industry and social services	NORTHWEST
CATAMARCA	D	7	Textile industry and social services	NORTHWEST
TRELEW-RAWSON	D	7	Urban and related services	PATAGONIA
RESISTENCIA-CORRIENTES	D	7	Diversified in services and extractive activity	NORTHEAST
POSADAS	D	7	Diversified in services and extractive activity	NORTHEAST
JUNIN	D	8	Agriculture, supporting industries and urban services	INTERIOR OF BS. AS. AND LA PAMPA
TANDIL	D	8	KIS and heavy industry	INTERIOR OF BS. AS. AND LA PAMPA
NECOCHEA	D	8	Specialized in tourism	INTERIOR OF BS. AS. AND LA PAMPA
PINAMAR - VILLA GESELL	D	8	Specialized in tourism	INTERIOR OF BS. AS. AND LA PAMPA
GENERAL PICO	D	8	Agriculture, supporting industries and urban services	INTERIOR OF BS. AS. AND LA PAMPA
TRES ARROYOS	D	8	Agriculture, supporting industries and urban services	INTERIOR OF BS. AS. AND LA PAMPA
RIO CUARTO	D	8	Agriculture, supporting industries and urban services	CENTER
CARLOS PAZ	D	8	Specialized in tourism	CENTER
LA FALDA	D	8	Textile industry and social services	CENTER
SALTA	D	8	Diversified in services and extractive activity	NORTHWEST
SANTIAGO DEL ESTERO	D	8	Textile industry and social services	NORTHWEST
SAN SALVADOR DE JUJUY	D	8	Diversified in services and extractive activity	NORTHWEST
ALTO VALLE DEL RIO NEGRO	D	8	Diversified in services and extractive activity	PATAGONIA
BARILOCHE	D	8	Specialized in tourism	PATAGONIA
RIO GALLEGOS	D	8	Diversified in services and extractive activity	PATAGONIA
VIEDMA	D	8	Urban and related services	PATAGONIA
ESQUEL	D	8	Urban and related services	PATAGONIA
FORMOSA	D	8	Urban and related services	NORTHEAST
LOBOS	E	9	Specialized in agri-food	INTERIOR OF BS. AS. AND LA PAMPA
CORONEL SUAREZ	E	9	Highly specialized in light industry	INTERIOR OF BS. AS. AND LA PAMPA
RECONQUISTA	E	9	Specialized in agri-food	CENTER
SUNCHALES	E	9	Not classified	CENTER
SAN RAFAEL	E	9	Specialized in agri-food	CUYO
ORAN	E	9	Specialized in agri-food	NORTHWEST
SAN PEDRO DE JUJUY	E	9	Specialized in agri-food	NORTHWEST
OBERÁ	E	9	Specialized in agri-food	NORTHEAST
ELDORADO	E	9	Highly specialized in light industry	NORTHEAST
GOBERNADOR VIRASORO	E	9	Specialized in agri-food	NORTHEAST
LIBERTADOR GENERAL SAN MARTIN	E	10	Specialized in agri-food	NORTHWEST
9 DEJULIO	F	11	Agriculture, supporting industries and urban services	INTERIOR OF BS. AS. AND LA PAMPA
TRENQUE LAUQUEN	F	11	Specialized in agri-food	INTERIOR OF BS. AS. AND LA PAMPA
SAN ANTONIO DE ARECO	F	11	Specialized in agri-food	INTERIOR OF BS. AS. AND LA PAMPA
CONCORDIA	F	11	Specialized in agri-food	CENTER
VILLA MARIA	F	11	Agriculture, supporting industries and urban services	CENTER
CHAJARI	F	11	Specialized in agri-food	CENTER
VILLAGUAY	F	11	Specialized in agri-food	CENTER
GUALEGUAY	F	11	Specialized in agri-food	CENTER
METAN	F	11	Specialized in agri-food	NORTHWEST
TERMAS DE RIO HONDO	F	11	Specialized in tourism	NORTHWEST
SAENZ PEÑA	F	11	Textile industry and social services	NORTHEAST
IGUAZU	F	11	Specialized in tourism	NORTHEAST
PASO DE LOS LIBRES	F	11	Specialized in tourism	NORTHEAST

References

Abdulla, K., 2021. Regional convergence and structural transformation in a resource-dependent country. Struct. Change Econ. Dyn. 59, 548–557.

Aboal, D., Arza, V., Rovira, F., 2017. Technological content of exports. Econ. Innov. N. Technol. 26 (7), 661–682.

Alberdi, X., Gibaja, J.J., Parrilli, M., 2016. Innovation gaps: A typology for Spain. In: Parrilli, M., Fitjar, R.D., Rodriguez-Pose, A. (Eds.), Innovation Drivers and Regional Innovation Strategies. Routledge, New York.

Andriansyah, A., Nurwanda, A., Rifai, B., 2023. Structural change and regional economic growth in Indonesia. Bull. Indones. Econ. Stud. 59 (1), 91–117.

Argüelles, M., Benavides, C., Fernández, I., 2014. A new approach to the identification of regional clusters: hierarchical clustering on principal components. Appl. Econ. 46 (21), 2511–2519.

Barletta, F., Fiorentin, F., Suárez, D., 2022. Diversificación productiva en contextos de heterogeneidad estructural: evidencia para el caso argentino. In: Roitter, S., Federico, J. (Eds.), Anales de la 27º Reunión Anual Red Pymes Mercosur. Asociación Civil Red Pymes Mercosur, Rafaela, Argentina.

Barletta, F., Yoguel, G., 2017. De qué hablamos cuando hablamos de política industrial (2017) In: Abeles, M., Cimoli, M., Lavarello, P. (Eds.), Manufactura y cambio estructural: aportes para pensar la política industrial en la Argentina. ECLAC, Santiago, Chile.

Beer, A., McKenzie, F., Blažek, J., Sotarauta, M., Ayres, S., 2021. Every Place Matters: Towards Effective Place-Based Policy. Taylor and Francis, Abingdon.

Belmartino, A., Calá, D., 2020. A regional approach to the study of industrial diversity in Argentina (1996–2012). CEPAL Review 130, 103–128.

Bernat, G., 2020. Contenido tecnológico de las exportaciones argentinas: ¿contiene más I +D+i un dólar de soja que un dólar de autos?. Technical Report No. 13. CIECTI, Buenos Aires.

Blanco, A., Díaz de Astarloa, B., Drenik, A., Moser, C., Trupkin, D., 2022. The evolution of the earnings distribution in a volatile economy: evidence from Argentina. Quant. Econ. 13 (4), 1361–1403.

Bonnet, J., 2006. Cambio estructural regional en Colombia: una aproximación con matrices insumo-producto. Coyunt. Econ. ómica: Invest. óN. Econ. ómica Y. Soc. 36 (1), 147–176.

Borello, J., 2002. Áreas económicas locales: criterios para su definición en la Argentina. Informe del Proyecto sobre Pequeñas y Medianas Empresas Industriales en América Latina (ITA/99/145). ECLAC, Santiago, Chile.

Borello, J., González, L., Pereira, M., Robert, V., 2016. Evolución de la actividad económica argentina desde una perspectiva territorial, 2004-2012. Serie Estudios y Perspectivas No. 50. ECLAC, Santiago, Chile.

Boschma, R., 2021. The geographical dimension of structural change. In: Foster-McGregor, A., Alcorta, L., Szirmai, N., Verspagen, B. (Eds.), New Perspectives on Structural Change: Causes and Consequences of Structural Change in the Global Economy. Oxford University Press, Oxford.

Buccellato, T., Corò, G., 2020. Path dependence in regional structural change: implications for the EU cohesion and innovation policy. Working Paper No. 14/2020. Department of Economics, Ca' Foscari University of Venice, Venice.

Bustillo Carrasco, R., 2019. Cambio estructural y patrón de crecimiento peruano (2001-2012): análisis desde un enfoque de economía regional (PhD Thesis). Universidad Complutense de Madrid, Madrid.

Capello, R., 2007. Regional Economics. Routledge, London.

Cassini, L., Robert, V., 2017. Oportunidad versus complejidad en los procesos de aprendizaje: criterios para clasificación de sectores según los atributos de los regímenes sectoriales de innovación. In: ECLAC (Ed.), La Encuesta Nacional de Dinámica de Empleo e Innovación (ENDEI) como herramienta de análisis: La innovación y el empleo en la industria manufacturera argentina. ECLAC, Santiago, Chile.

CEP, 2007. Contenido tecnológico de las exportaciones argentinas 1996-2007. Tendencias de upgrading intersectorial. Centro de Estudios para la Producción (CEP), Buenos Aires.

Coatz, D., García Díaz, F., Woyechezen, S., 2011. El rompecabezas productivo argentino: una mirada actualizada para el diseño de políticas. BoletíN. Inf. Techint 334, 17–43.

Coatz, D., García Díaz, F., Porta, F., Schteingart, D., 2018. Incentivos y trayectorias de cambio estructural. In: Mercado, R. (Ed.), Ensayos sobre desarrollo sostenible. La dimensión económica de la Agenda 2030 en la Argentina. UNDP, Buenos Aires.

Corradini, C., Morris, D., Vanino, E., 2023. Towards a regional approach for skills policy. Reg. Stud. 57 (6), 1043–1054.

Del Campo, C., Monteiro, C.M., Soares, J.O., 2008. The European regional policy and the socio-economic diversity of European regions: a multivariate analysis. Eur. J. Oper. Res. 187 (2), 600–612.

Dijkstra, L., Poelman, H., Rodríguez-Pose, A., 2020. The geography of EU discontent. Reg. Stud. 54 (6), 737–753.

ECLAC, 2012. Structural Change for Equality: An Integrated Approach to Development. ECLAC, Santiago, Chile.

Eurostat, 2011. Statistics Explained - Glossary. Eurostat, Luxembourg ISSN 2443-8219 (online).. ⟨https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Knowledge-intensive_services_(KIS)⟩.

Fernandez Bugna, C., Porta, F., 2008. Dinámica industrial en la Argentina 2002-2007. Continuidades y cambios. BoletíN. Inf. Techint 327, 49–74.

Fernández Bugna, C., Peirano, F., 2011. Cambio estructural. Cinco enfoques estilizados. Rev. De. Cienc. Soc., Segunda Época 19, 95–114.

Foster-McGregor, A., Alcorta, L., Szirmai, N., Verspagen, B. (Eds.), 2021. New Perspectives on Structural Change: Causes and Consequences of Structural Change in the Global Economy. Oxford University Press, Oxford.

Hair, J., Black, W., Babin, B., Anderson, R., 2010. Multivariate Data Analysis, 7th edition. Pearson, London.

Handayani, W., 2013. Rural-urban transition in Central Java: Population and economic structural changes based on cluster analysis. Land 2 (3), 419–436.

Hedlund, M., 2016. Mapping the socioeconomic landscape of rural Sweden: towards a typology of rural areas. Reg. Stud. 50 (3), 460–474.

Herrendorf, B., Rogerson, R., Valentinyi, A., 2014. Growth and Structural Transformation. In: Aghion, P., Durlauf, S. (Eds.), Handbook of Economic Growth – Volume 2B. Oxford, North Holland.

Hicks, D., 2011. Structural change and industrial classification. Struct. Change Econ. Dyn. 22 (2), 93–105.

Hollanders, H., Derbyshire, J., Lewney, R., Tijssen, R., Tarantola, S., Rivera, L., 2012. Regional Innovation Scoreboard 2012-Methodology report. European Commission, Brussels.

Jaramillo, D., Calá, D., Belmartino, A., 2016. Especialización industrial en Argentina: patrones provinciales y evolución reciente (1996-2014). Pymes, Innovación y Desarrollo 4 (2), 3–20.

Katz, J., 2006. Structural change and domestic technological capabilities. CEPAL Rev. 89, 55–68.

Katz, J., Bernat, G., 2011. Exit–entry, productivity growth and structural change in response to changes in macroeconomic policy: evidence from Argentina. Innov. Dev. 1 (2), 227–244.

Katz, J., Stumpo, G., 2001. Sectoral regimes, productivity and international competitiveness. CEPAL Rev. 75, 131–152.

Keogan, L., Calá, D., Belmartino, A., 2020. Perfiles sectoriales de especialización productiva en las provincias argentinas: distribución intersectorial del empleo entre 1996 y 2014. Regional and Sectoral Economic Studies 20 (1), 59–80.

Krieger-Boden, C., Morgenroth, E., Petrakos, G. (Eds.), 2008. The Impact of European Integration on Regional Structural Change and Cohesion. Routledge, New York.

Krieger-Boden, C., Traistaru-Siedschlag, I., 2008. Regional structural change and cohesion in the enlarged European Union: an introduction. In: Krieger-Boden, C., Morgenroth, E., Petrakos, G. (Eds.), The Impact of European Integration on Regional Structural Change and Cohesion. Routledge, New York.

Kronthaler, F., 2005. Economic capability of East German regions: results of a cluster analysis. Reg. Stud. 39 (6), 739–750.

Krüger, J., 2008. Productivity and structural change: a review of the literature. J. Econ. Surv. 22 (2), 330–363.

López, A., Niembro, A., Ramos, D., 2014. Latin America's competitive position in knowledge-intensive services trade. CEPAL Review 113, 21–33.

Mancini, M., Jelinski, F., Lavarello, P., 2022. Diversidad productiva, sectores difusores de progreso técnico y desempeño regional en Argentina entre 2008 y 2018. Rev. Desarro. Y. Soc. 90, 207–263.

Marin, A., Petralia, S., 2018. Sources and contexts of inter-industry differences in technological opportunities: the cases of Argentina and Brazil. Innov. Dev. 8 (1), 29–57.

Martínez Sidón, G., Barajas Ramos, A., Corrales, S., 2022. Cambio estructural y desindustrialización en la frontera norte de México. Estud. Front. 23, e095 1-23.

Martins, P., 2015. Sub-regional perspectives on structural change. CREDIT Research Paper No. 15/03. The University of Nottingham, Centre for Research in Economic Development and International Trade (CREDIT).

McMillan, M., Rodrik, D., Verduzco-Gallo, I., 2014. Globalization, structural change, and productivity growth, with an update on Africa. World Dev. 63, 11–32.

Meliciani, V., 2016. Regional disparities in the enlarged European Union: Geography, innovation and structural change. Routledge, New York.

Neffke, F., Hartog, M., Boschma, R., Henning, M., 2018. Agents of structural change: The role of firms and entrepreneurs in regional diversification. Econ. Geogr. 94 (1), 23–48.

Niembro, A., Calá, D., Belmartino, A., 2021. Una tipología de las áreas económicas locales de Argentina en base a perfiles sectoriales de coaglomeración territorial (2011-2018). Investigaciones Regionales - Journal of Regional Research 50, 169–203.

Niembro, A., Sarmiento, J., 2021. Regional development gaps in Argentina: A multidimensional approach to identify the location of policy priorities. Regional Science Policy & Practice 13 (4), 1297–1328.

Nordlund, C. (2023). Transformations, trajectories and similarities of national production structures: A comparative fingerprinting approach. Available at SSRN: ⟨http://dx.doi.org/10.2139/ssrn.4326405⟩.

OEDE, 2020. Boletín de Áreas Económicas Locales: Empleo, empresas y remuneraciones - 2019. Observatorio de Empleo y Dinámica Empresarial (OEDE), Ministerio de Trabajo, Empleo y Seguridad Social, Buenos Aires. ⟨https://www.trabajo.gob.ar/estadisticas/oede/estadisticasregionales.asp⟩.

Oyelaran-Oyeyinka, B., Lal, K., 2016. Structural transformation in developing countries. In: Oyelaran-Oyeyinka, B., Lal, K. (Eds.), Structural transformation and economic development: Cross regional analysis of industrialization and urbanization. Routledge, London.

Pereira, W.M., Cario, S.A.F., 2018. Desindustrialização e mudança estrutural na região sudeste: um estudo comparado. Rev. Bras. De. Estud. Reg. e Urbanos 12 (2), 173–204.

Perrotti, D., 2021. Growth cycles in Argentina: the recent behavior. Econ. ómica 67 (023), 107–143.

Quadrado, L., Loman, S., Folmer, H., 2001. Multi-dimensional analysis of regional inequality: the case of higher educational facilities in Spain. Pap. Reg. Sci. 80 (2), 189–209.

Quintana, L., Salas, C., Duarte, C., Correa-Quezada, R., 2020. Regional inequality and labour precariousness: an empirical regional analysis for Brazil. Mex. Equador. *Reg. Sci. Policy Pract.* 12 (1), 61–81.

Rada, C., Taylor, L., 2006. Developing and transition economies in the late 20th century: diverging growth rates, economic structures, and sources of demand. DESA Working Paper No. 34. United Nations Department of Economic and Social Affairs (UN/DESA), New York.

Ribeiro, L.C.S., Caldas, R.M., Souza, K.B., Cardoso, D.F., Domingues, E.P., 2020. Regional funding and regional inequalities in the Brazilian Northeast. Reg. Sci. Policy Pract. 12 (1), 43–59.
Rivas, D., Robert, V., 2015. Cambio estructural y desarrollo. Eficiencia keynesiana y schumpeteriana en la industria manufacturera en la Argentina en el período 2003-2011. Serie Estudios y Perspectivas -Buenos Aires- No. 42. ECLAC, Santiago, Chile.
Rodríguez Miranda, A., Menéndez, M.M., 2020. Desigualdades regionales, crecimiento económico y cambio estructural en Uruguay: 1983-2017. Working Paper No. 12/2020. Instituto de Economía, Facultad de Ciencias Económicas y Administración, Universidad de la República, Uruguay.
Roitter, S., Erbes, A., Kababe, Y., 2013. Desarrollo inclusivo en Argentina: Cambio estructural y empleo en las etapas de recuperación y crecimiento reciente. In: Infante, R., Gerstenfeld, P. (Eds.), Hacia un desarrollo inclusivo: El caso de la Argentina. ECLAC, Santiago, Chile.
Santarcángelo, J., Fal, J., Pinazo, G., 2011. Los motores del crecimiento económico en la Argentina: rupturas y continuidades. Invest. óN. Econ. ómica 70 (275), 93–114.
Sardadvar, S., Reiner, C., 2021. Austrian regions in the age of globalisation: trade exposure, urban dynamics and structural change. Reg. Sci. Policy Pract. 13 (3), 603–643.
Saviotti, P.P., Frenken, K., 2008. Export variety and the economic performance of countries. J. Evolut. Econ. 18, 201–218.
Saviotti, P.P., Pyka, A., 2004. Economic development by the creation of new sectors. J. Evolut. Econ. 14, 1–35.
Sen, K., 2019. Structural transformation around the world: patterns and drivers. Asian Dev. Rev. 36 (2), 1–31.
Silva, E.G., Teixeira, A.A., 2008. Surveying structural change: Seminal contributions and a bibliometric account. Struct. Change Econ. Dyn. 19 (4), 273–300.
Sztulwark, S., 2005. El estructuralismo latinoamericano: Fundamentos y transformaciones del pensamiento económico de la periferia. Prometeo, Buenos Aires.
Timmer, M., de Vries, G., de Vries, K., 2016. Patterns of structural change in developing countries. In: Weiss, J., Tribe, M. (Eds.), Routledge Handbook of Industry and Development. Routledge, New York.
Trejo Nieto, A., 2021. Regional disparities in Mexico and the spatially cumulative effects of national development and economic cycles, 1940–2013. Reg. Sci. Policy Pract. 13 (4), 1283–1296.
Tyler, P., Evenhuis, E., Martin, R., Sunley, P., Gardiner, B., 2017. Growing apart? Structural transformation and the uneven development of British cities. Camb. J. Reg., Econ. Soc. 10 (3), 425–454.
UN-Habitat, 2016. Structural transformation in developing countries: Cross regional analysis. UN-Habitat, Nairobi.
UNIDO, 2013. Industrial Development Report 2013. Sustaining Employment. Growth: The Role of Manufacturing and Structural Change. UNIDO, Vienna.
Velthuis, S., Royer, J., Le Petit-Guerin, M., Cauchi-Duval, N., Franklin, R., Leibert, T., MacKinnon, D., Pike, A., 2022. Geographically uneven structural change in EU15 regions from 1980 to 2017: a cluster analysis. Working Paper No. 01/22 - Beyond Left Behind Places Project. Centre for Urban and Regional Development Studies (CURDS), Newcastle University.
Wainer, A., 2021. Una nueva "década perdida" en la Argentina y su crónica crisis en el balance de pagos. Cuad. De. Econ. ía Crítica 7 (14), 53–79.
Wainer, A., Belloni, P., 2019. Exportaciones argentinas desde 1990 a la actualidad: Un crecimiento exportador sin cambio estructural. Pap. De. Trab. 13 (23), 173–190.
Yang, Y., Hu, A., 2008. Investigating regional disparities of China's human development with cluster analysis: A historical perspective. Soc. Indic. Res. 86 (3), 417–432.
Yoguel, G., 2014. ¿De qué hablamos cuando hablamos de cambio estructural? Una perspectiva evolucionista-neoschumpeteriana. Paper presented at the Seminario-Taller: La estructura productiva argentina - Evolución reciente y perspectivas. October 1-3. ECLAC, Buenos Aires Office.