Spatial Inequality in Ecuador: A Structural Gap Approach

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Abstract

Classical analyses of constraints and challenges associated with development in middle-income Latin American countries have been performed based on per capita income levels. Since the first decade of the twenty-first century, the structural gap approach has been an alternative criterion to that of per capita income. It identifies areas where there are gaps, such as poverty, inequality and social inclusion, which hinder social and economic development. In the present study, we used hierarchical cluster analysis to assess the socioeconomic development of cities in Ecuador. The goal was to add depth and flexibility to the study in order to assess a more complex reality regarding the development level of the country. This way, the resulting taxonomies of cities could be used to address specific policies to improve quality of life and sustainability of the population.

Keywords

Hierarchical cluster analysis · Latin America · Structural gap theory · Socioeconomic development

9.1 Introduction

The study of the explanatory factors of well-being, wealth and quality of life levels between countries, regions or cities is necessary for the development of rebalancing social policies. These factors are decisive to mitigate social differences and find tendencies that aggravate or improve the state of the population. Therefore, the analysis of inequality and how to avoid it by means of strategies and socioeconomic policies (Stiglitz 2015) is extremely important (Kanbur and Sumner 2012; Piketty 2014; Stiglitz 2012, 2015).

This chapter discusses the major precepts that define structural heterogeneity in the cities of Ecuador, in order to explain territorial inequalities in social and economic terms. To that end, we prepared a classification of cities according to the development level based on the structural gaps and hierarchical cluster analysis.

The structural heterogeneity of the territories is identified from the unequal occupational structure in terms of productivity, job access and quality of jobs. The result is uneven incomes with wealth concentration in the social and economic elite.

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This population group has a similar living condition to that found in developed countries, and live in major cities. On the other hand, there is a clear economic and social alienation in middle and small cities (CEPAL 2016).

Latin America is the most unequal region in the world in terms of socioeconomic discrepancies (de Ferranti et al. 2004; CEPAL 2010; Maryse 2011; Candia et al. 2015; Bárcena and Prado 2016). The study of sub-national[1] disparities considering space and territory factors helps understand historical and structural events (Kanbur and Venables 2005; Rodriguez-Pose and Sánchez-Reaza 2005; Cuervo and Morales Gutiérrez 2009; Modrego and Cazzuffi 2015). Permanent differences in economic growth between territories (Candia et al. 2015) are generated by a productive structure based on natural resources, and the results are diverse. On the one hand, exported products, manufactures and services are characterised by a significant volatility of demand and international prices. On the other hand, the strong economic fluctuations lead to internal changes in economic policies. For example, the strong dependence of Latin America on its natural resources has inhibited the transformation of the productive structure towards more dynamic sectors, whether in terms of demand or activities carried out using new technology (Bértola 2016). In addition, this fact has configured a structural heterogeneity characterised by large differences in inter-and intra-sectoral productivity, with important asymmetries in technological capabilities in comparison to other more developed countries (CEPAL 2010; Kats 2016).

9.2 Social and Economic Characteristics in Ecuador

Ecuador is located in the western hemisphere in north-western South America. It has a total area of 257,217.10 km^2 of continental and insular territory. The continental territory has 248,983.90 km^2, and the island territory, located on the west of the continental territory, corresponds to Galapagos Province. Ecuador is bordered on the north by Colombia, on the south and the east by Peru, and on the west by the Pacific Ocean.

The Andes mountain range crosses continental Ecuador and divides the country into three distinct regions: coast; hills; and Amazon. These regions have very particular characteristics in terms of climate, soil, culture and productive activity. The insular region is added to those regions, thus constituting a territory of extraordinary biodiversity.

In 2016, the population was composed of 16,530,746 inhabitants (National Institute of Statistics and Censuses of Ecuador—INEC), and 64.4% of the population was concentrated in urban areas,[2] with the highest demographic density of South America (56.8 inhabitants per km^2).

In the twentieth century, Ecuador had periods of specialisation and crisis in the production and export of primary products. In the first four decades, cocoa was the main source of resources and expansion. A deep production crisis in the sector was caused by the appearance of the 'witch's broom disease'. From the 1950s to the mid-1960s, the country specialised in the production and export of bananas. During this period, the roads infrastructure was restructured integrating the hills and the coast, and promoted banana trade, labour and new services associated with this business sector. The territorial consequence was an intense urbanisation process, in which cities like Quito, Guayaquil, Cuenca and Machala emerged, thus expanding the agricultural frontier of the coast and integrating other provinces (Villalobos 1983). In the 1970s, petroleum production started and caused decisive and significant impacts on the economy. This was the trigger for rapid growth, consolidation of the State, and uneven sectoral development (Larrea 1983).

[1]The term sub-national refers to the different levels of regional governments. In Ecuador, the administrative political division sets the regional, provincial, city and parochial levels. The present study was conducted at city level. Municipalities are the institutions that govern each city.

[2]The last census in Ecuador was performed at the end of the 2010s. It determined a population of 14,483,499 inhabitants, of which 62.8% corresponded to the urban population. The average urban population in Latin America corresponded to 80.2% of the inhabitants.

The import-substitution model promoted incentives in the industry. This circumstance reinforced the growth of major cities and the polarisation of wealth distribution, causing high rates of migration from the countryside to the cities, and the emergence of misery around big cities. The urban population, which represented 28.5% of the total population in 1950, grew to 41.4% in 1974.

Employment decreased since the 1960s. Unemployment went from an average of 5% (1960s) until 12% in the 1980s, with an 'underemployment' rate of about 50% (Pita 1991).[3]

In the 1980s and 1990s, the debt and structural adjustment crisis characterised a prolonged economic stagnation, with high rates of inflation, fiscal deficits, increased poverty, greater concentration in the distribution of incomes, increased unemployment and underemployment and reduced internal and external investments. In the twenty-first century, the crisis of the banking system caused the adoption of the US dollar as the official currency, which meant a strong adjustment in the relative prices of the economy.[4]

Ecuador's growth was based on a scarce product diversification concentrated in primary products, namely: petroleum (44.6%); bananas (12%); coffee (0.15%); shrimp (10%); cocoa (2.5%); wood (1%); tuna (0.5%); other fish (0.8%); flowers (3.8%); and others (3.9) which in total represented 79.25% of exports.[5] Until 2014, when the international price of petroleum fell, it had represented 70% of exports. The business structure of Ecuador has been little integrated and dominated by micro companies (90%) characterised by low productivity and employment generation.[6]

9.3 Theoretical Framework

Different studies found in the literature from the end of the twentieth century and the beginning of the twenty-first century have discussed how structural differences among developing and developed countries were endogenous (new structuralist economics). The diversification and modernisation of the production system through innovation processes (Yifu Lin 2009) based on structural heterogeneity (Prebisch 1962, 1973) help interpret the differences in regions and countries. Another variable that influences structural heterogeneity is the peripheral condition of countries in a region (Pinto 1973), where sectors of high and low productivity coexist (Rodríguez 2006). More recently, structural heterogeneity, based on the coexistence of internal and external gaps (neostructuralism), has been used to explain unequal development among countries. The internal gap is understood as differences in inter-and intra-sectoral productivity, whereas the external gap is defined by the asymmetries in technological capabilities of the region with respect to international competitors (Pinto 1973, 1976; Cimoli 2005; Rodríguez 2006; Mattar et al. 2012; Cimoli and Porcile 2013; Candia et al. 2015; CEPAL 2010, 2016).

The wide territorial inequality in Latin America, specifically in Ecuador, has been assessed from the structural heterogeneity reflected in productivity gaps. These gaps refer to workers' uneven yields, capital and labour, as well as the differences in the levels of environmental sustainability (CEPAL 2010; Mattar et al. 2012; Cimoli and Porcile 2013).

Structural heterogeneity has two main characteristics. The first includes the high geographic concentration of the population (= >40% of the total) and economic activity (with total gross

[3]Underemployment is an informal working condition with income generation below the basic wage and outside the social security system.

[4]In December 1998, the US dollar had an official exchange rate of 6.825,0 sucres (Ecuadorian currency) per dollar. When the country adopted the dollar as the official currency in January 2000, the exchange rate adopted for the dollarisation of the economy was 25,000 sucres per dollar, causing a strong deterioration of salaries and deposits in sucres (Quarterly Newsletters of the Central Bank of Ecuador 1999–2000).

[5]Central Bank of Ecuador. Economic statistics. Newsletter, April 2017. Series 3.1.1. Average figures for the export sector from 2012 to 2016.

[6]Labour and Companies Panorama of Ecuador 2016 (National Institute of Statistics and Censuses of Ecuador —INEC).

domestic product = >50%) in major cities or metropolitan districts. The second characteristic is the existence of a great number of relative gaps between territories with respect to living standards of the population (Candia et al. 2015).

These territorial disparities between regions and/or cities are structural gaps. In a circular and cumulative manner, levels of poverty, inequality, social inclusion and institutional and financial productive capacity are the variables that allow studying a complex reality (Tezanos 2012; Kaldewei 2015; CEPAL 2010, 2014a, 2016; Abramo et al. 2016). The analysis of these variables as hierarchical indicators provides depth in the development process of the regions (Pardo 2014). Reversing this circular process would imply achieving important changes in the productive and social structure (Titelman, Vera and Pérez-Caldentey 2012).

9.4 Methodology, the Structural Gaps Approach

Agencies such as the World Bank or the International Monetary Fund (IMF) have classified countries as 'developed countries' and 'developing countries' (Tezanos 2012). Eleven structural development gaps have been analysed in this classification.

In this chapter, we used the traditional concept of structural gaps to classify 220 cities[7] of Ecuador due to their development level. The cities, as an element of analysis, represent sites of high population density. In addition, they are a catalyst for territorial change, because they reveal growth cycles and tendencies (Ramírez et al. 2009). Cities have historical, economic, social and political particularities. They are structuring elements of a territory; cities reflect changes in the economy, reproduce social dysfunctions and constitute poles of economic and social attraction (Cuervo 2004). Structural heterogeneity of cities reflect the state and dynamics of a country, the processes of poverty and marginality, the level of productive diversification, sectoral composition of economic activities and social characteristics (Abramo et al. 2016).

The structural gap approach for the typology of cities consists of three phases. In the first, the structural gaps and the proxy variables are identified using a decision tree classification, in order to quantify and prioritise the main structural obstacles that limit the productive development of cities. In the second phase, hierarchical clusters are analysed using Ward's method to create homogeneous groups with similar sizes. In the third phase, an analysis of consistency is carried out to validate the results using one-factor analysis of variance (ANOVA) and Eta-squared to identify those variables with greater statistical significance in the discrimination of groups. To perform these calculations, we used the SPSS statistical package, which contains several cluster methods, including Ward's method, and the calculation of one-factor ANOVA and Eta-squared.

9.4.1 Decision Tree to Identify the Structural Gaps and the Proxy Variables

To identify the limiting factors of economic growth (growth diagnostics) on the basis of a standard model of neoclassical growth (Hausmann, Rodrick and Velasco 2005), it is necessary to define the restrictions using a decision tree. The branches represent the growth determinants. The decision tree is used to obtain a diagnosis to rank the interrelationships between the various gaps and their determinants (Kaldewei 2015). In the selection process of the proxy variables, which define the decision tree, the indicators can be quantitative or qualitative. Once the tree has been built, the structural gaps are used to identify, quantify and prioritise the productive, sustainable and inclusive development at sub-regional and sub-national levels (Titelman et al. 2012; Pardo 2014; Kaldewei 2015). In this method, the main indicator is the gross domestic

[7]We only excluded the city of Quinsaloma located on the coastal region, Los Ríos Province. This city was founded in 2007 and there were not necessary and inter-census statistical data (2001–2010) like those used in the present study.

product (GDP), but it also includes determinants of the productive, institutional, employment and social structure of the country. Other authors (Hausmann et al. 2005) have diagnosed growth only based on the GDP.

In the present study, we defined eleven structural gaps (Tezanos 2012; United Nations—CEPAL 2016) adapted to city level, namely: income; inequality; poverty; health; sex; environment; education; investment (savings and productivity); innovation; infrastructure; and taxation (Fig. 9.1).

We identified sixteen quantitative variables as proxy. Of these variables, three belonged to 'productivity and innovation', two to 'investment and savings' and two to 'taxation' (taxes and fundraising). The other variables were used to estimate the rest of the gaps.

The database was obtained from the Central Bank of Ecuador (BCE), the National Statistics Institute of Ecuador (INEC), the Superintendence of Banks, the Internal Revenue Service (SRI) and the Ministry of Finance (MF).

The calculated period varied between each gap due to the limited availability of statistical data at city level (Table 9.1).

9.4.2 Hierarchical Cluster Analysis

Hierarchical cluster analysis combines variables based on the premise that they are heterogeneous and form groups, so that: (a) each city belongs to a single cluster; (b) all cities should be classified in one group and (c) each cluster should be internally homogeneous. According to a multivariate statistical method, the cities are grouped by levels of development, with a maximum homogeneity in each group and a great difference between groups (De la Fuente 2011).

The method is based on a matrix of distances or similarities between cities and builds a hierarchy based on these distances (Fernández Santana 1991; Peña 2013). The criterion used to define the clusters was Ward's method (or method of minimum inertia loss). Ward connects the cities trying to minimise the variance within each group using the squared Euclidean distance criterion (Peña 2013) as a measure of distance. Firstly, the average of all the variables in each cluster is estimated. Secondly, the distance between each case and the average of the cluster are determined. Finally, the distances between all cases are added to those data. Subsequently, the clusters that generated

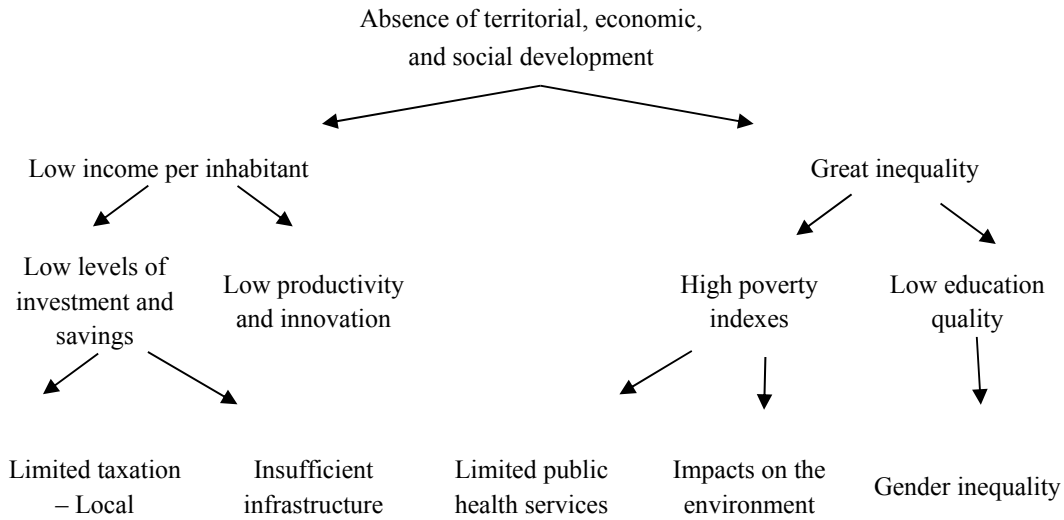

Fig. 9.1 Decision tree used to establish the diagnosis of development using structural gaps in cities of Ecuador. *Source* Prepared by the authors based on Tezanos (2012)

Table 9.1 Summary of structural gaps and their indicators

Gap	Indicator used as proxy	Source
1. Income	Average GDP per capita	BCE (2007, 2013, 2014)
2. Inequality	Gini index	INEC-BID (2014)
3. Poverty	Poverty rate	INEC-BID (2014)
4. Health	Percentage of adolescent mothers	INEC (2010)
5. Gender	Female population affiliated to social security	INEC (2010)
6. Environment	Homes use firewood for cooking	INEC (2010)
7. Education	Higher education attendance rate	INEC (2010)
8. Investment and savings	Credit volume per capita Manufacture GDP/Total GDP	Superintendence of Banks BCE (2007, 2013, 2014)
9. Productivity and innovation	Homes with Internet access Sales/companies per worker affiliated to social security Population registered in the IESS	INEC (2010) INEC (2010, 2014) INEC (2010)
10. Infrastructure	Homes with inadequate characteristics	INEC (2010)
11. Taxation (local institutionalisation)	Municipal financial self-sufficiency Tax revenue per capita	BEDE (2002–2014) SRI (2010–2015)

Source Prepared by the authors

fewer differences in the sum of the distances within each cluster are grouped. This procedure creates homogeneous groups with similar sizes (Bartholomew et al. 2008; De la Fuente 2011).

Ward defines a global measure of the heterogeneity of a number of observations as groups. This measure is W, the sum of squared Euclidean distances between each element, and the average of their groups. It is defined as follows:

$$W = \sum_{g=1}^{G} \sum_{i=1}^{n_g} (x_{ig} - \bar{x}_g)(x_{ig} - \bar{x}_g)' = min \sum_{g=1}^{G} \sum_{i=1}^{n_g} d^2(i, g)$$

where:

W	Ward;
$\bar{x}_g$	The measure of group g;
i	1 element up to n_g elements;
g	Total elements, and
$d^2(i, g)$	The squared of the Euclidean distance between each element i of group g, and the mean of g

The elements that produce the minimum increase of W are grouped. This fact involves using the closest values from the Euclidean distance. In the next step, two groups are again joined so that W grows as little as possible, thus having n—2 groups and so on until obtaining a single group. The W values indicate the growth of the criterion by forming groups, and can be used to determine the number of natural groups contained in the data (Peña 2013).

9.4.3 Consistency Analysis: ANOVA and Eta-Squared

We used one-factor analysis of variance (ANOVA) and measures of association (Eta-squared) in the consistency analysis of the results.

9.4.3.1 One-Factor Analysis of Variance (ANOVA)

ANOVA identifies those variables with a higher statistical significance in the discrimination of groups ($F = 0$ represents low significance). All the variables analysed were significant at a 95% confidence level. The coefficient of the variable 'home with Internet access' was $F = 103.145$. Other variables with higher values ($F >= 70$)

were 'higher education attendance rate', 'tax revenue per capita', 'average GDP per capita' and 'poverty rate'.

9.4.3.2 Measure of Association in One Sample (Eta-Squared)

Eta-squared identifies those variables with greater dependence on the definition of the various established clusters. The Eta-squared coefficient compares the variability of the variables explained by differences between groups and total variability, with values between 0 and 1. Values close to 0 indicate that the behaviour of the variables is independent of groups, whereas values close to 1 indicate great dependence. In this case, the average of the variables is greater than or less than the global average depending on the group (Ferran Aranaz 2001).

The variables 'homes with Internet access', 'higher education attendance rate', 'tax revenue per capita', 'average GDP per capita', poverty rate', 'population affiliated to social security', 'investment and savings volume per capita' and 'female population affiliated to social security' had an Eta-squared value greater than 0.7. There were two other variables with coefficients higher than 0.6 and less than 0.7, two additional variables greater than 0.4. The value of only one variable, which represented the inequality gap by the Gini coefficient, was less than 0.3. In this sense, the inequality gap did not provide meaning in the discrimination of groups, given that the inequality in Ecuador was a feature present in all cities.

9.5 Results and Discussion—Developmental Taxonomy by Cities of Ecuador

The cities of Ecuador were grouped into five clusters hierarchised from the greatest to the lowest development level (Fig. 9.2). The results revealed a polarised country, with significant productive, economic and social inequalities. Very precarious development levels were observed in 85% of the cities, and only 15% of them had high development levels.

Specifically, the classification of cities by development level was the following:

- *Cluster one (C1)–5 cities with the highest development level.*
- *Cluster two (C2)–20 cities—Higher development level than the average of the country.*
- *Cluster three (C3)–122 cities—Equal development level than the average of the country.*
- *Cluster four (C4)–41 cities—Lower development level than the average of the country.*
- *Cluster five (C5)–32 cities—Lower development level than the level of C4.*

9.5.1 Characterisation of Clusters

The characterisation of each cluster was obtained by the comparative analysis of the averages of each cluster.

9.5.1.1 C1–5 Cities with the Highest Development Level

C1 consisted of the biggest cities and those closer to their metropolitan areas. They were Quito (capital) and Guayaquil (main port), in addition to Rumiñahui and Samborondón, which were close to the two main metropolitan districts, and, finally, Cuenca, which stood out for being the third city in population and economic development. C1 grouped 35.7% of the inhabitants of the country (Fig. 9.2).

In nine of the eleven gaps and in fourteen of the sixteen variables used, this cluster had the indicators with the highest development level. It stood out in economy with the highest percentage of manufacturing activity (17%), followed by tax revenues, sales and credit per capita, which were five and six times greater than the national average. It exhibited the lowest poverty values relating to consumption (13.4%). However, this cluster had the greatest income inequality with respect to other values. The Gini index was 40% in comparison to the national average (33.3%). It had the highest higher education attendance rate (23.4%) and its cities raised 38% of total

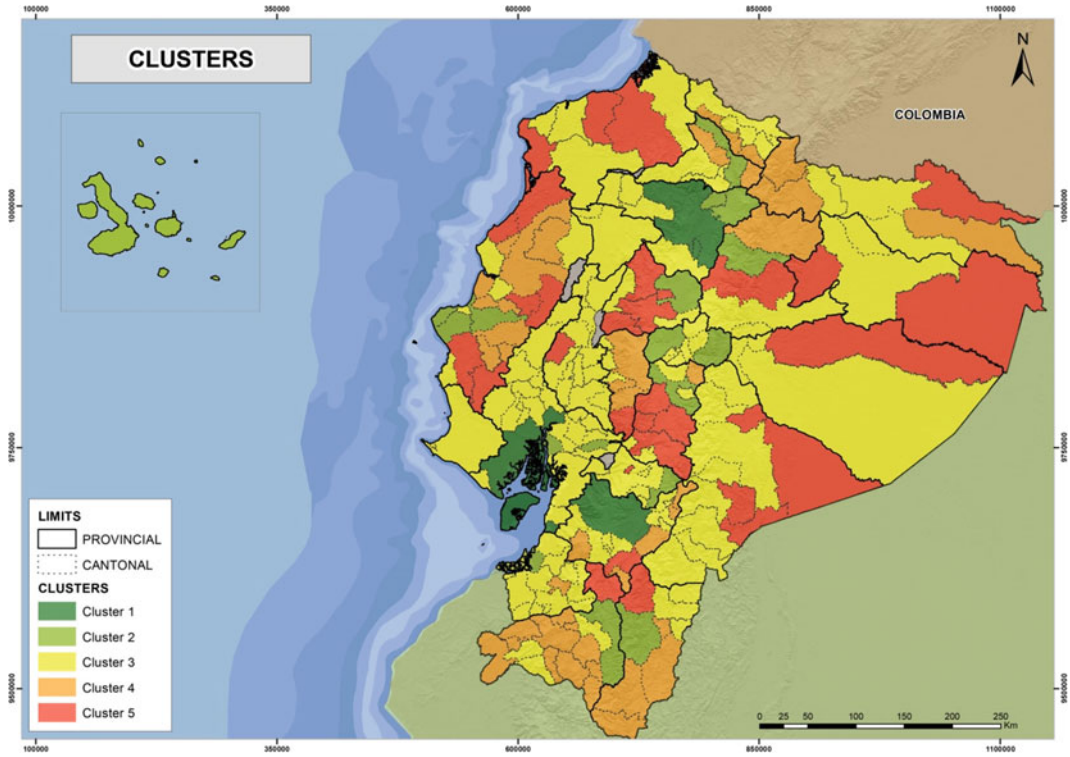

Fig. 9.2 Clusters of cities of Ecuador by development levels. *Source* Prepared by the authors

revenues by own management (average in the country = 11.3%).

The GDP per capita and average rate of annual growth (13.5%) was significantly above the average (5.3%, 2007–2014) and notably higher than in all the other clusters. The sectoral composition of the economy of this cluster was in the sector services (financial and professional activities), manufacturing, commerce and construction, which together reached 65% of their GDP.

9.5.1.2 C2–20 Cities. Higher Development Level Than the Average of the Country

C2 grouped 20 cities, nine of which belonged to the hills region, six to the coast, two to the Amazon region and included the three cities of the insular region. It had 17.1% of the inhabitants of the country, and the indicators were higher than the average of the country, but lower than the indicators of C1. The population distribution by region was as follows: 55.1% in the hills; 42.5% on the coast; 1.3% in the Amazon; and 1.1% in the insular region. The level of per capita income (4,736 USD) was 2.4 times higher than the national average (2,105 USD); however, it had an important dispersion. The leading economic sectors were agriculture, livestock, manufacturing, commerce and construction, which together reached 53.5% of the GDP. The average growth rate of GDP per capita was 8.9% from 2007 to 2014, which was higher than the national average (5%).

The average higher education attendance rate in C2 (16.2%) was lower than the average of C1 (23.4%) and higher than the national average (7.8%). Its tax revenue was five times lower than in C1, and just 1.3 times greater than the national average. Almost one-fifth of total revenues in their municipalities were being collected by own management. The population affiliated to social security was 21.8%, and 11.2% of the homes had

internet access (the national average was 5.1%). Average annual sales per capita (worker affiliated to social security) was twice the national average and three times less than in C1. Manufacturing represented 12% of the economic activity. However, even though this cluster had an important development level, 43% of the homes had 'inadequate physical characteristics'. In social terms, the health indicators revealed that 16.6% of its female adolescent population exhibited pregnancy condition. Poverty level relating to consumption in the cluster was 25.5% lower than the national average (41.8%). Only 17% of the female population was affiliated to social security.

9.5.1.3 C3–122 Cities. Average Development Level of the Country

C3 was characterised by indicators with values that were similar to the values of the country, and a significant dispersion relating to tax revenue, sales per worker and weight of manufacturing in the economy. It consisted of 122 cities, 44 of which were in the hills region, 57 on the coast and 21 in the Amazon region. It had 35.1% of the population of the country. With respect to the number of inhabitants per region, 25.4% were in the hills, 64.0% on the coast and 19.7% in the Amazon region.

The income per capita (2,023 USD) was similar to the national average (2,105 USD), and with moderate dispersion. The leading economic sectors were agriculture and livestock, which represented the third part of the GDP. The tertiary economic sectors were commerce, public administration and education, which together reached 58.6% of the GDP. The tertiary sector also had negative growth rates in transport, communication and construction (between 4 and 6%). The average rate of higher education attendance exhibited a significant disparity in comparison to C1 (23.4%). As for taxation, 'tax revenue per capita' was 14 times lower than in C1, and only 4.8% of the homes had internet access. The income obtained from the management of its municipalities represented only 12% of total revenues. Finally, only 14% of its working population had social security. The 'infrastructure gap' had 60% of 'homes with inadequate physical characteristics', and the 'sex gap' revealed that only 11% of the female population had social security. In social terms, the health indicators revealed that the pregnancy rate in 21% of the adolescent female population was close to the national average rate (20%).

Poverty relating to consumption in the cluster was 38.1%, that is slightly lower than the national average (41.8%). In the 'environmental gap', 8.6% of the homes used firewood for cooking, which was a lower value in comparison to the national average (15.1%).

9.5.1.4 C4–41 Cities. Lower Development Level Than the Average of the Country

C4 consisted of 41 cities, of which 24 were in the hills region, nine on the coast and eight in the Amazon region. With respect to the number of inhabitants, this cluster had 6.0% of the country population, with 58.5% in the hills region, 22% on the coast and 19.5% in the Amazon region. The development level of these cities was lower than the average level of the country (Fig. 9.2).

The level of income per capita in C4 (1,338 USD) represented 68% of the national average, with positive and dispersed asymmetrical distribution (coefficient of variation = 40%). As well as the former cluster, the agriculture, forestry, livestock and fishing sectors had about 25% of the GDP, followed by public administration (16.3%), teaching (15.6%) and construction (8.5%). The average growth rate of the GDP per capita in this cluster had been the lowest among all the clusters (2.6%) from 2007 to 2014.

With respect to the other gaps, the average 'higher education attendance rate' (6.6%) was lower than the national average (7.8%). Regarding 'tax collection per capita', this cluster reached an annual average of 52.6 USD (38% of the national average and 30 times lower than in C1). Total revenues in its municipalities depended on State transfers (93.2%). Only 2.6% of homes had Internet access. Productivity per worker (annual sales average from 2010 to 2014

relating to the affiliated population) represented 23% of the national average.

The average volume of credit per capita represented 65% of the national average. There were no industries in its economic activity (manufacturing GDP = 2%). There was a high percentage of 'homes with inadequate physical characteristics' (66%), and only 21% of the female population had social security. In social terms, health indicators revealed that the fifth part of its adolescent female population exhibited pregnancy condition. Poverty related to consumption reached half of its population (approximately 47%). In the 'environmental gap', a quarter of the homes used firewood for cooking (25.2%).

9.5.1.5 C5–32 Cities. Lower Development Level Than the Average of the Country

C5 consisted of 32 cities, 12 were in the hills region, whose inhabitants represented 43.0% of the cluster, 10 were on the coast, representing 44.8% of the population and 10 were in the Amazon region with the remaining 12.2% of the population. It grouped 6.2% of the country population. This cluster had the cities with the lowest development level of the country (Fig. 9.2).

The income per capita (1,211 USD) was just 57% of the national average. The average volume of credit per capita (170 USD) reached 38% of the national average. The coefficient of variation in this indicator was the lowest among the other clusters (24%).

Sectoral GDP was represented by 26.1% in agriculture, forestry, livestock and fishing, followed by education (20%) and public administration (14.7%). There were negative growth rates in transport, communication, commerce and construction, ranging between 6 and 8%. The average rate of GDP annual growth per capita (3.8%) from 2007 to 2014 was lower than the national average (5% per year).

The average rate of 'higher education attendance' was the lowest (4.3%). In per capita terms, this cluster collected an annual average of 30.5 USD (50 times less than C1). Total revenues of its municipalities depended on State transfers (95%). The population affiliated to social security was only 12%, and there was a marked disparity with respect to Internet access, given that only 2.2% of the homes had access (the national average was 5.1%). The annual sales average per worker was 2,759 USD, representing 27% of the national average (10,161 USD). Manufacturing was virtually non-existent in the economic activity of the cluster (1%). A worrisome gap was 'infrastructure', because 82% of the homes had inadequate physical characteristics. Regarding the 'sex gap', only 10% of the female population was affiliated to social security. In social terms, the health indicators revealed that the fifth part of the adolescent female population exhibited pregnancy conditions. Poverty related to consumption in the cluster reached 63.9% of its population (national average = 41.8%). With respect to the 'environmental gap', 35.4% of the homes used firewood for cooking, a value that was higher than the national average (15.1%).

9.5.2 Analysis of the Structural Heterogeneity of the Clusters

Structural heterogeneity in each cluster is presented in a comparative form considering the disparities observed in the structural gaps.

9.5.2.1 Income Concentration (GDP)

The differences between clusters at the level of GDP per capita and the rate of economy growth were significant. The evolution of GDP per capita between 2007 and 2014 is illustrated in Fig. 9.3. There was steady growth in C1 and C2, and a slight growth in the other three clusters (C3, C4 and C5).

According to the principles of structural heterogeneity, the disparity in income per capita between clusters had two main characteristics. The first was a strong geographic concentration of population and economic activity in the main cities and metropolitan districts. For example, C1 concentrated 36% of the total population, and

56.5% of the total GDP. The second characteristic was that the gaps relating to the general living conditions of the population had the highest values in C1.

9.5.2.2 Productivity Structure

Structural heterogeneity was complemented with the characteristics of employment in the agriculture, livestock and fishery sectors, which prevailed in all the clusters except for C1. These sectors had low productivity and low incomes. On the one hand, income sharing in these sectors reached just 4.43% of the total; on the other hand, they employed only 10% of affiliated workers. Finally, 93% of the companies engaged in these sectors were micro companies.[8] This way, sectoral, productive and business weakness was the cause of low potential for economic and social development in C3, C4 and C5.

9.5.2.3 Business Structure

Structural heterogeneity was also reflected in the size of companies in the country,[9] with a major presence of micro (90.6%), small (7.35%), medium type A (0.92%), medium type B (0.61%) and large companies (0.48%). According to the performance of companies, Ecuador had business weakness, because the companies with greater representativeness were those with lower total sales values, employability levels and income sharing. Large companies had 73.1% of total annual sales in 2015, employed 50% of affiliated workers, and had 61% of income sharing. Micro companies did not reach 1% of total sales, employed 5.4% of affiliated workers, and income sharing was 3.2%.[10] The distribution of this structure in the clusters indicated that about 70% of large companies were concentrated in C1, 14.5% in C2, 14% in C3, 1.2% in C4 and 1% in C5.

According to the 2016 Labour and Business Report, the INEC indicated differences in salaries between sectors. Incomes in the agricultural sector were equivalent to 65.8% of the average in the economy. This sector prevailed in C2, C3, C4 and C5. On the other hand, manufacturing companies were a minority in all clusters, which revealed a very low incidence and little industrial presence in the country. There was marked business, sectoral and productive weakness reflecting the structural heterogeneity in the clusters (Fig. 9.4).

Despite the weakness of the business structure, which directly affected productivity, salaries and employment, it represented the formal sector of the economy in the cities. Ecuador had high indicators of labour informality (inadequate employment),[11] which reinforced the weak productive structure that has persisted over time. For decades, the percentages of unemployment and underemployment had been higher than 50% considering the economically active population.[12] This precarious employment structure was distributed with noticeable inequality in the clusters.

9.5.2.4 Productivity

Productive and business heterogeneity was directly linked with occupational structure, marked by gaps in productivity, whether in local companies, human resources and institutional

[8]Labour and Companies Panorama of Ecuador 2016 (National Institute of Statistics and Censuses of Ecuador—INEC).

[9]The methodology of INEC considers the size of companies in accordance with the annual sales volume and the number of employed personnel. The criterion of annual sales volume prevails over the criterion of employed personnel. Resolution of the Andean Community of Nations (2009), cited in the DIIIE—INEC 2015.

- Large company: sales from 5,000.001 (USD) onwards; from 200 workers onwards.
- Medium type B company: sales from 2,000.001 to 5,000.000 (USD); from 100 to 199 workers.
- Medium type A company: sales from 1,000.001 to 2,000.000 USD); from 50 to 99 workers.
- Small company: sales from 100.001 to 1,000.000 (USD); from 10 to 49 workers.
- Micro company: sales from 0 to 100.000 (USD); from 1 to 9 workers.

[10]Calculations made on the basis of data from the Directory of Companies and Establishments (INEC 2014, 2015).

[11]Inadequate employment (INEC) is divided into three categories: underemployment (insufficiency of incomes and time), another inappropriate employment, and unpaid employment. In the present study, inadequate employment represented underemployment or informality.

[12]INEC. National survey on employment, unemployment and underemployment. Labour indicators. 2007–2015.

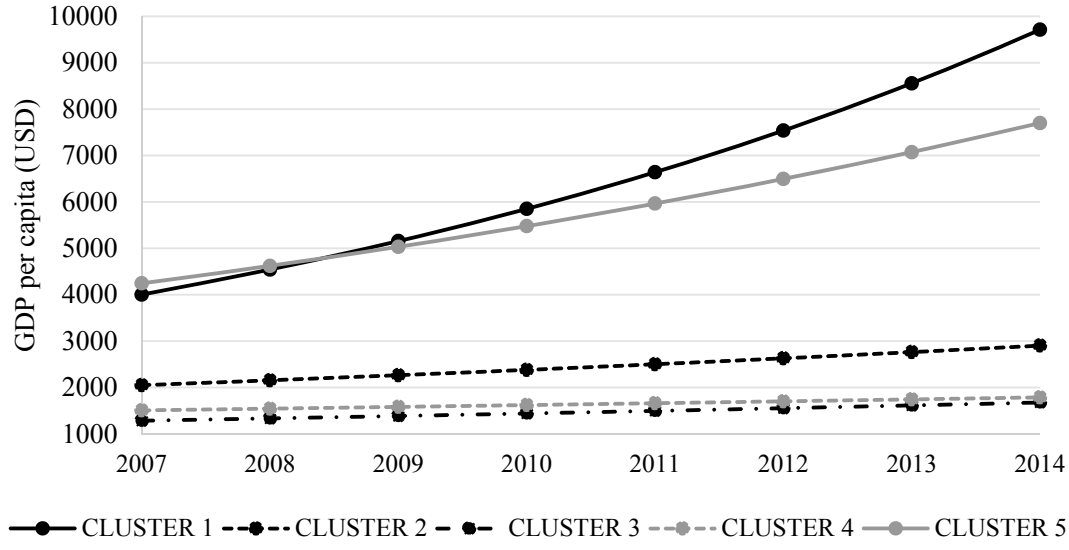

Fig. 9.3 GDP per capita (USD) from 2007 to 2014 per cluster. *Source* Prepared by Authors

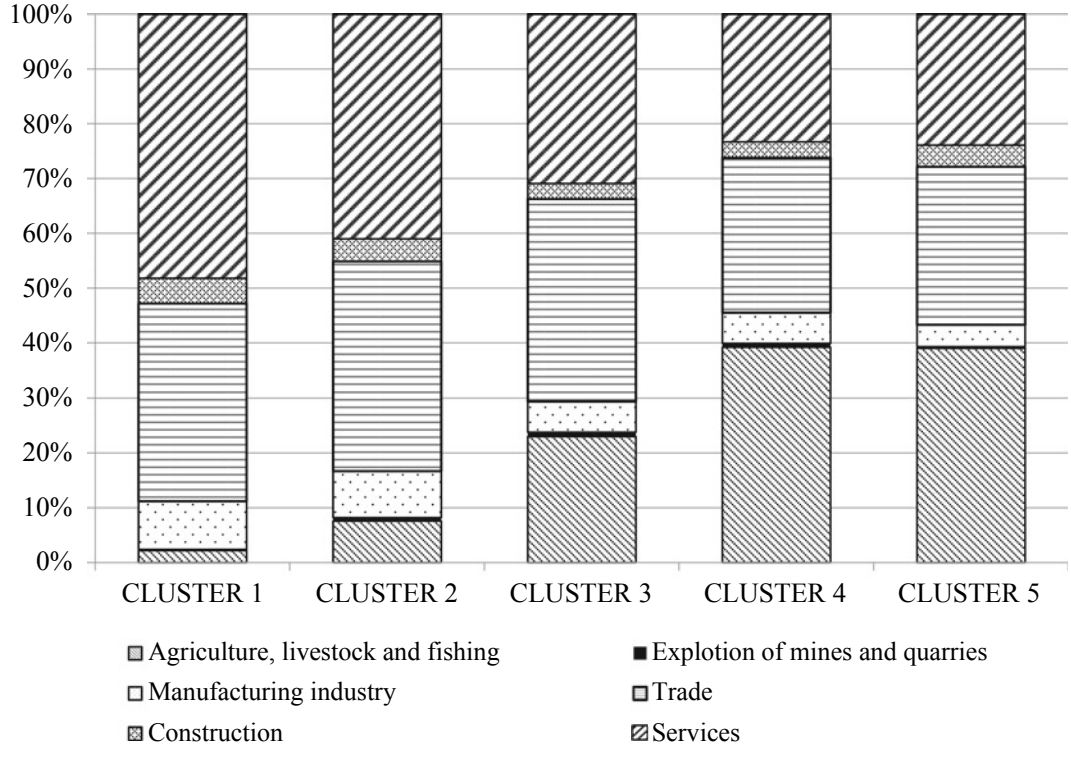

Fig. 9.4 Business structure of clusters per economic sector in 2014 (%)

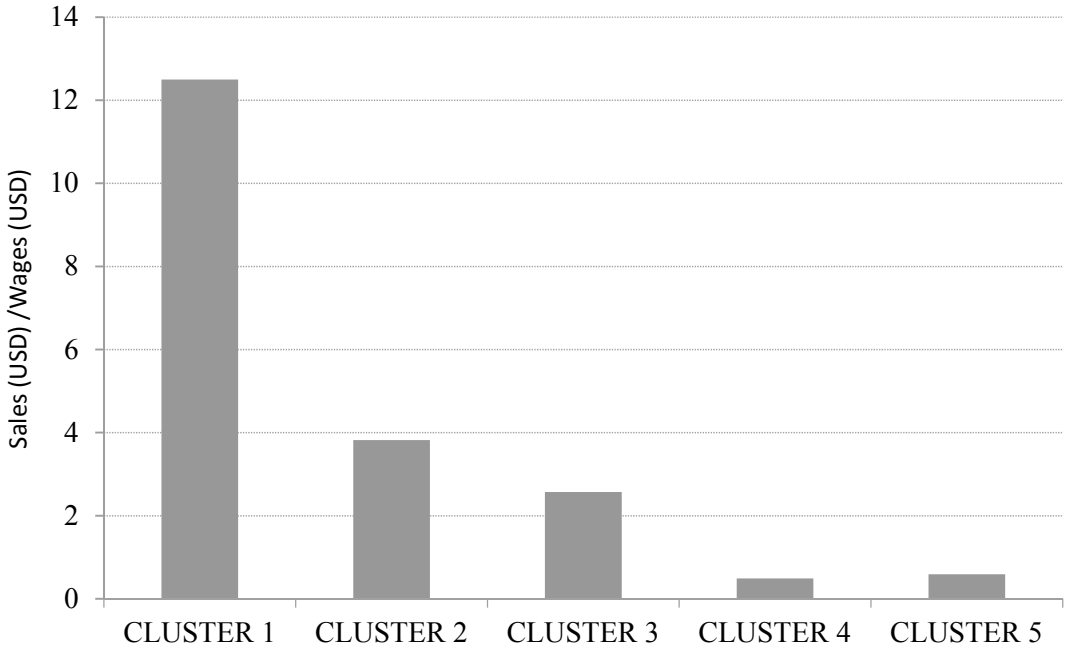

Fig. 9.5 Sales (dollars)/salaries (dollars). Annual averages (2010–2014), Total sales (companies)/salaries (companies) (2010–2015)

capacities. Employment incomes were very unequal, entailing a marked inequality in family incomes (Fig. 9.5).

For the analysis of productivity, we calculated an indicator that related total sales from 2010 to 2015 to the salaries paid to workers affiliated to social security during the same period. The results indicated significant difference in productivity by personnel employed among the clusters. On average, total sales in C1 were 12.5 times higher with respect to the salaries paid, 2.5 times higher in C2, 0.59 times higher in C3, 0.49 times higher in C4 and 3.8 times higher in C5. Clearly, C2, C3 and C4 managed to establish sales amounts that were only sufficient to cover the cost of salaries.

9.5.2.5 Investment and Savings

This gap reflected the heterogeneity in the concentration of tax collection and the volume of credit in C1 and C2 (expressed in per capita terms). The indicators revealed that the differences in tax revenues were significantly greater in comparison to the differences in productivity. In this case, the difference between the clusters with the highest tax collection (C1) and the cluster with the lowest tax collection (C3) was 50%, indicating that the economy in the cities of C3 was little formal. Similarly, credits had similar concentration and distribution.

9.5.2.6 Education, Access to Technology and Poverty

Education is the determining factor to improve employability and income level. The difference between clusters was significant. It was possible to observe strong direct and positive correlation between higher education attendance and Internet access, which was also opposed to the level of poverty (Fig. 9.6).

C1 and C2 had the most advantageous indicators, as opposed to C3 to C5, where cities had the worst social conditions. The same fact occurred with the 'environmental gap', and health and environment indicators.

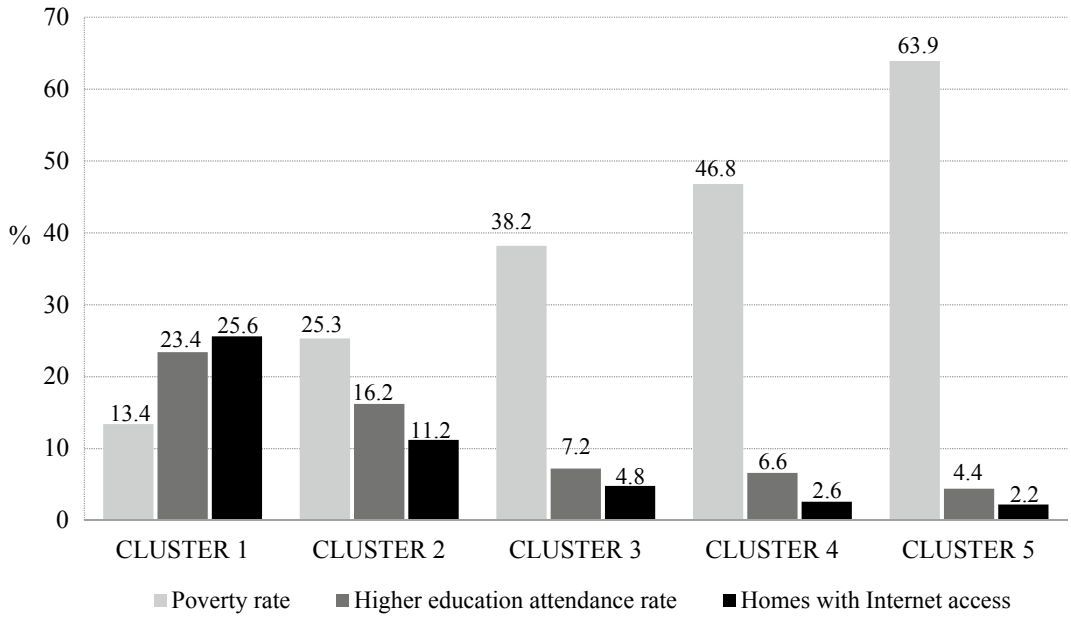

Fig. 9.6 Poverty rate, higher education attendance rate, and homes with Internet access per clusters (%)

9.5.2.7 Taxation—Local Institutional Capacity

The results in this gap demonstrated the institutional management capacity of the decentralised autonomous governments of the cities (municipalities). The indicator used was financial self-sufficiency (collection of own incomes/total income). In this sense, the heterogeneity manifested itself with large disparities. C3, C4 and C5 barely managed to collect between 6 and 12% of their total incomes by own management. This aspect implies an institutional weakness and a high dependency on resources transferred by the state. In the case of C1, it was 38%, and 23% in C2.

9.6 Conclusions

The hierarchy of groups of cities led to a system that clearly reflected the territorial disparities between clusters and cities. We observed that, for measures of association, it is fundamental to choose the statistical indicators that most properly reflect the gaps to be assessed. Similarly to other authors' findings (Tezanos 2012), we found that there is not a single classification for assessing the needs of development in the structural gap approach.

Our study revealed a clear territorial disparity in the cities of Ecuador. Quito and Guayaquil had the highest concentration of population and economic power. In this sense, this fact demonstrated a degree of urban primacy.[13] This characteristic tends to be higher in small countries, where the largest cities impose economic, political or social hegemony (Cuervo 2004). Structural heterogeneity caused a territorial inequality linked to differences in the productivity of individuals and companies. In addition, this heterogeneity was reinforced by a sectoral composition and a fractional and weak business structure (98% of micro and small companies) whose productive orientation was primary in the less developed clusters.

The growth rates of economy in the cities from 2007 to 2014 indicated clear growth

[13]We used the definition given by Cuervo (2004) in the sense that urban primacy is the relative weight that a city or major cities have with respect to the rest of the country, in terms of population size and economy, when these indicators exceed the behaviour patterns in a double sense, i.e., historically and synchronically.

tendencies in C1 and C2 (major cities) and virtual stagnation in C3, C4 and C5, which led to uneven and little sustainable development, in addition to expansion of territorial disparities. The sectoral composition of the clusters reinforced the territorial disparity. There was greater employment of non-skilled workers, and low probability of innovation and use of technology in the clusters with low development levels. To this fact, it should be added that there was a significant percentage of the population subjected to underemployment and informality. The significant differences in social and economic conditions observed in different gaps (poverty, education, environment, health, productivity, savings and investment, and taxation) reinforced the persistence and extent of disparities in the territories. There was a marked weakness of local institutions reflected in the almost non-existent capacity for financial management in the majority of the cities (85%) concentrated in the clusters with lower development levels. As the main agent of territorial development, this weakness in the municipal administration reinforced and extended territorial disparities.

References

Abramo L, Cecchini S, Espíndola E, Maldonado C, Martínez R (2016) La matriz de la desigualdad social en América Latina. CEPAL, Santiago de Chile

Banco Central del Ecuador. (BCE). (2017) Estadísticas Económicas. Boletín abril 2017. Serie 3.1.1. Cifras promedio del sector exportador período 2012–2016

Bárcena A, A Prado (2016) El imperativo de la Igualdad: Por un desarrollo sostenible en América Latina y el Caribe. Siglo XXI Eds and CEPAL, México

Bartholomew D, Steele F, Moustaki I, Galbraith JI (2008) Analysis of multivariate social science data, 2nd edn. Taylor and Francis Group, LLC, New York

Bértola L (2016) Ciclo económico y heterogeneidad estructural. In: Amarante V, Infante R (eds) Hacia un desarrollo inclusivo: El caso del Uruguay. CEPAL, OITT, Santiago de Chile, pp 19–54

Banco de Desarrollo del Ecuador (BEDE) (2002–2014) Sistema de Información Municipal del Ministerio de Finanzas sobre la base de cédulas presupuestarias ejecutadas

Candia D, L Riffo, C Sandoval, A Williner (2015) Panorama del Desarrollo Territorial en América Latina y el Caribe. United Nations—CEPAL, Cooperación Alemana, Santiago de Chile

CEPAL (2010) La hora de la igualdad: brechas por cerrar, caminos por abrir. Trigésimo tercer período de sesiones de la CEPAL

CEPAL (2014a) Cambio estructural para la igualdad. Una visión integrada de desarrollo. Naciones Unidas. Santiago de Chile

CEPAL (2014b) Pactos para la Igualdad. Hacia un futuro sostenible. Santiago de Chile. XXXV Período de sesiones de CEPAL. Santiago de Chile

Cimoli M (ed) (2005) Heterogeneidad estructural, asimetrías tecnológicas y crecimiento en América Latina. United Nations—CEPAL, Santiago de Chile

Cimoli M, G Porcile (2013) Tecnología, heterogeneidad y crecimiento. Una caja de herramientas estructuralistas, serie Desarrollo Productivo, 194. United Nations—CEPAL, Santiago de Chile

Comisión Económica para América Latina y el Caribe (CEPAL) (2016) Horizontes 2030: la igualdad en el centro del desarrollo sostenible. Síntesis LC/G.2661 (SES.36/4)), Santiago de Chile

Cuervo LM (2004) Desarrollo económico y primacía urbana en América Latina. Una visión histórico-comparativa. In: Torres AC (ed) El rostro urbano de América Latina. O rostro urbano da América Latina. CLACSO, Consejo Latinoamericano de Ciencias Sociales, Buenos Aires, pp 77–141

Cuervo LM, Morales Gutiérrez FJ (2009) Las teorías del desarrollo y las desigualdades regionales: una revisión bibliográfica. Análisis Económico XXIV 55:365–383

de Ferranti D, G Perry, F Ferrerira, M Walton (2004) Desigualdad en América Latina ¿Rompiendo con la historia? Alfaomega—World Bank, Bogotá

de la Fuente S (2011) Análisis de Conglomerados. Universidad Autónoma de Madrid, Madrid

Fernández Santana O (1991) El análisis de Cluster: Aplicación, interpretación y Validación. Papers. Revista de Sociología 37:67–76

Ferran Aranaz M (2001) SPSS para WINDOWS, Análisis estadístico. McGraw Hill Ed, Madrid

Hausmann R, Rodrick D, Velasco A (2005) Growth diagnostics. In: John F (ed) Kennedy school of government. Harvard University, Cambridge, MA

INEC (2010) Instituto de Estadísticas y Censos del Ecuador. Censo nacional 2010

INEC (2016a) Panorama Laboral y Empresarial del Ecuador 2016

INEC (2016b) Encuesta Nacional de Empleo, Desempleo y Subempleo. Indicadores Laborales 2007–2015

INEC-Banco Mundial (2014) Reporte de pobreza por consumo en Ecuador (2006-2014). Chapter 2. "Crecimiento y pobreza en Ecuador 1998-2014"

Kaldewei C (2015) Brechas Estructurales en los países de renta media. Consideraciones para un diagnóstico a nivel de país, serie Financiamiento para el desarrollo. CEPAL, Santiago de Chile

Kanbur R, Sumner A (2012) Poor countries or poor people? Development assistance and the new

geography of global poverty. J Int Dev 24(6):686–695. https://doi.org/10.1002/jid.2861
Kanbur R, Venables A (2005) Spatial inequality and development. Overview of UNU-WIDER. In: Kanvur R, Venables AJ (eds) Spatial inequality and development. Oxford Press, Oxford, pp 1–14
Kats J (2016) Adiós al viento de cola: se abre un nuevo ciclo de ajuste estructural, serie Desarrollo Productivo, vol 202. United Nations—CEPAL, Santiago de Chile
Larrea C (1983) La estructura social ecuatoriana entre 1960 y 1979. In: Ayala E (ed) Nueva Historia del Ecuador, vol 11. Corporación Editora Nacional, Quito, p 97–148
Maryse R (2011) La desigualdad y la inclusión social en las Américas: Elementos clave, tendencias recientes y caminos hacia el futuro. In: Zela H, Esquenazi P, Briones A, Ochoa G (eds) Desigualdad e inclusión social en las Américas. 14 ensayos, 2nd edn. Organización de los Estados Americanos, Bogotá, pp 35–55
Mattar J, Buitelaar R, GonzáleZ S (2012) Panorama del Desarrollo Territorial en América Latina y el Caribe. United Nations, CEPAL-ILPES, Santiago de Chile
Modrego F, C Cazzuffi (2015) Desigualdad y crecimiento económico: contribuciones desde el desarrollo territorial, serie documentos de trabajo, 155. Grupo de Trabajo Desarrollo con Cohesión Territorial. Programa Cohesión Territorial para el Desarrollo. RIMISP, Santiago de Chile
Pardo E (2014). "Diagnóstico del desarrollo" en países de renta media a partir de las brechas estructurales. El caso de América Latina y el Caribe, serie Financiamiento para el desarrollo, 252. United Nations—CEPAL, Santiago de Chile
Peña D (2013) Análisis de Datos Multivariantes. McGraw Hill, Madrid
Piketty T (2014) El capital en el siglo XXI. Fondo de Cultura Económica, México
Pinto A (1973) Heterogeneidad Estructural y Modelo de Desarrollo reciente de la América Latina. Instituto Latinoamericano de Planificación económica y social, CEPAL, Santiago de Chile
Pinto A (1976) Notas sobre los estilos de desarrollo de América Latina. Revista de la CEPAL Primer semestre 1976:97–196
Pita E (1991) "La precarización del empleo en Ecuador" Organización Internacional del Trabajo. Instituto Internacional del Trabajo. Series de Investigación: Reestructuración y regulación institucional del mercado de trabajo en América Latina
Prebisch R (1962) El desarrollo económico de la América Latina y algunos de sus principales problemas. Boletín económico de América Latina 7(1):1–26
Prebisch R (1973) Problemas teóricos y prácticos del crecimiento económico, 2nd edn commemorative. United Nations – CEPAL, Santiago de Chile
Ramírez JC, I Silva, L Cuervo (2009) Economía y territorio en América Latina y el Caribe. Instituto Latinoamericano y del Caribe de Planificación Economía y Social (ILPES) – CEPAL, United Nations, Santiago de Chile
Rodríguez O (2006) El Estructuralismo Latinoamericano. Siglo XXI Eds, México
Rodriguez-Pose A, Sánchez-Reaza J (2005) Economic Polarization Through Trade: Trade Liberalization and Regional Inequality in Mexico. In: Kanvur R, Venables AJ (eds) Spatial Inequality and Development. Oxford University Press, Oxford
Servicio de Rentas Internas (SRI) (2010–2015) Estadísticas por tipo de impuesto, provincia y cantón. http://www.sri.gob.ec/web/guest/estadisticas-generales-de-recaudacion
Stiglitz J (2012) The price of inequality: how today's divided society endangers our future. W. W. Norton and Co. Ed. Taurus, Barcelona
Stiglitz J (2015) The great divide: unequal societies and what we can do about them. Ed Taurus, Barcelona
Tezanos S (2012) Conglomerados de desarrollo en América Latina y el Caribe: Una aplicación al análisis de la distribución de la asistencia oficial para el desarrollo, serie Financiamiento para el desarrollo, 241. United Nations—CEPAL, Santiago de Chile
Titelman D, Vera C, Pérez-Caldentey E (2012) Los países de renta media: Un nuevo enfoque basado en brechas estructurales. United Nations—CEPAL, Santiago de Chile
United Nations—CEPAL (2016) El enfoque de brechas estructurales. Análisis del caso de Costa Rica. United Nations, Santiago de Chile
Villalobos F (1983) El proceso de industrialización hasta los años cincuenta. In: Ayala E (ed) Nueva Historia del Ecuador, vol 15. Corporación Editora Nacional, Quito, pp 53–59
Yifu Lin J (2009) New structural economics. In: A framework for rethinking development. World Bank, Washington, DC