We are IntechOpen,
the world's leading publisher of
Open Access books
Built by scientists, for scientists

6,900
Open access books available

186,000
International authors and editors

200M
Downloads

Our authors are among the

154
Countries delivered to

TOP 1%
most cited scientists

12.2%
Contributors from top 500 universities

CLARIVATE ANALYTICS
BOOK CITATION INDEX
INDEXED

WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com

The Spatial Structure of Ecuador: Analysis Using Market Potentials

Jorge Guido Sotomayor-Pereira,
Jesús López-Rodríguez and Laura Varela-Candamio

Abstract

The goal of this chapter is to analyze the spatial structure of Ecuador, that is, to find out if the economic activity in this country is clustered in or around several provinces and/or regions. In other words, we want to establish from a geographical economics perspective which provinces are considered belonging to the so-called core and which ones to the periphery. We will carry out the analysis by computing each region's market potentials. The methodological approach of this study is based on the well-known Harris, 1954, market potential concept of the regional economics literature. For each province and using as the time frame the period 2007–2014, we have computed its Harris, 1954, market potential, which takes into account the economic activity in the surrounding locations weighting them by the inverse of the distance. With regard to the weighting scheme, we will use two different proxies: on the one hand, the distance measured in kilometers between the capital of each province, and on the other hand, the distance measured in terms of the time needed to travel from the capital of one province to the other.

Keywords: market potential, regional development, center-periphery pattern, Ecuador, economic activity

1. Introduction

Without any doubt, one of the key concerns of the economics science is the study of the levels of wellbeing of the citizens and the process of income distribution which affects the wellbeing levels. From this perspective, it is very difficult that a country is able to fully accomplish the needs of its citizens. It is a very well-known feature that the economic activity is concentrated in few locations in the space and therefore this fact makes difficult to achieve a balanced

development of the different territories within a country and therefore to achieve good levels of citizens welfare. For instance, in the case of Ecuador according to the figures provided by its National Statistical Institute, only 1.9% of the population belongs to the upper class, 11.2% are upper-middle class, 22.8% are middle class, 49.3% are middle-low class and 14.8% are low class. Moreover, around 8% of the population lives with less than 1 dollar a day. On the other hand, it is well known that economic activity is concentrated in space and the identification of core-periphery patterns which are common to many countries are also present in the case of Ecuador. Without any doubt, there are two provinces that are acting as "core" from a geographical economics point of view, whereas the remaining ones would be acting as "periphery." Our main goal is to analyze whether the spatial distribution of the economic activity in Ecuador follows a core-periphery pattern which is clearly observed in other geographical settings in the world, such as in the European Union, Spain, Portugal, Romania, etc. In order to deal with this issue, we will resort to the computation of the Harris [1] market potentials for the Ecuador provinces. The results of the computations will be shown in a map which will provide us with a macroscopic picture of the spatial distribution of economic activity within Ecuador and will also be informative about the potential existence of a core-periphery structure in terms of spatial distribution. The remaining part of the chapter is structured as follows: in the next section, the theoretical background of the Harris [1] market potential concept is presented. Section III looks at the analysis of the spatial structure of Ecuador based on the market potential computations over the period 2007–2014. Section IV looks at the analysis of the distribution of economic activity in Ecuador by means of Lorenz curves and associated Gini indexes. The last section of the chapter contains the main conclusions.

2. Theoretical background

Following Harris [1], the market potential of a geographical observation (region i is defined as the summation of markets (M) accessible to i divided by their "distances" (d_{ij}) to that point i. When the calculation is done on areal units, a correction for the size of the internal market of each area (self-potential) is necessary in order to measure the accessibility of its firms to the markets. Therefore, considering the $R - 1$ possible markets of other j regions, the Harris's Market Potential of region i can be decomposed into its *Internal Market Potential* (*IMP*) and *External Market Potential* (*EMP*) components:

$$HMP_i = \sum_{j=1}^{R} \frac{M_j}{d_{ij}} = \frac{M_i}{d_{ii}} + \sum_{j=1}^{R-1} \frac{M_j}{d_{ij}} = IMP_i + EMP_I \qquad (1)$$

where the distance to the own regional market (d_{ii}) is measured by within region distances, as discussed below. Part of the focus of this chapter is on the construction and interpretation of External Market Potential. Versions of this last variable have been called "non-local" Head and Mayer [2], "surrounding" Blonigen et al. [3] or "foreign" Brakman et al. [4] market potential.

The distance between the locations i and j (d_{ij}) is going to be measured as follows:

a. In first place, we will proxy this distance by considering the distance between the capitals of the provinces measured in kilometers. The use of physical distances allow to capture not only the trade costs but also the "relative" trade costs Yotov [5] and the barriers which are not related to trade and other sort of interactions Linders et al. [6].

b. On the other hand, we will consider also the distance measured in travel time between the capitals of the provinces. This weighting scheme allows to control the quality of the infrastructure. It might well happen in case that comparing vis-à-vis two locations that are in terms of physical distance of equal distance but in terms of travel times are quite different on account of the quality of the infrastructure, physical geography of the region, etc., and therefore the centrality levels of the locations could be biased in case we only take into account a measure of physical distance based on kilometers.

As we see from the expression the market potential of a location can be broken down into a domestic or internal component and a foreign or external one (market potential generated by the surrounding locations excluding the location for which the computations is being made).

When facing the computation of the domestic market potential, the definition of the internal distance within each location (d_{ii}) is critical issue. The standard methodology assumes that the spatial units (in our case the Ecuadorian provinces) are circular and the internal distance is proxied as proportional to the square root of each province area. We follow Keeble et al. [7] and use our measure of internal distance as

$$d_{ii} = 1/3 \cdot r_i = 1/3 \sqrt{\text{area}_i/\pi} \qquad (2)$$

This measure allows the potential concentration of economic activity in and around the center. This way of computing internal distances increases the role of the internal market in comparison with other proxies, such as 2/3 of the radius used by other authors. Finally, as the proxy for the volume of economic activity M_j we have chosen on the one hand the provincial population and on the other the real per capital GDP. In both cases, we have a time series that goes from 2007 to 2014.

According to the theoretical background, the market potential indicators we have defined are the following:

(A) Indicators of market potential using a distance matrix based on kilometers:

1. pmp represents the Harris [1] market potential computed from data on population of each province. The internal distance is computed as 1/3 of the radius. Sources: Own elaboration based on provincial population data, area of each province, distance expressed in kilometers.

2. pmvyar represents the Harris [1] market potential computed from data on real gross value added of each province. The internal distance is computed as 1/3 of the radius. Sources: Own elaboration based on provincial population data, area of each province, distance expressed in kilometers.

(B) Indicators of market potential using a distance matrix based on travel times:

1. pmpt represents the Harris [1] market potential computed from data on population of each province. The internal distance is computed as 1/3 of the radius. Sources: Own elaboration based on provincial population data, area of each province, distance expressed in minutes of travel time between locations. For the computation of the internal distance, we consider a cruise speed of 60 km/h.

2. pmvyar represents the Harris [1] market potential computed from data on real gross value added of each province. The internal distance is computed as 1/3 of the radius. Sources: Own elaboration based on provincial population data, area of each province, distance expressed in minutes of travel time between locations. For the computation of the internal distance, we consider a cruise speed of 60 km/h.

The datasets for our computations have been obtained from different sources: Central bank of Ecuador, National Statistical Institute [8], Service of internal rents. In order to represent the indexes of market potential, we will use a geographic information system (ESRI from Arc map).

Harris's approach has been widely used in Regional Economics. One reason is that it offers a way of capturing Tobler´s [9] first law of Geography, which would be much quoted later by the Spatial Econometrics literature: "Everything is related to everything else, but near things are more related than distant things." In the 1990s, Krugman's general equilibrium setting provides microeconomic foundations to the physical analogies of Harris's indicator Krugman [10]. The NEG's "wage equation" predicts that regional wages are a function of the size of the markets available to each region. Here, the final basic equation is presented following Head and Mayer [2] and Combes et al. [11].

3. Spatial structure of Ecuador: 2007–2014

3.1. A short descriptive view of Ecuador

Ecuador with an area of 283.561 km^2 and a population of 16.298.217 inhabitants [8] is located on the northwestern part of South America. Its borders are in the North Colombia, in the South Peru and in the East and West the Pacific Ocean. The political capital is Quito whereas the economic and most populated city is Guayaquil. The official language of Ecuador is Spanish and its population is mostly catholic. Ecuador is considered one of the countries endowed with more biodiversity in the world Jaramillo [12]. From a geographical point of view, Ecuador is divided into three regions: coast, valley and East and the insular region. These three regions group the 24 provinces in which the country is divided for administrative purposes.

Historically, Ecuador is characterized by being a primary sector-export-oriented economy where the agricultural goods have been the main resource both in production and employment with the handicap that the economy relies on only one export product, cacao. At the

beginning of the twentieth century, the cacao was the main national product for foreign markets. The fall in the international prices of cacao and several diseases which affected this commodity were at the hearth of the shrink of this industry in Ecuador. At the end of 1940s, the cacao production was substitute by the banana production to convert Ecuador the first supplier of this fruit worldwide. However, from 1970s onwards, the oil production took the lead and from that moment onwards it was the more important trading commodity in the Ecuador economy. Currently, exports of oil account for 40% of total Ecuador exports and it represents a similar share in the Ecuador government budget. At the end of 1990s and influenced by a series of political and military circumstances jointly with the implementation of bad economic policies, Ecuador suffered the worst economic crisis of its history. The economy was dollarized in order to readjust the economic situation and since then Ecuador was able to keep the stability allowing the people to improve their standards of leaving.

3.2. Spatial structure of Ecuador: a provincial level analysis, 2007–2014

The next section contains the analysis of the main results.

Ecuador is divided into 24 provinces. This analysis does not take into account the insular province of Galapagos, so the analysis is carried out for the remaining 23 provinces. The first set of tables shown (**Tables 1** and **2**) contains the results of the computations of the market potentials using population as a proxy for the economic activity and as a distance matrix, one based on kilometers (**Table 1**) and another based on travel times (**Table 2**). The time period or this study is 2007–2014.

Our results show that there are two provinces with top ranking in terms of market potential: Guayas and Pichincha. In this sense, if we measure the demand accessibility using as our distance matrix the one based in travel times the top provinces in terms of market potential are the same. From a more general perspective, it can be appreciated that the provinces located along the coast Guayas, Manabí, Los Ríos and El Oro and those located in the central valley Pichincha, Bolívar, Cotopaxi, Tungurahua, Chimborazo, Santo Domingo have average values which are higher than for those provinces located in the Eastern (Morona Santiago, Napo, Pastaza, Sucumbíos, Orellana, Zamora Chinchipe) and Northern parts of the country (Carchi, Esmeraldas).

Tables 3 and **4** analyze the growth of the market potential based on population and distance matrix based on both kilometers and travel times over the period 2007–2014. The average growth rate of the period has been normalized to 100 and therefore the values presented in the table are deviations from it.

It can be seen that all provinces have experienced positive growth rates in terms of market potentials. The national average growth rate over this period was 20.6% and if we look at the average growth rates of the different regions the figures are pretty similar: coast 21.56%, valley 19.33% and east 21.98%. However, it is worth mentioning that the market potential growth experience by the provinces of Pichincha and Guayas is slightly above the remaining regions (with the exception of Santo Domingo and Santa Elena which in the past belonged to the

Province	Average	Maximum	Minimum
Azuay	92652.5705	100791.5361	83470.1759
Bolívar	102640.904	234778.2186	76385.87953
Cañar	84303.3891	92911.62696	75910.50379
Carchi	50203.8387	54774.91131	45791.56436
Cotopaxi	110749.6981	123452.41	101855.5623
Chimborazo	103211.5082	132311.1641	89189.67389
El Oro	92977.9622	99164.8545	86016.72381
Esmeraldas	56438.9936	61845.87432	50175.04418
Guayas	201438.9578	220138.0792	177975.4394
Imbabura	83868.7818	90205.37271	76674.98228
Loja	55531.8701	60488.38733	50222.18871
Los Rios	131864.6442	149285.0045	117676.4483
Manabí	99230.4968	107262.4807	89197.96576
Morona Santiago	44158.7542	50886.02031	38882.54179
Napo	53332.5414	61321.42445	47078.29336
Pastaza	63813.2107	74588.42534	56635.53775
Pichincha	185364.005	204115.2439	163019.6668
Tungurahua	124468.8505	130730.6259	113257.9825
Zamora Chinchipe	37087.2701	41173.98091	33073.5494
Sucumbíos	40942.0633	45593.58817	36212.60124
Orellana	37632.1285	42857.03254	33034.47325
Santo Domingo	95227.0321	104779.1647	83177.55473
Santa Elena	76081.575	84762.81198	65266.78877

Source: Own elaboration.

Table 1. Market potential based on population and distance matrix based on Kms (pmp): 2007–2014.

provinces of Pichincha and Guayas, respectively). Therefore, the results of this analysis show that besides the fact that Pichincha and Guayas are the provinces with the highest market potential values they are also the provinces which grow more. This is in line with a process of

Province	Average	Maximum	Minimum
Azuay	92592.5568	100731.3599	83412.5499
Bolívar	102535.049	234672.077	76284.2360
Cañar	84192.9403	92800.8791	75804.4493
Carchi	50222.8078	54793.9317	45809.7787
Cotopaxi	108774.2513	121471.615	99958.7109
Chimborazo	101570.0002	130665.2119	87613.4751
El Oro	93046.4709	99233.5486	86082.5068
Esmeraldas	56624.9354	62032.3196	50353.5881
Guayas	201426.2849	220124.8887	177963.2707
Imbabura	83938.1960	90274.9748	763741.6347
Loja	55535.9395	60492.4677	50226.0962
Los Rios	131932.0897	149352.6326	117741.2104
Manabí	99146.3469	107178.103	89107.1638
Morona Santiago	44148.7933	50876.0324	38872.9772
Napo	53051.8262	61039.9491	46808.7466
Pastaza	62876.0065	73648.6837	55735.6212
Pichincha	185307.6088	204056.5448	162965.5144
Tungurahua	121159.0108	127283.9717	110173.8251
Zamora Chinchipe	37246.9290	41334.0713	33226.8560
Sucumbíos	41281.7371	45934.1816	36538.7607
Orellana	37619.5657	42844.4356	33022.4102
Santo Domingo	95318.2998	104874.1591	83265.1912
Santa Elena	76293.5317	84975.3425	65470.3125

Source: Own elaboration.

Table 2. Market potential based on population and distance matrix based on travel times (pmpt): 2007–2014.

increasing concentration of economic activity in the Ecuadorian space in the aforementioned provinces. In short, we are facing with a core-periphery spatial type of structure in terms of economic development in Ecuador.

Province	Provincial indices (2007)	Provincial indices (2014)	Growth rate (2007–2014)
Azuay	90.0894	107.6601	19.5036
Bolívar	74.4205	88.7624	19.2714
Cañar	90.0444	107.2954	19.1583
Carchi	91.2112	106.3728	16.6225
Cotopaxi	91.9691	105.6850	14.9135
Chimborazo	86.4144	104.9252	21.4209
El Oro	92.5130	105.8198	14.3873
Esmeraldas	88.9013	108.5106	22.0573
Guayas	88.3520	109.2827	23.6901
Imbabura	91.4225	106.7099	16.7217
Loja	90.4384	107.1129	18.4373
Los Rios	89.2403	107.0655	19.9743
Manabí	89.8795	107.5099	19.6155
Morona Santiago	88.0517	107.8498	22.4846
Napo	88.2731	107.6785	21.9834
Pastaza	88.7520	106.6445	20.1600
Pichincha	87.9456	110.1159	25.2089
Tungurahua	90.9930	105.0307	15.4272
Zamora Chinchipe	89.1776	107.9099	21.0056
Sucumbíos	88.4484	108.6017	22.7854
Orellana	87.7826	108.4066	23.4944
Santo Domingo	87.3465	110.0309	25.9704
Santa Elena	85.7852	111.1875	29.6115

Source: Own elaboration.

Table 3. pmp Market potential growth: (2007–2014, Ecuador = 100).

Tables 5 and **6** show the market potential computations (along with the maximum and minimum values) based on the data on real gross value added and a weighting scheme based on kilometers (**Table 5**) and travel times (**Table 6**) over the period 2007–2014.

Province	Provincial indices (2007)	Provincial indices (2014)	Growth rate (2007–2014)
Azuay	90.0855	107.6624	19.5112
Bolívar	74.3980	88.7466	19.2859
Cañar	90.0365	107.2997	19.1734
Carchi	91.2130	106.3720	16.6192
Cotopaxi	91.8955	105.7141	15.0372
Chimborazo	86.2592	104.9388	21.6552
El Oro	92.5156	105.8185	14.3791
Esmeraldas	88.9247	108.4961	22.0089
Guayas	88.3515	109.2831	23.6911
Imbabura	91.4263	106.7078	16.7145
Loja	90.4389	107.1127	18.4365
Los Rios	89.2438	107.0640	19.9680
Manabí	89.8743	107.5128	19.6257
Morona Santiago	88.0499	107.8507	22.4881
Napo	88.2321	107.6976	22.0616
Pastaza	88.6437	106.6826	20.3499
Pichincha	87.9432	110.1177	25.2145
Tungurahua	90.9332	105.0553	15.5301
Zamora Chinchipe	89.2069	107.8935	20.9474
Sucumbíos	88.5107	108.5464	22.6569
Orellana	87.7798	108.4081	23.4999
Santo Domingo	87.3548	110.0252	25.9519
Santa Elena	85.8137	111.1678	29.5455

Source: Own elaboration.

Table 4. pmpt Market potential growth: (2007–2014, Ecuador = 100).

These results are also in line with the previous ones. The provinces of Guayas and Pichincha have the highest values in terms of the average values and also in terms of the maximum values. In the context of the Ecuadorian economy, the "center" of the economic activity is

Province	Average	Maximum	Minimum
Azuay	330790.0639	383810.751	288514.5
Bolívar	273622.048	318956.125	240500
Cañar	286376.6592	332880.842	250222.1
Carchi	187513.0012	218350.91	163299.4
Cotopaxi	389992.9367	455835.274	340354.1
Chimborazo	324140.4994	380217.919	282906.2
El Oro	307187.3137	372297.719	258022.4
Esmeraldas	196345.2721	219066.09	179702.8
Guayas	764554.4936	894921.42	680397.1
Imbabura	306003.2275	363380.632	262102.1
Loja	171716.7066	197779.8	147479.6
Los Rios	425388.5919	497077.361	371446.8
Manabí	301730.1684	354520.917	260227.1
Morona Santiago	160526.4038	185596.329	138712.1
Napo	223371.077	257049.974	197712.7
Pastaza	239690.2167	273774.265	207511.4
Pichincha	918315.932	1103744.33	810267.4
Tungurahua	413451.5802	481996.649	359893.1
Zamora Chinchipe	122847.6793	141977.57	106111.3
Sucumbíos	268916.6845	291250.95	219804.3
Orellana	300660.5064	368926.973	218269
Santo Domingo	339282.25	397740.056	299168
Santa Elena	267274.6315	295592.854	251272.2

Source: Own elaboration.

Table 5. Market potential based on real gross value added and a distance matrix based on kilometers (pmvyar): 2007–2014.

directed toward these two provinces and once again to those located in the central valley and the Ecuadorian coast. These results also show that the so-called "economic periphery" is located in the Eastern and Northern provinces of the country. Finally, **Tables 7** and **8** show the results of the market potential growth based on data on real gross value added and the

Province	Average	Maximum	Minimum
Azuay	330618.2731	383612.472	288366.2
Bolívar	273319.0349	318606.39	240238.4
Cañar	286060.4965	332515.93	249949.2
Carchi	187567.3008	218413.582	163346.3
Cotopaxi	384338.1643	449308.582	335472.6
Chimborazo	319441.6361	374794.53	278849.9
El Oro	307383.4219	372524.066	258191.7
Esmeraldas	196877.536	219680.425	180162.3
Guayas	764518.2169	894879.55	680365.8
Imbabura	306201.9275	363609.97	262273.6
Loja	171728.3554	197793.245	147479.6
Los Rios	425581.6565	497300.194	371613.5
Manabí	301489.287	354242.894	260019.1
Morona Santiago	160497.8905	185563.42	138867.5
Napo	222567.5215	256122.516	197019
Pastaza	237007.443	270677.83	205195.6
Pichincha	918154.4962	1103558	810127.9
Tungurahua	406200.8457	473343.502	354129.3
Zamora Chinchipe	123304.7073	142505.068	106505.8
Sucumbíos	269889.0104	292373.2	220725.2
Orellana	300624.5449	368887.902	218234.9
Santo Domingo	339543.5064	398041.596	299393.5
Santa Elena	267881.3637	296293.139	251795.9

Source: Own elaboration.

Table 6. Market potential based on real gross value added and a distance matrix based on travel times (pmvyar): 2007–2014 (pmvyart): 2007–2014.

two weighting schemes (kilometers and travel times) over the period 2007–2014. Once again we have normalized the average growth rate of the country to 100 and the figures for each province represent deviations from the average.

Province	Provincial indices (2007)	Provincial indices (2014)	Growth rate (2007–2014)
Azuay	87.2198194	116.028501	33.02997119
Bolívar	87.8949485	116.568137	32.62211257
Cañar	87.375178	116.238818	33.03414102
Carchi	87.0869815	116.445744	33.71199958
Cotopaxi	87.2718546	116.882956	33.92972661
Chimborazo	87.2788727	117.300344	34.39717997
El Oro	83.9951413	121.195669	44.28890396
Esmeraldas	91.5238707	111.571869	21.90466624
Guayas	90.1252275	117.051358	29.8763528
Imbabura	85.6533821	118.750588	38.64086286
Loja	85.879565	115.17796	34.11567701
Los Rios	87.3194179	116.852537	33.82193743
Manabí	86.2449577	117.496013	36.23522562
Morona Santiago	86.4107578	115.617322	33.7996855
Napo	88.5130982	115.077555	30.01189339
Pastaza	86.5748493	114.220042	31.93212884
Pichincha	88.5659937	120.192222	35.70922363
Tungurahua	87.0460036	116.578742	33.92773567
Zamora Chinchipe	86.3763184	115.572041	33.80061028
Sucumbíos	90.7023646	108.305273	19.40733141
Orellana	82.4137243	117.040982	42.01637301
Santo Domingo	88.1767193	117.229845	32.94874843
Santa Elena	94.0127261	110.595178	17.63851794

Source: Own elaboration.

Table 7. pmvyar Market potential growth: (2003–2014, Ecuador = 100).

The results show a positive market potential growth for all provinces being the average around 32.64%. The Oro province stands out as the leading province in this period.

Overall, our results show a clear core-periphery structure in the spatial distribution of economic activity across the Ecuadorian territory. The provinces of Pichincha and Guayas are the

Province	Provincial indices (2007)	Provincial indices (2014)	Growth rate (2007–2014)
Azuay	87.2202	116.0288	33.0296
Bolívar	87.8966	116.5694	32.6209
Cañar	87.3763	116.2397	33.0334
Carchi	87.0867	116.4454	33.7119
Cotopaxi	87.2857	116.9044	33.9330
Chimborazo	87.2929	117.3280	34.4072
El Oro	83.9966	121.1919	44.2819
Esmeraldas	91.5098	111.5822	21.9347
Guayas	90.1254	117.0514	29.8761
Imbabura	85.6538	118.7484	38.6376
Loja	85.8795	115.1779	34.1156
Los Rios	87.3189	116.8518	33.8218
Manabí	86.2448	117.4976	36.2372
Morona Santiago	86.4107	115.6173	33.7997
Napo	88.5210	115.0763	29.9988
Pastaza	86.5776	114.2064	31.9121
Pichincha	88.5663	120.1930	35.7095
Tungurahua	87.1808	116.5294	33.6640
Zamora Chinchipe	86.3761	115.5714	33.8002
Sucumbíos	90.6865	108.3309	19.4563
Orellana	82.4132	117.0411	42.0174
Santo Domingo	88.1752	117.2284	32.9493
Santa Elena	93.9953	110.6061	17.6719

Source: Own elaboration.

Table 8. pmvyart Market potential growth: (2003–2014, Ecuador = 100).

leading regions. These regions are followed by those located in the coast and some of the ones located in the central Valley. The economic periphery is made up of the provinces located in the Northern and Eastern parts of the country.

4. Lorenz curves and Gini index: an alternative analysis of concentration of the economic activity in Ecuador

To complement the analysis carried out in the previous section and with the goal of getting a more complete picture of the distribution of the economic activity in Ecuador, this section presents the results of the spatial concentration of population and GDP in space by computing the Gini index and plotting the associated Lorenz curves for 2007 and 2014.

The results of **Table 9** are quite remarkable. Of the total population, 41.5% in Ecuador is concentrated in the two provinces in which the highest market potentials values are reached, Guayas and Pichincha. However, in terms of space, these two provinces only represent a 10.1% of the total area of the country. Additionally, 66.2% of the total Ecuadorian population is concentrated in six provinces; four in the coast regions and two in the valley regions. These regions represent 25.3% of the total area. The Eastern provinces represent around 46.8% of the national territory but only the 4.7% of the total population.

As **Figure 1** shows, the Lorenz curve for 2007 is far from the equal distribution line. The value of the Gini coefficient for this year was 0.54. Comparing these results with those of 2014 (**Table 10**) gives the same image. Guayas and Pichincha keep concentrating a big share of the total Ecuadorian population. The figure for 2014 is 43.3% which means an increase in terms of concentration of population in these two provinces close to 2% over the course of these 7 years. Of the population, 66.69% is concentrated in the six provinces mentioned for 2007 (four in the coast and two in the valley). So, these data speak out clearly about a gradual process of increasing the concentration of population in Ecuador over the course of these 7 years of our analysis.

The 45% of the total Ecuadorian population is concentrated in six provinces; four in the coast regions and two in the valley regions (**Figure 2**).

In order to finish the analysis of the concentration of the economic activity in Ecuador, we replicate the computation but instead of working with population data we work with gross value added data. **Tables 11** and **12** show the results of the computations. In the year 2007, around 51.4% of the total national GDP was concentrated in Guayas and Pichincha. Therefore, the remaining 48.6% of the total Ecuadorian gross value added is distributed over the 21 provinces left with the reinforcing effect that five provinces of the Eastern part of Ecuador generate 2.5% of the gross value added (GVA) but represent 32.3% of the total area of the country. Moreover, these data also show that production is more concentrated than population in the space.

The fact that more than 50% of the Ecuadorian GVA is concentrated in less than 10% of the territory reflects quite clearly the center-periphery pattern of the spatial distribution of economic activity in Ecuador. Again, the Lorenz curve (**Figure 3**) associated with these data shows the lack of an equal distribution of GVA in space.

The results for the year 2014 are repeated (**Table 12** and **Figure 4**). Over the course of these 7 years, the concentration of GVA in space was quite stable: Guayas and Pichincha still concentrate
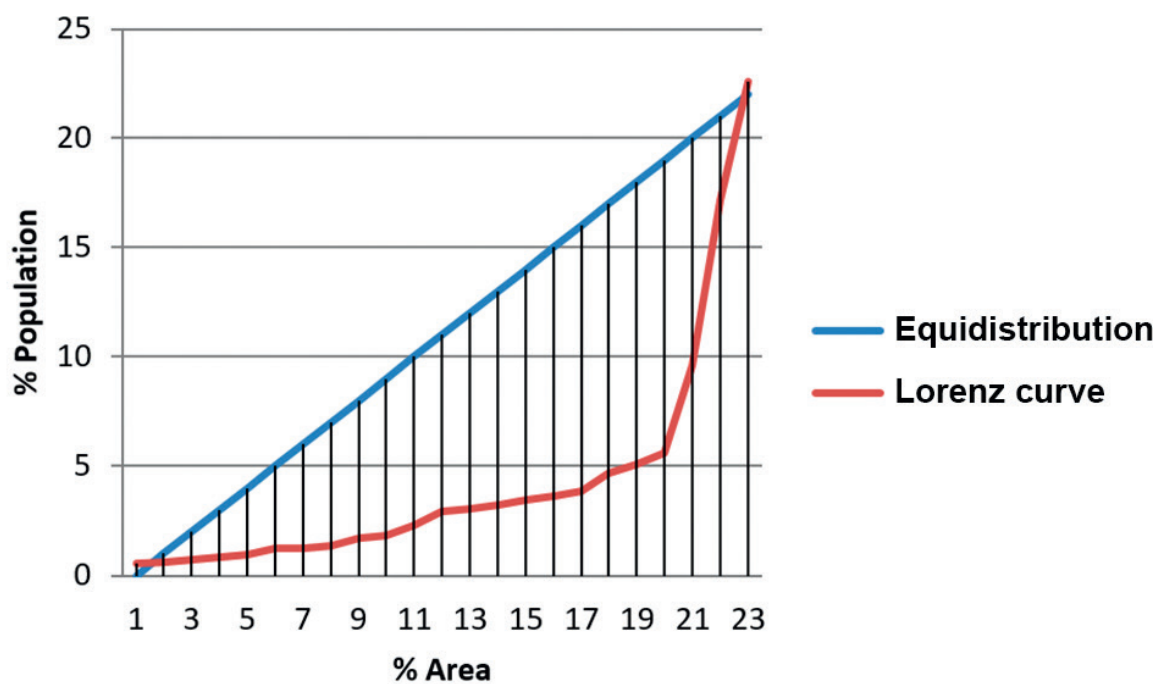
a share of GVA similar to that of 2007. Amazonia provinces continue to have a marginal share in the national aggregate.

The associated Lorenz curve for 2014 shows again the lack of an equal distribution in terms of GVA in space.

Province	POP 2007	POP index	Area	Area index
Ecuador	13180564	100	247576.91	100
Guayas	3216811	24.4057	15430.4	6.2325
Pichincha	2260935	17.1535	9535.91	3.8516
Manabí	1264524	9.5938	18939.6	7.6499
Los Ríos	736363	5.5867	7205.27	2.9103
Azuay	668715	5.0734	8309.58	3.3563
El Oro	619616	4.7009	5766.68	2.3292
Tungurahua	508166	3.8554	3386.25	1.3677
Esmeraldas	481426	3.6525	16132.23	6.5160
Cotopaxi	456378	3.4625	6108.23	2.4672
Loja	423997	3.2168	11062.73	4.4684
Imbabura	405041	3.0730	4587.51	1.8529
Chimborazo	387216	2.9377	6499.72	2.6253
Santo Domingo	302931	2.2983	3446.65	1.3921
Santa Elena	238158	1.8068	3690.17	1.4905
Cañar	223151	1.6930	3146.08	1.2707
Carchi	166646	1.2643	3780.45	1.5269
Sucumbíos	163631	1.2414	18084.42	7.3045
Morona Santiago	123012	0.9332	24059.4	9.7179
Orellana	107167	0.8130	21692.1	8.7617
Napo	94720	0.7186	12542.5	5.0661
Zamora Chinchipe	81418	0.6177	10584.28	4.2751
Pastaza	73652	0.5587	29641.37	11.9725
Bolivar	176880	1.3419	3945.38	1.5935

Source: Own elaboration.

Table 9. Concentration of population in space: provincial analysis for 2007.
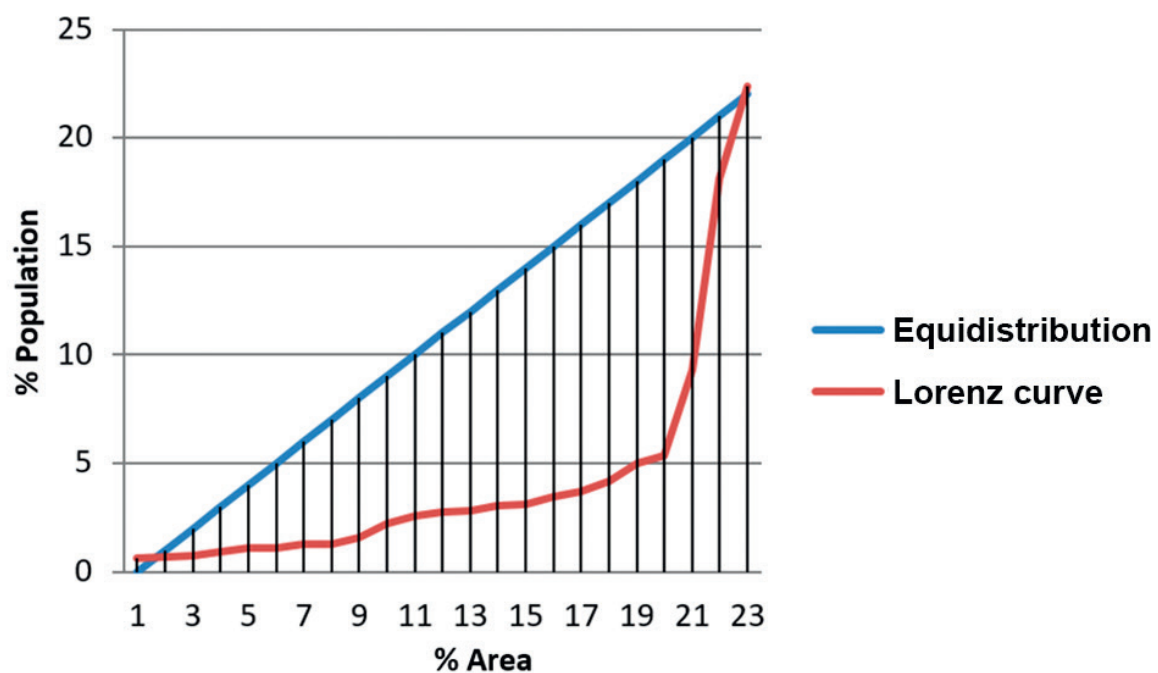
Source: Own elaboration

Figure 1. Concentration of population in the space: Lorenz curve (2007).

Province	POP 2014	POP index	Area	Area index
Ecuador	15990499	100	247576.91	100
Guayas	4024929	25.2160	15430.4	6.2325
Pichincha	2891472	18.1149	9535.91	3.8516
Manabí	1481940	9.2843	18939.6	7.6499
Los Ríos	853622	5.3479	7205.27	2.9103
Azuay	796169	4.9879	8309.58	3.3563
El Oro	662671	4.1516	5766.68	2.3292
Esmeraldas	590483	3.6993	16132.23	6.5160
Tungurahua	550832	3.4509	3386.25	1.3677
Chimborazo	496735	3.1120	6499.72	2.6253
Loja	490039	3.0700	11062.73	4.4684
Cotopaxi	450921	2.8250	6108.23	2.4672
Imbabura	438868	2.7494	4587.51	1.8529

Province	POP 2014	POP index	Area	Area index
Santo Domingo	411009	2.5749	3446.65	1.3921
Santa Elena	350624	2.1966	3690.17	1.4905
Cañar	253863	1.5904	3146.08	1.2707
Sucumbíos	200656	1.2571	18084.42	7.3045
Bolivar	199646	1.2507	3945.38	1.5935
Carchi	178228	1.1165	3780.45	1.5269
Morona Santiago	170722	1.0695	24059.4	9.7179
Orellana	148573	0.9308	21692.1	8.7617
Napo	117465	0.7359	12542.5	5.0661
Zamora Chinchipe	105213	0.6591	10584.28	4.2751
Pastaza	97093	0.6082	29641.37	11.9725

Source: Own elaboration.

Table 10. Concentration of population in the space: provincial analysis for 2014.

Source: Own elaboration

Figure 2. Concentration of population in the space: Lorenz curve (2014).

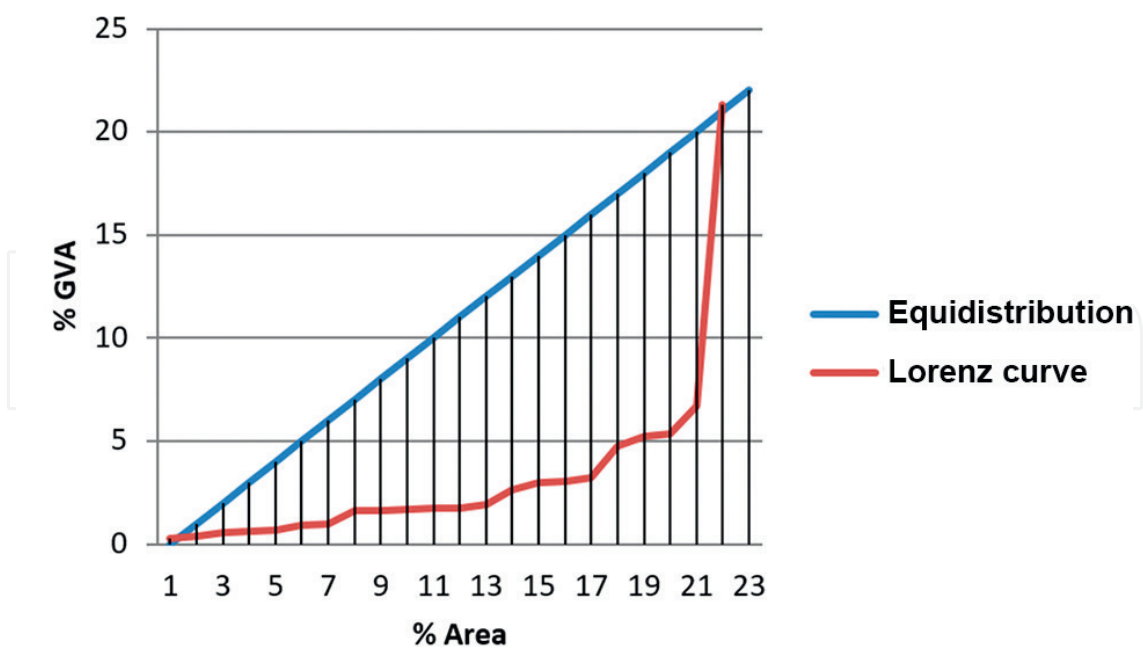| Province	Gross value added 2007	2007 GVA index	Area	Area index
Ecuador	50190086.88	100	247576.91	100
Guayas	13214750.89	26.3294	15430.4	6.2325
Pichincha	12611133.3	25.1267	9535.91	3.8516
Orellana	3358202.066	6.6909	21692.1	8.7617
Manabí	2688008.696	5.3556	18939.6	7.6499
Sucumbíos	2634997.387	5.2500	18084.42	7.3045
Azuay	2372847.61	4.7277	8309.58	3.3563
Esmeraldas	1535676.76	3.0597	16132.23	6.5160
El Oro	1485376.498	2.9595	5766.68	2.3292
Los Ríos	1610362.868	3.2085	7205.27	2.9103
Tungurahua	1307735.864	2.6055	3386.25	1.3677
Santa Elena	967550.6039	1.9277	3690.17	1.4905
Loja	886069.4937	1.7654	11062.73	4.4684
Santo Domingo	873247.841	1.7398	3446.65	1.3921
Imbabura	847935.3511	1.6894	4587.51	1.8529
Cotopaxi	813526.0521	1.6208	6108.23	2.4672
Chimborazo	805359.6217	1.6046	6499.72	2.6253
Cañar	492437.3047	0.9811	3146.08	1.2707
Pastaza	453855.0913	0.9042	29641.37	11.9725
Carchi	329638.4857	0.6567	3780.45	1.5269
Napo	308168.7469	0.6140	12542.5	5.0661
Bolívar	279234.4877	0.5563	3945.38	1.5935
Morona Santiago	180071.2014	0.3587	24059.4	9.7179
Zamora Chinchipe	133900.6612	0.2667	10584.28	4.2751

Source: Own elaboration.

Table 11. Concentration of GDP in the space: provincial analysis for 2007.

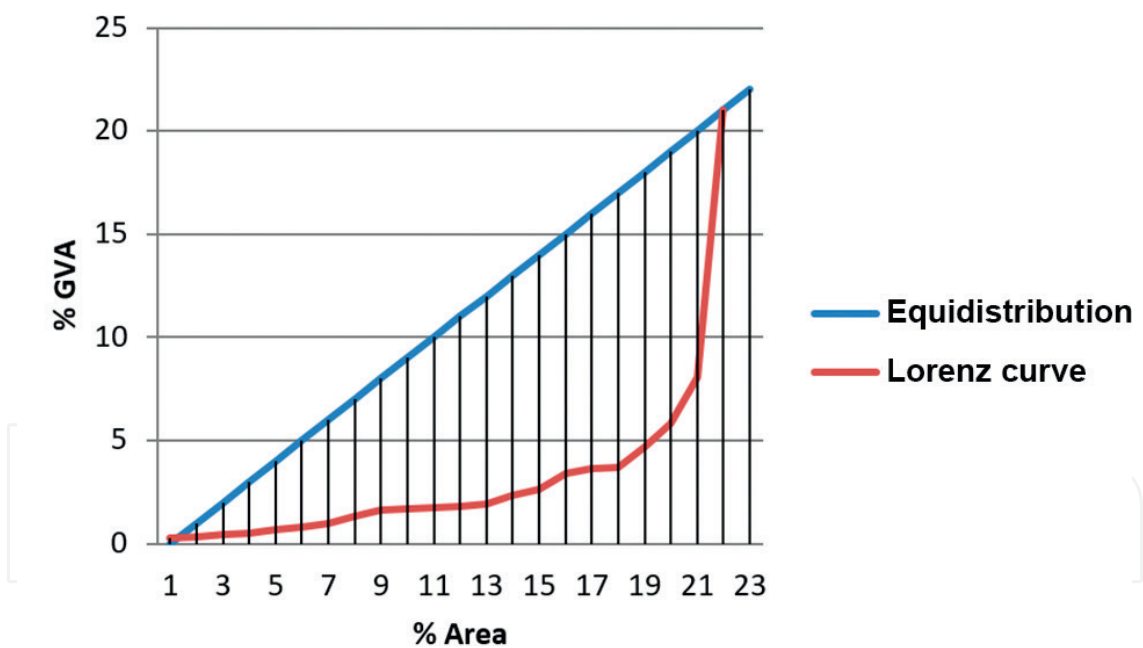| Province	GVA 2014	GVA index 2014	Area	Area index 2014
Ecuador	96149947.22	100	247576.91	100
Pichincha	24891270.92	25.8879	9535.91	3.8516
Guayas	24521159.48	25.5030	15430.4	6.2325
Orellana	7777765.855	8.0892	21692.1	8.7617
Manabí	5613352.904	5.8381	18939.6	7.6499
Azuay	4544320.808	4.7262	8309.58	3.3563
Sucumbíos	3555555.515	3.6979	18084.42	7.3045
El Oro	3514434.05	3.6551	5766.68	2.3292
Los Ríos	3290664.887	3.4224	7205.27	2.9103
Tungurahua	2529219.117	2.6304	3386.25	1.3677
Esmeraldas	2226630.386	2.3157	16132.23	6.5160
Imbabura	1874820.421	1.9498	4587.51	1.8529
Loja	1730412.907	1.7997	11062.73	4.4684
Santo Domingo	1669825.878	1.7366	3446.65	1.3921
Chimborazo	1645283.493	1.7111	6499.72	2.6253
Cotopaxi	1569886.543	1.6327	6108.23	2.4672
Santa Elena	1294825.234	1.3466	3690.17	1.4905
Cañar	955807.2926	0.9940	3146.08	1.2707
Pastaza	755638.0963	0.7858	29641.37	11.9725
Carchi	658539.5995	0.6849	3780.45	1.5269
Bolívar	504711.7462	0.5249	3945.38	1.5935
Morona Santiago	412703.5292	0.4292	24059.4	9.7179
Napo	344159.0745	0.3579	12542.5	5.0661
Zamora Chinchipe	268959.4799	0.2797	10584.28	4.2751

Source: Own elaboration.

Table 12. Concentration of GVA in the space: provincial analysis for 2014.

Source: Own elaboration

Figure 3. Concentration of GVA in space: Lorenz curve (2007).

Source: Own elaboration

Figure 4. Concentration of GVA in space: Lorenz curve for (2014).

5. Conclusions

This chapter carries out an analysis of the spatial distribution of Economic activity in Ecuador over the period 2007–2014. The methodology followed was the computation of the so-called

Harris [1] market potential values as well as the analysis by means of the Lorenz curves and associated Gini indexes.

Our results are very conclusive about the so-called core-periphery spatial distribution of activity in space. Guayas and Pichincha provinces characterized by being the economic and political capitals of Ecuador concentrate the biggest shares of population and GDP in a fairly small amount of space. Moreover, from and geographical perspective, the so-called economic center of Ecuador is made up of the provinces located in the center and the coast.

From this perspective, the Guayas province, the main Ecuadorian port, with a steady growth in terms of agriculture, industry and services, is endowed at the same time with a very good airport and road infrastructures. It has been the economic policy in the last 10 years in Ecuador to improve the infrastructure quality of this part of the country. The potential growth of this region can be seen by taking into account that in the year 2015 the DP World company was assigned the building and administration of the Posorja port which is located in the province of Guayas with an amount of 1200 millions of dollars.

Pichincha, the province of the Ecuadorian capital, keeps its development based on the agricultural activities (growing flowers) services and industrial activities. Similarly, to the Guayas province, it has also an international airport and very good infrastructures. Both provinces are also important touristic destinations.

In the other hand, the "economic periphery" is located in the Eastern and Northern parts of Ecuador. These areas are characterized by a low economic development with very low qualification levels of its population (most of this population is made up of indigenous). The provinces in the Eastern parts of Ecuador although they are very well-endowed with minerals, especially oil, they were not fully exploited due to various political and economic reasons which limited the private investment.

Acknowledgements

Author details

Jorge Guido Sotomayor-Pereira[1]*, Jesús López-Rodríguez[2] and Laura Varela-Candamio[2]

*Address all correspondence to: jsotomayor@utmachala.edu.ec

1 Technical University of Machala, Machala, Ecuador

2 Jean Monnet Group on Competition and Development (C+D), School of Economics and Business, University of A Coruña, A Coruña, Spain

References

[1] Harris CD. The market as a factor in the localization of industry in the United States. Annals of the Association of American Geographers. 1954;**44**(4):315-348

[2] Head K, Mayer T. Regional wage and employment responses to market potential in the EU. Regional Science and Urban Economics. 2006;**36**(5):573-594

[3] Blonigen BA, Davies RB, Waddell GR, Naughton HT. FDI in space: Spatial autoregressive relationships in foreign direct investment. European Economic Review. 2007;**51**(5):1303-1325

[4] Brakman S, Garretsen H, van Marrewijk C. Economic geography within and between European nations: The role of market potential and density across space and time. Journal of Regional Science. 2009;**49**(4):777-800

[5] Yotov YV. A simple solution to the distance puzzle in international trade. Economics Letters. 2012;**117**:794-798

[6] Linders G-J, Burger MJ, van Oort FG. A rather empty world: The many faces of distance and the persistent resistance to international trade. Cambridge Journal of Regions, Economy and Society. 2008;**1**:439-458

[7] Keeble D, Owens PL, Thompson C. Regional accessibility and economic potential in the European Community. Regional Studies. 1982;**16**(6):419-432

[8] INEC. National Institute of Statistics and Census [Internet]. 2010. Available from: http://www.ecuadorencifras.gob.ec/institucional/home/

[9] Tobler W. A computer movie simulating urban growth in the Detroit region. Economic Geography. 1970;**46**:234-240

[10] Krugman PR. First nature, second nature, and Metropolitan location. Journal of Regional Science. 1993;**33**(2):129-144

[11] Combes P-P, Mayer T, Thisse J-F, editors. Economic Geography: The Integration of Regions and Nations. Princeton, NJ: Princeton University Press; 2008

[12] Jaramillo A. Conservation and Biodiversity. 2015.