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A structural (change) approach to regional development traps and the development ladder in Argentina

Andrés Niembro[1] and Carla Daniela Calá[2]

[1] Universidad Nacional de Río Negro. Instituto de Estudios en Ciencia, Tecnología, Cultura y Desarrollo (CITECDE). Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina. aniembro@unrn.edu.ar

[2] Universidad Nacional de Mar del Plata. Facultad de Ciencias Económicas y Sociales. Mar del Plata, Argentina; dacala@mdp.edu.ar

Abstract:

The literature offers different definitions of development traps, which largely depend on the conceptual frameworks and the methodologies used. Instead of looking at this phenomenon from the reductionist side of relative income, GDP or economic growth, this paper aims to revisit the link between economic development and structural change, proposing a structural (change) approach to development traps. From this perspective, we define regional development traps as the inability of some regions to evolve and transform their productive structures along four dimensions (productivity, technological intensity, value added and diversity), thus remaining stuck at different levels of the regional development ladder. Based on employment data for the main 85 labor market areas in Argentina between 1996 and 2019, we propose two alternative and intuitive ways to identify regional development traps following the development ladder metaphor. The results reveal that several Argentine regions are trapped at low and intermediate steps of the development ladder, while others show regressive (or favorable) trajectories towards (or away from) these levels. Finally, we verify the relationship between regional development traps and movements along the ladder and different performance indicators.

Keywords: development traps, regional structural change, productivity, technological change, value chains, diversification.

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1. Introduction

There is a constant debate in economics and economic geography on how to measure and compare national or regional development, as the very concept of (economic) development remains fuzzy, despite the prolific empirical literature around it. In particular, this paper aims to contribute to the discussion on how to identify those regions that may have fallen into development traps, and what these traps may consist of. In addition to the recent academic interest in these topics, policymakers are also increasingly concerned about development traps and uneven development, in a context of growing regional polarization and political discontent in Europe and Latin America (Nieto-Parra *et al.*, 2019; Bourdin and Tai, 2022; ECLAC, 2024; European Commission, 2024a; 2024b; MacKinnon *et al.*, 2024; Rodríguez-Pose *et al.*, 2024b).

A rather simplistic view of economic development reduces its analysis to a comparison between relative levels of income or GDP per capita. From this approach, there is already a general consensus on the existence of poverty or low-income traps and also middle-income traps, with some accepted techniques for their measurement and identification (Azariadis and Stachurski, 2005; Gill and Kharas, 2007; Kharas and Kohli, 2011; Felipe *et al.*, 2012; Eichengreen *et al.*, 2014). In contrast, an important part of the literature has been calling for more complex and multidimensional definitions of development (Stiglitz *et al.*, 2009; OECD, 2019), but there are almost no specific tools to identify development traps from this perspective. Moreover, while it is common to find more (inter)national analyses, studies on regional traps are relatively scarce and very recent.

In their effort to move from middle-income traps at the country level to regional development traps in Europe, Diemer *et al.* (2022) take a first step by considering other variables besides GDP per capita, such as productivity and employment (though they are predictably correlated). However, their approach remains closer to the notion of economic growth (or stagnation) than to development in a broad sense.

Instead, this paper aims to revisit the link between economic development and structural change as a way to broaden the scope of development traps. Thus, we propose a structural (change) approach to identify regional development traps, providing a wider perspective that is not focused on income or GDP indicators. From this approach, we conceive regional development traps as the inability of some regions to evolve and transform certain dimensions of their productive structures, remaining stuck at different levels or steps of the development ladder.

When reviewing some of the main messages of Stiglitz *et al.* (2009), the OECD (2019: 67) highlights that “GDP fails to encompass the multidimensionality of development, as well as the structural changes that have characterised the evolution of modern economies.” In the economic development literature, many studies have focused on structural change, given that this process is considered, depending on the author, as a cause, consequence or manifestation of development (Foster-McGregor *et al.*, 2021). However, as it happens with the concept of development, the discussion on what is meant by structural change is far from settled and, thus, there are no single ways of measuring or identifying its quantitative and qualitative aspects (Yoguel, 2014; Niembro and Calá, 2024).

Several studies at the country level highlight the relationship between low- or middle-income traps and national trajectories of structural change (Jankowska *et al.*, 2012; Lee, 2013; Lavopa and Szirmai, 2018; Hartmann *et al.*, 2020; Bianchi *et al.,* 2024). In fact, as soon as one accepts that some particular sectors may function as growth engines, the importance of structural change as a development driver becomes evident (Lavopa, 2015). In terms of Lavopa and Szirmai (2018: 67), countries might get caught in these traps “if they are not able to perform a radical transformation of their productive structures.” Similarly, according to UNCTAD (2016), income traps occur when the structural changes required to maintain or accelerate economic growth become more difficult as nations move up the development ladder. The link between (the transformation of) productive structures and the development ladder metaphor has also been shown in other national-level analyses (Mohapatra *et al.*, 2006; Ozawa, 2016; Petralia *et al.*, 2017; Atkin *et al.*, 2021; Bianchi *et al.,* 2024), but not yet in regional studies.

In this sense, the conceptual discussion on regional development traps and the possible ways to measure or identify them is much more recent (Iammarino *et al.*, 2019; 2020). According to Diemer *et al.* (2022: 487), "the concept of regional development trap refers to regions that face significant structural challenges in retrieving past dynamism or improving prosperity for their residents." The European Commission (2024a) notes that *structural traps* occur when regions are unable to adapt their current productive structures to future economic changes, so that "structural interventions to foster structural change" become essential to overcome them (European Commission, 2024a: 30). Closely related, the notion of regional evolutionary traps by Balland and Boschma (2024) focuses on the structural incapacities to develop new and more complex activities, as some regions lack the necessary capabilities to do so.

Following this line of reasoning, this paper proposes a new way of identifying different types of development traps by focusing on some distinctive dimensions of the process of regional structural change (namely, changes in productivity, technological intensity, value added and productive diversity) and extending the development ladder metaphor from the national to the regional level. It also provides an application of this methodology for Argentina, a typical example of a developing country trapped in middle-income levels (Felipe *et al.*, 2012; Lavopa and Szirmai, 2018; Bianchi *et al.,* 2024), but with huge and historical regional development gaps (Cao and Vaca, 2006; Borello and González, 2021; Niembro and Sarmiento, 2021; Abeles and Villafañe, 2022). In addition, although several studies on Argentina highlight the absence of national structural change in the last decades (Roitter *et al.*, 2013; Rivas and Robert, 2015; Abeles and Amar, 2017; Coatz *et al.*, 2018; Wainer and Belloni, 2019), Niembro and Calá (2024) show different regional trajectories of structural change throughout the country. To the best of our knowledge, this is one of the first studies that seeks to adapt and apply the notion of regional development traps in a developing country and beyond Europe (or its surroundings), a research gap highlighted by Rodríguez-Pose *et al.* (2024a).

In line with the structural factors suggested in some development traps studies, but especially in the literature on structural change (Fernández Bugna and Peirano, 2011; Niembro and Calá, 2024), the proposal focuses on the analysis of the four main dimensions of this process: shifts in the labor force towards higher productivity sectors, towards more technology-intensive sectors, towards higher value-added activities (upgrading in value chains) and changes in the degree of productive diversity.[1] Based on data on total formal salaried employment in the main 85 labor market areas (LMAs) of the country between 1996 and 2019, we offer two alternative and somewhat complementary ways to identify regional development traps and, from there, we elaborate a typology of Argentine regions following the development ladder metaphor.

In addition to a better understanding of Argentine subnational development and its inequalities, the paper makes at least three contributions to the international literature. First, it provides a new approach to the recent debate on regional development traps, especially from the point of view of structural traps rather than income traps. To this end, based on previous studies that offer different criteria for measuring the structural change dimensions at the regional level (Niembro and Calá, 2024), we propose two ways of classifying regions (and regional development traps) according to their position or dynamics along the regional development ladder. This diagnostic tool for regional development traps is flexible enough to be adapted to the circumstances of countries with different levels of development and also different availability of sectoral data (employment, value added or trade).

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[1] Unlike the first three notions, which are very present in national and international studies of structural change, the last dimension (productive diversity) has been predominant in economic geography and regional studies (Boschma, 2021). In a previous paper (Niembro and Calá, 2024), we explored the patterns of regional structural change in Argentina following these four dimensions and showed the differences that arise from applying each criterion, but we did not connect those results to the debate on regional development traps.

Secondly, in the particular case of Argentina, the paper stresses the presence of different types of regional development traps at low and intermediate steps of the development ladder and diverse regional (regressive or favorable) trajectories towards or away from these levels. While the recognition of different types of development traps is a contribution to this specific literature (as Balland and Boschma, 2024), the empirical identification of negative or declining trajectories can also contribute to the debate on the dark side of regional path development (Blažek *et al.*, 2020).

In third place, although a distinctive aspect of our typology is that it is not based ex-ante on relative income or employment indicators (as traps are identified in other papers, including Diemer *et al.*, 2022), we verify ex-post that, in the case of Argentina, there is indeed a correspondence between regional development traps and positions on the ladder and different indicators of regional performance. In other words, regions trapped at the bottom or first levels of the development ladder show lower relative income and worse labor market indicators than regions outside these traps or at higher levels of development.

After this introduction, section 2 presents the literature review linking the concepts of economic development and structural change with those of development traps and structural traps, especially at the regional level. Section 3 describes the data and methods used to measure the main dimensions of regional structural change and to identify regional development traps. Section 4 shows the results, that is, the classification of Argentine regions according to two alternative ways of identifying development traps and regional dynamics along the development ladder, as well as an analysis of the relative performance of trapped and untrapped regions. Finally, section 5 summarizes the main conclusions.

2. From economic development to structural change and from development traps to structural traps

As with the notion of economic development, the concept of structural change is often used ambiguously, with circumstantial or *ad hoc* definitions. Consequently, if the conceptual framework is not made explicit, the empirical discussion on the occurrence or not of structural change can be an empty dialogue (Fernández Bugna and Peirano, 2011).

The adoption of diverse definitions implies different measures and forms of empirical identification. For example, OECD (2019) questions that per capita income does not fully reflect what happens with other development indicators. In particular, although most Latin American countries present middle-income levels, they show large disparities in other performance indicators and, at the same time, wide subnational inequalities (much higher than in developed OECD countries). According to this study, Latin American countries face different development traps or structural weaknesses that, once reaching an intermediate income level, operate as vicious circles that hinder inclusive and sustainable growth.

In order to identify regional development traps from a structural (change) approach, we examine the four main notions or dimensions of structural change, based on the conceptual review by Fernández Bugna and Peirano (2011). Despite we address each dimension separately, it should be noted that they have different points of contact (Bustillo Carrasco, 2019). For example, the OECD's definition of *productivity trap* seems to reflect rather a *structural (change) trap*, as it includes three of our four dimensions (productivity plus technological intensity and value added):

> "the stagnant productivity performance is associated with an export structure biased towards primary sectors with low levels of sophistication (such as agriculture, fisheries or mining) (…). Hence, the region has poor insertion into GVCs (…) associated with low levels of technology adoption and few incentives to invest in productive capacities. In all, competitiveness remains low, making it difficult to move towards a more sophisticated export structure and higher

> added-value segments of GVCs. This fuels a vicious circle that negatively affects productivity" (OECD, 2019: 102).

The European Commission (2024a) also notes that falling into a development trap can be linked to several interrelated factors, such as low growth in the manufacturing sector, skills shortages and lack of innovation, as well as decoupling from global value chains. As Fernández Bugna and Peirano (2011) highlight, each of the structural change dimensions requires specific analytical categories for its measurement and identification. Consequently, depending on the aspects stressed or the operational definitions adopted, different results can be achieved regarding the presence, magnitude and direction of structural change (Niembro and Calá, 2024).

According to Martins (2015) and Timmer *et al.* (2016), one of the most common and narrow definitions of structural change refers to the shift of workers and other resources to higher productivity activities. This is expected to increase the aggregate productivity of the economy, the rate of growth and the income level of the population (Fernández Bugna and Peirano, 2011; UNIDO, 2013; Martins, 2015; UN-Habitat, 2016). Even though the dispersion between sectoral productivities tends to be greater than that of wages by sector, the correlation between the two is high and sectors with above-average productivity usually have higher wages (ECLAC, 2012).

The second definition refers to the relocation of factors to technology-intensive activities in the manufacturing industry and, more recently, in some knowledge-intensive services (KIS). Since "technological change is at the heart of structural change" (UNIDO, 2013: 82), there is a close connection with the evolutionary and neo-Schumpeterian literature (Silva and Teixeira, 2008; Fernández Bugna and Peirano, 2011; Barletta and Yoguel, 2017; Lavopa and Szirmai, 2018). Moreover, a point of contact between the first and the second definition lies in the fact that the differences in sectoral productivity and their evolution may depend, among other factors, on the trajectories of technological change in those sectors (Krüger, 2008; Timmer *et al.*, 2016; Tyler *et al.*, 2017, Lavopa and Szirmai, 2018).

The third definition of structural change involves the upgrading along the supply chain to activities with higher value added or level of processing (Sztulwark, 2005; Fernández Bugna and Peirano, 2011; Barletta and Yoguel, 2017). It also has points of contact with the previous dimensions, as high productivity activities were historically related to *industrialization* (the shift from agriculture to manufacturing), and in recent decades to the notion of modern sectors, including both manufacturing and some service activities (Li and Haynes, 2011; UN-Habitat, 2016; Foster-McGregor *et al.*, 2021). In other words, the transformation from primary to manufacturing (or modern) activities may imply gains in productivity and value added.

Interestingly, in one of the few studies that examine the link between (national) structural transformations and income traps, Lavopa and Szirmai (2018) seem to mix or combine elements of the first three dimensions of structural change. They employ two indicators to calculate an index of structural modernization or to draw a *structural modernization landscape*. First, the share of total employment in modern sectors, considered in a very broad way, that is, industry (mining, manufacturing, utilities and construction) and internationally tradable services (transport, telecommunications, financial and professional services). For the authors, these sectors usually have higher levels of productivity and also a higher potential for technological upgrading and productivity gains. Secondly, labor productivity is assumed as a proxy for the level of technological knowledge incorporated in these modern sectors.

Finally, in Boschma's (2021) review of the geographic perspective of structural change, he focuses on what we take in this paper as the fourth dimension, productive diversity. Like other authors (Saviotti and Pyka, 2004; Saviotti and Frenken, 2008; Fernández Bugna and Peirano, 2011; Barletta and Yoguel, 2017; Neffke *et al.*, 2018), he stresses that diversification, seen as the emergence of new activities, is a central component of structural change. In the same way, UNIDO (2013: 108) points out that "structural change and diversification are strongly interconnected." Although the diversification literature distinguishes between related and unrelated variety, Boschma (2021) highlights that there is much more evidence of the former type, given that new activities are usually based on pre-existing capabilities and resources, while unrelated diversification requires radical transformations.

In line with the above-mentioned fuzzy boundaries between dimensions, it is interesting that one of the main studies introducing the notion of regional development traps also mentions many of the aspects of structural change:

> "a successful transition from agriculture to industry, and from industry to high-skilled and high value-added activities, is fundamental for preventing countries from falling into the middle-income trap and/or escaping it. This requires an upgrading of the economic structure and a transition from imitation-based to more innovation-intense strategies. This largely holds true at the regional level" (Iammarino *et al.*, 2020: 13).

This report by Iammarino *et al.* (2020) and the condensed version of the article by Diemer *et al.* (2022) are, undoubtedly, the main empirical antecedents on regional development traps. The methods and indices proposed by these authors have been replicated in quantitative studies focused on Turkey (Çinar, 2023a; 2023b), China (Chen, 2024) and the relationship between regional traps and the geography of discontent in Europe (Rodríguez-Pose *et al.*, 2024b), and even inspired qualitative research (Roessler, 2024).

From an operational standpoint, Diemer *et al.* (2022: 489) understand a regional development trap (in Europe) "as the state of a region unable to retain its economic dynamism in terms of income, productivity, and employment, while also underperforming its national and European peers on these same dimensions." On this basis, they propose two alternative measures. The first one (called development-trap index 1 or DT1) captures with a series of dummies whether the growth of each region in the three indicators has been lower than three benchmarks (its past, other regions of its country and Europe), making a total of nine comparisons. The second index (or DT2) considers, instead of dummies, the intensity or magnitude of the deviations from these benchmarks, accounting for the severity of the trap in which a region may be found. In addition, the authors argue that a trap can occur at different levels of economic development (relative to Europe), thus distinguishing regional development traps at low, middle and high income levels.

Rather than focusing on dynamics of low economic growth or relative stagnation, Balland and Boschma (2024) propose an evolutionary (in a sense, structural) approach to derive a new typology of regional traps in Europe. Inspired by recent studies showing that regions can become trapped in low-complexity activities because they lack the necessary capabilities to develop (and diversify into) more complex ones (Hartmann and Pinheiro, 2022; Pinheiro *et al.*, 2022, Queiroz *et al.*, 2024), the authors draw on the relatedness-complexity framework (Balland *et al.*, 2019; Li and Rigby, 2023) to identify regional traps. In the style of a four-quadrant graph, they cross regional indicators of relatedness density and complexity with their respective averages and, thus, differentiate four scenarios (including three different traps): structural trap (the worst situation), low relatedness trap, low complexity trap, and complexity loop (the most favorable scenario).

The elaboration of a taxonomy of regional traps is related, albeit partially, to other recent studies that indicate the existence of different types of peripheral regions or *left-behind* places (Eder, 2019; Hertrich and Brenner, 2023; Nilsen *et al.*, 2023; Calignano *et al.*, 2024; Velthuis *et al.*, 2024), generally based on a multidimensional interpretation of these conditions (Glückler *et al.*, 2023; Tsiotas and Tselios, 2023; Pike *et al.*, 2024). As MacKinnon *et al.* (2024: 1162) note, one way "in which the problems of 'left-behind' regions has been conceptualised is in terms of these regions being stuck in development traps" (see also, Rodríguez-Pose *et al.*, 2024a; Roessler, 2024). In empirical terms, it is worth noting that Velthuis *et al.* (2022) identify distinct groups of left-behind places in Europe according to different (unfavorable) dynamics of structural change. Furthermore, the trajectories of regional *left-behindness* in Le Petit-Guerin *et al.* (2023) can be linked to the types of declining dynamics outlined by Blažek *et al.* (2020) in their analysis of the dark side of regional path development.

Based on this literature, we expect that our structural (change) approach to regional development traps may also reflect the existence of different types of regional traps and dynamics, following the development ladder metaphor. Moreover, these distinct regional situations could be linked to other characteristics or performance indicators of each group of regions (Balland and Boschma, 2024; Chen, 2024).

3. Data and methodology

3.1. Data and period under analysis

Structural change analysis usually focuses on the evolution of sectoral aggregates, mainly from GDP or employment statistics. Like many other studies (Lavopa and Szirmai, 2018; Velthuis *et al.*, 2022; Balland and Boschma, 2024), we work with employment data by sector, since there are no GDP statistics available at the scale of labor market areas (LMAs) in Argentina. It is important to note that, in the database, employment is recorded in the region where people work and not where they live, which allows us to describe the productive structure of each region.

The database was provided by the Observatory of Employment and Business Dynamics (OEDE in Spanish) and covers all formal salaried employees in private companies, disaggregated into 56 sectors (2 digits, ISIC rev. 3), for the main 85 LMAs of the country between 1996 and 2019 (the first and last year available). LMAs are portions of the territory determined by workers' movements between their place of work and their home, and consist of a central node or city and a set of other linked towns (Borello, 2002; OEDE, 2020). It should be noted that these 85 LMAs represent 86% of the total population of the country and 95% of formal employment in the private sector (OEDE, 2020).

Our analysis focuses on the changes between extreme years for the entire period. However, we also explore and check the dynamics in two different sub-periods, without finding significant differential trends. Given that we take the average of three-year windows to avoid the results being affected by occasional issues, shifts between extreme years refer to 1996-1998 versus 2017-2019. Meanwhile, the sub-periods are defined according to different peaks before three economic recessions (1998, 2008 and 2018, coincidentally separated by ten years). The first sub-period contains the lengthy recession of 1998-2002, followed by a sharp recovery until 2008. The second one starts with the 2009 slowdown, which was quickly overcome, but since 2011 the Argentine economy has been stagnant.[2]

3.2. Measuring the four dimensions of structural change

As highlighted by other authors (Lavopa, 2015; Lavopa and Szirmai, 2018), one of the main challenges is how to determine which activities should be included among the sectors with higher productivity, higher technological intensity or higher value added. According to Lavopa (2015: 77), “part of the theoretical soundness needs to be sacrificed in order to have a measurable variable.” While the data available in those studies are limited to 9 or 10 broad sectoral aggregates, one of the strengths of this paper is the availability of 56 sectors –also higher than the 33 industrial categories used by Balland and Boschma (2024)–. Nevertheless, it is worth noting that standard sectoral classifications present different limitations (Hicks, 2011) and we still deal with some intra-sectoral heterogeneity that cannot be isolated with the available data.

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[2] These sub-periods, and especially the identification of the peaks in 1998 and 2008, are consistent with other recent studies (Perrotti, 2021; Blanco *et al.*, 2022).

Bearing in mind these caveats, to identify the activities with higher productivity, we use sectoral statistics at the national level and select a group of 18 sectors (one-third of the 56) that, between 2004 and 2019, have the highest wages in Argentina (from OEDE) and also high levels of value added per worker (INDEC, the national institute of statistics).[3] This is consistent with the evidence of ECLAC (2012), which shows a high correlation between these variables in other Latin American countries.

Secondly, we use two criteria to identify the most knowledge-intensive activities. For manufacturing, we follow the widely used OECD taxonomy (UNIDO, 2013; Rivas and Robert, 2015; Barletta *et al.*, 2022) and include medium-high and high-tech sectors. On the other hand, we take as knowledge-intensive services the sectors examined by López *et al.* (2014) in the case of Latin America, which are largely in line with high-tech KIS and KIBS (B of business) defined by Eurostat (2011), excluding financial services and other personal KIS.

It is worth noting that several authors have suggested industrial classifications different from the OECD taxonomy to reflect some specificities of Latin America (Katz and Stumpo, 2001; Katz and Bernat, 2011; Kataishi and Morero, 2020). In addition, some studies use data from Argentine companies to develop taxonomies that reflect local technological opportunities (Cassini and Robert, 2017; Marin and Petralia, 2018), local intensity of R&D expenditure (CEP, 2007) or, more generally, the intensity of innovation activities (Bernat, 2020). Combined with the study by Aboal *et al.* (2017) in the bordering country of Uruguay, they present a more favorable perspective than the OECD classification regarding, for example, food and beverage production, which is commonly considered a low-tech sector in developed countries.

Even though this debate is not taken into account when identifying medium-high and high-tech sectors, it can be partially considered in the application of the third dimension of structural change, the shift of resources to sectors with higher value added or higher level of transformation from natural resources. Considering that much of Latin American production and exports remain concentrated in raw materials with little or no processing, an emphasis is placed on the potential for adding value and upgrading in the value chains of agriculture, livestock, forestry, minerals or hydrocarbons. Therefore, for the third conception of structural change, we focus on manufacturing sectors based on the processing of natural resources and some higher value-added activities that are transversal to different chains, such as the provision of machinery, equipment and professional and technical services (see Appendix A). In part, this resembles Lavopa and Szirmai's (2018) broad consideration of modern sectors, which includes manufacturing activities typically considered low-tech.

Finally, for the fourth dimension of structural change, we calculate a synthetic measure of productive diversity commonly used in the literature, the inverse of the Herfindhal-Hirschman Index (1/HHI). As Krieger-Boden and Traistaru-Siedschlag (2008) note, although there are many alternative indexes, the results are usually consistent. Unfortunately, we do not have the necessary data to distinguish between related and unrelated variety at the level of LMAs, which is certainly an interesting topic for future research.

Based on the above operational definitions, we obtain the annual percentage of employment in sectors with higher productivity, higher technological intensity and higher value added or level of processing from natural resources (Appendix A), as well as the diversity index (1/HHI) for each year. Then, we calculate the averages for 1996-1998 and 2017-2019 (or 2006-2008 as the pivot for the two sub-periods) and standardize the measures as Z scores, but using the mean and standard deviation of 1996-1998. This type of standardization is also carried out by Diemer *et al.* (2022), following the recommendation of Nardo *et al.* (2008), when the focus is on changes over time rather than comparing units in the same cross-section.

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[3] Sectoral classifications are available in Appendix A.

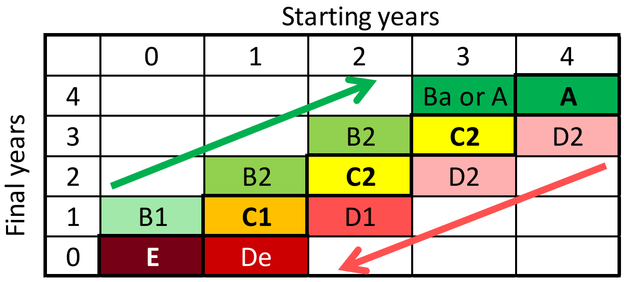
3.3. Identification of regional traps and different dynamics along the development ladder

For the sake of robustness, we propose and compare two alternative ways of identifying regional development or structural traps, which we call ST1 and ST2. The first one is simpler and is based on a series of dummies according to the (combination of) dimensions of structural change above the regional average in Argentina. Beyond this dichotomous view, the second form of identification considers the intensity of (positive and negative) differences with the regional mean, thus providing more information about the traps. For example, it allows a better treatment or identification of those regions close to the average (above or below) in some dimensions. In addition, regions may experience improvements or regressions in one or more dimensions but, if they do not cross the threshold of the regional mean, these dynamics may not be captured by the first method.

The typology of regional traps and dynamics along the development ladder is derived from the exploration of the transition matrix between extreme years (1996-1998 and 2017-2019). For the dummies of above-average dimensions, we can explore a more complex 16 x 16 matrix (given the 4 x 4 possible combinations of dimensions) or a simpler and more intuitive 5 x 5 matrix depending on the number of dimensions higher than the average (from none to 4). We take the latter matrix and reformulate the axes to plot the development ladder and specify our analytical categories (Figure 1).

Along the ascending diagonal, we identify four positions or levels that coincide both at the starting and final years: E) structural poverty trap (all dimensions below average); C1) lower-middle development trap (a single dimension above average, or positive as they are Z scores); C2) upper-middle development trap (for the sake of simplicity, we combine here 2 or 3 positive dimensions); and A) virtuous structural loop (all dimensions above average, especially in the final years). Below the diagonal, we find regressive dynamics, meaning a worsening between the starting point and the final years: De) falling into *the trap* (from one positive dimension to none); D1) dropping to lower-middle (from two to one positive dimension); and D2) dropping to/in upper-middle (4 to 3 or 3 to 2). Similarly, above the diagonal, we find favorable dynamics: B1) escaping *the trap* (from none to one positive dimension) and B2) climbing to/in upper-middle (1 to 2 or 2 to 3). Although it is true that, as a counterpart of De, we could think of a trajectory *Ba* (entering the virtuous loop), as will be shown below, only two of the 85 Argentine LMAs are in this situation. Therefore, we decided to consider them in group A for the rest of the analysis, privileging the four positive dimensions in final years.

Figure 1. Development ladder from a reformulated transition matrix



	0	1	2	3	4
4				Ba or A	**A**
3			B2	**C2**	D2
2		B2	**C2**	D2	
1	B1	**C1**	D1		
0	**E**	De			

Source: Own elaboration.

A similar exercise, based on the transition matrix, is carried out for the second form of identification according to the intensity or magnitude of structural change (ST2). For this purpose, instead of counting dummies, we take the average of the four dimensions in Z scores for each moment.[4] In addition, a series of thresholds every 0.25 (one quarter of a standard deviation) are defined for the axes of the matrix. Type 1 categories (B1, C1 and D1) will be below the regional mean (zero) in final

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[4] This decision is similar to the one adopted by Diemer *et al.* (2022: 496) with their three variables of analysis in DT2, when mentioning that each dimension "is simply added up together".

years and type 2 (B2, C2, D2) will be above the average. Here is an additional reason (perhaps not so clear in Figure 1) for distinguishing only two intermediate levels (lower-middle and upper-middle). All of this will be discussed in more detail in the results section.

3.4. Relationships between development traps and regional performance indicators

As mentioned above, a distinctive aspect of our structural approach to identify development traps is that it does not rely on relative income or employment performance indicators, as is usual in studies on income traps (including Diemer *et al.*, 2022). However, we explore ex-post the links between the typology of traps obtained for Argentine LMAs and different regional performance indicators, as done by Balland and Boschma (2024) and Chen (2024). Diemer *et al.* (2022) also examine some characteristics of trapped and untrapped regions, but noting that "this analysis is purely descriptive and is not to be interpreted in a causal way, nor as an indication of the relative contribution of either variable to the status of being trapped" (Diemer *et al.*, 2022: 502).

Unfortunately, the only subnational level for which GDP estimates are available is the country's 24 provinces, but there is no similar measure at the level of LMAs. For this reason, we resort to a set of alternative indicators, which imperfectly or partially cover different angles of regional performance (Table 1). Four indicators are constructed using information from OEDE specifically for LMAs and, thus, only cover formal salaried employment in the private sector. Two other indicators are more comprehensive, since they come from a transformation exercise of information from the 2022 National Population Census, from the scale of departments (more than 500 in the country) to that of the 85 LMAs, following the experience of previous studies (Niembro and Calá, 2021).

The first indicators in Table 1 try to approximate relative incomes: firstly, average wages in LMAs in the early years available in this database (2008-2010) and the last years of our period of analysis (2017-2019); and secondly, the wage bill (average wage per total private employment), relative to the population of the previous 2010 Census. With all possible caveats and, above all, despite the other dimensions of income not covered, the per capita wage bill is the closest proxy to the per capita income (or GDP) of LMAs. The following two indicators look from complementary angles at the volume of regional employment: the density of formal private employment in the latest available years (2017-2019), which OEDE calculates for LMAs; and a proxy of the employment rate of LMAs, from the 2022 Census data by department. This last indicator has the appeal of covering the entire population that declares to be employed, salaried and non-salaried, formal and informal, in both private and public sectors. However, due to the conversion between geographic scales, it is still an approximation at the level of LMAs.

Table 1. Regional performance indicators

Indicator	Year/s	Elaborated based on	Remarks
Average wage in formal private sector	2008-2010 average	OEDE	First years available
	2017-2019 average		Last years available
Per capita wage bill (formal private sector)	2010	OEDE	Total population according to 2010 Census
Density of formal private employment	2017-2019 average	OEDE	Formal private salaried employment / estimated total population
Employment rate	2022	INDEC - 2022 Census	Total employment / population aged 14 and over. Conversion from departments to LMAs
Proportion of migrants (born in another province or country)	2022	INDEC - 2022 Census	Conversion from departments to LMAs

Source: Own elaboration.

The last variable in Table 1, the proportion of immigrant population in LMAs, also arises from the transformation between scales of census data, but it does not strictly represent a traditional dimension of regional performance. We include it as an additional variable because, as will be shown below, it has an interesting relationship with regional development traps –it is often linked to the risk of falling into a *talent development trap*, according to the European Commission (2024b)– and thus may trigger in-depth studies in the future.

Given that none of the first performance indicators (income and employment) is free of limitations, in addition to analyzing them separately, we construct a synthetic indicator through principal component analysis. It will be useful to order the groups of LMAs (obtained according to the classification of traps) from the best to the worst relative situation.

4. Results

4.1. Typology of structural traps and dynamics along the development ladder

The following reformulated transition matrix (Table 2) shows the results of the first form of identification of structural traps (ST1), using the same colors and categories as in Figure 1. It can be seen that 10 LMAs in Argentina are immersed in a structural poverty trap (E), while another 10 fall into this trap (De). There is also one special case that drops from 2 positive dimensions to no one. That is, almost one quarter of the regions finish the period in the worst structural scenario.

In addition, 12 LMAs are included in the lower-middle development trap (C1, orange) and 15 in the upper-middle development trap (C2, yellow). In comparison to Figure 1, there is a novelty along the diagonal of Table 2. In these intermediate levels (C1 and C2), we can distinguish some regions that maintain the same number of structural change dimensions above the regional average but, at the same time, experience some changes in which are those positive dimensions. This is particularly evident in (6 of 9) LMAs with two structural dimensions above the mean. Throughout the period, they sustain one of the initial dimensions and modify the other (more details in Appendix B, with the 16 x 16 table).

Regarding the positive cases, 9 LMAs are classified in group A (virtuous structural loop), including the (already mentioned) 2 regions that start with 3 positive dimensions and advance to 4. There are also 10 LMAs with positive trajectories to/in the upper-middle level (B2), including a very particular case that progresses from one dimension to 4.[5] As for regressive dynamics, 13 LMAs reduce their number of positive dimensions during the period (from 2 to 1, 3 to 2 or 4 to 3).

Table 2. Distribution of LMAs in the first form of identification of structural traps (ST1)

1996-1998 -->

		0	1	2	3	4
<-- 2017-2019	4		**1**		2	7
	3		1	3	6 (1)	3
	2		5	9 (6)	5	
	1	5	12 (2)	5		
	0	10	10	**1**		

Source: Own elaboration. Note: in parentheses, number of LMAs that change positive dimensions

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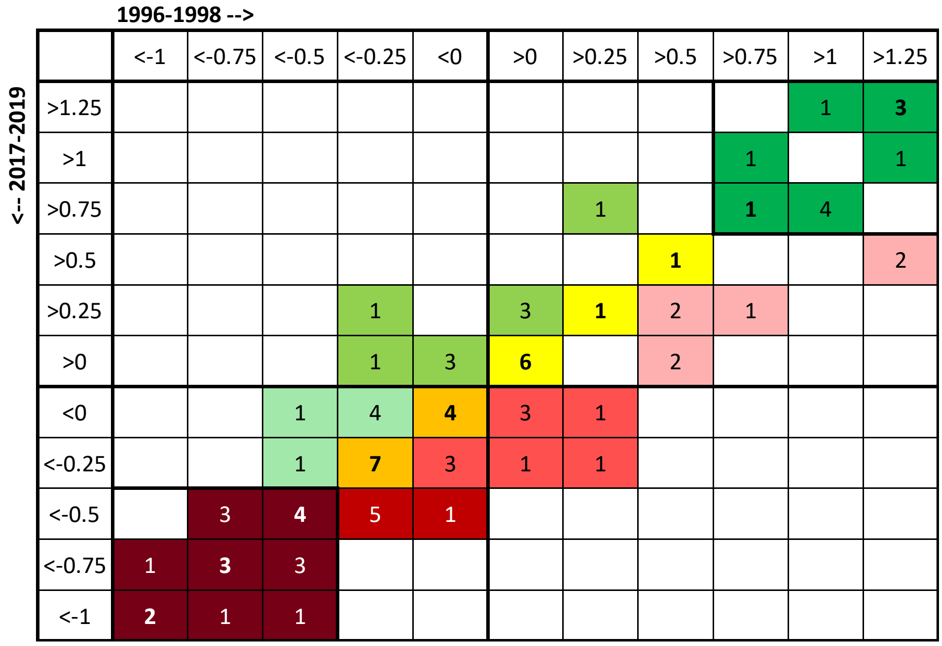
[5] In a context with more observations, it could be considered to have a separate category *Ba* (entering the virtuous loop), but here we prioritize having at least five LMAs in each group.

Table 3 shows the reformulated transition matrix for the second form of identification of structural traps (ST2), taking into account the intensity of structural change. As can be seen, the definition of thresholds every 0.25 allows a finer look, which captures more variability in the dynamics than the jumps between the four dimensions. In line with the greater dispersion of positive values in Figure 2, we opt to identify in group A those LMAs with values above 0.75 at both the initial and final years. Only one special case starts below this threshold and then surpasses it (but we consider this region as B2). Thus, 11 LMAs appear to be in a virtuous structural loop, while 15 show positive trajectories (9 in group B2 and 6 in B1).

At the other extreme, the LMAs in a structural poverty trap (E) are those that start and end the period with values below -0.50. There are 18 regions in this situation, along with another 6 that fall into this trap in final years (De).

Table 3. Distribution of LMAs in the second form of identification of structural traps (ST2)



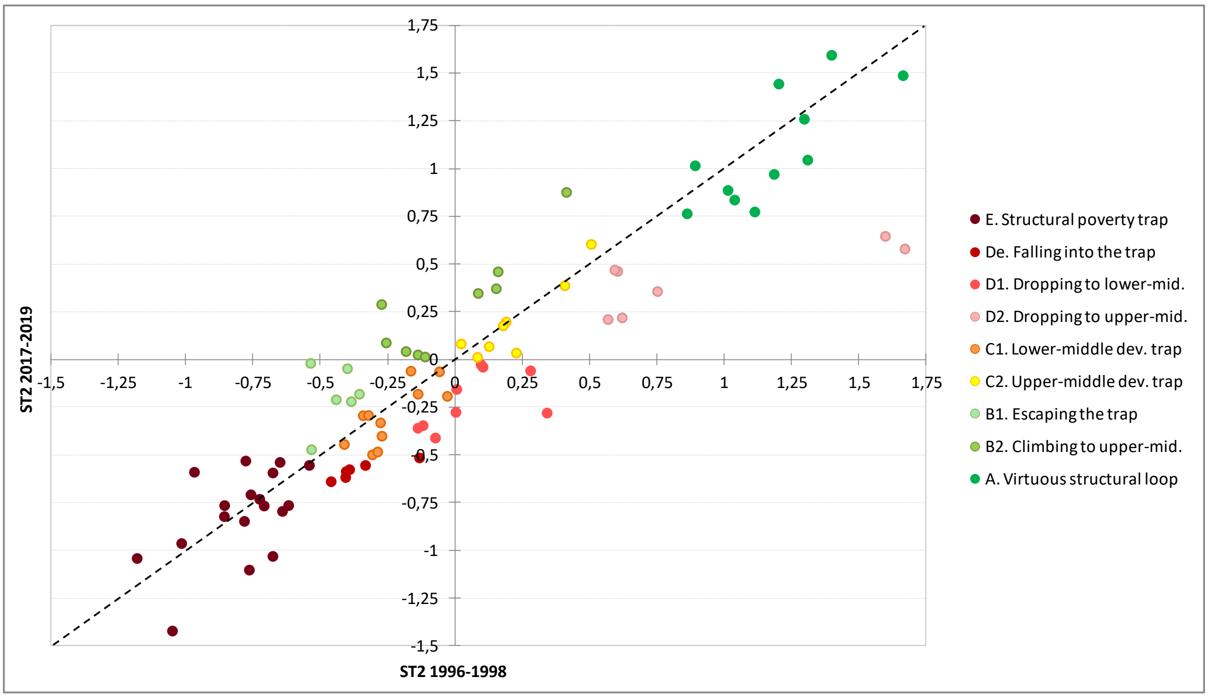
1996-1998 -->

<-- 2017-2019

	<-1	<-0.75	<-0.5	<-0.25	<0	>0	>0.25	>0.5	>0.75	>1	>1.25
>1.25										1	**3**
>1									1		1
>0.75							1		**1**	4	
>0.5								**1**			2
>0.25				1		3	**1**	2	1		
>0				1	3	**6**		2			
<0			1	4	**4**	3	1				
<-0.25			1	**7**	3	1	1				
<-0.5		3	**4**	5	1						
<-0.75	1	**3**	3								
<-1	**2**	1	1								

Source: Own elaboration. Note: Axes values refer to the average of the four dimensions of structural change in Z scores.

Figure 2. Second form of identification of structural traps (LMAs values in 1996-1998 versus 2017-2019)



Source: Own elaboration. Note: Axes values refer to the average of the four dimensions of structural change in Z scores.

Predictably, the two alternative forms of identification and classification are not entirely coincident. Since they contemplate the possible existence of regional structural traps from different angles, they call for a detailed analysis, especially, of the characteristics and trajectories of the regions classified in *distant groups* (from the diagonal in Table 4). To give an example, the 3 LMAs that according to ST1 appear in B1 (escaping *the trap*), but for ST2 remain in E (structural poverty trap), respond to a general situation where the improvements in one dimension (captured by ST1) are not enough to offset the very negative situation in the other dimensions (reflected in the average intensity of ST2).

In addition to full matches on the diagonal (in bold), we also mark some *close categories* with grey in Table 4. For example, of the 10 LMAs in structural poverty trap according to ST1, 8 are in the same group for ST2. Viewed the other way around, from the 18 LMAs in group E according to ST2, along with these 8 matches, we could consider 3 regions in the nearby category De (falling into *the trap*). At the other extreme, of the 9 LMAs in virtuous structural loop according to ST1, 8 appear in the same group for ST2. In the opposite sense, we could add one close region in B2. In the next section, we will see how, despite the differences between both forms of identification, they tend to show a similar picture concerning the relative performance of the different groups.

Table 4. Coincidences and differences between both forms of classification

ST2 classification -->

<-- ST1 classification

	E	De	D1	D2	C1	C2	B1	B2	A	LMA
E	**8**						2			10
De	3	**5**	2		1					11
D1			**3**		1			1		5
D2			1	**5**		1			1	8
C1	4		1		**6**		1			12
C2			3	1		**6**		4	1	15
B1	3				1		**1**			5
B2					2	1	2	**4**	1	10
A				1					**8**	9
LMA	18	5	10	7	11	8	6	9	11	85

Source: Own elaboration.

Moreover, the geographic distribution of the groups of LMAs is relatively similar in both forms of classification (Figure 3). The LMAs that face a structural poverty trap (E) or fall into it (De) are mostly located in the north of the country (historically, the most backward region), rural-agricultural areas in the interior of the provinces of Buenos Aires and Córdoba, as well as some tourist regions in these provinces and the Patagonia (south of the country). At the other extreme, the LMAs in a virtuous structural loop (A) are mainly located in the industrial belt of the center of the country –connecting the Buenos Aires metropolitan area with the cities of Rosario (in Santa Fe) and Córdoba–, together with some LMAs that have enjoyed industrial promotion regimes (in the province of San Luis according to ST1 or in the extreme south of the territory according to ST2).[6]

Except for a few cases (especially in ST1), the rest of the northern LMAs are distributed among type 1 categories (B1, C1 and D1), linked to the lower-middle level of the development ladder. On the other hand, the bulk of the LMAs in type 2 or upper-middle categories are located in the central part of the country, along with several Patagonian areas. However, it is important to highlight the heterogeneity of situations within some provinces, as is common in the cases of Buenos Aires and Córdoba, but also in some Patagonian provinces.[7] In contrast, other provinces with numerous LMAs show a more homogeneous scenario, which tends to be favorable in Santa Fe and negative (with many trapped regions) in Entre Ríos.

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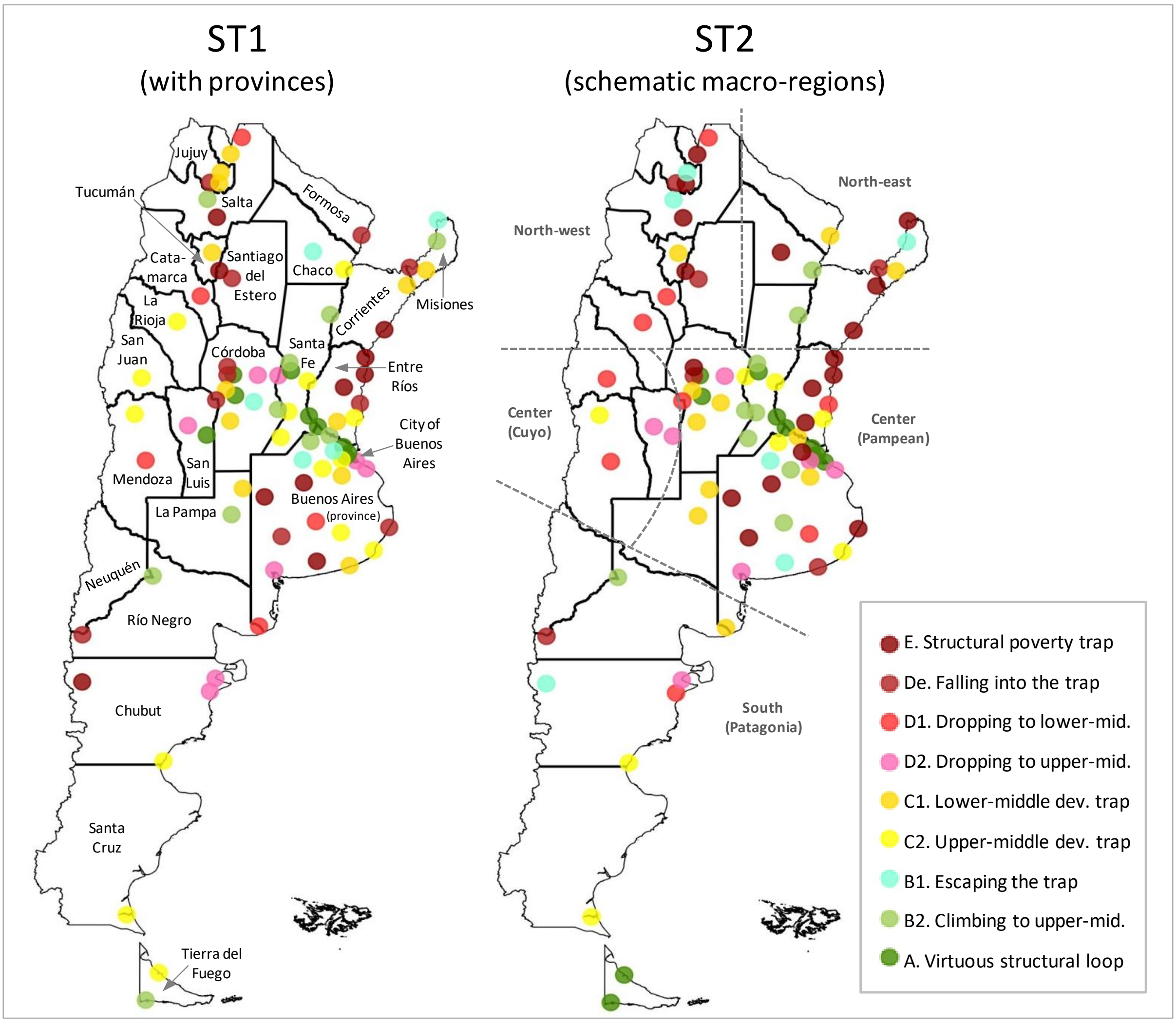
[6] This regional picture is similar to the one that emerges from the analysis of productive complexity (by departments, not LMAs) provided by Abeles and Villafañe (2022).

[7] There is also considerable heterogeneity in terms of regional specialization profiles (as classified by Niembro *et al.*, 2021). For example, although some LMAs specialized in primary and extractive activities manage to escape from different traps, other regions with the same productive profile appear in opposite situations.

Figure 3. Maps of LMAs according to both forms of classification



Source: Own elaboration. Notes: the point does not reflect the full extension of each LMA, but the location of the central node; internal lines represent the provincial boundaries.

Finally, as an additional check, we analyze regional trajectories by differentiating two sub-periods of about 10 years each (taking 2006-2008 as the pivot). Although, as mentioned above, there are no significantly different results from one sub-period to another (Appendix C), some aspects are worth highlighting. For example, according to ST1, almost half of the LMAs (41 out of 85) remain stable in both sub-periods, that is, with the same number of positive dimensions. Given the greater variability of ST2, as it is an intensity indicator and because of the multiple thresholds (every 0.25), the number of LMAs in the same situation at both times decreased to 23. Another interesting point is that, in most of the remaining cases, an improvement (regression) for the entire period is generally explained by progress (setbacks) in one sub-period and stability in the other, without identifying a clear prevalence (in frequency) of changes in the first or second sub-period. Other dynamics of sustained changes in the same direction or reversions (V and inverted V) are much less frequent but may be interesting for future in-depth analysis.

4.2. Relative performance of trapped and untrapped regions

In this section, we first examine the correlations between the four dimensions of structural change and some performance indicators (Table 5) and then the relative performance of the different groups of LMAs, especially of trapped regions. It is remarkable that, in contrast to Diemer *et al.* (2022), the correlations between the four structural dimensions are low or null in several cases. This shows that each dimension provides additional information for the identification of development traps. The most significant and positive relationships are between productivity and technological intensity –in line with the assumptions of Lavopa (2015) and much of the literature– and between technological intensity and productive diversity.

Table 5 also shows that the value-added dimension has weak or no linkages with the rest of the structural change categories and it is practically unrelated to the different performance indicators (followed, to a lesser extent, by productive diversity). This could raise some reservations regarding the development strategies usually advocated in Latin America, since the shift of resources to sectors with higher value added (or higher levels of processing) based on the natural resources available does not seem to be accompanied by significant regional improvements in terms of income or volume of employment.

As expected, there is a high correlation between productivity and wages, due to the form of selection of high-productivity sectors. Interestingly, the correlations between both wage and employment indicators are relatively high and this supports the use of principal component analysis to synthesize most of the information shared by the different performance measures.

Table 5. Correlations between structural change dimensions and performance indicators

	PR 96-98	TI 96-98	VA 96-98	DI 96-98	PR 17-19	TI 17-19	VA 17-19	DI 17-19	Wage 08-10	Wage 17-19	Wage Bill 10	Density 17-19	Emp. Rate 22	Migrant 22
PR 96-98	**1**													
TI 96-98	0,560	**1**												
VA 96-98	-0,013	0,215	**1**											
DI 96-98	0,374	0,572	0,007	**1**										
PR 17-19	0,882	0,580	0,027	0,328	**1**									
TI 17-19	0,520	0,898	0,183	0,574	0,546	**1**								
VA 17-19	-0,040	0,202	0,892	-0,050	-0,031	0,221	**1**							
DI 17-19	0,415	0,619	0,161	0,792	0,416	0,667	0,073	**1**						
Wage 08-10	0,742	0,542	0,092	0,247	0,890	0,478	0,078	0,284	**1**					
Wage 17-19	0,730	0,516	0,055	0,248	0,882	0,474	0,058	0,319	0,972	**1**				
Wage Bill 10	0,721	0,533	0,083	0,300	0,864	0,501	0,084	0,330	0,916	0,902	**1**			
Density 17-19	0,607	0,534	0,076	0,376	0,667	0,576	0,127	0,405	0,676	0,682	0,861	**1**		
Emp. Rate 22	0,230	0,342	0,042	0,203	0,323	0,359	0,041	0,344	0,341	0,405	0,371	0,465	**1**	
Migrant 22	0,586	0,396	-0,096	0,219	0,600	0,361	-0,146	0,185	0,649	0,652	0,650	0,573	0,407	**1**

Source: Own elaboration. Notes: PR: productivity, TI: technological intensity, VA: value added, DI: diversity.

Figure 4 shows the link between the per capita wage bill (proxy of per capita income) and the density of formal private employment (over total population) for all LMAs, according to our ST2 classification.[8] About 80% of the LMAs in a structural poverty trap or that fall into this trap (groups E and De) appear in the lower left quadrant, below the means of both variables. Something similar occurs with the regions that fall to the lower-middle level during the period under analysis (6 of 9 LMAs in group D1) or with those that are trapped at this level (7 of 11 in C1) and even with the LMAs

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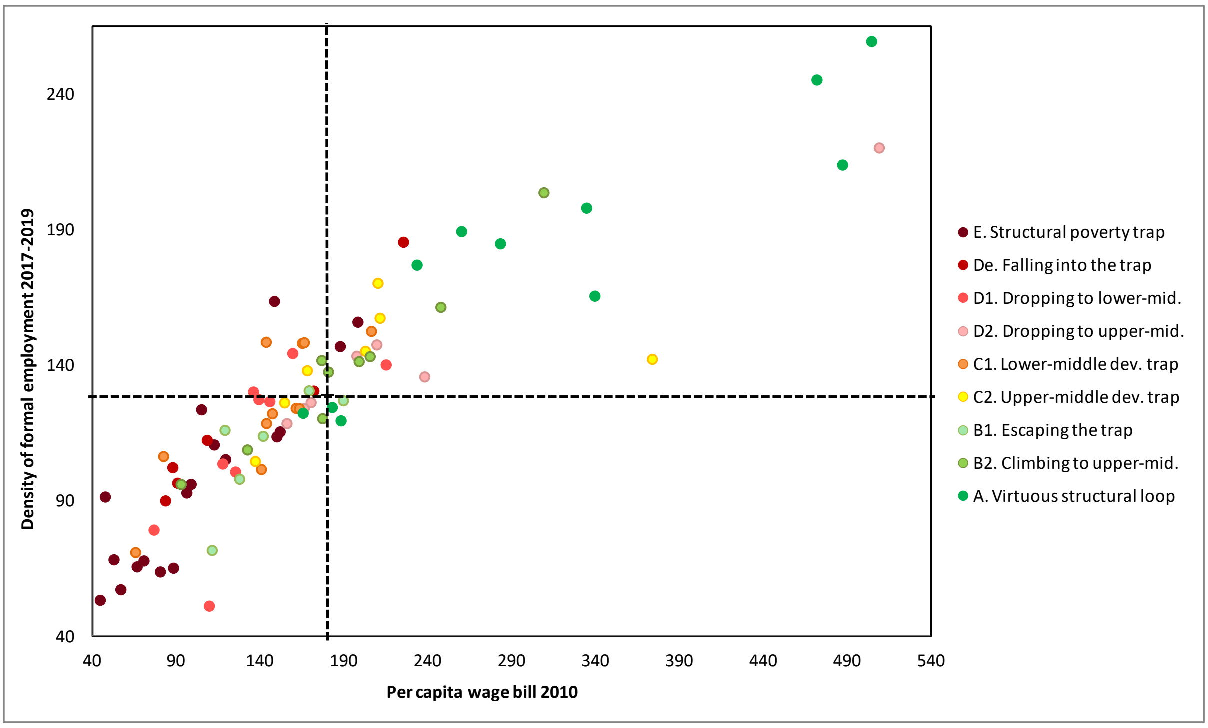
[8] Unlike Diemer *et al.* (2022), who prioritize the index constructed from dummies (DT1), we consider that our second form of trap identification (ST2), based on the intensity of structural change, is superior in informative terms and, thus, the following results correspond to this classification of Argentine LMAs.

that manage to escape the poverty trap (4 of 6 in B1). However, in all of these latter categories, there are also several regions close to the averages. In contrast, 8 of the 11 LMAs in a virtuous structural loop are located in the upper right quadrant, above both means. The LMAs that climbed to the upper-middle level (group B2) appear in the same quadrant or around the averages, while those that fall to that level (D2) or remain stuck at it (C2) tend to split between the two quadrants described above.

Figure 4. Per capita income and employment density by groups of LMAs (ST2 classification)



Source: Own elaboration.

Table 6 shows a synthetic measure of all performance variables using principal component analysis (PCA) and the means of each individual indicator, along with the additional dimension of migration, for each group of LMAs (means are standardized as Z scores to match the scale of the PCA indicator). In general terms, our typology of regional traps and dynamics along the development ladder has a coherent relationship with the different regional performance indicators. As a robustness check, if we had opted for the classification by dummies (ST1), the five groups highlighted in bold in the first column of Table 6 would be ordered in the same way. This means that the different levels of the ladder appear consistently in the expected order: E) structural poverty trap (followed by falling into it, De), C1) lower-middle development trap, C2) upper-middle development trap, and finally, A) virtuous structural loop. Another noteworthy aspect is that, in both alternative classifications, the type 1 or lower-middle categories (B1, C1 and D1) appear individually and jointly below their correlative type 2 or upper-middle categories (B2, C2 and D2).[9]

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[9] What changes between classifications (ST1 and ST2) is the relative position of type 1 categories among themselves, and the same with type 2 categories.

Table 6. Performance indicators (in Z scores) by groups of LMAs (ST2 classification)

Group	PCA	Wage 08-10	Wage Bill 10	Wage 17-19	Density 17-19	Employ. Rate 22	Migrant 22
A. Virtuous structural loop	1,208	1,688	1,656	1,773	1,968	1,147	2,135
C2. Upper-middle dev. trap	0,721	1,197	1,074	1,179	0,734	0,190	0,398
D2. Dropping to upper-mid.	0,521	0,715	0,828	0,691	0,548	0,618	0,872
B2. Climbing to upper-mid.	0,186	0,106	0,115	0,084	0,326	0,659	-0,953
C1. Lower-middle dev. trap	-0,193	-0,594	-0,361	-0,565	-0,264	0,546	-0,423
B1. Escaping the trap	-0,288	-0,467	-0,272	-0,580	-0,829	-0,381	-0,635
D1. Dropping to lower-mid.	-0,378	-0,485	-0,759	-0,677	-0,753	-0,538	-0,579
De. Falling into the trap	-0,433	-0,908	-1,028	-0,788	-0,442	0,016	0,023
E. Structural poverty trap	-0,807	-1,251	-1,252	-1,116	-1,290	-2,258	-0,836

Source: Own elaboration.

Similar to what Lavopa and Szirmai (2018) and Bianchi *et al.* (2024) show at the national level, the analysis of Argentine regions presents a diversity of intermediate traps between the extremes of the *landscape* (groups E and A), rather than a single type of trap. In addition, another particular contribution of this paper is to identify the possible movements along the regional development ladder and the relative performance of these regions in comparison with trapped regions. Remarkably, it seems that climbing the ladder does not necessarily guarantee an *immediate improvement* in regional performance, compared, for example, with regions that are already trapped at the arrival level (B1 versus C1 and B2 versus C2). This is similar to some findings of Lavopa (2015: 101), who notes that three special cases (countries) "have managed to enter in the next region of the landscape in terms of the [structural] modernisation index but are still trapped in the lower-middle income category," while their productive structures are closer to those of upper-middle income nations.

Finally, an interesting issue that could be further explored in future studies is the relationship between structural traps (and the development ladder) and migration dynamics (Bénassy and Brezis, 2013; Fan and Anwar, 2021).[10] In Table 6, it is possible to observe a certain correspondence with the classification of Argentine LMAs. In particular, the groups at the top of the development ladder (especially A, followed by D2 and C2) have managed to attract, throughout their history, a greater volume of migrants than the type 1 or lower-middle categories and the LMAs trapped in structural poverty. Among many other possible reasons, it can be assumed that (at least part of) these migrations may have been driven by the search for greater employment opportunities and higher wages. All this calls for a closer look at the regions at the bottom of the development ladder in Argentina, since at least in the context of Europe's lagging regions "their skilled people have been out-migrating, generating a vicious circle of population and talent loss that is creating spatial traps for those who remain" (Iammarino *et al.*, 2019: 281). This may result in another (or complementary) type of trap, a *talent development trap* (European Commission, 2024b).

5. Conclusions

In this paper, we highlight that what is meant by development traps depends, to a large extent, on how (economic) development is defined, measured and compared between countries or regions. Instead of looking at these complex questions from the simplistic or reductionist side of relative

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[10] The available indicator only reflects the attracting side of this phenomenon (proportion of the population that immigrated from another province or country), but tells us nothing about the temporality of this process (at what time they migrated) or about emigration or net migration.

income, GDP or economic growth/stagnation –as the seminal contribution of Diemer *et al.* (2022) and the other studies replicating its methodology–, we seek to revisit the development ladder metaphor and the crucial link between economic development and structural change, proposing a structural (change) approach to development traps. From this perspective, we define regional development traps as the inability of some regions to transform their productive structures, along four main dimensions (productivity, technological intensity, value added and diversity), thus becoming trapped at different levels of the regional development ladder. Based on employment data for labor market areas in Argentina, we propose two alternative ways to identify regional traps and show the presence of different types of structural traps at low and intermediate steps of the development ladder, as well as diverse trajectories towards or away from these levels.

With very few exceptions, the recent discussion on regional development traps has been mainly concentrated in Europe and remains closer to economic growth or stagnation than to development in a broader sense. In this sense, this paper provides a new empirical approach to this debate, especially from the perspective of structural change or structural traps, and shows its application in the particular case of Argentina, a developing country trapped in middle-income levels and with large regional inequalities. In some way, our structural approach can be seen as complementary to Balland and Boschma's (2024) perspective on regional evolutionary traps, since both exercises examine specific features of the productive structure. However, their analysis focuses on some dimensions of the diversification process (complexity and relatedness) and does not address the other faces or sides of structural change, which are also relevant for developing countries. Despite these differences, or precisely because of them, comparing the results and classifications of traps obtained by both approaches could be an interesting line of research.

Even though our approach is not free from the usual limitations of the empirical studies on income and development traps –related to somewhat arbitrary or *ad hoc* definitions of operational criteria to identify them (Iammarino *et al.*, 2020)–, we hope that the flexibility of the proposal and its intuitive nature will allow adaptations and adjustments to other contexts and available data. Regarding the latter, one of the strengths of this paper is examining the dynamics of regional structural change at a relatively high level of sectoral disaggregation. As Lavopa (2015) notes, this can improve the understanding of the major transformations that occur as countries or regions move up the development ladder and the challenges they face in avoiding falling into development traps.

Our main results reveal that almost one quarter of the Argentine LMAs ends the period in the worst structural scenario. Many of these areas are located in the historically most backward regions (the north of the country), rural-agricultural areas in the interior of central provinces and some tourist regions. On the other hand, the LMAs in a virtuous structural loop are mainly concentrated in the central industrial belt or in provinces with industrial promotion regimes. Finally, we show that these extreme situations, but also the different types of regional traps at low and intermediate levels of the development ladder, have a correspondence with various performance indicators (and migration dynamics).

The variety of (intermediate) traps and regressive trajectories that emerge from our analysis represents perhaps one of the hardest challenges in terms of policy, especially if we consider that the regions in these situations often show poor performance indicators. While horizontal or *aspatial* policies tend to benefit the most developed regions, place-based policies targeting territorial inequalities usually focus on the other end of the spectrum, the (most) lagging regions (Iammarino *et al.*, 2019; Diemer *et al.*, 2022). Thus, a challenge for policymakers in developing countries such as Argentina may be to include the regions with intermediate development traps in their portfolio of concerns. Even though these regions are currently outside the structural poverty trap, they still face different productive and socioeconomic limitations that should be addressed, bearing in mind that some of them show negative dynamics that, over time, could lead to the worst scenario. This paper may help to open the debate on the political relevance of these intermediate traps and regressive trajectories, as well as to identify some of the Argentine regions in such situations (besides those already in a poverty trap).

Additionally, since the causes of the various types of development traps also differ from region to region and have idiosyncratic components, policy responses will probably require individual diagnosis and tailored instruments or programs. Furthermore, the large heterogeneity of situations between and within provinces adds another level of complexity in policy design and implementation, since multilevel and multi-stakeholder interventions may be required (ECLAC, 2024), instead of homogeneous national or provincial policies. Although not usually considered when designing industrial policies in Argentina, local governments and stakeholders can play an important role in identifying the main opportunities for productive transformation and the current obstacles to their development.

Finally, the exploration of some performance indicators of trapped and untrapped regions should be considered as a first exploratory step in a broader and future line of research, in which many interesting questions remain to be answered. For example, what factors or determinants explain the emergence of regional development traps or the chances of escaping them. Since LMAs with the same productive profile or located in the same province appear at different levels of the development ladder or show different dynamics, the answer is not obvious. Another interesting extension is to explore the socioeconomic consequences for the population in regions stuck at different levels of the development ladder.

References

Abeles, M., & Amar, A. (2017). La industria manufacturera argentina y su encrucijada. In Abeles, M., Cimoli, M., & Lavarello, P. (eds.), *Manufactura y cambio estructural: aportes para pensar la política industrial en la Argentina*. Santiago, Chile: ECLAC.

Abeles, M., & Villafañe, S. (eds.) (2022). *Asimetrías y desigualdades territoriales en la Argentina: aportes para el debate*. Santiago, Chile: ECLAC.

Aboal, D., Arza, V., & Rovira, F. (2017). Technological content of exports. *Economics of Innovation and New Technology*, 26(7), 661-682.

Atkin, D., Costinot, A., & Fukui, M. (2021). Globalization and the Ladder of Development: Pushed to the Top or Held at the Bottom?. CEPR Discussion Paper No. DP16741. Available at SSRN: https://ssrn.com/abstract=4026582.

Azariadis, C., & Stachurski, J. (2005). Poverty traps. In Aghion, P., & Durlauf, S. (eds.), *Handbook of Economic Growth - Volume 2*. Amsterdam: North Holland.

Balland, P.A., & Boschma, R. (2024). An evolutionary approach to regional development traps in European regions. Papers in Evolutionary Economic Geography No. 24-20. Utrecht University.

Balland, P.A., Boschma, R., Crespo, J., & Rigby, D. (2019). Smart specialization policy in the European union: Relatedness, knowledge complexity and regional diversification. *Regional Studies*, 53(9), 1252-1268.

Bénassy, J.P., & Brezis, E.S. (2013). Brain drain and development traps. *Journal of Development Economics*, 102, 15-22.

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*. Rafaela, Argentina: Asociación Civil Red Pymes Mercosur.

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

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. Buenos Aires: CIECTI.

Bianchi, C., Isabella, F., Martinis, A., & Picasso, S. (2024). Varieties of middle-income trap: heterogeneous trajectories and common determinants. *Structural Change and Economic Dynamics*, 71, 320-336.

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. *Quantitative Economics*, 13(4), 1361-1403.

Blažek, J., Květoň, V., Baumgartinger-Seiringer, S., & Trippl, M. (2020). The dark side of regional industrial path development: towards a typology of trajectories of decline. *European Planning Studies*, 28(8), 1455-1473.

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). Santiago, Chile: ECLAC.

Borello, J., & González, L. (2021). *Distribución geográfica de la actividad económica en la Argentina: revisión bibliográfica y perspectivas*. Santiago, Chile: ECLAC.

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: Oxford University Press.

Bourdin, S., & Tai, J. (2022). Abstentionist voting–between disengagement and protestation in neglected areas: A spatial analysis of the Paris metropolis. *International Regional Science Review*, 45(3), 263-292.

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

Calignano, G., Nilsen, T., Jørgensen Nordli, A., & Hauge, A. (2024). Beyond 'periphery': A detailed and nuanced taxonomy of the Norwegian regions. *Geografiska Annaler: Series B, Human Geography*, 106(1), 49-73.

Cao, H., & Vaca, J. (2006). Desarrollo regional en la Argentina: la centenaria vigencia de un patrón de asimetría territorial. *EURE*, 32(95), 95-111.

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*. Santiago, Chile: ECLAC.

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

Chen, T. (2024). *Regional Development Traps in China*. MSc Thesis on Entrepreneurship and Innovation. Università degli studi di Padova.

Çınar, İ.T. (2023a). Regional development trap and economic complexity in Turkey: Evidence from provincial data. *Regional Science Policy & Practice*, 15(9), 2224-2252.

Çınar, İ.T. (2023b). Regional development trap in Turkey: Can relatedness find a way out?. *Papers in Regional Science*, 102(4), 817-850.

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*. Buenos Aires: UNDP.

Diemer, A., Iammarino, S., Rodríguez-Pose, A., & Storper, M. (2022). The regional development trap in Europe. *Economic Geography*, 98(5), 487-509.

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

ECLAC (2024). *Development Traps in Latin America and the Caribbean: Vital Transformations and How to Manage Them.* Santiago, Chile: ECLAC.

Eder, J. (2019). Innovation in the periphery: A critical survey and research agenda. *International Regional Science Review*, 42(2), 119-146.

Eichengreen, B., Park, D., & Shin, K. (2014). Growth slowdowns redux. *Japan and the World Economy*, 32, 65-84.

European Commission (2024a). *Forging a Sustainable Future Together: Cohesion for a Competitive and Inclusive Europe*. Report of the High-level Group on the Future of Cohesion Policy. Brussels: European Commission.

European Commission (2024b). *Ninth Report on Economic, Social and Territorial Cohesion*. Luxembourg: European Union.

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

Fan, Z., & Anwar, S. (2021). International migration of entrepreneurs and the emergence of economic development traps. *Review of Development Economics*, 25(1), 6-22.

Felipe, J., Abdon, A., & Kumar, U. (2012). Tracking the middle-income trap: What is it, who is in it, and why?. Working Paper No. 715. Annandale-on-Hudson: Levy Economics Institute.

Fernández Bugna, C., & Peirano, F. (2011). Cambio estructural. Cinco enfoques estilizados. *Revista de Ciencias Sociales, 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: Oxford University Press.

Gill, I., & Kharas, H. (2007). *An East Asian Renaissance. Ideas for Economic Growth*. Washington DC: The World Bank.

Glückler, J., Shearmur, R., & Martinus, K. (2023). Liability or opportunity? Reconceptualizing the periphery and its role in innovation. *Journal of Economic Geography*, 23(1), 231-249.

Hartmann, D., Bezerra, M., Lodolo, B., & Pinheiro, F. (2020). International trade, development traps, and the core-periphery structure of income inequality. *EconomiA*, 21(2), 255-278.

Hartmann, D., & Pinheiro, F. (2022). Economic complexity and inequality at the national and regional level. To appear in Chen, P., Elsner, W., & Pyka, A. (eds.), *Handbook of Complexity Economics*. London: Routledge. Available at: https://arxiv.org/pdf/2206.00818.

Hertrich, T., & Brenner, T. (2023). Classification of regions according to the dominant innovation barriers: The characteristics and stability of region types in Germany. *Regional Science Policy & Practice*, 15(9), 2182-2223.

Hicks, D. (2011). Structural change and industrial classification. *Structural Change and Economic Dynamics*, 22(2), 93-105.

Iammarino, S., Rodríguez-Pose, A., & Storper, M. (2019). Regional inequality in Europe: evidence, theory and policy implications. *Journal of Economic Geography*, 19(2), 273-298.

Iammarino, S., Rodríguez-Pose, A., Storper, M., & Diemer, A. (2020). *Falling into the Middle-Income Trap? A Study on the Risks for EU Regions to be Caught in a Middle-Income Trap*. Report Contract No. 2018CE16BAT055. Brussels: European Commission.

Jankowska, A., Nagengast, A., & Perea, J.R. (2012). The product space and the middle-income trap: Comparing Asian and Latin American experiences. OECD Development Centre Working Paper No. 311. Paris: OECD.

Kataishi, R., & Morero, H. (2020). Taxonomías, oportunidades tecnológicas y cadenas globales de valor en países en vías de desarrollo: una sistematización conceptual y una propuesta de abordaje. *Investigación y Desarrollo*, 28(2), 168-220.

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

Katz J., & Stumpo, G. (2001). Sectoral regimes, productivity and international competitiveness. *CEPAL Review*, 75, 131-152.

Kharas, H., & Kohli, H. (2011). What is the middle income trap, why do countries fall into it, and how can it be avoided?. *Global Journal of Emerging Market Economies*, 3(3), 281-289.

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*. New York: Routledge.

Krüger, J. (2008). Productivity and structural change: A review of the literature. *Journal of Economic Surveys*, 22(2), 330-363.

Lavopa, A. (2015). *Structural Transformation and Economic Development: Can Development Traps be Avoided?.* Doctoral Thesis. Maastricht: Maastricht University.

Lavopa, A., & Szirmai, A. (2018). Structural modernisation and development traps. An empirical approach. *World Development*, 112, 59-73.

Le Petit-Guerin, M., Velthuis, S., Royer, J., Cauchi-Duval, N., Franklin, R., Leibert, T., MacKinnon, D., & Pike, A. (2023). Lost in transition? Trajectories of regional 'left-behindness' in the EU15 from 1982 to 2017. Beyond Left Behind Places Project Working Paper 04/23. Centre for Urban and Regional Development Studies (CURDS), Newcastle University.

Lee, K. (2013). *Schumpeterian Analysis of Economic Catch-up: Knowledge, Path-creation, and the Middle-income Trap*. Cambridge: Cambridge University Press.

Li, H., & Haynes, K.E. (2011). Economic structure and regional disparity in China: Beyond the Kuznets transition. *International Regional Science Review*, 34(2), 157-190.

Li, Y., & Rigby, D. (2023). Relatedness, complexity, and economic growth in Chinese cities. *International Regional Science Review*, 46(1), 3-37.

López, A., Niembro, A., & Ramos, D. (2014). Latin America's competitive position in knowledge-intensive services trade. *CEPAL Review*, 113, 21-39.

MacKinnon, D., Béal, V., & Leibert, T. (2024). Rethinking 'left-behind' places in a context of rising spatial inequalities and political discontent. *Regional Studies*, 58(6), 1161-1166.

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

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

Mohapatra, S., Rozelle, S., & Huang, J. (2006). Climbing the development ladder: Economic development and the evolution of occupations in rural China. *The Journal of Development Studies*, 42(6), 1023-1055.

Nardo, M., Saisana, M., Saltelli, A., Tarantola, S., Hoffmann, A., & Giovannini, E. (2008). *Handbook on constructing composite indicators: Methodology and user guide*. Paris: OECD.

Neffke, F., Hartog, M., Boschma, R., & Henning, M. (2018). Agents of structural change: The role of firms and entrepreneurs in regional diversification. *Economic Geography*, 94(1), 23-48.

Niembro, A., & Calá, C.D. (2021). Approximating the impact of COVID-19 on regional production in countries with scarce subnational data: A proposal and application for Argentina during the first wave. *REGION*, 8(2), 167-186.

Niembro, A., & Calá, C.D. (2024). Regional structural change in Argentina (1996-2019): Concepts, measurements and unequal trajectories over the business cycle. *Regional Science Policy & Practice*, 16(8), 100068.

Niembro, A., Calá, C.D., & Belmartino, A. (2021). Una tipología de las Áreas Económicas Locales de Argentina en base a perfiles sectoriales de coaglomeración territorial (20112018). *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.

Nieto-Parra, S., Pezzini, M., & Vázquez, J. (2019). Social discontent in Latin America through the lens of development traps. *OECD Development Matters*. Available at: https://oecd-development-matters.org/2019/12/23/social-discontent-in-latin-america-through-the-lens-of-development-traps/.

Nilsen, T., Grillitsch, M., & Hauge, A. (2023). Varieties of periphery and local agency in regional development. *Regional Studies*, 57(4), 749-762.

OECD (2019), *Latin American Economic Outlook 2019: Development in Transition.* Paris: OECD.

OEDE (2020). *Boletín de Áreas Económicas Locales: Empleo, empresas y remuneraciones - 2019*. Buenos Aires: Observatorio de Empleo y Dinámica Empresarial (OEDE). Available at: https://www.trabajo.gob.ar/estadisticas/oede/estadisticasregionales.asp.

Ozawa, T. (2016). *The Evolution of the World Economy: The 'Flying-Geese' Theory of Multinational Corporations and Structural Transformation*. Cheltenham: Edward Elgar.

Perrotti, D. (2021). Growth cycles in Argentina: The recent behavior. *Económica*, 67, 107-143.

Petralia, S., Balland, P.A., & Morrison, A. (2017). Climbing the ladder of technological development. *Research Policy*, 46(5), 956-969.

Pike, A., Béal, V., Cauchi-Duval, N., Franklin, R., Kinossian, N., Lang, T., Leibert, T., MacKinnon, D., Rousseau, M., Royer, J., Servillo, L., Tomaney, J., & Velthuis, S. (2024). 'Left behind places': A geographical etymology. *Regional Studies*, 58(6), 1167-1179.

Pinheiro, F., Balland, P.A., Boschma, R., & Hartmann, D. (2022). The dark side of the geography of innovation: relatedness, complexity and regional inequality in Europe. *Regional Studies*, 59(1), Article 2106362.

Queiroz, A.R., Romero, J.P., & Freitas, E.E. (2024). Relatedness and regional economic complexity: Good news for some, bad news for others. *EconomiA*, 25(2), 264-288.

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. Santiago, Chile: ECLAC.

Rodríguez-Pose, A., Bartalucci, F., Dávalos, M., & Lozano-Gracia, N. (2024a). Overcoming left-behindedness: Moving beyond the efficiency versus equity debate in territorial development. Policy Research Working Paper No. 10734. Washington DC: World Bank.

Rodríguez-Pose, A., Dijkstra, L., & Poelman, H. (2024b). The geography of EU discontent and the regional development trap. *Economic Geography*, 100(3), 213-245.

Roessler, M. (2024). Untangling regional development traps through narratives. *Regional Studies, Regional Science*, 11(1), 406-418.

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*. Santiago, Chile: ECLAC.

Saviotti, P.P., & Frenken, K. (2008). Export variety and the economic performance of countries. *Journal of Evolutionary Economics*, 18, 201-218.

Saviotti, P.P., & Pyka, A. (2004). Economic development by the creation of new sectors. *Journal of Evolutionary Economics*, 14, 1-35.

Silva, E.G., & Teixeira, A.A. (2008). Surveying structural change: Seminal contributions and a bibliometric account. *Structural Change and Economic Dynamics*, 19(4), 273-300.

Stiglitz, J., Sen, A., & Fitoussi, J.P. (2009). *Report by the Commission on the Measurement of Economic Performance and Social Progress*. Brussels: European Commission.

Sztulwark, S. (2005). *El estructuralismo latinoamericano: Fundamentos y transformaciones del pensamiento económico de la periferia*. Buenos Aires: Prometeo.

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*. New York: Routledge.

Tsiotas, D., & Tselios, V. (2023). Understanding peripherality in a multidimensional geographical, socioeconomic, and institutional context: Evidence from Greece. *Regional Science Policy & Practice*, 15(7), 1424-1457.

Tyler, P., Evenhuis, E., Martin, R., Sunley, P., & Gardiner, B. (2017). Growing apart? Structural transformation and the uneven development of British cities. *Cambridge Journal of Regions, Economy and Society*, 10(3), 425-454.

UNCTAD (2016). Many developing countries, unable to climb the economic ladder, trapped in the low- or middle-income bracket. Information Note UNCTAD/PRESS/U14/IN/2016/003. Geneva: UNCTAD. Available at: https://unctad.org/press-material/many-developing-countries-unable-climb-economic-ladder-trapped-low-or-middle-income.

UN-Habitat (2016). *Structural Transformation in Developing Countries: Cross Regional Analysis*. Nairobi: UN-Habitat.

UNIDO (2013). *Industrial Development Report 2013. Sustaining Employment Growth: The Role of Manufacturing and Structural Change*. Vienna: UNIDO.

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. Beyond Left Behind Places Project Working Paper 01/22. Centre for Urban and Regional Development Studies (CURDS), Newcastle University.

Velthuis, S., Royer, J., Le Petit-Guerin, M., Cauchi-Duval, N., Franklin, R., Leibert, T., MacKinnon, D., & Pike, A. (2024). Regional varieties of ‘left-behindness’ in the EU15. *Regional Studies*, published online.

Wainer, A., & Belloni, P. (2019). Exportaciones argentinas desde 1990 a la actualidad: Un crecimiento exportador sin cambio estructural. *Papeles de Trabajo*, 13(23), 173-190.

Yoguel, G. (2014). ¿De qué hablamos cuando hablamos de cambio estructural? Una perspectiva evolucionista-neoschumpeteriana. Paper presented at Seminario-Taller: La estructura productiva argentina - Evolución reciente y perspectivas. October 1-3, ECLAC, Buenos Aires Office.

Appendix A. Sectoral classifications used (2 digits, 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			

Source: Own elaboration (Niembro and Calá, 2024).

Appendix B. Distribution of LMAs in the first form of identification (ST1): 16 x 16 matrix

2017-2019 -->

<-- 1996-1998

	NONE	PR	TI	VA	DI	PR-TI	PR-VA	PR-DI	TI-VA	TI-DI	VA-DI	PR-TI-VA	PR-TI-DI	PR-VA-DI	TI-VA-DI	ALL	LMA
NONE	**10**		1	1	3												15
PR	2	**1**			1												4
TI									1								1
VA	1			**7**							2				1	1	12
DI	7		1		**2**					2							12
PR-TI		1				**1**				1			1				4
PR-VA				1													1
PR-DI	1				1				1	2			1				6
TI-VA										1							1
TI-DI										**1**							1
VA-DI					2				1		**1**				1		5
PR-TI-VA									1							1	2
PR-TI-DI										2			**2**			1	5
PR-VA-DI								2							1		3
TI-VA-DI															**3**		3
ALL													1		2	**7**	10
LMA	21	2	2	9	9	1	0	2	4	9	3	0	5	0	8	10	85

Source: Own elaboration. Notes: PR: productivity, TI: technological intensity, VA: value added, DI: diversity.

Appendix C. Evolution of the LMAs in two sub-periods, according to both forms of classification

ST2 classification -->

<-- ST1 classification

	Equal 1 & 2	Up 1 - Equal 2	Equal 1 - Up 2	Up 1 & 2	Fall 1 - Equal 2	Equal 1 - Fall 2	Fall 1 & 2	Inverted V	V	LMA
Equal 1 & 2	**15**	7	4		2	7	2	3	1	**41**
Up 1 - Equal 2	2	**1**			2			1	1	7
Equal 1 - Up 2	1	3	**2**						1	7
Up 1 & 2				**1**						1
Fall 1 - Equal 2	2		1		**5**	1	1	1		11
Equal 1 - Fall 2	1				3	**3**	3		1	11
Fall 1 & 2						1				1
Inverted V	1	1						**1**		3
V	1				1				**1**	3
LMA	**23**	12	7	1	13	12	6	6	5	85

Source: Own elaboration.