On the Intergenerational Transmission of Inequality in Life Chances in Latin America: A Cardinal Approach.

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1. Introduction

Intergenerational mobility has become in recent years a very popular topic of research among economists. There have been on one hand important developments concerning the way this type of mobility should be econometrically apprehended (see the surveys by Solon, 1999, and Corak et al., 2004, as well as the special issue of the *B.E. Journal of Economic Policy and Analysis*, 2007). But lately there have also been crucial advances at the theoretical level, linked without any doubt, to the growing literature on the measurement of equality of opportunity. Van de gaer et al. (2001) made, for example, a very useful distinction between three meanings of intergenerational mobility, stressing respectively the idea of movement, the inequality of opportunity and the inequality of life chances. Finally the subject of intergenerational mobility has also drawn the attention of policy makers (see the 2006 World Development Report, its review by Roemer, 2006, and the reply by Bourguignon et al., 2007), among other reasons because of its connection with the idea of "inequality trap". Rao (2006, cited by Bourguignon et al., 2007) thus writes that "Inequality traps…describe situations where the entire distribution is stable because the various dimensions of inequality (in wealth, power and social status) interact to protect the rich from downward mobility, and to prevent the poor from being upward mobile".

The present study is another attempt to analyze intergenerational mobility or more generally inequality in life chances. It takes a cardinal approach to this topic. A distinction will be made between three different concepts. First we will show that, given the kind of data provided by the Latinobarómetro data which is the database used in this study, it is possible to derive indices of inequality of opportunities, that is, indices that will measure the degree of dependence between the level of education of the parents and the standard of living or the income of the children. Then indices measuring the degree of inequality of circumstances, the latter being also called "types" in the literature on equality of opportunity, will be defined. Finally, given that the circumstances (types) refer here to the educational level of the parents and that such a variable will be assumed to be an ordered variable, like that referring to the standard of living, a technique will be proposed to evaluate the effect of the educational level of the parents on inequality in circumstances.

The paper is organized as follows. Section 2 gives a short survey of some of the previous studies of intergenerational mobility in Latin America. Given that the Latinobarómetro survey does not provide direct information on the income of the children (it only asks the individual to which one of ten possible income classes he/she thinks he/she belongs) but includes information on the durable goods owned by the individual and the facilities to which he/she has access, Section 3 explains how it is possible to use this type of data to derive a "latent" measure of the standard of living of the individuals, which will be considered as a proxy to his/her wealth or permanent income. Section 4 indicates then how to use the distribution of such a "latent" measure of the standard of living of the individuals to compute indices of inequality of opportunities and circumstances, concepts that will be defined and whose link with the idea of intergenerational (im)mobility will become evident. Section 5 will then apply these measures to the data of the 2006 Latinobarómetro survey. Section 6 finally will provide some concluding comments.

2. Some Previous Studies of Intergenerational Mobility in Latin America:

One of the first studies of intergenerational mobility in Latin America is that of Behrman et al. (2001) who used more than 100 household surveys that had been conducted in Latin America. They found that although children surpassed generally the schooling attainment of their parents, the schooling attainment of children was highly correlated with that of their parents. This is why they recommended redirecting part of the schooling expansion towards children from families with low parental schooling. Among the other factors affecting the transmission of socioeconomic outcomes from parents to children they mention the likely role of borrowing constraints, discrimination, spatial segregation and marital sorting.

The paper by Gaviria (2006) is quite relevant to our study since he also worked with the Latinobarómetro Survey, that of the year 2000. He found that educational mobility is much lower in Latin American countries than in the United States but stressed that little is known about "the extent to which inequality is explained by differences in opportunities or by unequal efforts and personal skills".

Bourguignon, Ferreira and Menéndez (2007) looked at the distribution of male hourly earnings in urban Brazil and took advantage of the fact that the 1996 Brazilian household survey included information on parental education and father's ooccupation.Their goal was to estimate the share of observed inequality in current earnings that can be attributed to inequality of opportunity. They identified "opportunity" with the impact on earnings of "circumstances", that is, with determinants of earnings over which the individual has no control. They found that for men born between 1941 and 1945 the elimination of inequality due to five observed circumstances (father's and mother's education, father's occupation, race and region of birth) would reduce earnings inequality by 10% to 37%. They further decomposed the impact of "opportunities" into a direct effect on earnings and an indirect effect through the "effort" decisions individuals make. The authors concluded that "family background is the most important set of circumstances determining a person's opportunities".

Working also with Brazilian data, Dunn (2007) focused his attention on the intergenerational transmission of *lifetime earnings*. He stressed that "in Brazil education is an experience that both results in significant return in the labor market and is provided disproportionately according to the income of one's parents". He found that the growth in educational attainment in Brazil has been quite rapid but the link between father's and son's education has remained stable over time. Dunn (2007) noted also that the levels of educational transmission in Brazil were in fact extremely high by international standards. Finally, and this is one of the main contributions of his study, it turns out that the age at which earnings are observed has a crucial impact on the intergenerational earnings elasticity. Using data on sons of relatively young age turns out to significantly underestimate the true intergenerational elasticity in lifetime earnings. Finally the author concluded his study by stressing that education transmission and education returns explain over 90% of the variation in earnings elasticity across age and cohort.

Hertz et al. (2007) estimated 50-year trends in the intergenerational persistence of educational attainment for a sample of 42 nations around the globe. They noted that the seven highest intergenerational schooling correlations were found in the seven Latin American countries included in their sample but emphasized the fact that not much is known about the origins of long-run differences in educational persistence between nations.

The present paper is not focused on the intergenerational transmission of educational attainments. It rather looks at the link between parents' education and children's standard of living. The next section explains first how we estimated the standard of living of individuals.

3. Measuring the standard of living via the order of acquisition of durable goods:

3.1. The concept of order of acquisition of durable goods

Forty years ago Paroush (1963, 1965 and 1973) suggested using information available on the order of acquisition of durable goods to estimate the standard of living of households. Deutsch and Silber (2008) adopted recently this approach to propose a new approach to the measurement of multidimensional poverty. Let us quickly summarize the basic idea that lies behind the concept of order of acquisition of durable goods.

Assume there are three durable goods X, Y and Z. An individual can own one two, three or none of these goods so that there are $2^3 = 8$ possible profiles of ownership of durable goods. Table 1 summarizes the different possibilities: a one indicates that the household owns the corresponding good, a zero that it does not.

Table 1: List of possible orders of acquisition when there are 3 durable goods

Ownership Profile	The individual owns good X	The individual owns good Y	The individual owns good Z
1	0	0	0
2	1	0	0
3	0	1	0
4	0	0	1
5	1	1	0
6	0	1	1
7	1	0	1
8	1	1	1

If it is assumed that every household follows the order X, Y, Z (that is, an individual acquires first good X, then good Y and then good Z) there will be no individual with the profiles 3, 4, 6 and 7. We cannot however assume that every individual strictly follows this order X, Y, Z. There will always be individuals who will slightly deviate from this most common order of acquisition. Paroush (1963, 1965 and 1973) suggested computing the number of changes in numbers (from 0 to 1 or from 1 to 0) required to bring a deviating individual back to one of the profiles corresponding to a given order of acquisition of durable goods.

It should be clear that, for a given order of acquisition and k durable goods, there will be k+1 possible profiles in the acquisition path. Define p_j (composed of 1 and 0) with $p_j = (p_{j1},..., p_{jk})$ as a vector corresponding to a possible profile in the acquisition path, with $j = 1,..., k+1$, and let x_i be the vector (composed of 1 and 0) describing the order of acquisition for individual *i* with $x_i = (x_{i1},\dots, x_{ij},\dots, x_{ik})$. Now compare the profile of individual i (the vector

x_i) with every possible profile p_j in the acquisition path. Call S_i the distance of the profile of individual *i* to the closest profile p_j in the acquisition path. That is,

$$S_i = Min\{|x_i - p_1|, |x_i - p_2|, ..., |x_i - p_{k+1}|\} \text{ with } |x_i - p_j| = \sum_{h=1}^{k} |x_{ih} - p_{jh}| \quad (1)$$

Assuming there are N_i individuals having such a profile, Paroush (1963, 1965 and 1973) suggested computing a coefficient R of Reproducibility which he defined as

$$R = 1 - \{(\sum_i N_i S_i)/(k \sum_i N_i)\} \quad (2)$$

It is easy to prove that $(1/2) \leq R \leq 1$ and, according to Paroush (1963, 1965 and 1973), "for most practical applications of the order of acquisition of durable goods a population is considered sufficiently "scalable" if about ninety percent of its purchases are "reproducible", provided the number of commodities is not very small."

Note that the "distance" d_{ip} between the order of acquisition of individual *i* and the profile $p_c = (p_{c1}, ..., p_{ck})$ most common in the population may be expressed as

$$d_{ip} = \sum_{h=1}^{k} |x_{ih} - p_{ch}| \quad (3)$$

Thus if X, Y, Z is the order of acquisition most commonly found in the population, the "distance" for an individual with profile 4 in Table 1 will be expressed as

|0 - 1| + |0 - 1| + |1 - 1| = 2

If there are k goods *k* will clearly be the maximal value of the distance for an individual (this is thus the case of an individual with profile 1 in Table 1). The "standardized distance" for individual *i* may then be defined as (d_{ip}/k). If there are N_i individuals with a profile identical to that of individual *i* and *N* individuals in the whole population, the "average standardized distance" d_{sp} in the population can be defined as the weighted average of the "standardized distance" for the different individuals, that is as

$$d_{sp} = \sum_i (N_i / N)(d_{ip} / k) \quad (4)$$

The "proximity index" R will be defined as being equal to the complement to 1 of d_{sp}, that is

$$R = 1 - d_{sp} \quad (5)$$

The most common order of acquisition in the population is however not known and has to be discovered. As a consequence one has to compute the distances d_{ip} and d_{sp} and the proximity index R for each possible order of acquisition. There are clearly *k!* such profiles. If d_{ip1}, d_{sp1} and R_1 represent respectively the distance for individual *i*, the corresponding "average standardized distance" in the population and the proximity index order of acquisition where profile 1 is the profile with which that of individual *i* is compared, the most commonly selected order of acquisition in the population will then be the one with the highest value of the proximity index R_1.

Discovering this most common order of acquisition requires evidently a very high number of computations. For example, for each individual in the sample, if there are 12 durable goods, the determination of the minimum distance S_i of his/her profile to the profile in the order of acquisition is based on 13 comparisons. This operation has to be repeated for each individual in the sample in order to determine the proximity index *R* for a single order of acquisition. This procedure has however to be repeated 12! = 479,001,600 times. This is the total number of possible orders of acquisition resulting from 12 durable goods. The total number of computations necessary to find the order of acquisition with the highest index of proximity *R* is hence very high.

3.2. The order of acquisition of durable goods and access to basic services on the basis of the 2006 Latinobarómetro survey:

The algorithm described in Section 3.1. was applied to the 2006 Latinobarómetro survey, for each of the 18 countries included in the survey (Argentina, Bolivia, Brazil, Colombia, Costa Rica, Chile, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela and the Dominican Republic). We implemented our algorithm on the basis of 12 durables goods or types of access to basic services in our analysis: television, refrigerator, home, personal computer, washing machine, phone, mobile phone, car, second home, access to drinking water, access to hot water and sewage facilities.

The results of the analysis are presented in Table 2. It appears that the first good is generally either a refrigerator (in seven cuntries) or a home (in seven countries). The second good, somehow surprisingly, is in 10 of the 18 countries a personal computer. The third good is either a refrigerator (in seven countries) or a televison set (5 countries). The fourth good or facility is either access to drinking water (1o countries) or access to hot water (6 countries). The reproducibility coefficients are generally quite high (close to 0.9). The ordering we obtained for each country will now be used to derive, using an ordered logit regression, the standard of living of the individuals that were selected in each country on the basis of the most common order of acquisition of durable goods or facilities in this country.

3.3. From the order of acquisition of durable goods to the derivation of a standard of living index, using an ordered logit regression

Once the most common order of acquisition of durable goods has been discovered it becomes possible to use an ordered logit[1] procedure to find out which factors affect this order of acquisition. Following Paroush (1965), it will be assumed that the stage at which an individual is located in the order of acquisition of durable goods is an indication of his/her standard of living.

Let S_i denote the standard of living of individual *i* such that a higher value of S_i corresponds to a higher standard of living. Such a standard of living will be assumed to be a function of *H* factors (e.g. gender, age, education, marital status,…) whose value for individual *i* is V_{ih} , h = 1 to *H*. This standard of living (a latent variable) S_i may hence be expressed as

$$S_i = \sum_{h=1}^{k} \beta_h V_{ih} + \varepsilon_i \tag{6}$$

Such a standard of living is however a latent variable. Assuming again that there are 12 durable goods, and assuming a given order of acquisition of durables, we will call T_i the number of durables owned by individual *i*.

We may then write that

[1] We could have also used an ordered probit model.

$T_i = 1$ if $S_i \leq \delta_1$ (the case where the household does not own any durable good)

$T_i = 2$ if $\delta_1 \leq S_i \leq \delta_2$ (the household owns only one durable good in the acquisition path)

$T_i = j$ if $\delta_{j-1} \leq S_i \leq \delta_j$ (the household owns only the first j-1 durables in the acquisition path)

$T_i = 13$ if $S_i \geq \delta_{13}$ (the household owns all the durable goods)

The parameters δ_m (m = 1 to 13) as well as the parameters β_h (h = 1 to H) can be estimated using the ordered logit procedure and then S_i can be considered as the (latent) variable measuring the standard of living of the individual**.**

Table 2: Order of acquisition of the different durable goods and of the access to basic services, by country

	Television	Refrigerator	Home	Personal Computer	Washing Machine	Phone	Mobile Phone	Car	Second Home	Drinking Water	Hot Water	Sewage	Reproducibility Coefficient
Argentina	3	1	10	2	5	7	11	12	6	8	4	9	0.890
Bolivia	10	3	1	12	7	2	6	11	8	4	9	5	0.831
Brazil	10	3	1	2	12	7	11	5	6	8	4	9	0.887
Colombia	10	1	12	7	2	3	6	5	11	4	8	9	0.861
Costa Rica	10	1	2	5	12	3	6	7	8	4	11	9	0.897
Chile	1	10	2	12	7	5	3	11	6	4	8	9	0.912
Ecuador	10	1	3	2	12	7	6	5	11	4	8	9	0.877
El Salvador	3	1	10	2	7	12	6	8	5	4	11	9	0.856
Guatemala	10	3	12	1	7	2	11	6	8	4	5	9	0.848
Honduras	10	3	1	2	12	7	6	8	9	4	5	11	0.864
Mexico	3	10	1	2	12	11	5	6	8	7	4	9	0.891
Nicaragua	3	10	1	2	7	12	6	9	8	11	4	5	0.884
Panama	10	3	1	2	5	7	12	6	8	4	9	11	0.880
Paraguay	3	1	2	10	7	5	11	8	6	12	4	9	0.896
Peru	10	3	12	1	2	7	6	4	5	8	11	9	0.866
Uruguay	10	1	2	3	7	12	11	6	5	8	4	9	0.868
Venezuela	3	10	1	2	12	7	5	6	8	4	11	9	0.870
Dominican Republic	1	3	10	2	5	12	7	6	4	8	11	9	0.872

3.4. Results of the ordered logit regressions on the basis of the 2006 Latinobarómetro survey:

For the ordered logit regressions that have been estimated separately for each country we used the same three explanatory variables: the size of the place in which the individual lives[2], the age of the individual and his/her level of education[3]. The results of these estimations are given in Table 3 and indicate that for almost all the countries the latent variable assumed to measure the standard of living increases with the size of the city, the educational level of the individual and his/her age. The ordered logit regression coefficients obtained for each country were then used to estimate the predicted value of the standard of living of each individual in the sample (of the ordered logit regressions). Using kernel densities[4] (see, Silverman, 1998) we then obtained a distribution of the predicted value of the latent variable and this value will be used, in the following sections, as an estimate of the standard of living of each individual in 2006.

[2] The Latinobarómetro survey classified the "size of the town" in 8 categories: "up to 5,000 inhabitants", "5001 to 10,000 inhabitants", "10,001to 20,000 inhabitants", "20,001 to 40,000 inhabitants", "40,001 to 50,000 inhabitants", "50,001 to 100,000 inhabitamts", "100,001 and more inhabitants" and "lives in the capital". To simplify the analysis we gave a value of 1 to 8 to these different categories.

[3] The level of education of the respondent was generally given in years, from zero to 12. Four levels were not given in years. To simplify we assumed that those who belonged to the categories "High school/academies/incomplete technical training", "High school/academies/complete technical training", "Incomplete university" and "Completed university" had studied 13, 14, 15 and 16 years respectively.

[4] For the Kernel we used the normal density function.

Table 3: Results for Each Country of the Ordered Logit Regression (order of acquisition of durable goods and access to basic services)

Country	Explanatory Variable: City Size		Explanatory Variable: Age		Explanatory Variable: Education		Likelihood Ratio Statistic	Number of Observations
	Regression Coefficient	t-value	Regression Coefficient	t-value	Regression Coefficient	t-value		
Argentina	0.2258	5.13	0.0049	0.79	0.2425	8.45	126.0	368
Bolivia	-0.0061	-0.09	0.0118	1.45	0.3417	9.87	143.0	235
Brazil	0.1216	2.33	0.0244	3.97	0.3109	11.46	186.7	377
Colombia	0.2331	4.68	0.0367	4.94	0.2007	7.62	105.5	302
Costa Rica	0.2131	3.03	0.0163	2.57	0.2573	10.13	138.5	349
Chile	0.2890	7.57	0.0310	5.19	0.3126	11.03	229.8	477
Ecuador	0.2061	3.11	0.0094	1.56	0.2757	11.17	200.5	374
El Salvador	0.5376	8.36	0.0085	0.96	0.1909	6.30	176.8	254
Guatemala	0.2543	3.52	0.0005	0.06	0.2695	7.33	86.2	203
Honduras	0.2447	3.76	0.0197	2.89	0.2596	7.52	116.9	272
Mexico	0.5429	11.18	0.0076	1.23	0.2825	11.14	448.1	445
Nicaragua	0.3957	6.55	-0.0001	-0.02	0.1851	7.17	94.4	366
Panama	0.3085	6.61	0.0016	0.24	0.2310	8.53	209.7	321
Paraguay	0.1473	3.89	0.0238	4.28	0.3253	12.90	231.1	461
Peru	0.5029	7.43	0.0188	2.99	0.2850	10.55	333.8	393
Uruguay	0.1371	3.16	0.0203	2.88	0.3851	9.75	139.6	242
Venezuela	0.3627	7.48	0.0269	3.74	0.2850	10.54	186.0	369
Dominican Republic	0.3117	5.34	0.0267	3.19	0.3416	10.59	184.1	224

4. A Cardinal Approach to Measuring Inequality in Life Chances: Methodological Considerations

4.1. Measuring Social Immobility:

Let us assume a data matrix M whose lines i correspond to the social origin of the individuals (educational level of the parents) and whose columns j correspond to the income brackets to which these individuals belong. For example, M_{ij} would give the number of individuals whose income belongs to income bracket j and whose parents had educational level i.

Define now m_{ij} as $m_{ij} = M_{ij} / (\sum_{i=1}^{I} \sum_{j=1}^{J} M_{ij})$, $m_{i.}$ as $m_{i.} = (\sum_{j=1}^{J} m_{ij})$ and $m_{.j}$ as $m_{.j} = \sum_{i=1}^{I} m_{ij}$.

Perfect social mobility will be assumed to exist when the probability that an individual belongs to a specific income bracket k is independent of his social origin h (e.g. educational level of his parents). In other words in such a case we may write that $m_{hk} = (m_{h.} m_{.k})$. As a consequence, as suggested by Silber and Spadaro (forthcoming), any index measuring the degree of independence between the lines and the columns of such a matrix could be selected as a measure of social mobility.

A first measure one may think of is an entropy related index such as one of Theil´s (1967) famous indices which amount somehow to comparing "prior probabilities" with "posterior probabilities". In our case the "prior probabilities" would be the products $(m_{h.} m_{.k})$ while the "posterior probabilities" would be the proportions m_{hk}. Such a formulation of the Theil index would give us an index of social immobility T_{sim} defined as

$$T_{sim} = \sum_{i=1}^{I} \sum_{j=1}^{J} \{(m_{i.} m_{.j}) \ln[(m_{i.} m_{.j}) / m_{ij}]\} \tag{7}$$

It is easy to observe that this index will be equal to 0 when there is perfect independence between the social origins and the income brackets.

Theil defined also an alternative index, where the role of the "prior" and "posterior" probabilities are reversed so that such an index $T_{sim}^{'}$ will be written as

$$T'_{sim} = \sum_{i=1}^{I}\sum_{j=1}^{J}\{m_{ij} \ln[m_{ij} /(m_{i.}m_{.j})]\} \quad (8)$$

Another possibility is to use a Gini-related index, as suggested originally by Flückiger and Silber (1994). As stressed also by Silber (1989a) the Gini index may be also used to measure the degree of dissimilarity between a set of "prior probabilities" and a set of "posterior probabilities". In the case of inequality measurement the "prior probabilities" are the population shares and the "posterior probabilities" the income shares.

Such a Gini-related index of social immobility may then be expressed as

$$G_{sim} = [...(m_{i.}m_{.j})...]' \, G \, [...(m_{ij})...] \quad (9)$$

where $[...(m_{i.}m_{.j})...]'$ is a row vector giving the "prior probabilities" corresponding to the various $(I \times J)$ cells (i, j) while $[...(m_{ij})...]$ is a column vector giving the "posterior probabilities" (the actual probabilities) for these cells. Note that, as indicated in Silber (1989a), the elements of these row and column vectors have both to be ranked by decreasing ratios $m_{ij} /(m_{i.}m_{.j})$. The operator G in (2), called G-matrix (see, Silber, 1989b), is a $(I \times J)$ by $(I \times J)$ square matrix whose typical element g_{pq} is equal to 0 if $p = q$, to -1 if $p \succ q$ and to +1 if $p \prec q$.

Note that the index G_{sim} is also a social immobility index because it will be equal to zero when all "prior probabilities" $(m_{i.}m_{.j})$ are equal to the "posterior probabilities" m_{ij} and in such a case we would have perfect mobility.

The properties of the Theil and Gini social immobility indices, are discussed in Silber and Spadaro (forthcoming).

A graphical representation of the index G_{sim}:

Assume we order the products $(m_{i.})(m_{.j})$ of the elements $(m_{i.})$ and $(m_{.j})$ by increasing values of the ratios $(m_{ij})/((m_{i.})(m_{.j}))$. Let us similarly order the shares (m_{ij}) by increasing values of the ratios $(m_{ij})/((m_{i.})(m_{.j}))$. We now plot the cumulative values of the elements $(m_{i.})(m_{.j})$ on the horizontal axis and the cumulative values of the shares (m_{ij}) on the vertical axis. The curve obtained will be called a "social immobility curve". It is in fact what is known in the literature as a relative concentration curve and clearly its slope is non-decreasing. Note that in the specific case where $m_{ij} = ((m_{i.})(m_{.j}))$ $\forall i$ and $\forall j$ this curve will become the diagonal line going from (0,0) to (1,1).

On the basis of such "social immobility curves" and using results that have appeared in the income inequality literature we can conclude, when comparing social immobility in two populations, that if in subpopulation A the "social immobility curve" lies nowhere below but at times lies above that corresponding to subpopulation B, social immobility in subpopulation A is smaller than that in subpopulation B.

4.2. Measuring Inequality in Circumstances:

Given that the case we are studying is that where the lines of the matrix to be analyzed corresponds to the educational level of the parents and the columns to standard of living classes (income classes, in short) of the children one may want to adopt the terminology used in the literature related to the measurement of equality of opportunity and call the lines "types" or "circumstances". Under certain conditions one may want to call the columns "levels of effort" although such an extension implies quite strong assumptions concerning the link between income and effort.

In any case we will limit ourselves to attempting to derive a measure of inequality in circumstances. Adopting Kolm's (2001) ideas we may define (see, Silber and Spadaro, forthcoming) the inequality in circumstances as the weighted average of the inequalities within each "income class" ("effort level"), the weights being the population shares of the various income classes. We cannot however measure inequality the way Kolm (2001) suggested by comparing the average level of income for a given level of effort with what he calls the "equal equivalent" level of income for this same level of effort. We can however measure inequality within a given income class ("effort level") by comparing the distribution of the "actual shares" ($m_{ij}/m_{.j}$) for each income class j with what could be considered as the "expected shares" ($m_{i.}/1$)= $m_{i.}$.

Using one of Theil's inequality measures this leads to the following measure of inequality within income class j:

$$T_j = \sum_{i=1}^{I} \{(m_{i.}) \ln[(m_{i.})/(m_{ij} / m_{.j})]\} \tag{10}$$

A Theil measure of overall inequality in circumstances T_{circ} would then be defined as

$$T_{circ} = \sum_{j=1}^{J}(m_{.j})T_j = \sum_{j=1}^{J}(m_{.j})\sum_{i=1}^{I}\{(m_{i.})\ln[(m_{i.})/(m_{ij}/m_{.j})]\} \tag{11}$$

$$\leftrightarrow T_{circ} = \sum_{j=1}^{J}\sum_{i=1}^{I}\{(m_{.j})(m_{i.})\ln[(m_{i.})/(m_{ij}/m_{.j})]\} = \sum_{j=1}^{J}\sum_{i=1}^{I}\{(m_{i.})(m_{.j})\ln[((m_{i.})(m_{.j}))/m_{ij})]\} \tag{12}$$

which is in fact identical to the measure T_{sim} of social immobility suggested in (7).

Let us now measure inequality in circumstances on the basis of the Gini index. Here again we will measure inequality within a given income class ("effort level") by comparing the distribution of the "actual shares" $(m_{ij})/(m_{.j})$ for each income class *j* with what could be considered as the "expected shares" $(m_{i.}/1) = m_{i.}$. Using the Gini-matrix which was defined in (9) we derive the following measure of inequality within income class ("effort level") *j*:

$$G_j = [...(m_{i.})...]'G[...(m_{ij}/m_{.j})..] = (1/m_{.j})[...(m_{i.})...]'G[...(m_{ij})...] \tag{13}$$

where the two vectors (of length *I*) on both sides of the G-matrix in (13) are ranked by decreasing values of the ratios $(m_{ij})/(m_{i.})$.

To derive an overall Gini index of inequality of circumstances G_{circ} we will have to weight the indices given in (13) by the weights of the income classes *j*. We should however remember that in defining such an overall within groups Gini inequality index the sum of the weights will not be equal to 1 because each weight will in fact be equal to $(m_{.j})^2$ in the same way as in the traditional within groups Gini index the weights are equal to the product of the population and income shares. We therefore end up with

$$G_{circ} = \sum_{j=1}^{J}(m_{.j})^2(1/m_{.j})[...(m_{i.})...]'G[...(m_{ij})...]$$

$$\leftrightarrow G_{circ} = \sum_{j=1}^{J}(m_{.j})[...(m_{i.}(...]'G[...(m_{ij})...] = \sum_{j=1}^{J}[...,((m_{i.})(m_{.j}))...]'G[...(m_{ij})...] \tag{14}$$

Note that the formulation for G_{circ} in (14) is not identical to that of G_{sim} in (9). To see the difference between these two formulations the following graphical interpretation may be given.

A graphical illustration of the concept of inequality in circumstances

As was done when drawing a social immobility curve put respectively on the horizontal and vertical axes the expected shares $(m_{i.})$ and the actual shares (m_{ij}), starting with income class 1 and ranking both sets of shares by increasing ratios $(m_{ij})/(m_{i.})$. Then do the same for income class 2 and continue with the other classes until you end up with income class *I*. What we have then obtained is a curve which could be called an "inequality in circumstances" curve which comprises I sections, one for each income class. Clearly the slope of this curve is not always non-decreasing. It is non-decreasing within each income class but the curve reaches the diagonal each time we end with an income class.

We should however note that the shares used to draw such an "inequality in circumstances curve" are the same as those used in constructing a social immobility curve (compare both sides of the G-matrix in (9) and (14)). In drawing the curve measuring inequality in circumstances we have simply "reshuffled" the sets of shares used in drawing a social immobility curve. Rather than ranking both sets of shares (on one hand the cumulative shares $(m_{i.})(m_{.j})$, the cumulative shares (m_{ij}) on the other hand) by increasing values of the ratios $(m_{ij})/((m_{i.})(m_{.j}))$ working with all the *I* by *J* shares, we have first collected the shares corresponding to the first (poorest) income class and ranked them by increasing ratios $(m_{i1})/((m_{i.})(m_{.1}))$ and then did the same successively for all income classes.

An illustration of the difference between an "inequality in circumstances" curve and a social immobility curve is given in Figure 2 which will be analyzed in Section 5. Note that whereas the Index G_{circ} is equal to twice the area lying between the "inequality in circumstances" curve and the diagonal, the index G_{sim} is equal to twice the area lying between the social immobility curve and the diagonal. The area lying between the inequality in circumstances curve and the social immobility curve may then be considered as a measure of the degree of overlap between the various income classes in terms of the gaps between the "expected" and "actual" shares.

4.3. Determining the impact of parents' education on inequality in circumstances:

In expression (13) we estimated a within income group j Gini index G_j which was computed by comparing, for each cell (i, j), its expected share $(m_{i.})$ in column j with its actual share

$(m_{ij}/m_{.j})$ (see the first expression on the R.H.S. of (13)). This comparison of expected and actual shares was based on the use of the G-matrix, the operator we have been using to compute the Gini index. Moreover the elements of the row vector $[...(m_{i..})..]'$ and of the column vector $[...(m_{ij}/m_{.j})..]$ which appear on the first expression on the R.H.S. of (13) were both classified by decreasing ratios $((m_{ij}/m_{.j})/m_{i.}) = (m_{ij}/((m_{i.})(m_{.j}))$.

Let us however assume now that, within each income group (class of standard of living) of the children, we classify these elements (of the vectors $[...(m_{i.})..]'$ and $[...(m_{ij}/m_{.j})..]$) by decreasing educational level *i*. It can then be shown that what we would compute would be another kind of relative concentration ratio, one that would measure the link between the ratios $(m_{ij}/((m_{i.})(m_{.j}))$ and the educational level of the parents. If these ratios grow in a monotonic way with the level of education of the parents then we will get in fact, for each children's income group, the Gini ratios we derived in the previous section and which measured inequality in circumstances. The corresponding curve obtained for a given income group of the children by plotting points corresponding on the horizontal axis to the cumulative shares $m_{i.}$ and on the vertical axis to the cumulative shares $m_{ij}/m_{.j}$, both sets of shares being ranked by increasing educational level, would be identical to that depicting inequality in circumstances. If however, for a given income group, there is an inverse relationship between the ratios $(m_{ij}/((m_{i.})(m_{.j}))$ and the level of education of the parents, the index we propose to compute in this section will be a kind of Pseudo-Gini[5]. It will be negative and equal in absolute value to the Gini index measuring inequality in circumstances and derived previously. In such a case the curve will lie above the diagonal (in the range of the corresponding income group) and its slope will be decreasing[6]. In the more general case we may observe a curve that can cross one or several times the diagonal but it will still be an increasing curve. If the sum of the areas lying below the diagonal is close to the sum of the areas lying above the diagonal the Pseudo-Gini will be close to zero. This kind of relative concentration curve was already suggested by Kakwani (1980) to measure in a way the income elasticity of the consumption of a specific good and more recently by Dawkins (2006) in a study of spatial segregation. In our case one may observe that if this curve lies mostly below the diagonal it means that cases where the actual number of individuals in a given cell is higher than the expected number, will be observed mainly among high educational levels (of the parents). If on the contrary this curve lies mostly above the diagonal it means that cases where the actual

[5] See, Silber, 1989b, for more details on the concept of Pseudo-Gini.

[6] The area between the diagonal and this curve will be equal to half the absolute value of this Pseudo-Gini.

number of individuals in a given cell is higher than the expected number, will be observed mainly among low educational levels (of the parents). As a consequence if the educational level of the parents has an impact on the income (standard of living) of the children we may expect the curve to lie above the diagonal for low income groups and below it for high income groups.

5. Implementing the Cardinal Approach to Measuring Inequality in Life Chances, on the Basis of the Latinobarómetro Data

5.1. Computing Gini indices of social immobility

To derive social immobility indices we built for each country a matrix whose lines correspond to the educational levels of the parents[7] (up to 17 levels) and whose columns are the deciles of the distribution of the latent variable derived from the ordered logit regression. To derive this distribution we computed for each individual the expected value of this latent variable on the basis of the results of the ordered logit regression of the country to which the individual belong. Then for each country we smoothed this distribution using the Kernel density approach. Since quiet a few cells in each country had zeros we could not use the Theil index of social immobility and hence we used only the Gini social immobility index. The results of these computations[8] are given in Table 4.

Table 4 indicates that social immobility is highest in Bolivia, the Dominican Republic, Peru and Panama and lowest in Honduras, Venezuela and Nicaragua. It is interesting to note that the ranking of the seven Latin American countries covered by Hertz et al. (2007) in their international comparison of the inheritance of educational inequality is quite similar to the one that appears in table 4. Hertz et al. (2007) computed for seven Latin American countries the average parent-child schooling correlation and found that among more than 40 countries, the seven Latin American countries had the highest correlation. The ordering of these countries (by decreasing correlation) was as follows: Peru, Ecuador, Panama, Chile, Brazil, Colombia and Nicaragua. Table 4 indicates a very similar ordering for these seven countries, the only differences being that in Table 4 Panama comes slightly before Ecuador and Brazil before Chile.

Figure 1 gives, as an illustration, the social immobility curve for the country with the highest level of social immobility (Bolivia) and that with the lowest level (Nicaragua).

[7] See Appendix A for the definition of the 17 educational levels.

[8] The country specific social immobility matrices can be obtained upon request from the authors.

As an alternative approach we have used as standard of living the level of own wealth indicated by the individuals on a 1 to 10 scale. This is a subjective measure selected by them. On the basis of the same individuals that had been selected by the order of acquisition algorithm described previously, we then computed, as before, social immobility matrices whose lines are the levels of education of the parents and whose columns are the 10 levels of subjective wealth. Each cell *(i,j)*

Table 4: Gini Social Immobility Index Based on Cross Tables of Deciles of Standard of Living Scores by Level of Education of Parents (in descending order)

Bolivia	0.5277
Dominican Republic	0.5246
Peru	0.5139
Panama	0.5020
Ecuador	0.4996
Guatemala	0.4970
Mexico	0.4957
Uruguay	0.4626
Paraguay	0.4625
El Salvador	0.4617
Brazil	0.4509
Chile	0.4355
Colombia	0.4297
Argentina	0.4294
Costa Rica	0.4284
Honduras	0.4061
Venezuela	0.3780
Nicaragua	0.3489

of such a matrix gives then the number of individuals whose parents had a level of education *i* and whose subjective evaluation of their own wealth was *j*. Then we computed for each country the Gini index of social immobility that has been defined previously. The results of these computations are given in Table 5 and are somehow different from those of Table 4. Note however that the coefficient of correlation between the two sets of Gini indices is equal to 0.597.

Figure 1: Social Immobility Curves

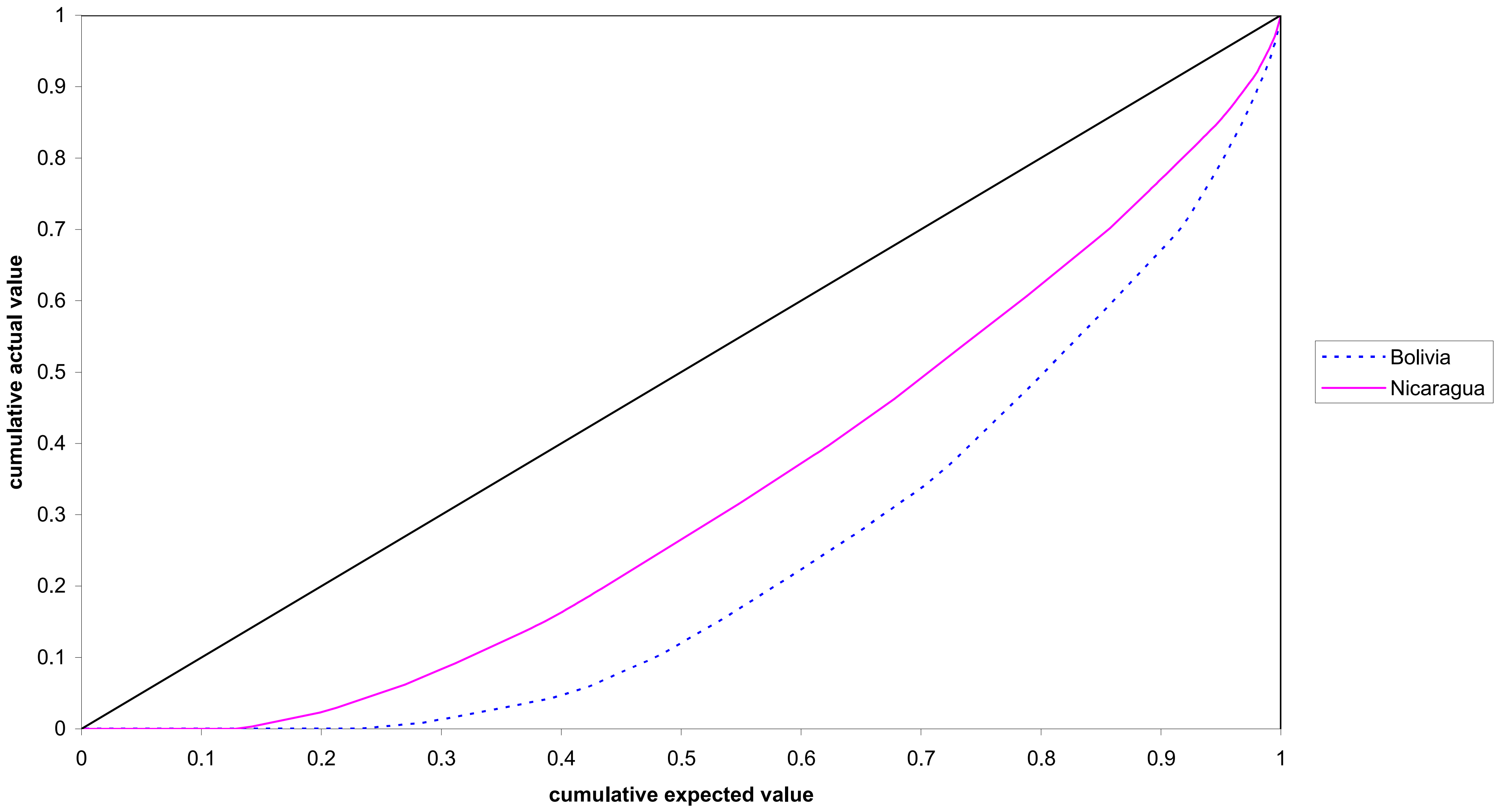

Table 5: Gini Social Immobility Index Based on Cross Tables of Deciles of Subjective Scale of Wealth of Individuals by Level of Education of Parents (in descending order)

Dominican Republic	0.3999
Guatemala	0.3880
Ecuador	0.3811
Panama	0.3615
Colombia	0.3585
Peru	0.3572
Mexico	0.3525
Uruguay	0.3423
Honduras	0.3403
Costa Rica	0.3396
El Salvador	0.3295
Paraguay	0.3263
Argentina	0.3168
Bolivia	0.3094
Brazil	0.3052
Nicaragua	0.3022
Venezuela	0.2910
Chile	0.2689

5.2. Computing Gini Indices of Inequality in Circumstances

In Table 6 we give, for each country, the values of the Gini indices that measure the inequality in circumstances. It appears that the highest levels of inequality are observed in the Dominican Republic, Guatemala, Ecuador and Panama and the lowest levels in Bolivia, Brazil, Nicaragua, Venezuela and Chile. Note that although the ranking of the countries is not the same in Table 4 (Gini indices of social immobility) and 6 (Gini indices of inequality in circumstances), the countries having the highest levels of inequality in circumstances belonged to the set of countries which had also quite high levels of social immobility. Similarly the countries that have the lowest level of inequality in circumstances were as a whole classified also as countries with a low level of social immobility.

5.3. Determining the impact of parents' education on inequality in circumstances

In the next step of the analysis we compute, as was mentioned before, a kind of Pseudo-Gini index where, for each income class, the expected and actual shares of the various educational levels are not ranked by decreasing ratio of the actual over the expected values but by decreasing educational level. The results are given for each income class and country in Table 7 which gives also the Gini index of inequality in circumstances for each income class and country. As far as the latter is concerned we observe that for all the countries there is more or less a U-shaped relationship between the Gini index of inequality in circumstances and the level of income. Such a link was expected since the educational structure of the middle class is generally more similar to the overall educational structure of a country than that of high or low income groups.

Table 6: Gini Indices of Inequality in Circumstances Based on Cross Tables of Deciles of Standard of Living Scores by Level of Education of Parents (in descending order)

Dominican Republic	0.049121
Peru	0.046845
Bolivia	0.046345
Mexico	0.046129
Panama	0.046080
Ecuador	0.045539
Guatemala	0.044396
Paraguay	0.043983
Uruguay	0.042502
Brazil	0.042070
Chile	0.041668
El Salvador	0.041196
Costa Rica	0.040752
Colombia	0.040639
Argentina	0.039641
Honduras	0.035122
Venezuela	0.034954
Nicaragua	0.031070

What is more interesting to observe is that, as expected, for practically all the countries, the Pseudo-Gini index which appears in the last column on the right of Table 7 is negative for the four or five lowest income groups and positive for the higher income groupss. This means that, among low incomes groups, high educational levels are under-represented and low educational levels are over-represented, the contrary being true for the higher income groups. This simply implies that individuals whose parents had a low educational level are likely to be found in low income groups while individuals whose parents had a high educational level will be found more often among high income groups. Finally in Table B-1 in Appendix B we give the value of the weighted average of all these Pseudo-Gini indices (see, expression (14) above) and, at the light of what was stressed previously, it is, as expected close to zero in all the countries.

In addition we present in Figure 2 a graphical illustration based on the case of the Dominican Republic. Three curves have been drawn. The first one is the social immobility curve that has been defined before and is similar to those given in Figure 1. The second curve depicts the inequality in circumstances and, as explained previously, it includes ten sections (corresponding to each of the ten standard of living groups) where each section has a non decreasing slope and describes the inequality of circumstances within a given income (standard of living) group. The third curve depicts the link between the level of education of the parents and inequality in circumstances. It is striking to observe that, as expected, for low income groups this curve is above the diagonal whereas for high income groups it is above the diagonal.

Figure 2: The three curves in the case of the Dominican Republic

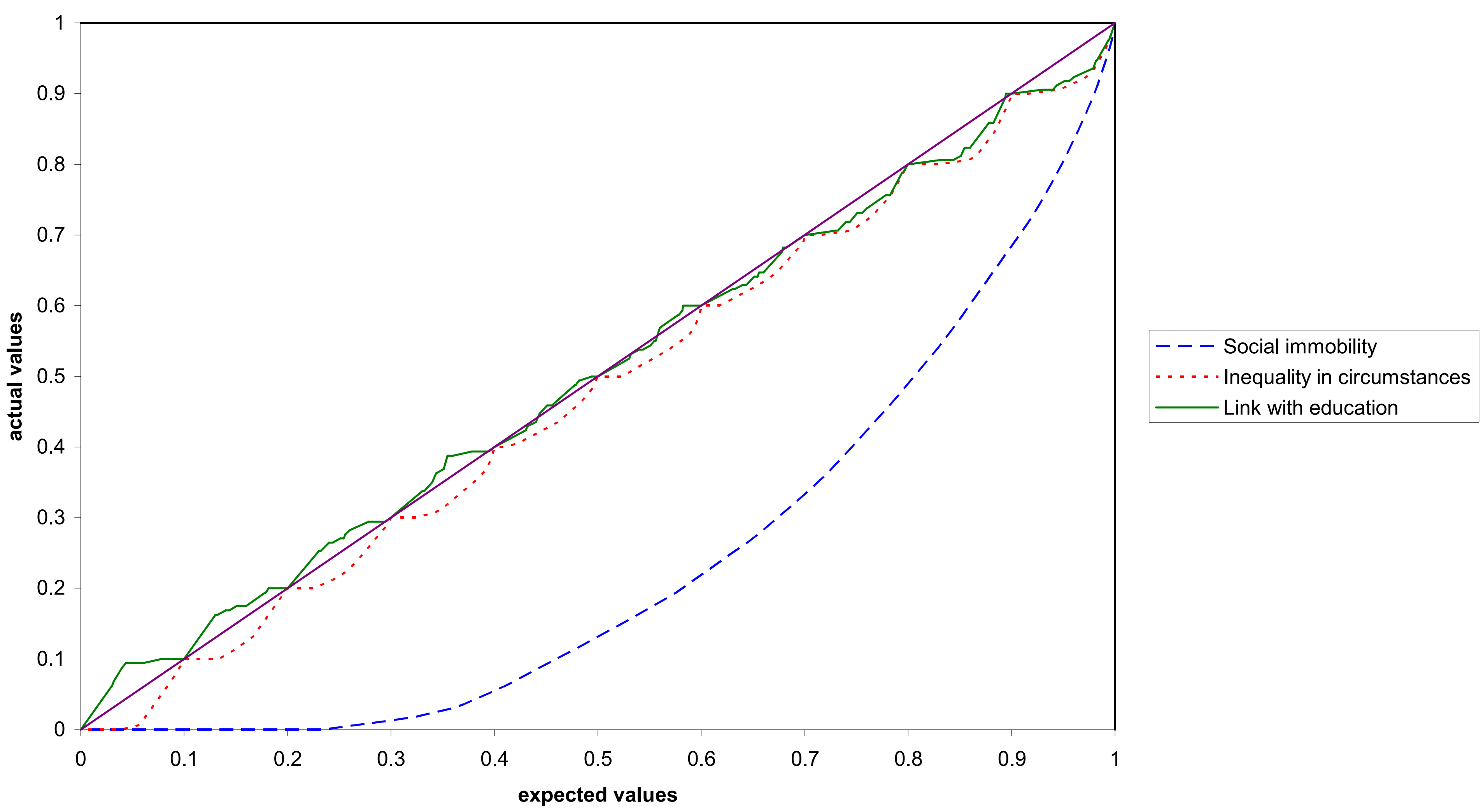

Table 7: Gini Indices of Inequality in Circumstances and Pseudo-Gini indices by Country and Income Group

Income Deciles	Gini Index of Inequality in Circumstances	Pseudo-Gini Index
ARGENTINA		
1	0.6311	-0.6213
2	0.3753	-0.2635
3	0.4548	-0.1908
4	0.3242	-0.1904
5	0.3818	0.0174
6	0.2233	0.1026
7	0.4360	0.2855
8	0.3472	0.1833
9	0.3209	0.2535
10	0.4808	0.4074
BOLIVIA		
1	0.4272	-0.3521
2	0.4431	-0.4405
3	0.4418	-0.3918
4	0.2681	-0.0720
5	0.4583	-0.1878
6	0.4401	0.1153
7	0.2663	-0.1613
8	0.5932	0.3737
9	0.5881	0.4651
10	0.6943	0.6358
BRAZIL		
1	0.5553	-0.4996
2	0.5227	-0.4505
3	0.4602	-0.3669
4	0.3168	-0.1331
5	0.2321	0.0559
6	0.2324	0.0926
7	0.3829	0.1868
8	0.4184	0.1631
9	0.6379	0.5980
10	0.4444	0.3308

COLOMBIA		
1	0.5013	-0.3550
2	0.4814	-0.3512
3	0.3805	-0.2534
4	0.3966	-0.1698
5	0.2325	-0.0540
6	0.3978	0.1822
7	0.2720	-0.0275
8	0.5059	0.3747
9	0.4082	0.2896
10	0.4832	0.3448
COSTA RICA		
1	0.4970	-0.4076
2	0.3854	-0.3312
3	0.4210	-0.2359
4	0.4129	-0.1518
5	0.3740	-0.1416
6	0.3087	-0.0102
7	0.4171	0.2251
8	0.3506	0.2894
9	0.5094	0.4081
10	0.4043	0.3310
CHILE		
1	0.5916	-0.5000
2	0.4564	-0.3109
3	0.4068	-0.3534
4	0.3506	0.0416
5	0.3142	-0.1047
6	0.3603	0.1007
7	0.2915	0.1192
8	0.3820	0.1439
9	0.4652	0.3583
10	0.5469	0.4970
ECUADOR		
1	0.5992	-0.5854
2	0.5157	-0.4018
3	0.3745	-0.2216
4	0.3066	-0.1122
5	0.3989	-0.3488
6	0.3550	0.0508
7	0.4633	0.3174
8	0.2968	0.1880
9	0.5915	0.5366
10	0.6485	0.5455

EL SALVADOR		
1	0.3648	-0.3466
2	0.4714	-0.3647
3	0.3042	-0.2292
4	0.3812	-0.1746
5	0.2836	-0.1968
6	0.2630	-0.0160
7	0.5028	0.2011
8	0.4361	0.2243
9	0.5350	0.3759
10	0.5752	0.5061
GUATEMALA		
1	0.5647	-0.5216
2	0.4880	-0.2441
3	0.3917	-0.2756
4	0.2818	-0.2127
5	0.4114	-0.0410
6	0.2728	-0.0821
7	0.3256	-0.0145
8	0.5611	0.3975
9	0.6269	0.5941
10	0.5175	0.3515
HONDURAS		
1	0.3820	-0.2233
2	0.3113	-0.1951
3	0.3506	-0.3373
4	0.2601	-0.0143
5	0.3531	-0.1999
6	0.1474	-0.0282
7	0.3740	0.1025
8	0.4004	0.2078
9	0.3813	0.2314
10	0.5542	0.4462
MEXICO		
1	0.5553	-0.5357
2	0.5223	-0.5133
3	0.3239	-0.1935
4	0.4408	-0.3734
5	0.3292	-0.2293
6	0.4296	0.1179
7	0.4309	0.3027
8	0.4344	0.3571
9	0.6301	0.5860
10	0.5220	0.4638

NICARAGUA		
1	0.2756	-0.2280
2	0.2948	-0.2226
3	0.2270	-0.0597
4	0.2944	-0.2225
5	0.2235	-0.0674
6	0.3234	0.1221
7	0.2638	0.0131
8	0.3352	-0.1096
9	0.3578	0.2971
10	0.5088	0.4562
PANAMA		
1	0.5950	-0.5826
2	0.4809	-0.4565
3	0.4378	-0.2901
4	0.3981	-0.2868
5	0.2775	-0.0672
6	0.4377	0.1309
7	0.3391	0.2020
8	0.4243	0.3077
9	0.6061	0.4705
10	0.6014	0.5462
PARAGUAY		
1	0.5340	-0.5164
2	0.4976	-0.4860
3	0.4122	-0.3055
4	0.3168	-0.2414
5	0.3314	-0.0676
6	0.3170	0.1427
7	0.4029	0.2134
8	0.4711	0.3747
9	0.5264	0.3843
10	0.5868	0.4847
PERU		
1	0.5630	-0.5418
2	0.5126	-0.4566
3	0.4092	-0.3297
4	0.3924	-0.2587
5	0.5058	0.0225
6	0.2287	-0.0540
7	0.3221	0.0871
8	0.4774	0.3075
9	0.6280	0.6001
10	0.6403	0.5931

URUGUAY		
1	0.6751	-0.6596
2	0.4028	-0.3257
3	0.3740	-0.0503
4	0.3630	-0.1946
5	0.5143	-0.0724
6	0.2187	0.0132
7	0.4350	0.2852
8	0.3638	0.2778
9	0.4405	0.3402
10	0.4625	0.3654
VENEZUELA		
1	0.5731	-0.5473
2	0.3191	-0.2523
3	0.2880	-0.1842
4	0.3076	-0.1978
5	0.2082	0.0027
6	0.2933	0.0494
7	0.3516	0.2612
8	0.3763	0.2679
9	0.3792	0.2487
10	0.4051	0.3323
DOMINICAN REPUBLIC		
1	0.5485	-0.4977
2	0.4644	-0.3470
3	0.4232	-0.2891
4	0.5117	-0.2269
5	0.3629	-0.0485
6	0.4686	-0.0360
7	0.3807	0.1105
8	0.5061	0.3530
9	0.6374	0.4185
10	0.6093	0.5187

5.4. Regression Results:

We complete this analysis by presenting results of a regression (see, Table 8) where the dependent variable is the logarithm of the ratio of the actual over the expected number of observations in the cell in which each individual is located, remembering that we have separate tables for each country. It makes sense to use this variable as dependent variable because it is directly related to one of the two Theil indices defined previously and this ratio is linked to the idea of dependence between the educational level of the parents and the income group to which the individual belongs. As explanatory variables we used dummy variables for the country to

Table 8: Regression Results where the dependent variable is the logarithm of the ratio of the actual over the expected number of cases in the cell to which an individual belongs (assuming 10 standard of living groups for the individual and up to 17 levels of education for the parents)

	Mean	Standard Deviation	Regression Coefficient	t-value
Dependent Variable	0.39883	0.61377		
constant			1.15473	26.24557
Argentina	0.06717	0.25031	-0.15664	-3.33308
Bolivia	0.04313	0.20314	0.04561	0.89800
Brazil	0.06497	0.24647	-0.13431	-2.85616
Colombia	0.05084	0.21966	-0.13451	-2.73891
Costa Rica	0.05506	0.22809	-0.13686	-2.83009
Chile	0.07653	0.26584	-0.18197	-3.92904
Ecuador	0.06570	0.24776	-0.09170	-1.95351
El Salvador	0.04441	0.20601	-0.03412	-0.67538
Guatemala	0.03303	0.17872	0.00304	0.05652
Honduras	0.04019	0.19641	-0.02700	-0.52251
Mexico	0.07781	0.26788	-0.09690	-2.11655
Nicaragua	0.05579	0.22952	-0.13128	-2.71309
Panama	0.04808	0.21394	-0.08922	-1.79931
Paraguay	0.07543	0.26408	-0.07292	-1.58570
Peru	0.06772	0.25126	-0.09549	-2.04298
Uruguay	0.04056	0.19726	-0.13180	-2.54872
Venezuela	0.06331	0.24353	-0.20952	-4.43382
Level of Education of the Parents	6.49899	5.04009	-0.11121	-28.76931
Standard of Living Group to Which the Individual Belongs	5.51312	2.87078	-0.17247	-42.00170
Interaction Between the Parents' Education and the Individual's Standard of Living	43.30299	45.49301	0.02359	44.92718

R-Square: 0.34200 Adjusted R-Square: 0.33958
F-value for the regression: 141.06 Number of observations: 5449

which the individual belongs, the educational level of his/her parents (up to 17 educational levels, depending on the country), the standard of living group to which the individual belongs (10 groups) and an interaction term between the educational level of the parents and the income (standard of living) group of the individual. It is easy to verify, for example, that in the lowest income group the predicted (logarithm of the) ratio of actual over expected cases is much lower for the highest than the lowest educational level. On the contrary for the highest income group we observe that the predicted (logarithm of the) ratio of actual over expected cases is, as expected, much higher for the highest than the lowest educational level. A simpler illustration where only three educational levels (up to 6 years of education, 7 to 12 years and more than 12 years) and three income (standard of living groups) are distinguished (two lowest deciles, third to eighth decile, two highest deciles) is given in Table C-1 in Appendix C and there it is easy to see that low levels of education of the parents are overrepresented in the lowest income group and underrepresented in the highest income group. Conversely high levels of education of the parents are underrepresented in the low income group and overrepresented in the high income group.

8. Concluding Comments

This paper attempted to look at the intergenerational transmission of life chances in Latin America. It proposed to study this question on the basis of a cardinal approach. Such a cardinal approach suggested using measures of social immobility and of inequality in circumstances that have appeared lately in the literature (Theil and Gini type of indices).

The empirical illustration was based on the data of the 2006 Latinobarómetro survey which covers 18 Latin American countries and provides information on the durable goods owned by the individuals (the "children") and the facilities they have access to. Using the idea of order of acquisition of durable goods this information was then used to derive, at the individual level, a latent variable measuring the standard of living. The distribution of this latent variable together with information provided by the Latinobarómetro survey on the level of education of the parents allowed us deriving social immobility indices and indices measuring the inequality in circumstances.

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Appendix A: List of Educational Levels (Parents of Respondent)

1: without education
2: 1 year of education
3: 2 years of education
4: 3 years of education
5: 4 years of education
6: 5 years of education
7: 6 years of education
8: 7 years of education
9: 8 years of education
10: 9 years of education
11: 10 years of education
12: 11 years v
13: 12 years of education
14: High school/academies/incomplete technical training
15: High school/academies/complete technical training
16: Incomplete University
17: Completed University

Appendix B

Table B-1: Weighted Sum of the Pseudo-Gini Indices for all income groups and countries (based on Cross Tables of Deciles of Standard of Living Scores by Level of Education of Parents).

(in descending order)

Guatemala	0.000480
Dominican Republic	0.000443
Ecuador	0.000314
Peru	0.000307
Panama	0.000266
Costa Rica	0.000245
Brazil	0.000230
Nicaragua	0.000213
Uruguay	0.000211
El Salvador	0.000209
Colombia	0.000194
Venezuela	0.000194
Mexico	0.000178
Paraguay	0.000171
Argentina	0.000161
Bolivia	0.000156
Honduras	0.000098
Chile	0.000080

Appendix C

Table C-1: Regression Results where the dependent variable is the logarithm of the ratio of the actual over the expected number of cases in the cell to which an individual belongs (assuming only three levels of education for the parents and three standard of living groups for the individual)

	Mean	Standard Deviation	Regression Coefficient	t-value
Dependent Variable	0.10022	0.40078		
constant			0.28986	19.13210
Argentina	0.06739	0.25069	0.01259	0.73739
Bolivia	0.04303	0.20293	0.03419	1.84738
Brazil	0.06501	0.24654	0.00891	0.52057
Colombia	0.05072	0.21943	0.00210	0.11733
Costa Rica	0.05493	0.22785	0.00336	0.19034
Chile	0.07636	0.26557	0.01492	0.88977
Ecuador	0.06592	0.24815	0.02636	1.54158
El Salvador	0.04431	0.20579	0.02166	1.17735
Guatemala	0.03296	0.17853	0.03252	1.65234
Honduras	0.04010	0.19620	0.04737	2.51207
Mexico	0.07764	0.26761	0.00934	0.55861
Nicaragua	0.05585	0.22963	0.03114	1.76576
Panama	0.04798	0.21372	0.01321	0.73110
Paraguay	0.07581	0.26469	0.02074	1.23574
Peru	0.06775	0.25132	0.01404	0.82340
Uruguay	0.04084	0.19791	0.01618	0.86592
Venezuela	0.06318	0.24328	0.00212	0.12359
Middle Level of Education (of the Parents)	0.22835	0.41977	-1.00785	-52.09479
High Level of Education (of the Parents)	0.10035	0.30046	-2.09435	-25.70529
Middle Standard of Living Group (of the Individual)	0.60026	0.48985	-0.26778	-38.48449
High Standard of Living Group (of the Individual)	0.20234	0.40175	-0.87726	-81.53773

Interaction Term Between Middle Level of Education and Middle Standard of Living Group	0.13862	0.34555	0.99569	48.59923
Interaction Term Between Middle Level of Education and High Standard of Living Group	0.07123	0.25721	2.07429	89.99006
Interaction Term Between High Level of Education and Middle Standard of Living Group	0.04267	0.20210	1.76904	21.47484
Interaction Term Between High Level of Education and High Standard of Living Group	0.05677	0.23140	3.72123	45.05068

R-Square: 0.79618
F-value for the regression: 849.21

Adjusted R-Square: 0.79524
Number of observations: 5461