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Income and Beyond: Multidimensional Poverty in Six Latin American Countries

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Abstract This paper studies multidimensional poverty for Argentina, Brazil, Chile, El Salvador, Mexico and Uruguay for the period 1992–2006. The approach overcomes the limitations of the two traditional methods of poverty analysis in Latin America

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(income-based and unmet basic needs) by combining income with five other dimensions: school attendance for children, education of the household head, sanitation, water and shelter. The results allow a fuller understanding of the evolution of poverty in the selected countries. Over the study period, El Salvador, Brazil, Mexico and Chile experienced significant reductions in multidimensional poverty. In contrast, in urban Uruguay there was a small reduction in multidimensional poverty, while in urban Argentina the estimates did not change significantly. El Salvador, Brazil and Mexico, and rural areas of Chile display significantly higher and more simultaneous deprivations than urban areas of Argentina, Chile and Uruguay. In all countries, deprivation in access to proper sanitation and education of the household head are the highest contributors to overall multidimensional poverty.

Keywords Multidimensional poverty measurement · Counting approach · Latin America · Unsatisfied basic needs · Rural and urban areas

1 Introduction

This study contributes to the longstanding literature on poverty analysis in Latin America. This literature is mostly based on either the Unsatisfied Basic Needs (UBN) approach or on income poverty. The former approach was promoted in the region by the United Nation's Economic Commission for Latin America and the Caribbean (ECLAC) and used extensively since the beginning of the 1980s (Feres and Mancero, 2001).[1] The latter was spurred by the development of calorie consumption-based national poverty lines derived from consumption and expenditure surveys (Altimir 1982). These two approaches have a series of advantages and disadvantages that differentiate them. The UBN approach aggregates a set of disparate indicators of living standard such as construction material of the dwelling, number of people per room, access to sanitary services, and the level of education and economic capacity of household members (generally the household head), while the income approach has the advantage of dealing with a homogeneous indicator (although this entails a large number of decisions and assumptions along its computation). However, both share the same crudeness in the aggregation methodology when reporting headcount ratios.

This study provides an analysis of poverty which combines the strengths of the two traditions—the relevance of the underlying dimensions—by means of a more sophisticated approach: income and other indicators are combined based on sound principles of distributive analysis. This document not only contributes to a fuller understanding of the characteristics of poverty in the region, but its results are also relevant to creating the targeting tools that effective social programmes require.[2]

The existing studies on multidimensional poverty in Latin America that go beyond the Unsatisfied Basic Need approach are few and are all country specific. Amarante et al. (2010) analyse the evolution of poverty in Montevideo, Uruguay, between 2004 and 2006 using three alternative methodologies: Bourguignon and Chakravarty (2003), the fuzzy sets approach (Lemmi and Betti 2006; Chiappero Martinetti 2000) and the stochastic dominance

[1] The approach was also implemented by the World Bank in other developing regions of the world since 1978 (Streeten et al. 1981).

[2] Indeed, a growing number of social policy initiatives in Latin America are based on multidimensional indicators—for instance, for the identification of beneficiaries of the Progresa/Oportunidades conditional cash transfer program in Mexico and in the SISBEN targeting system in Colombia.

approach (Duclos et al. 2006). The authors find that all methods agree that multidimensional poverty has decreased, with the exception of stochastic dominance when income is excluded from the set of dimensions of well-being. Also on Uruguay, Arim and Vigorito (2007) compare the evolution of income poverty among households with children between 1991 and 2005 with that of multidimensional poverty using the Bourguignon and Chakravarty (2003) family of indices. They find that the evolution of multidimensional poverty over time is smoother than that of income poverty, as the first one includes less volatile indicators. Finally, the Bourguignon and Chakravarty family of indices is also employed in a study on Argentina for the period around the last financial crisis. Conconi and Ham (2007) compute multidimensional poverty measurements between 1998 and 2002 using four dimensions: dwelling, education, employment and income. The authors find that the increased deprivation in the last two dimensions is behind the rising trend in poverty in the study period.

A number of other studies propose alternative measures of multidimensional poverty to study Latin American countries. Paes de Barros et al. (2006) suggest using a weighted average of dichotomous indicators of deprivations as a multidimensional poverty measure for Brazil. They apply the measure to the national periodic household survey, including 48 indicators associated with six poverty dimensions. The authors find a monotonic decreasing trend in multidimensional poverty between 1993 and 2003. Calvo (2008) proposes a measure of vulnerability to multidimensional poverty and exemplifies it using Peruvian data. Ballon and Krishnakumar (2008) develop a multidimensional capability deprivation index based on structural equation modeling. The 'freedom to choose' in each capability domain is modeled as a latent variable, partially observed by a set of indicators and explained by a set of exogenous variables. The model is applied to a household survey dataset for Bolivia in 2002, focusing on two capability domains of children: knowledge and living conditions. The authors find a strong interdependence between the two studied dimensions. López-Calva and Rodríguez-Chamussy (2005) and López-Calva and Ortiz-Juárez (2009) have also adopted a multidimensional approach to studying poverty in Mexico. They estimate the magnitude of the 'exclusion error' in targeting programmes when a monetary measure is adopted instead of a multidimensional one. They find a large variability in the exclusion error depending on the selected criterion to identify the multidimensionally poor (union vs. intersection, explained in the next section). The Mercosur Human Development Report 2009–2010 developed a multidimensional poverty index for young people (15–29 years old) for the four Mercosur's countries, implementing the Alkire and Foster methodology (PNUD 2009). Finally, since 2004, the Programa Observatorio de la Deuda Social Argentina (Pontificia Universidad Catolica Argentina) implements a survey which collects information on housing conditions, health and subsistence and computes a composite indicator of deprivation constructed using principal components analysis.

The present paper analyses the evolution of multidimensional poverty in six Latin American countries (Argentina, Brazil, Chile, El Salvador, Mexico and Uruguay). The contribution of this study is twofold. First, we make over-time and cross-country poverty comparisons using two existing multidimensional measures—those of Bourguignon and Chakravarty (BC) (2003) and the Unsatisfied Basic Needs index (UBN)—and a new multidimensional poverty index proposed by Alkire and Foster (AF) (2007, 2011), built in the spirit of the capability approach. Second, we use a unique dataset based on comparable data sources and indicators for the six countries. This allows the comparisons of the evolution of poverty across countries. The analysis and evidence presented contribute to the documentation of the diversity of experiences in terms of poverty reduction in the countries and period under study—Argentina, Brazil, Chile, El Salvador, Mexico and Uruguay from the early 1990s to the mid- 2000s.

All the poverty measures used in this paper (UBN, BC and AF measures) have been presented in the Introduction to this special issue (Alkire and Santos 2013). Thus, the rest of the paper is organised as follows. Section 2 presents the dataset, the selected dimensions and indicators, as well as the thresholds and weights employed in the analysis. Section 3 discusses the empirical results, and Sect. 4 provides some concluding remarks.

2 Datasets, Dimensions, Poverty Lines and Weights

2.1 Dataset

The dataset used in this paper corresponds to the *Socioeconomic Database for Latin America and the Caribbean* (SEDLAC), constructed by the Centro de Estudios Distributivos Laborales y Sociales (CEDLAS) and the World Bank (CEDLAS and World Bank 2009). The dataset comprises household surveys of different Latin American countries which have been homogenised to make variables comparable across countries—the details of this process are covered in CEDLAS (2009). The present research concentrates on a subset of the available database to maximize the possibilities for comparison across time and between countries. The study covers Argentina, Brazil, Chile and Uruguay, El Salvador and Mexico. Altogether, they account for about 64 % of the total population in Latin America in 2006.

The paper performs estimates at five points in time between 1992 and 2006 for each country. In the case of Argentina and Uruguay, the data are representative of urban areas only.[3] In the other four countries data are nationally representative, including information from both urban and rural areas. In each country data corresponds to six point observations between 1991 and 2006; in most cases the years coincide across countries. Full details of survey names, sample sizes and precise estimation years can be found in Table 2 in the Appendix. The definition of 'rural areas' by the surveys performed in each of these four countries is fairly similar.[4] In each country, only households with complete information on all variables and consistent answers on income were considered.

2.2 Dimensions and Indicators

The selection of dimensions and indicators constitutes a crucial step in the process of defining a multidimensional poverty measure, and there has been significant discussion on the best procedures to follow (Alkire 2002, 2008, Alkire and Santos 2009 for a summary). In this paper we do not intend to prescribe a list of indicators that should constitute a multidimensional poverty measure for Latin America. The aim is much more modest in

[3] Both Argentina and Uruguay are highly urbanized countries, with an urban population share of 87 and 92 % correspondingly. In the case of Argentina, the survey currently covers about 61 % of the total population in the country. However, over the years, the survey has progressively incorporated urban areas. For comparability reasons we work with the 15 urban agglomerations that were included since 1992. These urban areas represent 45.7 % of the total country population. The survey in Uruguay covers about 80 % of the total country population.

[4] In Chile it corresponds to localities of less than 1,000 people or with 1,000–2,000 people, of which most perform primary activities. In Mexico it refers to localities of less than 2,500 people. In Brazil, rural areas are not defined according to population size but rather they are all those not defined as urban agglomerations by the Brazilian Institute of Geography and Statistics. In El Salvador, rural areas are all those outside the limits of municipalities heads, which are populated centres where the administration of the municipality is located. Again, this definition does not refer to any particular population size.

that respect: we intend to look at the evolution and current state of indicators that have *traditionally* constituted measures of poverty in the region and put them together in better aggregate measures. Yet, the tradition for using these indicators has well-founded reasons.

In the mid- 1970s a new approach to development issues started to gain consensus: the basic needs approach. *The Declaration of Cocoyoc* (1974) presented by two United Nations bodies (UNCTAD and UNEP)[5] was echoed by the 1976 International Labour Organisation's World Employment Conference *Meeting Basic Needs: Strategies for Eradicating Mass Poverty and Unemployment* (ILO 1976) and the 1976 Report of the Dag Hammarskjöld Foundation, *What Now: Another Development*. The approach was also supported within the Latin America region by the Bariloche Project's *Catastrophe or New Society?* (Herrera et al. 1976). All these reports, books and declarations pointed to the need for prioritizing the satisfaction of the basic human needs in the development agenda. In 1978, the World Bank started to foster this approach, promoting a series of country studies. The approach constituted a powerful and important idea that shifted the attention of the development thinking away from growth and its assumed 'trickle downs' to removing mass deprivation.

Although it was recognised that it was not possible to reach complete agreement on the list of basic needs, a few were consistently mentioned: '… some needs are common to the poor in most countries—these include food and nutrition, health services, education, water, sanitation and shelter. These are basic human needs in large part because they contribute to two fundamental aspects of human life—health and education' (Stewart 1980). In order to monitor progress, ECLAC adopted this approach to measure poverty, which became known as the Unsatisfied Basic Needs or the 'direct' method to measure poverty, as opposed to the 'indirect method', based on household income. The UBN method was implemented using census data. The level of disaggregation of census data allowed the construction of poverty maps.[6] However, some compromises had to be made in terms of the indicators to be considered. In particular, censuses do not typically incorporate indicators of health such as nutrition or mortality. Thus, this had to be proxied by access to water and sanitation, which were in the indicators of basic needs themselves. Such approximation is actually incomplete, yet at least it captures part of the health threats. There is ample evidence on the positive impact that safe water and improved sanitation have on reducing the prevalence of a number of diseases, some of which are direct causes of child mortality.[7]

We draw from the tradition of the UBN approach and its gained consensus and use five indicators typically included there. However, it has been long argued that both the direct and the indirect methods capture partial aspects of poverty (Feres and Mancero 2001; Boltvinik 1990), that both the income dimension as well as the UBN indicators are relevant for assessing well-being, and that there are significant errors in targeting the poor (either of inclusion or exclusion) when only one of them is used.[8] Thus, given the availability of the

[5] UNCTAD is the United Nations Conference on Trade and Development, and UNEP is the United Nations Environment Programme.

[6] For most countries in the region there are UBN estimates with the 1980, 1990 and 2000 censuses.

[7] For example, water, sanitation, and hygiene interventions reduce diarrhoeal disease on average by between one-quarter and one-third. According to the WHO, diarrhoea causes 2.2 million deaths every year mostly among children under the age of five. Safe water is estimated to reduce the median infection rate of trachoma by 25 %. It has also been found that well designed water and sanitation interventions reduce by 77 % the median infection rate of schistosomiasis. Finally, cholera can also be prevented with access to safe drinking water (WHO and UNICEF 2000).

[8] Cruces and Gasparini (2008) illustrate these inclusion and exclusion effects by studying the targeting of cash transfer programs based on a combination of income and other UBN-related indicators.

Table 1 Selected indicators, deprivation cut-off values and weights

Indicator	Deprivation cut-off value	Weights	
		Equal weights	Voices-of-the-poor weights
Income	Having a per capita family income of PPP $2.15	1	2.4
Child in school	Having all children between 7 and 15 attending school	1	1.8
Education of HH	Household head with at least 5 years of education	1	0.6
Running water	Having tap water in the dwelling	1	0.6
Sanitation	Having flush toilet or pit latrine in the dwelling	1	0.3
Shelter	House with non-precarious wall materials	1	0.3

income indicator in household surveys, we incorporate it in our measurement, as a complement of the others, constituting what can be seen as a *hybrid method*.[9]

Table 1 presents the indicators selected to perform the poverty estimates. For income, the World Bank's poverty line of PPP $2.15 per capita per day was selected. It is acknowledged that this is a rather conservative poverty line for Latin America, but it guarantees full comparability across countries.[10] Children's education is another indicator considered, requiring all children between 7 and 15 years old (inclusive) to be attending school. This indicator belongs to the UBN approach. Households with no children are considered non-deprived in this indicator.[11] A third indicator refers to the educational level of the household head, with the threshold set at 5 years of education. Again this indicator is part of the UBN approach, although in that approach the required threshold is the second grade of primary school and it is usually part of a composite indicator together with the dependency index of the household (considered to be deprived if there are four or more people per employed member). Two years of education seemed a very low threshold, so 5 years were used instead. Also, given that the income indicator is being included, the high dependency index seemed less relevant in this hybrid approach. Additionally, it is worth noting that the education of the household head is a stock variable; it is very unlikely to change in the short run. The other three indicators used relate to the dwelling's conditions and are also UBN indicators: having proper sanitation (flush toilet or pit latrine), living in a shelter with non-precarious wall materials and having access to running water in the dwelling.

[9] This 'hybrid method' can be criticized for potential double-counting, arguing that dimensions that may have been considered in the basic consumption basket used to determine the poverty line are included again as a separate indicator. However, in this dataset, the Spearman correlations between income and the other different indicators are relatively low (not exceeding 0.5 in any case) and decrease over time, suggesting that a multidimensional approach does indeed incorporate new elements to poverty analysis. Table A.2 in the Appendix reports these correlations.

[10] Note that the $2.15 per capita per day line was usually referred as $2 per day line and was set as twice the value of the so called $1 per day line (actually 1993 PPP $1.08).This poverty line is prior to the latest revision by the World Bank (Ravallion et al. 2009), which replaced the 1993 PPP $1.08 a day line with the 2005 PPP $1.25 a day line, and the 1993 PPP $2.15 a day line with the 2005 PPP $2.00 a day line. For further details on this change, see World Bank (2008).

[11] Note that this is also the approach taken in the Multidimensional Poverty Index developed by Alkire and Santos (2010) for the 2010 Human Development Report.

It is worth recognising that the six considered indicators are less than perfect. They are all indicators of *access* to resources but provide no guarantee that the person actually enjoys good nutrition and education for example. Sen's capability approach—developed later than the basic needs approach—argues the importance of considering the person's *functionings*—that is—the actual abilities she has to pursue the life she values and has reason to value (Sen 1992, 1999). 'To understand that the *means* of satisfactory human living are not themselves the *ends* of good living helps to bring about a significant extension of the reach of the evaluative exercise' (Sen 2009, p. 234). Moreover, Sen argues that the list of *capabilities* (defined as the set of functionings) to be included in such evaluative exercises should be developed through participatory processes and public reasoning (Sen 2009). Unfortunately, we are limited by the data in including indicators of functionings, but we consider that these ideas should guide future developments in the design of household surveys.

Within the restrictions imposed by the data, it is interesting to note that the hybrid approach allows depicting a richer portrait of poverty. In the spirit of the cross-tabulation of the UBN and the income method proposed by Beccaria and Minujin (1985) and Kaztman (1989), Table 3 in the Appendix presents the percentage of population with different numbers of UBN for individuals who are deprived in income and for those who are non-deprived in income. The figures correspond to the last year in the sample in each country (for rural and urban areas, separately). The overlap between the two types of poverty measures (income-based and UBN deprivation) is only partial. For instance, in the rural areas of El Salvador, Brazil and Mexico nearly all individuals who are income deprived are also deprived in at least one additional indicator. However, it is also the case in these areas that 60 % or more of those not deprived in income, experience two or more UBN. Also, in the urban areas of Argentina, Uruguay and Chile most of the income deprived are solely deprived in that dimension (40, 50 and 60 % correspondingly). This evidence reinforces the case for combining income-based and other measures of deprivation.

2.3 Weights

The weighting of indicators also constitutes a challenge when constructing a multidimensional poverty measure since they reflect the relative value of the different considered dimensions.[12] Both statistical and normative weights have been used in the literature. Normative weights have the advantage of being more transparent and allowing comparisons over time. When discussing the selection and aggregation of social indicators for Europe, Atkinson et al. (2002) have argued in favour of a balanced portfolio of indicators across different dimensions and of proportionate weights across indicators.

In this paper two alternative weighting systems are used. The first scheme weights each indicator equally. However, it can be argued that in the set of selected indicators, more than one indicator is associated with the same dimension. For example, water, sanitation and shelter can be associated with a dwelling's characteristics and the other two indicators (children attending school and the education of the household head) refer to the dimension of education of the household.[13] Therefore, the equal weights are implicitly weighting the

[12] On the meaning of dimension weights in multidimensional indices of well-being and deprivation and alternative approaches to setting them, see Decancq and Lugo (2012).

[13] Note however that the distinction is not clear. As argued above, sanitation and water can be understood as proxies for health, belonging to a different dimension.

dwelling conditions three times, and the education dimension twice, compared to the income dimension.

The second weighting structure is derived from a replica of a participatory study on the voices of the poor carried out by Mexico's Secretaría de Desarrollo Social (Székely 2003). In this study the poor were asked about their valuation of different dimensions. The number and variety of dimensions included in the questionnaire exceeds those considered here; however, its results are useful for producing a ranking of the six indicators. This weight structure (last column in Table 1) gives the income dimension the highest weight—a weight which is 1.3 times the weight assigned to children's education, four times the weight placed on the education of the household head and access to running water, and eight times the weight assigned to access to sanitation and proper shelter. These sets of weights will be referred to in what follows as voices of the poor weights (VP weights). This weighting system is in line with Sen's capability approach in that it aims at weighting indicators according to what the poor value. However, in this particular case it has some limitations. Because the study was restricted to Mexico, this ranking should not be interpreted as necessarily representing the poor's values in the six countries under study. Also, a different cardinalisation of these weights would have emerged if we had considered some of the other dimensions included in the study. Despite these shortcomings, we understand that the VP weights offer a valuable and interesting alternative to quantify multidimensional poverty in the region in this study.

Three of the indicators are cardinal variables (income, proportion of children in the household not attending school and years of education of the household head) and three are dichotomous (having running water in the household, having proper sanitation and living in a house with non-precarious materials). If a person falls short in one of the dichotomous indicators, her poverty gap in this indicator will be equal to one, provided she has been identified as multidimensionally poor. This implies that for measures such as M_1, M_2 and the BC measures, deprivation in dichotomous indicators will generally have *by definition* a higher impact than deprivation in cardinal ones. Also, for pairs of dichotomous indicators, the substitutability or complementarity relationship does not apply. Therefore, using dichotomous information in measures that require cardinal data is not completely satisfactory; their difference with respect to M_0 as well as their changes over time will be dominated by the variations in the cardinal variables. Still, we present these results to obtain a rough sense of the depth and distribution of the deprivation in these dimensions. It is also worth noting that when VP weights are used, the two variables that receive the highest weights (income and children in school) are continuous, shifting weight from dichotomous to cardinal variables, which lessens some of the problems mentioned above.

3 Empirical Results[14]

3.1 Deprivation Rates by Indicator

Figure 1 presents the deprivation rates for each indicator in each country and year, in rural and urban areas, except for Argentina and Uruguay where the rates correspond only to urban areas. Despite being a crude poverty measure, the headcount ratio for each indicator provides a preliminary picture of deprivation in the region. It is possible to distinguish two

[14] All estimates were bootstrapped using 200 replications. Detailed and complete estimates of all measures, all k cut-offs and weights, as well as their confidence intervals, are available upon request to the authors.

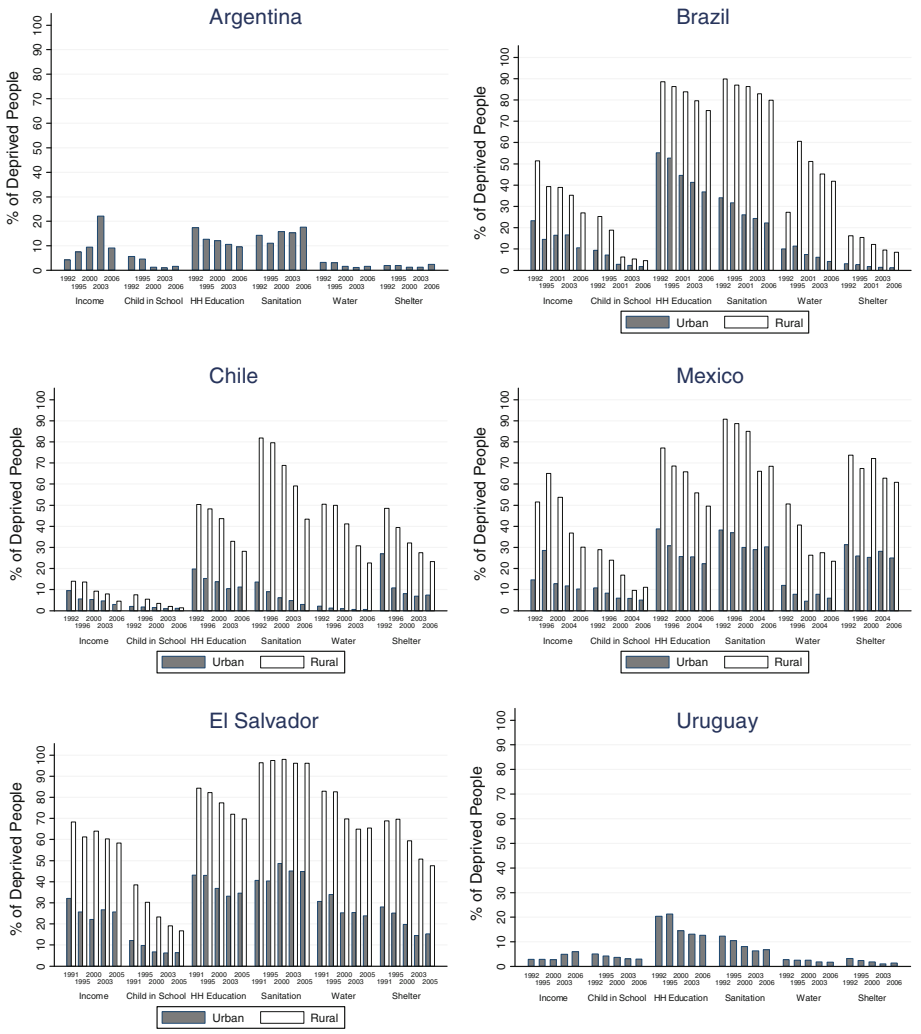


Fig. 1 Deprivation rates by indicator rural and urban areas, 1992–2006

groups: the urban and rural areas of El Salvador, Mexico and Brazil together with the rural areas of Chile, and the urban areas of the southern cone countries—Argentina, Chile and Uruguay. The first group of countries and regions exhibit much higher deprivation rates than those in the second group. In particular, El Salvador is the country with the highest levels of deprivation in all indicators. The deprivation rates in this country are high, not only relative to those of other countries, but also from an absolute point of view: in five out of the six indicators, the rural areas of the country presented deprivation rates of 50 % or higher in 2006. Deprivation headcount ratios in rural areas of El Salvador are followed by those of the rural areas of Brazil, Mexico and Chile, and then by the urban areas of El Salvador, Brazil and Mexico. Deprivation rates in the urban areas of Argentina, Chile and Uruguay are, for each indicator, well below those in the aforementioned regions. It is also worth noting the disparities within countries between urban and rural areas: deprivation

rates in rural areas are at least double urban deprivation rates. In Chile the difference is particularly marked, as if each of these areas—rural and urban—belonged to a different country.

Comparing across indicators, three interesting features emerge. First, the indicators with the highest headcount ratios for all countries refer to deprivations in the level of education of the household head and sanitation. In the rural areas of El Salvador, Brazil and Mexico 70, 75 and 50 % of the population, respectively, lived in a household where the household head had less than 5 years of education in 2006 and 96, 80 and 68 %, respectively, lived in a household without access to proper sanitation facilities. Comparable deprivation rates in respective urban areas and in rural areas of Chile are between 22 and 45 %, whereas in the urban areas of Argentina, Chile and Uruguay they do not exceed 17 %. Second, in all countries, income deprivation lies in the middle of the rankings of deprivations, though rates vary significantly across countries (between 58 % in rural El Salvador to 3 % in urban Chile). Finally, a somewhat encouraging feature is that, although deprivation in the education level of the household head is one of the most prevalent deprivations in all countries, the percentage of families with at least one child not attending school is among the lowest deprivation rates.

Temporal trends are also encouraging. In almost all cases, deprivation rates declined between 1992 and 2006 and in many cases they were halved. The few exceptions are Uruguay, where income poverty steadily increased throughout the period, and Argentina, where raw headcount ratios in income, sanitation and shelter are somewhat higher in 2006 than 15 years before.

3.2 Multidimensional Poverty: The Multidimensional H and the M_0 Measure

The Multidimensional Headcount Ratio H and the Adjusted Headcount Ratio M_0 measures were estimated for $k = 1, \ldots 6$, using the two weighting structures detailed above. This section focuses on the most relevant points that can be derived from these results.

Figure 2 presents the Multidimensional Headcount Ratio (a) and Adjusted Headcount Ratio (b) for the different k values using equal weights in 1992 and 2006. The H measure is used by the UBN approach and indicates the percentage of people deprived in one or more

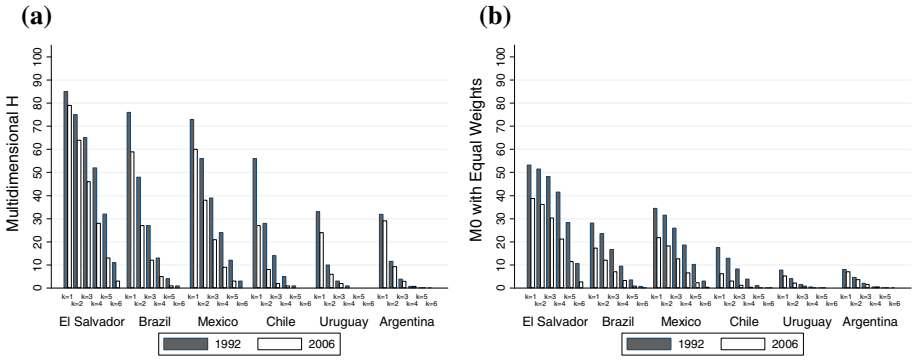


Fig. 2 Multidimensional poverty for different k values and equal weights 1992 and 2006. **a** Multidimensional Headcount Ratio H. **b** Adjusted Headcount Ratio M_0. *Note*: Estimates in Uruguay and Argentina correspond only to urban areas

dimensions ($k = 1$), two or more ($k = 2$), and so on. In the figure, countries are sorted according to their deprivation in 1992 when $k = 1$.

Among the countries for which data are available for both urban and rural areas, El Salvador is the poorest country, followed by Brazil, Mexico and then Chile. For $k = 1$, Brazil has a higher H than Mexico in 1992, and about the same in 2006, but for higher k values, Mexico has much higher H. This suggests that deprivations in Mexico are more coupled than in Brazil: if one person fails to achieve an adequate level in a given indicator, it is more likely that she will also fall short in another indicator in Mexico than in Brazil.

Between 1992 and 2006, all countries reduced their multidimensional headcount ratios for all k values. Most impressively, Chile halved its headcount ratios for all k values whereas El Salvador, Mexico and Brazil achieved this sort of reduction for higher k values ($k \geq 4$). In urban Argentina, the reduction in the multidimensional headcount ratio was very mild and indicates that losses in some dimensions (such as income, shelter and sanitation) are being compensated by gains in others (such as education and water).

Using the adjusted headcount ratio M_0, a measure sensitive to the breadth of poverty shown in (b) of Fig. 2, the differences between El Salvador and the rest of the countries for which urban and rural data are available become sharper. Not only does it exhibit the highest multidimensional poverty levels, but it is also well above the estimates for the other countries, doubling or more the next highest estimate for all k values. Also, once the multidimensional headcount ratio is adjusted it becomes more evident that Mexico is worse off than Brazil; the average number of deprivations experienced by the poor in Mexico is higher relative to Brazil. In El Salvador, Mexico, Brazil and Chile, the declines in M_0 are larger in relative terms than those in H, most notably for lower values of k. The interpretation of this is that not only are fewer deprived people at the end of the period but also that those who are deprived experience fewer deprivations on average. In urban Uruguay, the reduction of M_0 was very small and virtually nil for urban Argentina. All in all, this is a promising picture in terms of poverty for the countries considered and complements the declining trend in inequality documented by Gasparini et al. (2008) for most countries in Latin America over the same period.

Figure 3 presents the most recent estimate of M_0 using equal weights in (a) and using VP weights in (b), distinguishing between urban and rural estimates. Not surprisingly, the rural estimates are at least twice the urban values in all cases. One particularly important point to note from this figure is that in the urban areas of Argentina, Chile and Uruguay, with both equal and VP weights, the M_0 estimate becomes virtually zero (<5 %) with

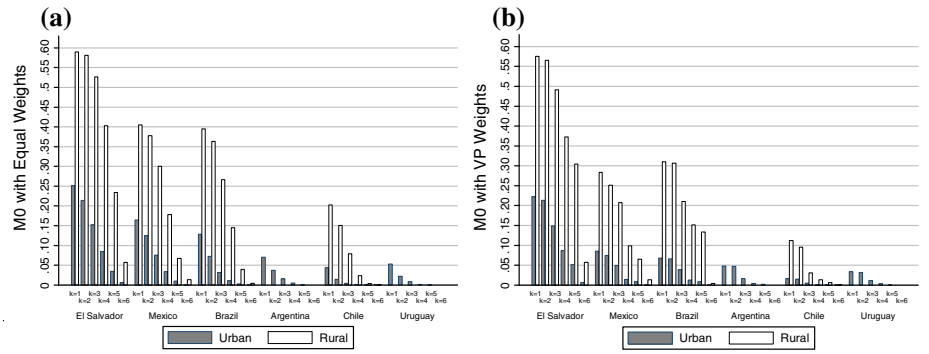


Fig. 3 M_0 Measure for different k values in 2006 urban versus rural areas. **a** Equal weights. **b** VP weights

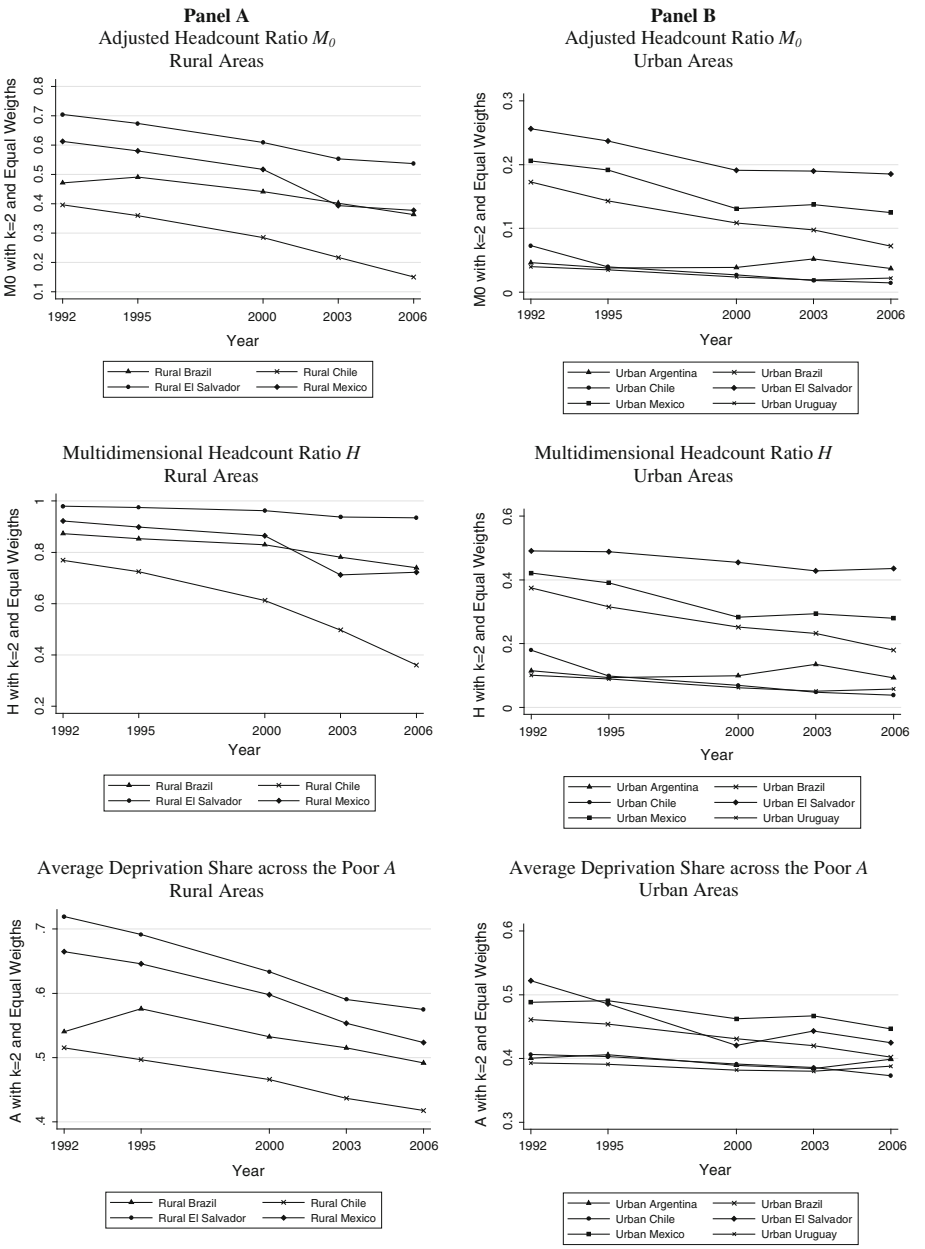
$k \geq 2$. This is a consequence of a small fraction of the urban population being deprived in two or more dimensions simultaneously and a relatively low average deprivation share among the poor.[15] However, this is not the case for the rural areas of Chile and both the urban and rural areas of Brazil, El Salvador and Mexico. For these countries and regions, the M_0 estimates become closer to zero only with much higher k values. Note, for example, that in the rural areas of El Salvador and Mexico, the M_0 estimates using equal weights become close or below 5 % only with the intersection approach at the identification step ($k = 6$). This suggests a pattern in terms of coupled or simultaneous versus single deprivations in the analysed countries. In Brazil, Mexico, El Salvador and in the rural areas of Chile, if someone is deprived in one indicator, she is likely to be deprived in several other indicators at the same time; however, if she lived in the urban areas of Argentina, Chile or Uruguay, she is likely to be deprived only in that single indicator. Moreover, within Brazil, El Salvador and Mexico, coupled deprivations are more likely in rural areas than in urban ones.

Finally, comparing the two weighting schemes, for lower values of k the M_0 estimates using the VP weights tend to be smaller than those using equal weights. This is to be expected, because, for smaller values of k, the requirement to be counted as poor is generally more demanding for a given k than with equal weighting—unless the person is deprived in the highest weighted dimensions (income and children in school), which is less likely as these are among the lowest deprivation counts.[16] Assuming the participatory study from which these weights were derived is representative of the poor in Latin America, the estimates suggest that when dimensions are weighted according to the value ranking the poor assign, multidimensional poverty is lower. They care more about having enough income and having their children in school, dimensions which have relatively lower deprivation rates, than having access to sanitation and a household head with 5 or more year of education, dimensions which have relatively higher deprivation rates.

As explained in the Introduction to this special issue, the M_0 measure is the product of two informative measures: the multidimensional headcount ratio H and the average deprivation share across the poor A. The evolution of M_0 together with its two components H and A over the study period is presented in Fig. 4 for the case of $k = 2$ and equal weights. Figure 4 panel A refers to rural areas of Brazil, Chile, El Salvador and Mexico, while panel B refers to urban areas of these countries together with Argentina and Uruguay. $k = 2$ is chosen because it is the minimum k that requires an individual to be deprived in more than one indicator in order to be considered poor (i.e., it is 'truly' *multidimensional*) and at the same time it is meaningful for all countries (for higher k values the aggregate M_0 estimate becomes virtually zero in the urban areas of Chile, Argentina and Uruguay). This figure shows clearly the different patterns of evolution of multidimensional poverty in rural and urban areas of the six countries. For example, in both the urban and rural areas of Brazil, Chile, El Salvador and Mexico, the reduction in

[15] Indeed, with equal weights for example, the multidimensional headcount ratio with k = 2 in 2006 is 10 % in Argentina, 8 % in Chile and 6 % in Uruguay, whereas the average deprivation share is about 0.38 in the three countries (2.3 indicators). This can be verified in panel (a) of Fig. 2.

[16] For example, when VP weights are used and the cut-off is $k = 1$, someone living in a household deprived either in income or having children who do not go to school would be considered poor. However, someone with a household head with a low level of education and without access to sanitation would not be identified as poor, since the sum of weights is lower than one.



Note: It is worth emphasizing that the Adjusted Headcount Ratio M_0 (top graph of each panel) is the product of the Multidimensional Headcount H (middle graph of each panel) and the Average Deprivation Share across the poor A (bottom graph of each panel).

Fig. 4 Evolution over time of M_0 and its components with $k = 2$ and equal weights

M_0 is the result both of reductions in the percentage of people deprived in two or more dimensions (H), as well as of the fact that, on average, they became poor in fewer dimensions (A). However, the proportional reductions in each of the components of M_0 differs among countries and regions.

One advantage of the M_0 measure over the UBN Index and BC measures is that it can be broken down into the contributions of deprivation in each dimension to overall poverty. Santos et al. (2010) provide a detailed description of the results of such decomposition for the case of $k = 2$. For this paper it is worth emphasizing that in all countries deprivation in access to proper sanitation and in the years of education of the household head are the highest contributors to overall multidimensional poverty –about a third each. Income deprivation increased its contribution over time in Argentina and Uruguay, and it is also a significant contributor in Brazil, while in Mexico and Chile, deprivation in shelter is

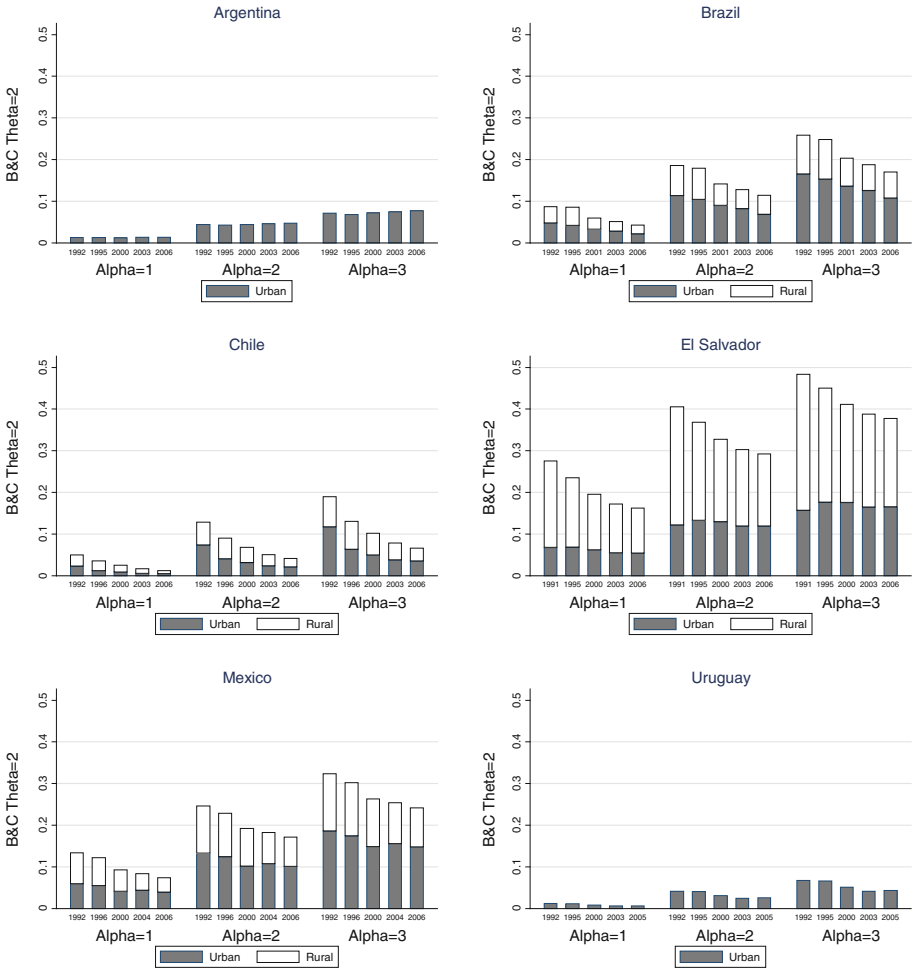


Fig. 5 Evolution of BC estimates with $\theta = 2$, $\alpha = 1, 2, 3$ and equal weights urban and rural contributions

another significant contributor. What seems encouraging is that deprivation in children attending school is among the lowest contributors in all countries, which results from the high enrolment rates observed in the region. This may imply that future generations will enjoy better educated household heads. These results are consistent with the raw headcount ratios by indicator analyzed in Sect. 2.1.

3.3 Multidimensional Poverty: BC Family of Measures

Figure 5 presents the BC estimates for each country and each year, with $\theta = 2$ and equal weights. It also contains the contribution of urban and rural areas to the overall estimate. The first group of bars corresponds to the combination of ($\theta = 2$, $\alpha = 1$), meaning that dimensions are considered substitutes, the second group of bars corresponds to the case of ($\theta = 2$, $\alpha = 2$), which is the M_2 measure of AF with $k = 1$, and dimensions are considered independent, and finally the third group of bars corresponds to the case of ($\theta = 2$, $\alpha = 3$), with dimensions considered as complements. In all the figures, results correspond to the equal weights case.[17] For a given value of θ, the estimates of poverty are higher as α increases, as the lower elasticity of substitution, the higher the weight given in the aggregation to larger gaps.

BC indices with $\theta = 1$ and $\theta = 3$, with equal and VP weights were also estimated. Results do not differ from those emphasized here. The main finding is that for each country over time and across countries, the same pattern is found across the different values of θ and α, which is in turn coincident to the one found with the M_0 measure. For all combinations of parameters among countries with information on both urban and rural areas, El Salvador, Mexico and Brazil are the countries with the highest levels of multidimensional poverty, while Chile is the lowest. In terms of evolution over time, El Salvador, Mexico, Brazil and Chile experienced important decreases in the levels of multidimensional poverty for all combinations of parameters. Urban Uruguay experienced a small reduction in multidimensional poverty, which was already at low levels at the beginning of the period, while urban Argentina's estimates remained stable over the study period. The importance of the results with the BC measures lies in the fact that they imply that both the reduction of multidimensional poverty found in Brazil, Chile, El Salvador, Mexico and urban Uruguay, as well as the stagnation found in urban Argentina are robust to the values of the parameters regarding poverty aversion; in those countries where there was poverty reduction, this was not only in terms of incidence but also in depth and severity (for the cardinal indicators). Moreover, the results are robust to alternative assumptions regarding the substitutability, complementarity or independent relationship between the cardinal indicators.

Independent of the measure used, rural areas have higher poverty than urban ones. However, it is worth noting that the BC measures allow analysing the change in the ratio of rural to urban poverty in each country as one alters the balance between the aversion to multidimensional poverty and aversion to dimension-specific poverty by varying the values

[17] Note that the BC indices with $\theta = 0$ coincide with the multidimensional headcount ratio for $k = 1$ already reported in Fig. 3. When VP weights are used, the estimates with each combination of (θ, α) are lower. This is because weight is shifted from the dichotomous variables to the two continuous variables that receive the highest weights (income and children in school), which are not the ones with the highest deprivation rates.

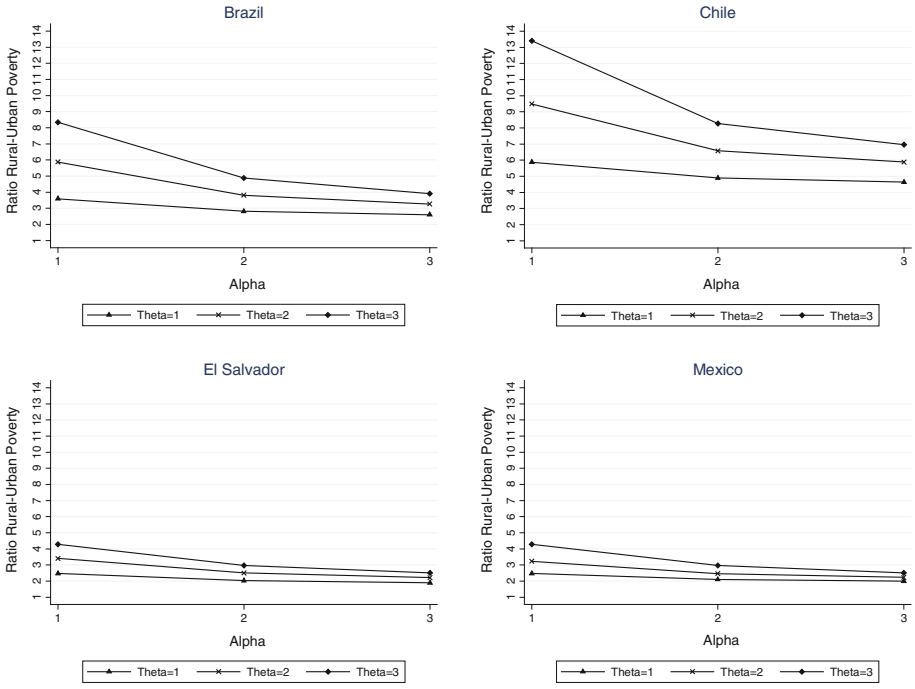


Fig. 6 Ratio of rural poverty to urban poverty BC estimates with $\alpha = 1, 2, 3$, $\theta = 1, 2, 3$ and equal weights, 2006

of the two parameters θ and α. A higher value of θ gives a higher weight to the multidimensionally poorest individuals whereas a higher value of α gives a higher weight to the biggest gaps. In Fig. 6, it can be seen that for a given value of θ, the ratio of rural to urban poverty is decreasing in α whereas for a given value of α, it is increasing in θ. These results suggest that more people in rural areas suffer from *coupled or simultaneous deprivations*, so that as θ is increased, they receive a higher weight and the difference with poverty in urban areas increases more and more. While people in urban areas experience fewer simultaneous deprivations than in rural areas, they suffer from poverty gaps at least as big as those in rural areas. When the poorest gaps receive an increasing weight as α increases, the difference between poverty in rural and urban areas is reduced. Therefore, the magnitude of the rural–urban gap depends upon the judgement on the two types of aversion to poverty.

4 Concluding Remarks

This paper provides an in-depth study of multidimensional poverty in Argentina, Brazil, Chile, El Salvador, Mexico and Uruguay for the period 1992–2006. A hybrid approach is used for the selected dimensions. They include the widely used income dimension (using the PPP $2.15 per day poverty line), together with five indicators typically considered in the Unsatisfied Basic Needs Approach: education of the household head (at least 5 years of education), children

attending school, access to improved sanitation, shelter with adequate wall materials, and access to running water (the latter is used as the best available proxy for health).

A broad set of measures is estimated, ranging from simple raw headcount ratios by indicator and the multidimensional headcount ratio with different deprivation cut-offs (as typically used by the UBN approach), to more sophisticated ones which correspond to two multidimensional versions of the Foster-Greer-Thorbecke class of poverty indices. One of these extensions corresponds to Alkire and Foster (2007, 2011) which, by assuming that dimensions are independent, allows the measure to be broken down into the contributions of each dimension (once identification has been applied). The other extension corresponds to Bourguignon and Chakravarty (2003), which allows for interrelationships between the dimensions. All estimations were performed for two alternative weighting systems: one in which each indicator receives the same weight, and another derived from a participatory study performed in Mexico, where the income and children in school indicators receive the highest weights (VP weights).

The data available for Brazil, Chile, El Salvador and Mexico allows urban areas to be distinguished from rural areas. Among these four countries, El Salvador is the poorest, followed by Mexico and Brazil, while Chile is the least multidimensionally poor. The possibility to distinguish between areas allows the huge disparities within countries to be identified, to the point that rural areas of Chile can be grouped together with El Salvador, Mexico and Brazil in terms of their poverty estimates and the degree of simultaneous deprivations, while the urban areas of Chile have poverty levels similar to those of urban Argentina and Uruguay. In El Salvador, Mexico and Brazil, higher poverty and more simultaneous disadvantages are found in the rural areas as compared to the urban ones.

Over the study period, El Salvador, Brazil, Mexico and Chile experienced significant reductions of multidimensional poverty independently of the measure considered. This is a robust result and suggests that in these countries there was a decrease in the incidence, as well as in the depth and severity, of multidimensional poverty. An analysis of the components of M_0 also showed that the average number of deprivations among those multidimensionally deprived decreased in the four countries over the study period. In contrast, in urban Uruguay there was a small reduction in multidimensional poverty, while in urban Argentina the estimates did not change significantly. Also contrasting with the other four countries, both Uruguay and Argentina experienced an important increase in income poverty between 1992 and 2006. However, because of the reduction of deprivation in other dimensions, this worsening did not translate to an increase in multidimensional poverty. When VP weights are used, the estimates for all countries tend to be lower, because the two dimensions that have the highest weight (income and children in school) are not those that show the highest levels of deprivation. These weights do not significantly change the conclusions regarding cross-country and over-time comparisons.

These robust results contribute to the discussion of the diversity of experiences in terms of poverty reduction in the region over the period under study. The years between the early 1990s and the mid- 2000s were especially eventful in Latin America, with a series of structural market-oriented reforms, the effects of the increasing internationalization and openness of its economies, episodes of growth and some severe macroeconomic crises. The evidence summarized in the previous paragraph both complements and reflects these circumstances and trends. The fall in most non-income measures of deprivation over the whole period indicates a relatively positive outlook, since more structural facets of poverty seem to have a declining secular trend. Moreover, this trend is especially strong in rural

areas, which have exhibited higher degrees of deprivation over time in the region. The differences between country-specific trends are also informative: Chile experienced substantial economic growth over this period, and this is reflected in the downward tendency of all (income and non-income) measures of deprivation. The results also highlight the economic growth and the vast social programmes implemented in Brazil and Mexico over the period. Finally, the evidence for Argentina and Uruguay indicates that non-income measures of deprivation might improve despite mixed trajectories in terms of income poverty.

This paper opens several lines of debate in terms of policy implications and measures to monitor poverty in the region. In terms of the measures to monitor poverty, the paper places renewed attention on the fact that neither the income nor the UBN measures alone are satisfactory. The evolution of income poverty is sensitive to changes in the flow variable which reacts quickly to crisis situations. On the other hand, the UBN indicators reflect more structural conditions of poverty, such as access to basic services, housing and education. These change more slowly, reflecting lagged effects of policies implemented in the past. Integrating both types of indicators into a single measure seems relevant and useful. However, a thorough discussion of the dimensions and indicators to include in a multidimensional poverty measure is needed in the region. Such a discussion is required to move beyond what data currently offers and to determine whether it is necessary to collect different indicators, ones that—as suggested by the capability approach—capture actual functionings rather than mere means to them. A further point is the aggregation methodology to be used when combining such indicators into a multidimensional poverty measure. Whenever the considered indicators include ordinal variables, which is the most frequent case, it is advisable to use a measure that is not based on gaps. In such a context, the adjusted headcount ratio M_0 is recommended, as it combines the multidimensional headcount ratio with the average share of deprivations that the poor experience—making it sensitive to the intensity of poverty.

In terms of policy implications, the paper also refocuses the rural–urban discussion. Many Latin American countries are now highly urbanised, and this has concentrated resources for poverty reduction into urban areas. However, our results indicate that poverty is more acute in rural areas. This calls for policies tailored to these particular regions.

The overall picture from these six Latin American countries seems encouraging, with a decreasing trend in aggregate multidimensional poverty and in deprivation in the underlying dimensions over the 1990s and the first half of the 2000s. On the other hand, the international financial crisis of 2007–2008 and the ensuing fall in prices of commodities exported by countries in the region might hamper the declining trends in both poverty and inequality in the near future.

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Appendix

See Tables 2, 3, 4.

Table 2 Sample size for each country and year, rural and urban areas

Country	Household survey	Year	Sample size (people)	
			Urban	Rural
Argentina[a]	Encuesta Permanente de Hogares (EPH)	1992	59,528	NA
		1995	62,372	NA
		2000	43,255	NA
		2003	29,075	NA
	Encuesta Permanente de Hogares Continua (EPH-C)	2006	45,676	NA
Brazil	Pesquisa Nacional por Amostra de Domicilios (PNAD)	1992	244,473	55,544
		1995	266,287	57,859
		2001	316,860	52,753
		2003	322,839	53,932
		2006	337,509	65,372
Chile	Encuesta de Caracterizacion Socioeconomica Nacional (CASEN)	1992	86,179	46,698
		1996	94,925	32,500
		2000	142,029	89,441
		2003	150,156	80,411
		2005	153,234	86,058
El Salvador	Encuesta de Hogares de Propositos Multiples (EHPM)	1991	49,243	39,235
		1995	20,989	18,009
		2000	40,940	29,843
		2003	35,622	35,708
		2005	34,127	35,517
Mexico	Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH)	1992	27,913	20,265
		1996	39,974	21,840
		2000	26,402	13,989
		2004	68,016	21,907
		2006	58,760	23,140
Uruguay	Encuesta Continua de Hogares (ECH)	1992	28,658	NA
		1995	64,177	NA
		2000	51,913	NA
		2003	54,750	NA
		2005	53,738	NA

[a] For the sake of comparability over time, the samples used correspond to the same 15 urban agglomerations

Table 3 Distribution of the population by number of unmet basic needs and income deprivation status rural and urban areas, 2006

	Urban								Rural							
	% Sample	No of UBN							% Sample	No of UBN						
		[0]	[1]	[2]	[3]	[4]	[5]	Total		[0]	[1]	[2]	[3]	[4]	[5]	Total
Argentina																
Income deprived	9.1	39.6	36.7	17.0	6.1	0.6	0.0	100	–	–	–	–	–	–	–	–
Income non-deprived	90.9	78.0	17.9	3.4	0.7	0.0	0.0	100	–	–	–	–	–	–	–	–
Brasil																
Income deprived	10.6	28.7	35.6	23.8	9.4	2.3	0.2	100	27.0	2.1	11.5	25.1	44.9	14.8	1.5	100
Income non-deprived	89.4	53.9	34.4	9.6	1.8	0.3	0.0	100	73.0	10.2	24.7	35.7	24.1	5.1	0.3	100
Chile																
Income deprived	3.0	60.3	28.3	7.5	3.2	0.6	0.0	100	4.5	17.5	25.6	29.1	18.7	8.3	0.8	100
Income non-deprived	97.0	80.9	16.3	2.4	0.3	0.1	0.0	100	95.5	34.5	31.6	21.5	10.2	2.2	0.0	100
Uruguay[a]																
Income deprived	6.0	49.8	29.5	18.0	2.8	0.0	0.0	100	–	–	–	–	–	–	–	–
Income non-deprived	94.0	80.8	16.3	2.5	0.4	0.0	0.0	100	–	–	–	–	–	–	–	–
Mexico																
Income deprived	10.3	17.3	21.5	28.1	22.8	9.7	0.7	100	30.1	3.0	11.5	25.4	35.5	20.2	4.4	100
Income non-deprived	89.7	54.2	24.1	14.2	6.1	1.3	0.1	100	69.9	16.7	21.7	28.5	24.0	8.5	0.6	100
El Salvador[a]																
Income deprived	25.6	14.9	21.1	27.3	22.1	12.1	2.5	100	58.4	0.3	3.9	20.5	30.9	34.5	9.8	100
Income non-deprived	74.4	46.0	24.7	17.6	8.8	2.5	0.3	100	41.6	3.5	11.8	34.0	30.7	17.6	2.4	100

[a] For these countries, the estimated values correspond to the year 2005

Table 4 Spearman rank correlation coefficient between dimensions 1992 and 2006

Country	Dimension	Income		Child school		Educ. HH		Water		Sanitation	
		1992	2006	1992	2006	1992	2006	1992	2006	1992	2006
Argentina	Income	1	1								
	Child School	0.19	0.21	1	1						
	Educ. HH	0.37	0.41	0.03	0.05	1	1				
	Water	0.16	0.09	0.05	0.02	0.14	0.06	1	1		
	Sanitation	0.27	0.31	0.06	0.10	0.23	0.24	0.39	0.25	1	1
	Shelter	0.12	0.16	*0.01*	0.02	0.10	0.12	0.11	0.14	0.20	0.23
Brazil	Income	1	1								
	Child School	0.22	0.19	1	1						
	Educ. HH	0.43	0.39	0.13	0.05	1	1				
	Water	0.29	0.25	0.10	0.07	0.26	0.27	1	1		
	Sanitation	0.39	0.30	0.13	0.07	0.39	0.32	0.33	0.38	1	1
	Shelter	0.18	0.13	0.07	0.03	0.18	0.12	0.23	0.24	0.21	0.15
Chile	Income	1	1								
	Child School	0.17	0.15	1	1						
	Educ. HH	0.20	0.29	0.02	−0.04	1	1				
	Water	0.16	0.07	0.06	*0*	0.30	0.19	1	1		
	Sanitation	0.28	0.20	0.05	0.01	0.37	0.28	0.56	0.47	1	1
	Shelter	0.18	0.12	0.02	−0.01	0.18	0.16	0.25	0.14	0.31	0.28
El Salvador*	Income	1	1								
	Child School	0.23	0.21	1	1						
	Educ. HH	0.41	0.40	0.17	0.10	1	1				
	Water	0.40	0.31	0.19	0.09	0.41	0.24	1	1		
	Sanitation	0.46	0.41	0.18	0.11	0.47	0.41	0.67	0.46	1	1
	Shelter	0.35	0.30	0.13	0.09	0.33	0.28	0.38	0.30	0.45	0.35

Table 4 continued

Country	Dimension	Income		Child school		Educ. HH		Water		Sanitation	
		1992	2006	1992	2006	1992	2006	1992	2006	1992	2006
Mexico	Income	1	1								
	Child School	0.21	0.15	1	1						
	Educ. HH	0.46	0.50	0.16	0.08	1	1				
	Water	0.30	0.24	0.09	0.06	0.26	0.22	1	1		
	Sanitation	0.44	0.47	0.14	0.11	0.44	0.43	0.45	0.37	1	1
	Shelter	0.34	0.36	0.11	0.07	0.35	0.37	0.35	0.31	0.48	0.49
Uruguay*	Income	1	1								
	Child School	0.22	0.23	1	1						
	Educ. HH	0.31	0.41	−0.02	0	1	1				
	Water	0.13	0.09	0.03	0.01	0.05	0.07	1	1		
	Sanitation	0.35	0.27	0.10	0.08	0.21	0.18	0.27	0.25	1	1
	Shelter	0.10	0.06	*0.01*	*−0.01*	0.06	0.04	*0*	*0*	0.13	0.04

[a] For these countries, the estimated correlations reported in the column titled '2006' actually correspond to the year 2005. Also, for El Salvador, the estimates reported in the column titled '1992', actually correspond to the year 1991. Correlations refer to the entire sampled population in each country and not merely the poor. All correlations are significant at the 5 % level (most at the 1 % level) except for those marked in italics

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