Does spatial clustering help explaining differences in the inequality of income distribution? Evidence from Argentina

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Abstract

This paper analyzes the relationship between the spatial clustering of income distribution and inequality in the provinces of Argentina. The goal of the paper is to use spatial techniques to analyze to what extent the spatial clustering of income distribution affects the inequality of income distribution in a regional context of Argentina. In general, the literature of inequality implicitly considers each region or province as an independent entity and the potential for observational interaction across space has often gone ignored. However, spatial autocorrelation occurs when the spatial distribution of the variable of interest exhibits a systematic pattern. I compute three measures of global spatial autocorrelation: Moran's I, Geary's c, and Getis and Ord's G, as the degree of provincial clustering between 1991 and 2002. The paper's main conclusion is that there is evidence that relatively high (low) unequal provinces tend to be located nearby other high (low) unequal provinces more often than would be expected due to random chance. Therefore each province should not be viewed as an independent observation, as it has been implicitly assumed in previous studies of regional income inequality.

Resumen

Este artículo analiza la relación entre la agrupación espacial de la distribución del ingreso y la desigualdad en las provincias de Argentina. El objetivo de este trabajo es usar técnicas espaciales para analizar hasta que punto la agrupación espacial de la distribución del ingreso afecta la desigualdad de la distribución del ingreso en un contexto regional de Argentina. En general, la literatura de desigualdad implícitamente considera a cada región o provincia como una entidad independiente y el potencial para la observación de la interacción a través del espacio a menudo se ha ignorado. Mientras tanto, la autocorrelación espacial ocurre cuando la distribución espacial de la variable de interés exhibe un patrón sistemático. Yo computo tres medidas de autocorrelación espacial global: La I de Moran, c de Geary, y G de Getis y Ord, como grado de CLUSTERING provincial entre 1991 y 2002. La principal conclusión del trabajo es que hay evidencia que provincias con desigualdad relativamente alta (baja) tienden a ser localizadas cerca de otras provincias con alta (baja) desigualdad más a menudo de lo esperado debido al azar. Por ende cada provincia no debería ser vista como una observación independiente, como ha sido supuesto implícitamente en estudios previos sobre la desigualdad de ingresos regional.

Keywords:
Inequality in income distribution, spatial autocorrelation, Argentina

JEL Classification: [D31] [R11] [R12]

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1. Introduction

This paper deals with the research question: of whether spatial clustering helps in explaining differences in the inequality of the distribution of per capita income across regions in Argentina.

The paper has three main purposes. First, it shows the importance of studying inequality, particularly in its relationship with poverty and growth. Second, it assesses the income distribution of Argentina and it compares it to that of other Latin American countries. Third, it analyzes Argentina's regional differences in income distribution inequality using spatial econometrics tools.

Most economic analysis is concerned with inequality in the distribution of some measure of individual well-being. Inequality generally refers to a measure of dispersion in the distribution. Most measures used are consistent with certain desirable attributes, known as axioms of inequality measurement (Atkinson, 1970; Cowell and Jenkins, 1995; Cowell, 1998).

2. Importance of the Study of Inequality

As de Ferranti et al. (2004) conclude, inequality is pervasive. It characterizes every aspect of life, including access to education, health, and public services. It prevents access to land and other assets, and it affects the functioning of credit and formal labor markets. It excludes people from the attainment of political voice and influence (inequality of agency). Inequality in Latin America has been rooted in exclusionary institutions that have been perpetuated ever since colonial times. It has reduced the impact of economic growth on poverty reduction and, inequality is associated with a greater prevalence of social conflict and violence and it may impair an economy's ability to respond effectively to macroeconomics shocks (de Ferranti et al., 2004).

3. Relationships among Poverty-Growth-Inequality

Bourguignon (2004) describes changes in poverty in a given period as reflecting growth in mean income and changes in the distribution of relative income. The decomposition illustrated in Figure 1 in the Appendix corresponds to an identity described as the "Poverty-Growth-Inequality Triangle."

A change in the distribution of income can actually be decomposed into two effects. First, there is the effect of a proportional change in all incomes that leaves the distribution of relative income unchanged (*growth* effect). Second, there is the effect of a change in the distribution of relative incomes (which, by definition, is independent of the mean), known as a *distributional* effect.

In Figure 1 in the Appendix, the poverty headcount is the area under the density curve to the left of the poverty line (here set at US$1 a day).[2] The movement from the initial to a new distribution goes through an intermediate step, namely the horizontal shift of the initial density curve to curve (I). Because of the logarithmic scale, this change corresponds to the same proportional increase of all incomes and thus stands for the pure "growth effect." Then, the movement from curve (I) to the new distribution occurs at constant mean income and it corresponds to the "distribution"

2.- This figure shows the density of the distribution of income, which is the share of the population at each level of income, where income is represented on a logarithmic scale on the horizontal axis.

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effect. Both growth and inequality changes thus play a role in generating changes in poverty. The shaded areas to the left of the poverty line show these changes.

4. Relationship between Inequality and Growth

Beyond the Bourguignon (2004) identity, former levels of inequality may have an influence on future growth. The literature on inequality and economic growth is indeed rich. However, the empirical evidence about the relationship is mixed. On the one hand, the literature that uses OLS regressions over a cross-section of nations generally finds that initial inequality is negatively related with future growth, when considering over 30 years (Alesina and Perotti, 1994). On the other hand, the literature using panel data over shorter periods generally finds a positive inequality-growth relationship (Li and Zou, 1998; Forbes, 2000).

In particular, Forbes (2000) suggests that one reason for the conflicting inequality-growth results in the literature is that the relationship may differ for short and for long periods (for example 5-10 versus 25-30 years). Forbes also notes that panel techniques, such as fixed-effect estimators, capture how time-series changes in inequality within a country (or state) affect changes in its growth rate over a short period. In contrast, Barro (2000) argues that OLS models capture how persistent cross-sectional differences in inequality affect long-run growth rates, which is more relevant to understanding growth disparities. Therefore, the two methods may reflect different responses.

Recently, the influences of the New Economic Geography and spatial econometrics have shed light on the relationship between regional inequality and economic growth. There are a few studies of US regional growth, such as Partridge (1997). Using pooled OLS models, this author finds that inequality is positively related to growth. Panizza (2002), using panel data with fixed-effect models, finds that small specification changes can turn around these results. Thus, cross-state results can suffer from the same sign changes that characterize cross-country studies, when switching from OLS to panel approaches. Again, these results may suggest different short-term and long-term influences. This calls for careful specifications of the relationship.

An important advantage of these types of studies is that regions or states can be used as good laboratories to examine inequality-growth issues. For example, Partridge (1997, 2005) and Panizza (2002) both note that many of the hypotheses about these relationships should apply to states, because they are essentially small open economies with distinct histories and institutions. These authors also claim that, among states, there appears to be sufficient variation in income distribution to produce differential outcomes, due to large factor flows across states. In contrast, greater legal and informational barriers would limit the flow of resources among countries, especially for low-income economies. This, in turn, would reduce the factor flows that produce larger growth rate differentials. Consequently, any income distribution-growth relationship should be much easier to detect using data for states rather than countries (Siebert, 1998).

Partridge (2005) studies these issues using data for 48 US states, over the 1960-2000 period, and he finds that inequality is positively related to long-run growth. In his paper, Partridge makes four important contributions. First, regarding the ambiguous findings in the literature when moving from cross-sectional to panel data methods, Partridge suggests that, instead of considering them as conflicting, these results should be considered as complements in the analysis. In general, conflicting results from various methodologies may not be a signal of lack of robustness, if there are separate long-run and short-run linkages. The results support Temple (1999), who argued that a variety of cross-sectional and panel approaches are necessary to fully understand the determi-

ensayo 2010 (formulitas).indd 9 5/2/11 8:42:19 AM

nants of growth. Partridge's conclusion is that "by examining separate short-run and long-run models, researchers can gain a more complete picture of transitory and dynamic responses and a better understanding of how policy affects economic processes" (p.389).

Second, after allowing for short-run and long-run effects, Partridge (2005) controls for different effects for the tails and the middle of the distribution. In this, he follows Easterly (2001), who argues that a middle-class consensus promotes growth by encouraging stability, mass education, and better public services. In effect, Partridge finds that a more vibrant middle class, measured by the middle-quintile income share (Q3), is positively related to growth.

Third, following Kaldor (1956), Partridge (2005) argues that income inequality generates incentives for resources to be channeled into more efficient uses and is conductive to saving and capital accumulation. This may explain the positive inequality-growth relationships found. However, these hypotheses assume that there is sufficient factor mobility in a given society, which may not be true for some developing countries. In fact, Partridge (2005) makes it clear that these results are derived from the experience of advanced economies. It is thus interesting to test these hypotheses for developing countries, where high inequality and slow growth have been present.

5. Inequality in Argentina

In order to assess the dynamics of income inequality in Argentina, I will use data from the SEDLAC, which is a database of socio-economic statistics constructed from microdata coming from the Latin American and Caribbean (LAC) household surveys and developed by CEDLAS (Universidad Nacional de La Plata) and The World Bank's LAC poverty group (LCSPP). All estimates are computed from the *Encuesta Permanente de Hogares* (EPH). This survey has been carried out by the *Instituto Nacional de Estadística y Censos* (INDEC) since the early 1970s in the Greater Buenos Aires area and since the 1980s in most large cities (with over 100,000 inhabitants), in two rounds: May and October.

During 2003, a major methodological change was implemented by INDEC, including changes in the questionnaires and in the timing of the survey visits. The new survey (known as EPH Continua or EPH-C) is now conducted over the whole year. INDEC also started to provide population weights that take the income non-response problem into account. To assess the impact of these methodological changes, I present three sets of statistics for 2003 in most tables: one computed from the EPH carried out in May, and two computed from the EPH-C of the second semester of 2003. One of them is generated with the old weights (ignoring income non-response) and the other two use the new weights.

The EPH-C covers 28 conglomerates or large urban areas, which are home to around 70 percent of the Argentine urban population. Since the share of urban areas in Argentina is 87 percent of the total population, the sample of the EPH represents around 60 percent of the total population of the country. Household surveys in Argentina cover only urban areas (the same problem is found in Uruguay). However, both Argentina and Uruguay are two of the most urban countries in the world, with over 85 percent of the population living in cities.

In Argentina, like in many Latin American countries, household surveys have experienced significant improvements. In particular, major changes have been implemented since the early 1990s. Although these changes are very welcome, they pose significant problems for comparison purposes within countries over time. This is one reason why I decided to present data for Argentina

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since 1992. Other reasons are the incorporation of major cities in 1998 and the change in methodology.

Each decile in Table 1 in the Appendix includes an equal number of individuals (not households). The income ratio 10/1 is the mean income of decil ten divided by the mean income of decil one. The ratio 90/10 is the mean income of percentile 90 divided by the mean income of percentile ten. Finally, the ratio 95/80 is the mean income of percentile 95 divided by the mean income of percentile 80.

The richest 10 percent of the population earned up to 40 percent of the total income, a peak reached in the first semester of 2002. By the second semester of 2005, this share had declined lo levels similar to those for a decade before. However, the post-crisis shares are higher than the pre-crisis shares of the Menem's period (1989-1995 and 1995-1999). In contrast, the poorest 10 percent of the population earned as little as 1 percent of total income (2001 to 2003). These extremes coincided with the financial crisis in 2001. Afterwards, however, the share of the poorest 10 percent never recovered to its 1992 level. This share was higher in the pre-crisis period. Thus, the rapid growth and stability of the pre-crisis era seem to have been associated with less inequality.

Table 2 in the Appendix shows several inequality indices related to the distribution of per capita household income: the Gini coefficient, the Theil index, the Coefficient of Variation (CV), the Atkinson index with parameters 0.5, 1 and 2, and the generalized entropy index, with parameters 0 and 2 (the Theil index is the entropy index with parameter 1). A simple correlation analysis among these indices shows that the Gini coefficient is highly correlated with the Theil index (95 percent), the Atkinson index with parameters 0.5, 1 and 2 (99 percent, 99 percent, and 96 percent, respectively), and with the generalized entropy index with parameter 0 (99 percent). Therefore, I can analyze the inequality in the distribution of income by just looking at the Gini coefficient. All the inequality indices were calculated from the various editions of the household surveys (*Encuesta Permanente de Hogares, EPH*). Table 2 compares all the indices taking care of all the modifications in the EPH between 1992 and 2005.

Figure 2 in the Appendix shows the Gini coefficient for Argentina. A major increase in inequality took place in the country since 1992 (when the Gini was 0.45 percent). After the Argentinean crisis in December of 2001, the Gini jumped to 0.533, and then it reached its maximum level during the first half of 2003, at 0.537. Since then, the level of inequality has declined slightly.

6. Inequality in Latin America

It is known that Latin America has been having high and persistent level of inequality. What explains the high level of inequality observed in Latin America? To a large extent, most interpretations pursue the colonial inheritance argument, together with the persistence of the initial institutions. Among others, de Ferranti et al. (2004) highlight the combined role played by factor endowments and institutions. These authors explain that factor endowments, technology, and the relative scarcity of resources had important implications for the initial inequality. In Latin America, the characteristics of the colonies favored the establishment of large plantations (such as sugar) and mining activities that employed forced labor. As a result, a social structure emerged where a privileged few were in control of the most profitable activities and where most of the population was excluded from access to land, education, and political power. In contrast, the colonial powers in North America soon learned that there was no gold, there were few indigenous peoples to exploit, and soils and climates would not support the production of crops based on large slave plantations. Interestingly, Argentina is very different compared to most Latin American countries. In Argentina, there were no large plantations and mining activities that employed forced labor. Like in North America, land was cheap and labor scarce, while fertile soil and good weather conditions attracted migrants. These conditions might have explained the success of Argentina up to 1913.

Why did inequality persist over time? In answering this question, de Ferranti et al. (2004) argue that the persistence of inequality during the colonial and early independence period took place because the initial "nexus" of institutions continued to exist, as did the justification for these institutions. The elites that had benefited from colonial disparities were able to quickly gain effective control of the independent countries and determine the general structure of the institutions in ways that favored their interests (Engerman and Sokoloff, 2006).

For many scholars, explaining the persistence of inequality over the 20th century is more challenging, because significant social, economic, and political changes occurred during the 1900s. Moreover, for some authors the increase in urbanization rates should have somewhat mitigated the relevance of the highly inegalitarian pattern of land ownership and its impact on income inequality. Also, modernization moved most of the Latin American countries in the direction of more open and democratic societies. However, de Ferranti et al. (2004) believe that the most important causes for the persistence of inequality over the 20th century are the low quality of education, a development strategy based on import substitution and isolation from world markets, and imperfect financial markets that may have prevented the poorest from taking advantage of economic opportunities, by restricting their access to credit.

Unfortunately, there is no quantitative estimation of long-run inequality authenticating these arguments for Latin America. A good example is provided by Bourguignon and Morrisson (2002), who investigated the historical trends in world income inequality. In their studies, conventional wisdom and lack of empirical evidence led them to assume that no changes in income distribution had taken place in Latin America from independence to the mid-20th century.

Some authors claim that it is possible to infer the evolution of inequality since 1950 on the basis of direct income distribution observations. Table 3 in the Appendix reports Gini coefficients for several Latin American countries. The table indicates that inequality continued to be essentially constant from 1950 to 2000, with a Gini between 0.51 and 0.55. There is, however, significant country heterogeneity. For instance, the Gini coefficient noticeably increased in Argentina, from 0.396 to 0.477 between 1950 and 1990, but it may have declined in Venezuela, from a high of 0.613 in the mid-20th century to 0.459 in 1990. Likewise, El Salvador may have experienced a major deterioration in inequality over the 1960–1990 period, while Peru saw some progress.

For the pre-1950 period, data availability prevents direct inequality assessments. One can still empirically investigate the evolution of income inequality using indirect indicators and ranges of country studies follow this approach. Bértola (2005) provides rough estimates of income distribution and Gini coefficients for Uruguay that go back to the late 1800s. Williamson (1999) looked at the consequences for inequality of the early phase of globalization (1870–1914). This author showed an increase of within-country inequality for Argentina and Uruguay over that period, on the basis of the evolution of the wage–land rental ratio. Bértola and Williamson (2003) claim that inequality trends reverted in the interwar period, when the observed abrupt decline in the wage-rental ratio stopped. This ratio increased somewhat after the 1930s. Calvo, Torre, and Szwarcberg (2002) suggest that the level of inequality changed little during the 20th century in Argentina,

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while Londoño (1995) claims that the inequality levels observed in Colombia during the 1990s were probably similar to those observed in 1938.

Prados de la Escosura (2005) builds on Williamson (2002) to explore the historical evolution of the ratio of GDP per worker to the unskilled wage between 1850 and 1950 (or earliest possible date) for Argentina, Brazil, Chile, Mexico, and Uruguay. The justification for this selection is that such a ratio compares the returns to unskilled labor with the returns to all factors of production. Since unskilled labor is the more equally distributed factor of production in developing countries, an increase in the ratio suggests that inequality is rising.

On this basis, Prados de la Escosura (2005) infers that in Argentina, Chile, and Uruguay income inequality does not seem to have changed much over the period, whereas Brazil and Mexico may have suffered some worsening in the distribution of income. On the whole, the evidence that emerges from these studies indicates that, on average, Latin America started the 20th century with a very high level of inequality, which continued for the rest of the century, regardless of large variations by country in special periods.

Table 4 in the Appendix compares the changes in inequality measured by the Gini coefficient, using household surveys for 18 Latin American countries. By focusing on the performance of inequality between 1989 and 2004, Gasparini, Gutierrez and Tornarolli (2007) find that Argentina, Costa Rica, the Dominican Republic, Uruguay, and Venezuela consistently rank as the most equal economies in the region, while Bolivia, Brazil, Ecuador, Panama and Paraguay occupy the last positions in the inequality ladder. However, Argentina and Colombia stand out as the countries that experienced the largest increases in inequality, with Gini changes of around 6 percentage points. Brazil and Mexico are the only countries that have experienced a drop in income inequality.

How do these tendencies contrast to those observed in developed economies? Spain, for instance, experienced an important decline in income inequality between the 1970s and the 1990s, when the Gini coefficient went down by more than 10 percentage points (Table 3 in the Appendix). Prados de la Escosura (2005) finds indirect indicators that suggest that income inequality has been declining in Spain since the 1950s, when Spain may have had inequality levels comparable to (if not higher than) those observed in Latin America. For 1950, Prados de la Escosura (2005) estimates a Gini coefficient for Spain above 0.50.

In the United States, at the beginning of the century inequality was very high, with a Gini of approximately 0.60 in 1920 (Plotnick et al., 1996). Inequality reached its pre-World War II high in 1929. Then, from 1929 to 1951, income inequality fell dramatically, to a Gini of about 0.40.

The United Kingdom experienced a similar pattern. Acemoglu, Johnson, and Robinson (2002) show that the Gini coefficient for the United Kingdom might have been more or less 0.55 in the 1890s. After that, for most of the 20th century, inequality seems to have weakened. The authors also conclude that most of the decline of the United Kingdom's inequality took place between 1940 and the late 1970s. Atkinson (2003) relies on income tax statistics to show that, in the early 1900s, the richest 1 percent in the United Kingdom shared almost 20 percent of total personal income; in the late 1970s, this group got 6 percent of this total.

Inequality in France evolved in about the same way. In the early 1900s, the share of income of the wealthiest percentile in France was about 20 percent, whereas in the 1980s it was approximately 7 percent. The main difference between France and the United Kingdom is that most of the decline in French income inequality took place between the 1920s and 1950.

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Thus, while inequality in Latin America has been persistent and steady over the last century, inequality in Europe and the United States seems to have declined significantly over the 20th century. If other countries have managed to break with their histories on both the growth and income distribution fronts, then why Latin America cannot also break with its history? This question goes beyond the scope of this paper.

7. Regional Inequality in Argentina

Figure 3 in the Appendix shows the Gini coefficient for 23 provinces in Argentina, for the period 1991-2002. This coefficient ranges between 0.40 and 0.50.

Figure 4 in the Appendix compares the regional Gini coefficient for six regions in Argentina (See Maps 1 and 2 in the Appendix). Two interesting conclusions emerge. First, during the 1991-2002 period, the regions that experienced some positive per capita GDP growth (Pampeana and Patagonia) showed relatively less inequality, while the regions that experienced negative per capita GDP growth (Northwest, Northeast, and Cuyo) showed relatively higher inequality levels. Second, the capital of Argentina, Greater Buenos Aires (BA) showed the highest per capita growth rate and also the highest level of inequality (0.482).

To test for differences in the Gini coefficient among regions, I use the General Linear Model (GML) procedure that tests the null hypothesis that there is no difference in the mean of the Gini coefficient among the provinces in each region. The test rejects the null at the 1 percent level. So, after finding that differences exist among the means of the Gini coefficient across regions, I use the Bonferroni's and Tukey's tests to determine which means differ.[3] Table 5 in the Appendix shows that both tests found that there are differences among Gini coefficient among regions. So, I can consider regions 2, 6, and 3 (Pampeana, Patagonia and Cuyo) as one cluster with lower Gini coefficients, and regions 5, 1 and 4 (Northwest, Capital City, and Northeast) as another cluster of higher Gini coefficients.

In order to analyze the development of inequality within each region in Argentina, Table 6 in the Appendix presents the percentage change of four measures related to the income distribution. Column 1 compares the percentage change in the Gini coefficient for the six regions of Argentina between 1991 and 2002. It shows that the Pampeana Region had the largest increment in inequality (19.3 percent, which represents a 0.079 points increment), followed by Greater Buenos Aires (17.1 percent, which represents a 0.078 points increment). Patagonia showed the smallest increase in inequality. Column 2 shows the changes in the share of the third Quintile (Q3), which accounts for a "middle class consensus" and the role of the median voter.[4]

Partridge (2005) explains that the Gini is used to control for the overall distribution, while the share of the third Quintile (Q3) can be used to account for that specific group in the population.

3.- The Bonferroni test, based on Student's t statistic, adjusts the observed significance level for the fact that multiple comparisons are made. Tukey's honestly significant difference test uses the Studentized range statistic to make all pairwise comparisons between groups and sets the experiment wise error rate to the error rate for the collection for all pairwise comparisons. When testing a large number of pairs of means, Tukey's honestly significant difference test is more powerful than the Bonferroni test. For a small number of pairs, Bonferroni is more powerful.

4.- A quintile is any of the four values which divide the sorted data set into five equal parts, so that each part represent one fifth or 20 percent of the sample population. The third quintile represents the group of population between the 40 and 60 percent of income levels.

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Comparing across the regions of Argentina, Table 3 indicates that the share of total income that the "middle class group" earned during this period has been getting smaller in all regions. The decline amounts between 6 percent (0.059 points) in Cuyo to 15 percent (0.067 points) in the Northeast region of Argentina.

Finally, I compare the changes in the shares of the richest 10 percent of the population and poorest 20 percent of the population, in each region. In column 3, with the exception of Pampeana, in all the other regions the richest 10 percent of the population gained, up to additional 14.6 percent (4.8 percentage points) of total income in the Northeast. In contrast, in all the regions, the share of the poorest 20 percent of the population declined. The worst negative effect was suffered by Buenos

8. Spatial Autocorrelation of Income Inequality

Now I want to test if spatial autocorrelation characterizes the measures of inequality among the provinces of Argentina. Figure 5 in the Appendix displays the Moran's I statistic for the provincial Gini coefficients in Argentina between 1991 and 2002. [5] It shows that the Moran's I statistic has been fluctuating during this period.

Table 7 in the Appendix presents the estimates for the Moran's I statistic. For the 1991-2002 period, I estimated the coefficients using the EPH. The table shows that there is evidence of spatial dependence, as the statistics are highly significant during this period.

The Moran's I statistic corroborates that positive spatial autocorrelation exists. The same results are found using the Geary's c, and Getis and Ord's G statistics. That is, the value taken by the Gini coefficient at each province *i* tends to be similar to the values taken by the Gini coefficient at spatially contiguous provinces.

8.1 Local Spatial Autocorrelation for Income Inequality

Figures 6 and 7 in the Appendix offer a more disaggregated view of nature of the spatial autocorrelation for the initial (Figure 6) and final (Figure 7 and 8) years. Each figure contains a Moran scatterplot for the Gini coefficient. The slope of the regression line equals Moran's I = 0.015 for 1991, and Moran's I = -0.111 for 2002. The Moran scatterplot is divided into four quadrants:

- The upper right quadrant represents spatial clustering of a high-Gini province with high-Gini neighbors (HH-quadrant I). In general, these locations are associated with positive values of the local Moran I_i.
- The upper left quadrant represents spatial clustering of a low-Gini province surrounded by high-Gini neighbors (LH-quadrant II). In general, these locations are associated with negative values of the local Moran I_i.
- The lower left quadrant represents spatial clustering of a low-Gini province surrounded by

5.- The reason why I am considering the period 1991-2002 in order to calculate the Moran's I statistic for the provincial Gini Coefficient is because only during those years the "*Encuesta Permanente de Hogares*" (EPH) includes 23 provinces from a total of 24 provinces, and only the province of Rio Negro is not included in the sample.

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low-Gini neighbors (LL-quadrant III). In general, these locations are associated with positive values of the local Moran I_i ; and

- The lower right quadrant represents spatial clustering of a high-Gini province with low-Gini neighbors (HL-quadrant IV). In general, these locations are associated with negative values of the local Moran I_i .

Viewing Figures 6 and 7 together corroborates the lack of stability in the measures of local spatial dependence for the Gini coefficient. While in Figure 6 there is no sign of local spatial autocorrelation at all in 1991, in Figure 7 there seems to be some negative spatial autocorrelation in 2002. However, the local Moran's I in those years, 1991 and 2002, is not statistically significant. Then the local Moran's I was considered in 2001. In summary, the relationship is not stable.

From Figures 6 and 7 it can be concluded that there is not a clear pattern of clustering for the Gini coefficient. More specifically, only in half of the years, a pattern given by a positive spatial autocorrelation for the provincial Gini coefficient can be observed. Thus, only for the years 1992 to 1994, 1997 and 1998, and 2001, provinces have the local indicators that significant fall in either quadrant I or III of the scatterplot, reflecting HH and LL clustering, respectively.

Concentrating only on those years where the Moran's I shows statistically significant local spatial autocorrelation, two clusters were identified. First, there is the cluster of high-Gini province with high-Gini neighbors, represented mainly by the provinces of the Northeast region like Chaco, Formosa, Misiones and some provinces from the Northwest region, including Catamarca, Jujuy, Tucuman and Santiago del Estero, each of which appears in quadrant I. The other main cluster of a low-Gini province surrounded by low-Gini neighbors (LL) includes provinces from the Pampeana region, Cuyo and Patagonia, such as Buenos Aires, Capital City, and La Pampa (Pampeana); Mendoza, San Luis, and San Juan (Cuyo); Chubut, Santa Cruz and Tierra del Fuego (Patagonia), all of which fall in quadrant III, the vast majority of the years. These results corroborate the findings using Bonferroni and the Tukey's tests (see Map 3 in the Appendix).

Finally, as a measure of robustness of these results, the global and local measures of spatial autocorrelation were estimated while changing the *W* matrix. All the previous results were obtained using w_{ij} as an element of a spatial weights matrix W such that w_{ij} = distance in kilometers between each provincial capital city (location *i*) to all the others provincial capital cities (location *j*), using a cutoff point of 800 km and the actual routes available in Argentina. Alternatively, I calculated w_{ij} as an element of a spatial weights matrix *W* such that w_{ij} = number of hours that it takes to drive from location *i* to location *j,* using seven hours as the cutoff point. The same significant results were obtained.

9. Conclusion

Latin America is characterized by high and persistent level of inequality. The high level of inequality observed in Latin America could be explained by a social structure emerged where a privileged few were in control of the most profitable activities and where most of the population was excluded from access to land, education, and political power. The persistence of inequality over the 20th century is due to the low quality of education, a development strategy based on import substitution and isolation from world markets, and imperfect financial markets that may have prevented the poorest from taking advantage of economic opportunities, by restricting their access to credit.

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Argentina is a very special case; it has also experienced the second largest increase in inequality in the region with Gini changes of around 6 percentage points between 1992 and 2004.

So, when spatial clustering of income distribution was tested using the Gini coefficient, there is some evidence that at least 50 percent of the time the Moran's I shows statistically significant local spatial autocorrelation. Concentrating on those years, two clusters were identified. First, there is the cluster of high-Gini province with high-Gini neighbors, represented mainly by the provinces of the Northeast region like Chaco, Formosa, Misiones and some provinces from the Northwest region, including Catamarca, Jujuy, Tucuman and Santiago del Estero, each of which appears in quadrant I. The other main cluster of a low-Gini province surrounded by low-Gini neighbors (LL) includes provinces from the Pampeana region, Cuyo and Patagonia, such as Buenos Aires, Capital City, and La Pampa (Pampeana); Mendoza, San Luis, and San Juan (Cuyo); Chubut, Santa Cruz and Tierra del Fuego (Patagonia), all of which fall in quadrant III, the vast majority of the years. These results corroborate the findings using Bonferroni and the Tukey's tests for differences in the Gini coefficient among regions for the whole sample (see Map 3 in the Appendix).

Therefore, there is evidence to show that in Argentina between 1991 and 2002 relatively high (low) unequal provinces tend to be located nearby other high (low) unequal provinces more often than would be expected due to random chance. Therefore each province should not be viewed as an independent observation.

For future research these results should be analyzed together with the real per capita growth in GDP in order to discover any pattern of spatial interaction between inequality and growth that would help us understand such complex relationship a little better.

10 References

Acemoglu, D., S. Johnson, and J. Robinson (2002). Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution. The Quarterly Journal of Economics, 117(4), 1231-1294.

Alesina, A., and R. Perotti. (1994). The Political Economy of Economic Growth: A Critical Survey of the Literature. World Bank Economic Review, 3, 351–371.

Atkinson, A. (1970). On the Measurement of Inequality. Journal of Economic Theory, 2, 244-263.

Atkinson, A. (2003). Top Incomes in the United Kingdom over the Twentieth Century. U.K.: University of Oxford.

Barro, R. J. (2000). Inequality and Growth in a Panel of Countries. Journal of Economic Growth 5(1), 5-32.

Bértola, L. (2005). A 50 años de la curva de Kuznets, una reivindicación sustantiva: distribución del ingreso y crecimiento económico en Uruguay y otros países de nuevo asentamiento desde 1870. Instituto Laurentano Figuerola de Historia Económica, Working Paper Series 05-04(Universidad Carlos III de Madrid).

Bértola, L., and J.G. Williamson (2003). Globalization in Latin America before 1940. National Bureau of Economic Research, Working Paper 9687. Cambridge, MA: National Bureau of Economic Research..

Bourguignon, F. (2004). The Poverty-Growth-Inequality Triangle. The World Bank Policy Research Working Paper (28102).

Bourguignon, F., and C. Morrisson (2002). Inequality among World Citizens: 1820-1992. The American Economic Review, 92(4), 727-744.

ensayo 2010 (formulitas).indd 17 5/2/11 8:42:20 AM

Calvo, E., J. Torre, and M. Szwarcberg (2002). The New Welfare Alliance. Buenos Aires: Universidad di Tella, Department of Political Science.
Cowell, F. (1998). Measurement of Inequality. Paper presented at the London School of Economics and Political Science, London.
Cowell, F. A., and A. Jenkins. (1995). How Much Inequality Can We Explain? A Methodology and an Application to the United States. Economic Journal, 105, 421-430.
De Ferranti, D., G. E. Perry, F. Ferreira, and M. Walton. (2004). *Inequality in Latin America & the Caribbean: Breaking with History?* Washington D.C.: World Bank.
Easterly, W. (2001). The Middle Class Consensus and Economic Development. Journal of Development Economics, 6, 317–335.
Engerman, S., and K. Sokoloff. (2006). The Persistence of Poverty in the Americas: The Role of Institutions. In S. Bowless, S. Durlauf, and K. Hoff (ed.), In Poverty Traps: Forthcoming.
Forbes, K. J. (2000). A Reassessment of the Relationship Between Inequality and Growth American Economic Review, 90, 869–887.
Gasparini, L., F. Gutierrez, and L. Tornarolli. (2007). Growth and Income Poverty in Latin America and the Caribbean: Evidence from Household Surveys. Review of Income and Wealth, 53(2), 209-245.
Kaldor, N. (1956). Alternative Theories of Distribution. Review of Economic Studies, 23 83–100.
Li, H., and Hengfu Zou. (1998). Income Inequality is Not Harmful for Growth: Theory and Evidence. Review of Development Economics, 2, 318–334.
Londoño, J. L. (1995). Distribucióon del Ingreso y Desarrollo Económico: Colombia en el Siglo XX. Bogotá.
Panizza, U. (2002). Income Inequality and Economic Growth: Evidence from American Data. Journal of Economic Growth 7(1), 25-41
Partridge, M. (1997). Is Inequality Harmful for Growth? Comment. The American Economic Review, , 87, 1019–1032.
Partridge, M. (2005). Does Income Distribution Affect U.S. State Economic Growth? Journal of Regional Science, 45(2), 363–394.
Plotnick, B., E. Smolensky, E. Evenhouse, and S. Reilly. (1996). The Twentieth-Century Record of Inequality and Poverty in the United States. In G. Engerman and R.Gallman (ed.), The Cambridge Economic History of the United States (Vol. II). Cambridge, U.K.: Cambridge University Press.
Prados de la Escosura, L. (2005). Growth, Inequality, and Poverty in Latin America: Historical Evidence, Controlled Conjectures. Economics History and Institutions Working Papers, 54104(Universidad Carlos III, Departamento de Historia Económica e Instituciones, Madrid).
Siebert, H. (1998). Commentary: Economic Consequences of Income Inequality. Paper presented at the Symposium of the Federal Reserve Bank of Kansas City on Income Inequality: Issues and Policy Options.
Temple, J. (1999). The New Growth Evidence. Journal of Economic Literature, 37, 112–156.
Williamson , J. G. (1999). Real Wage Inequality and Globalization in Latin America before 1940. Revista de Historia Económica, 17, 101-142.
Williamson , J. G. (2002). Land, Labor, and Globalization in the Third World, 1870-1940. Journal of Economic History, 62(1), 55-85.

ensayo 2010 (formulitas).indd 18 5/2/11 8:42:20 AM

11 Appendix

Source: http://209.15.138.224/argentina_mapas/m_rArgeninaPolitic.htm

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Map 1-Map of the provinces of Argentina

Note: Metropolitana is the Ciudad Autonoma de Buenos Aires,
Noroeste is Northwest, Nordeste is Northeast.

Source: http://209.15.138.224/argentina_mapas/m_rArgentinaZonas.htm

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Map 2-Map of the regions of Argentina

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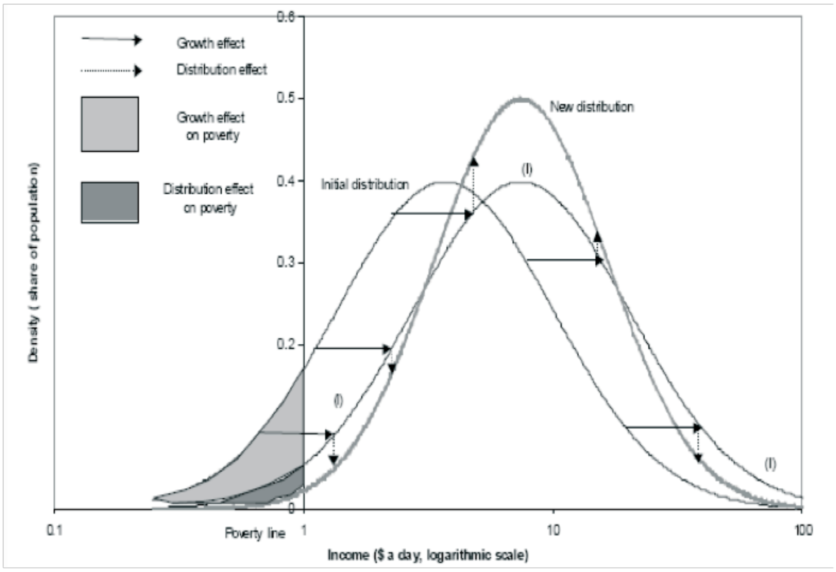
Map 3- Two main clusters for the Gini in the provinces of Argentina using the Moran I, 1991-2002



Source: Bourguignon (2004).

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Figure 1- Decomposition of a change in distribution and poverty into growth and distributional effects.

	Share of deciles										Income ratios		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**10/1**	**90/10**	**95/80**
EPH-15 cities													
1992	1.8	3.0	4.1	5.1	6.2	7.6	9.4	12.0	16.5	34.1	19.0	7.9	2.0
1993	1.7	3.0	4.1	5.2	6.4	7.9	9.6	12.3	16.6	33.1	19.9	8.1	1.9
1994	1.7	2.9	4.0	5.1	6.3	7.7	9.5	12.1	16.4	34.2	19.7	8.2	1.9
1995	1.4	2.7	3.7	4.8	5.9	7.3	9.1	11.6	16.7	36.7	25.8	9.6	2.1
1996	1.4	2.6	3.6	4.7	5.9	7.3	9.2	11.9	17.0	36.5	26.5	10.1	2.0
1997	1.4	2.6	3.6	4.7	6.0	7.3	9.2	12.0	17.2	36.1	26.7	10.5	2.1
1998	1.2	2.4	3.4	4.5	5.7	7.0	9.0	12.0	17.1	37.7	30.2	11.2	2.1
EPH - 28 cities													
1998	1.3	2.4	3.4	4.5	5.7	7.1	9.0	11.9	16.9	37.8	29.9	11.1	2.1
1999	1.3	2.5	3.5	4.6	5.8	7.3	9.2	12.0	17.0	36.8	28.0	10.9	2.1
2000	1.2	2.3	3.3	4.4	5.6	7.2	9.1	12.2	17.4	37.4	32.3	11.9	2.1
2001	1.0	2.1	3.1	4.1	5.4	6.9	9.0	12.0	17.4	39.0	40.0	13.9	2.2
2002	1.0	2.0	3.0	4.1	5.4	6.9	8.7	11.6	17.2	40.3	39.4	14.3	2.3
2003	1.1	2.1	3.0	4.0	5.2	6.8	8.8	11.9	17.3	39.8	34.8	13.5	2.2
EPH-C													
2003-II	1.0	2.1	3.1	4.1	5.3	6.7	8.8	11.9	17.1	39.8	38.1	13.7	2.2
2004-I	1.2	2.3	3.3	4.3	5.5	7.1	9.0	11.9	16.8	38.6	32.7	11.8	2.1
2004-II	1.1	2.3	3.3	4.4	5.7	7.2	9.1	12.0	17.0	37.9	33.0	12.0	2.0
2005-I	1.2	2.4	3.4	4.4	5.7	7.3	9.1	11.9	16.9	37.8	32.5	11.7	2.1
2005-II	1.2	2.3	3.4	4.5	5.8	7.3	9.1	11.9	16.8	37.6	32.7	11.8	2.1

Note: Income distribution for the population in major urban cities of Argentina.

Source: Constructed by the author using Socio-Economic Database for Latin America and the Caribbean (CEDLAS and The World Bank).

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Table 1- Distribution of household per capita income in Argentina (deciles shares and income ratios), 1992-2005.

	Gini	Theil	CV	A(.5)	A(1)	A(2)	E(0)	E(2)
EPH-15 cities								
1992	0.450	0.370	1.101	0.165	0.299	0.510	0.355	0.606
1993	0.444	0.359	1.077	0.162	0.297	0.517	0.352	0.580
1994	0.453	0.378	1.112	0.168	0.303	0.510	0.361	0.618
1995	0.481	0.430	1.205	0.190	0.340	0.569	0.416	0.726
1996	0.486	0.442	1.260	0.194	0.349	0.607	0.429	0.793
1997	0.484	0.422	1.146	0.190	0.346	0.586	0.424	0.656
1998	0.502	0.471	1.300	0.207	0.369	0.608	0.461	0.845
EPH - 28 cities								
1998	0.502	0.472	1.307	0.207	0.368	0.605	0.458	0.854
1999	0.491	0.443	1.213	0.197	0.356	0.606	0.440	0.735
2000	0.504	0.464	1.231	0.208	0.377	0.647	0.474	0.757
2001	0.522	0.497	1.264	0.224	0.404	0.675	0.517	0.798
2002	0.533	0.530	1.356	0.233	0.412	0.657	0.530	0.920
2003	0.528	0.519	1.343	0.227	0.401	0.637	0.512	0.902
EPH-C								
2003-II (*)	0.537	0.625	3.056	0.244	0.417	0.673	0.539	4.671
2003-II	0.529	0.532	1.457	0.231	0.407	0.672	0.522	1.061
2004-I	0.510	0.507	1.714	0.216	0.380	0.621	0.478	1.469
2004-II	0.506	0.499	1.550	0.213	0.379	0.624	0.476	1.201
2005-I	0.502	0.473	1.306	0.208	0.373	0.624	0.466	0.853
2005-II	0.501	0.480	1.418	0.209	0.373	0.624	0.467	1.005

Note: (*) this calculation uses the EPH weights corresponding to the 28 major provincial cities. CV=coefficient of variation. A(e) refers to the Atkinson index with a CES function with parameter e. E(e) refers to the generalized entropy index with parameter e. E(1)=Theil.

Source: Constructed by the author using Socio-Economic Database for Latin America and the Caribbean (CEDLAS and The World Bank).

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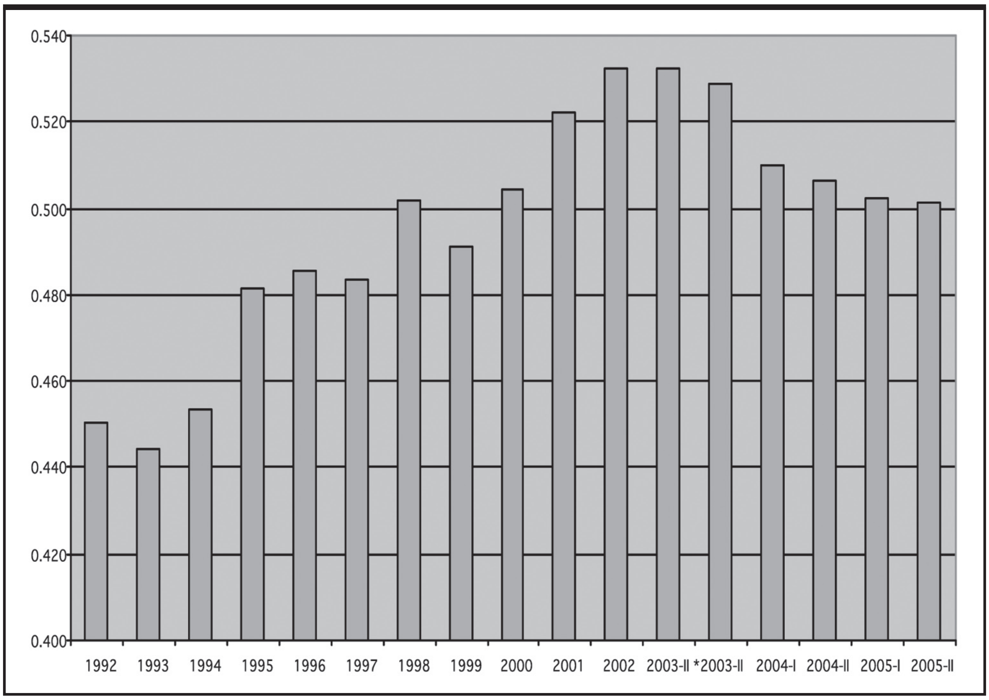
Table 2- Inequality Indices from household surveys in major provincial cities in Argentina, 1992-2005



Note: (*) this calculation uses the EPH weights corresponding to the 28 major provincial cities.

Source: Constructed by the author using EPH.

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Figure 2- Gini Coefficient for Argentina, from the distribution of per capita household income, 1992-2005.

Country	1950	1960	1970	1980	1990
Argentina	0.396	0.414	0.412	0.472	0.477
Bolivia			0.53	0.534	0.545
Brazil		0.57	0.571	0.571	0.573
Chile		0.482	0.474	0.531	0.547
Colombia	0.51	0.54	0.573	0.488	0.503
Costa Rica		0.5	0.445	0.485	0.46
Dominican Republic			0.455	0.421	0.481
El Salvador		0.424	0.465	0.484	0.505
Honduras			0.618	0.549	0.57
Mexico	0.55	0.606	0.579	0.509	0.531
Panama		0.5	0.584	0.475	0.563
Paraguay			0	0.451	0.57
Peru		0.61	0.485	0.43	0.464
Uruguay		0.37	0.428	0.436	0.406
Venezuela	0.613	0.462	0.48	0.447	0.459
LAC 4	0.505	0.532	0.531	0.491	0.507
LAC 6		0.548	0.548	0.532	0.542
LAC 15			0.539	0.519	0.532
Spain			0.457	0.363	0.347

Note: LAC 4 = population-weighted average of Brazil, Chile, Mexico and Venezuela. LAC 6 = population-weighted average of LAC 4 + Argentina and Uruguay. LAC 15 = population-weighted average of LAC 6 + Colombia, Cuba, Ecuador, Peru, Costa Rica, El Salvador, Guatemala, Honduras, and Panama.

Source: Constructed by the author using Perry (2006); Altimir (1987); Lodoño and Szekely (2000).

ensayo 2010 (formulitas).indd 26 5/2/11 8:42:22 AM

Table 3- Inequality in Latin America between 1950 and 2000. Measured by Gini coefficients.

Country	Period	Change in Gini points	Country	Period	Change in Gini points
Argentina	1992-1998	**0.05**	**El Salvador**	1991-2003	**-0.02**
	1998-2002	**0.03**	**Honduras**	1997-2003	**0.01**
	2002-2004	**-0.02**	**Jamaica**	1990-1999	**-0.02**
	1992-2004	**0.06**		1990-2002	**0.02**
Bolivia	1993-1997	**0**	**Mexico**	1992-1996	**-0.02**
	1997-2002	**0.03**		1996-2002	**-0.03**
	1993-2002	**0.02**		1992-2002	**-0.04**
Brazil	1990-1995	**-0.01**	**Nicaragua**	1993-1998	**-0.02**
	1995-2003	**-0.02**		1998-2001	**0**
	1990-2003	**-0.03**		1993-2001	**-0.02**
Chile	1990-1996	**0**	**Panama**	1995-2002	**0.01**
	1996-2003	**0**	**Paraguay**	1997-2002	**0.01**
	1990-2003	**-0.01**	**Peru**	1997-2002	**0.01**
Colombia	1992-2000	**0.07**	**Uruguay**	1989-1998	**0.02**
	2000-2004	**0**		1998-2003	**0.01**
Costa Rica	1992-1997	**0**	**Venezuela**	1989-1995	**0.04**
	1997-2003	**0.04**		1995-2003	**0**
	1992-2003	**0.04**		1989-2000	**0.02**
Dominican Republic	2000-2004	**-0.01**		1989-2003	**0.04**
Ecuador	1994-1998	**0.02**			

Source: Constructed by the author using Gasparini, Gutierréz and Tornarolli (2007).

Table 4- Changes in inequality measured by percentage points of Gini Coefficient using household surveys in each country.

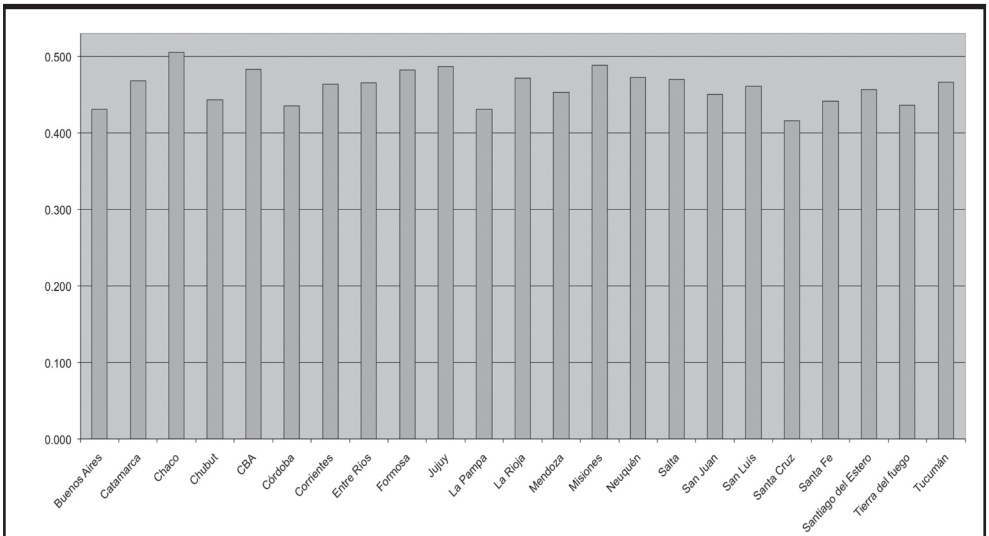

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Figure 3- Provincial Gini coefficients for Argentina. Averages for 1991-2002

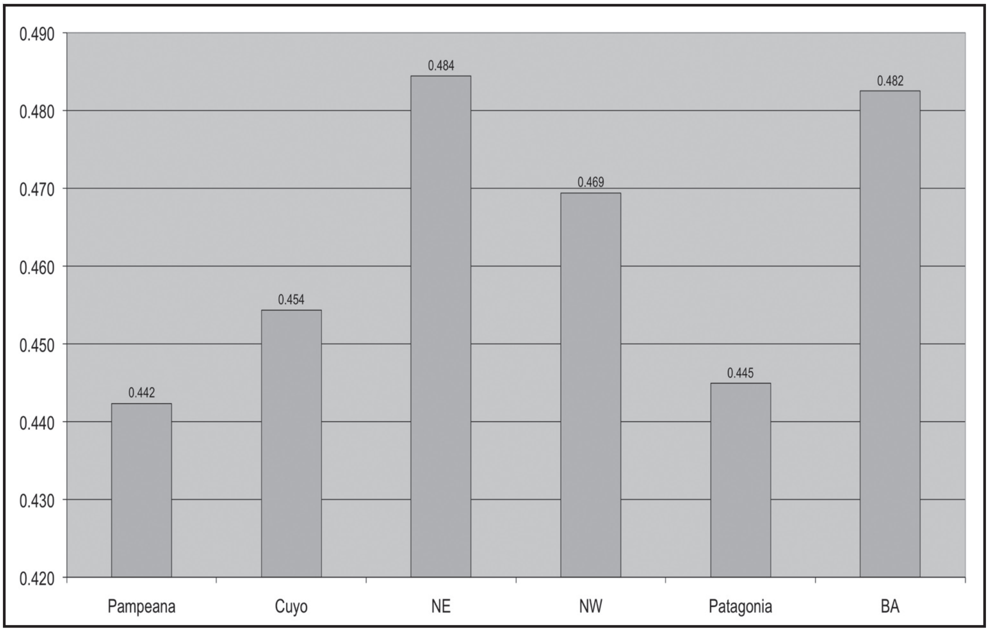


Figure 4- Regional Inequality in Argentina, as shown by Gini coefficients. Averages for 1991-2002.

	Región	N	Subset		
			1	2	3
Tukey HSD(a,b,c)	2	60	.44047753		
	6	48	.44218363		
	3	36	.45430459	.45430459	
	5	72		.46939949	.46939949
	1	12			.48243993
	4	48			.48440541
	Sig.		.418	.317	.323

Notes: Means for groups in homogeneous subsets are displayed. Based on Type III Sum of Squares. The error term is Mean Square(Error) = .001.
a Uses Harmonic Mean Sample Size = 32.727.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.
c Alpha = .05.
Regions: 1) Capital City, 2) Pampeana, 3) Cuyo, 4) Northwest, 5)Northeast and 6) Patagonia.

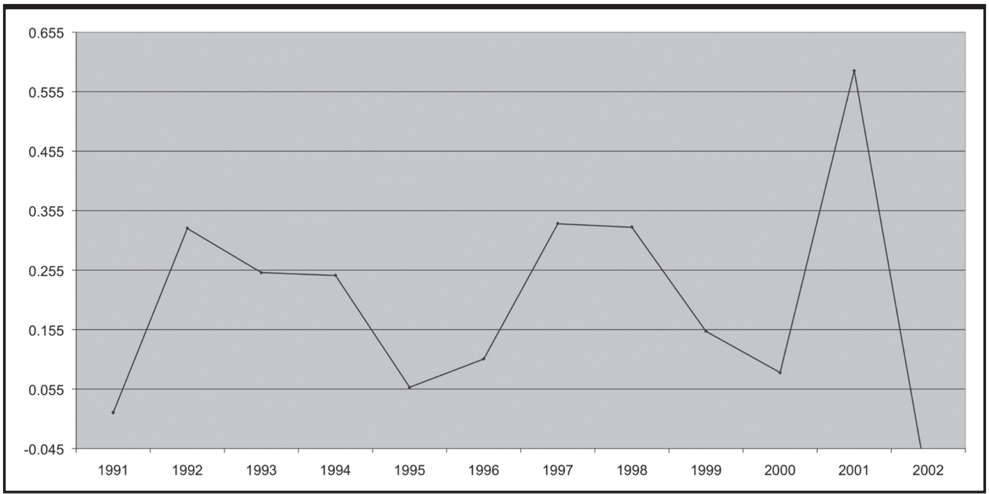
ensayo 2010 (formulitas).indd 28 5/2/11 8:42:22 AM

Table 5- Bonferroni and the Tukey's tests to determine means differ in Gini coefficient among regions in Argentina, 1991-2002.

Region	Change Gini 91-02	Change Q3 91-02	Change Top 10% 91-02	Change Bottom 20% 91-02
Buenos Aires	17.06	-11.26	12.52	**-44.32**
Pampeana	**19.28**	-10.42	-2.59	-29.71
Cuyo	14.21	-6.23	12.45	-28.39
Northeast	15.23	**-15.05**	**14.59**	-33.54
Northwest	11.94	-7.49	12.32	-19.21
Patagonia	9.32	-12.07	9.77	-18.61
Argentina	**16.22**	**-7.82**	**15.30**	**-35.56**

Source: Constructed by the author using EPH.

Table 6- Changes in Gini coefficient, third quantile (Q3), top 10 percent and bottom 20 percent shares in income of the population by region, between 1991 and 2002 (percentage).



Source: Constructed by the author using EPH.

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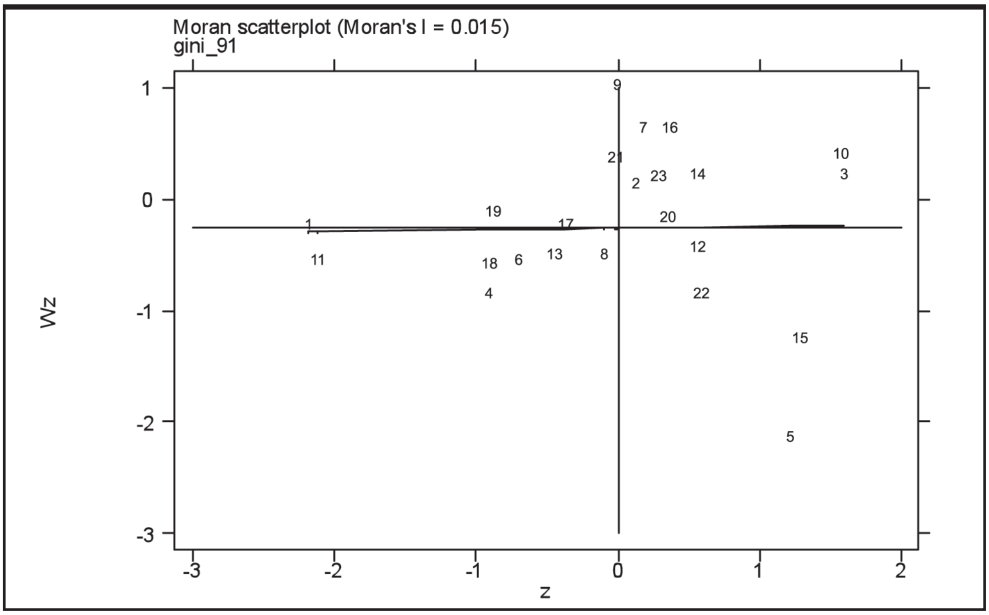
Figure 5- Moran's I statistic for the provincial Gini coefficients of Argentina, 1991-2002.

Year	Moran's I	E(I)	sd(I)	z	p-value*
1991	0.015	-0.045	0.164	0.372	0.71
1992	0.325	-0.045	0.164	2.25	0.024
1993	0.25	-0.045	0.169	1.75	0.08
1994	0.246	-0.045	0.167	1.746	0.081
1995	0.057	-0.045	0.168	0.608	0.543
1996	0.105	-0.045	0.168	0.894	0.371
1997	0.333	-0.045	0.169	2.244	0.025
1998	0.327	-0.045	0.168	2.221	0.026
1999	0.152	-0.045	0.166	1.188	0.235
2000	0.082	-0.045	0.16	0.795	0.427
2001	0.59	-0.045	0.167	3.801	0.000
2002	-0.114	-0.045	0.165	-0.417	0.676

*Two-tail test

Source: Author's calculation using the EPH.

Table 7- Estimates of the Moran's I statistic for the provincial Gini coefficients of Argentina, 1991-2002.



Source: Author's calculation using the EPH.

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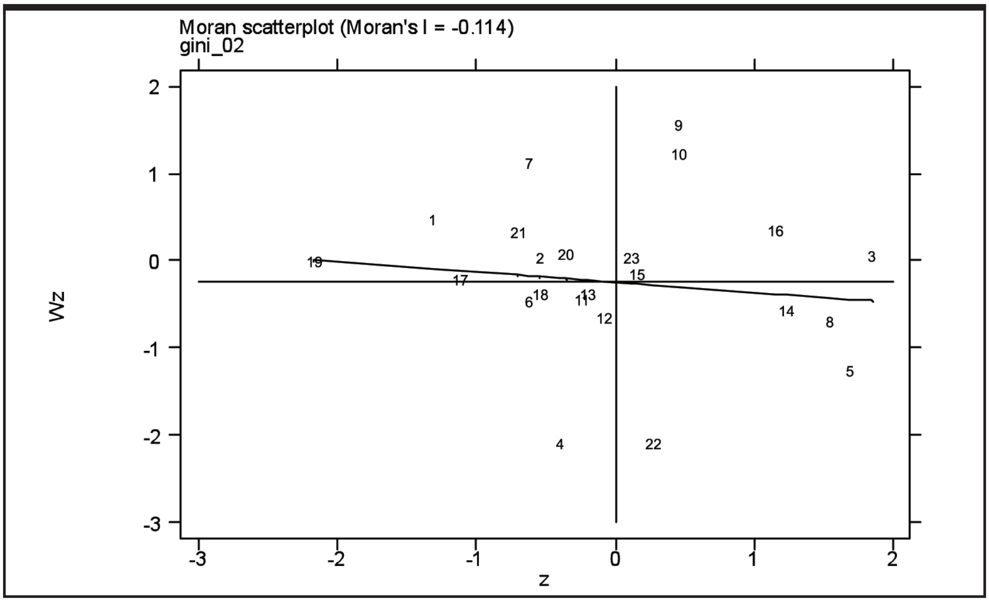
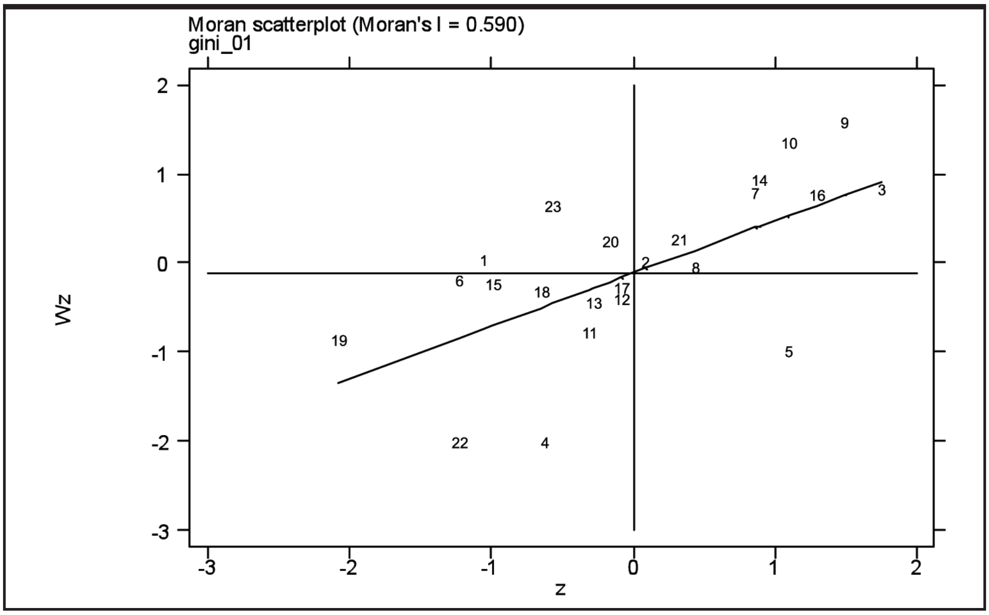
Figure 6- Local Moran's I statistic for the Gini coefficients provincial in 1991.



Source: Author's calculation using the EPH.

Figure 7- Local Moran's I statistic for the Gini coefficients in 2002.



Source: Author's calculation using the EPH.