Universidad del Desarrollo
Facultad de Gobierno

Documento de Trabajo
N°24

"Chronic Multidimensional Poverty or Multidimensional Chronic Deprivation"

Mauricio Apablaza
Facultad de Gobierno
Universidad del Desarrollo
Las Condes, Chile

Julio de 2013
Facultad de Gobierno

Abstract

Literature has recognized the limitations of income as the sole indicator of the quality of life. At the same time, there is an increasing demand from policy makers for better welfare and poverty measures for social policy design and evaluation. In this context, the measurement of poverty using multidimensional indicators emerges as a complementary tool to existing measures including other dimensions of welfare such as education, employment and health.

Following the capabilities approach of Amartya Sen, the Alkire and Foster methodology proposes a robust and popular framework for multidimensional poverty measurement. The methodology is already implemented as the official poverty measures in Mexico and Colombia.

The present work aims to contribute to the national discussion on the development of a multidimensional poverty indicator, exploring the evolution of an indicator of this type in Chile from 1990 to 2009.

1. Introduction

There is increasing conscious about the limitations of income (and GDP) as a measure of quality of life, development and social progress. Researches from different fields have coincided that "additional information might be required for the production of more relevant indicators of social progress" (Stiglitz, Amartya Sen, & Fitoussi, 2009, pag. 3) arguing that without a proper and trustable set of indicators "those attempting to guide the economy and our societies are like pilots trying to steering a course without a reliable compass" (page. 9).

Poverty is crucial to determine the quality of life not only for those who are suffering deprivation but also because it undermines the welfare of the entire society. The welfarist tradition defines poverty according the command (possession and consumption) that a single indicator (income or expenditure) provides over a predefined set of commodities considered as a minimum. Only in recent year, there is an increasing international consensus about the multidimensional nature of wellbeing and subsequently, poverty (Anand & Sen, 2004; Atkinson, 2003a).

The modern multidimensional understanding of poverty finds its theoretical roots in the capabilities approach. Sen (1985) suggest that the welfarist approach fails to understand the human poverty since it focuses its attention only on means and not ends. The author argues that despite the relevance of the possession or command over a set of set of satisfactory "ultimately, the focus has to be on what we can or cannot do, can or cannot be" (page. 16).

Additionally and in practical terms, the multidimensional approach has found support in the fails of the unidimensional ones based on income. Inclusion of more variables seems to complement the income approach in several areas: [1] extending the poverty analysis to non-monetary areas (especially for those dimensions less correlated with income); [2] considering imperfect markets in developing countries where purchasing power does not imply the ability to satisfy a need; and, [3] helping the decision making of policy makers specially in the short term.

Despite that "poverty is being increasingly recognized as an inherently multidimensional phenomenon" (Santos, Lugo, López-Calva, Cruces, & Battistón, 2010) and scholars have recognized the limitations on income as a measure of poverty and wellbeing: mainly as a weak predictor of minimum standards (Millennium Development Goals) satisfaction, and, subsequently, human rights (Atkinson, 2003a; Bourguignon & Chakravarty, 2003; Duclos & Araar, 2006); only in the last years this requirement to understand poverty from a multidimensional approach have guided "the search for an adequate indicator of human poverty" (Anand & Sen 1997 in (Alkire & Santos, 2010)). Despite that multidimensional indicators are well known in the literature, its applications to poverty are more recent. Only during the last decade new aggregated indicators have tried to deal with the challenge; firstly, proposing composite indicators (Human poverty index), and then, implementing axiomatic measures like the Alkire and Foster family.

Nevertheless, it is the seminal work of (Atkinson, 2003b) and (Bourguignon & Chakravarty, 2003) that revolt the multidimensional poverty measurement. The former breaking the "composite" tradition of the multidimensional measures introducing the counting approach; and the later, as a first attempt of multidimensional measure following the desirable conditions (axioms) of a poverty measure defined by Sen back in 1976. Following these outlooks, the Alkire and Foster family of measures is highlighted as a new paradigm in the multidimensional measurement due to it intuitive methodology and interpretation following the unidimensional FTG indexes. The (Alkire & Foster, 2010a) procedure allows the inclusion of cardinal and ordinal variables in the same aggregated indicator[1]. And at the same time, it is able to account for the relationships and overlaps generating information about the joint distribution between poverty and each indicator. And differently from previous multidimensional indicators, it allows for dimensions and subgroup decomposition.

---

[1] As suggested by Stiglitz, Sen, Fitoussi commission in 2009: Material living standards, Health, Education, Personal activities, Political voice, Social connections and relationships, Environment, Economic &

This "elegant formulation of the problem by Alkire and Foster" (Ravallion, 2010a) has increased its popularity of the measure among scholars and policy makers not only for its technical benefits but also based on its straightforward interpretation and analyses for public policies. Among others, the chance to distinguish the poorest among the poor (required for targeting policies) and to decompose by dimension or subgroup.

However, the new multidimensional methodologies have been under a strong criticism, especially after the (United Nations Development Programme, 2010) that includes a multidimensional poverty index for 104 countries based on the Alkire and Foster work. Among other, the set of normative measures required and its implications for the comparison between dimensions of poverty and countries has been raised as one of the most questionable aspects (Ravallion, 2010a, 2010b). However, values and subjective decisions were required to include extremely heterogeneous countries[2] since in this case and to some extend, "poverty, like beauty, lies in the eye of the beholder" (Orshansky, 1969; Ver Ploeg & Citro, 2008). In practical terms, (Alkire & Foster, 2010b, 2011; Alkire & Santos, 2010; Alkire, Santos, Seth, & Yalonetzky, 2010), show the robustness of the general results relaxing the set of normative decisions.

This essay will present a short literature review of the multidimensional poverty measurement with a focus on their applications to Latin America. Subsequently, I will compute multidimensional poverty measures to nine repeated cross-sectional Chilean household surveys (1990-2009) where the decomposition, proposed by Apablaza and Yalonettzky (2012) is implemented[3].

2. Multidimensional Measurement in Latin America

The multidimensional approach is not new in economics; there is an extensive number of studies using aggregated multidimensional indicators (Bandura, 2008) generally based on composite indicators. In Latin-America the first attempt was based on the basic needs approach and in the construction of poverty maps since late seventies (Chile, 1975) and form early eighties the methodology was supported and promoted by the United Nation's Economic Commission for Latin America and the Caribbean (ECLAC) (Feres & Mancero, 2001).

Using census information, a set of basic need was selected and defined according to the data availability and then aggregated using the union approach. Since indicators were based on census information; results were extremely disaggregated and obtained for a low cost (no extra surveys required) and headcounts were commonly represented geographically to identify and generate information for governmental decisions.

---

[2] (Sen, 1979b, 1980) suggests that the poverty measurement does not require a set of strong assumptions or normative decision, since these can be obtained according to each society. However, international comparisons require assumption in the selection of dimensions and their relevance.

[3] The results for the cross-sectional surveys were obtained in parallel with another group of researchers in Chile affiliated to the Universidad Alberto Hurtado. However, despite that in both cases the Alkire and Foster methodology is implemented, differences in the construction and interpretation of the index are highlighted.

However, distance between censuses (10 years); bias in the geographic aggregation, heterogeneity of the population inside of each area and insensibility to recent poverty generated issues about the utility of the measures and the possible public policy lessons (Feres & Mancero, 2001).

(Boltvinik, 1990) suggest a new measure combining the information of income poverty and the unsatisfied needs denominated integrated method of poverty, being one of the first empirical attempts to use the intersection approach in the identification. The author describes 4 types of individual or households: [1] non-poor; [2] transitory poverty: income poor but no in terms of basic needs; [3] structural poverty: unsatisfied basic need but non-income poor), [4] chronic poverty: poor in terms of income and basic needs. Some examples of this method can be found in Argentina, Uruguay y Mexico (Beccaria & Minujin, 1985; Cortés, 1997; Kaztman, 1989) reflecting of the constant concern of Latin American scholars in multidimensional measurement (Boltvinik, 1990, 2001; Boltvinik & Laos, 2000; Hernandez, 2001).

Despite the interest, only in 2004, there is a serious attempt to introduce multidimensional indicators in the poverty measurement under the Capabilities framework[4]. In Mexico, after a transversal process of discussion, a new General Law of Social Development (LGS) commanded the development of a multidimensional poverty measure. The law established the creation of a new institution (CONEVAL) in charge of the calculation of the new measure using a set of dimensions defined by the same law. After 3 years, the commission decided to use the (Alkire & Foster, 2010a) methodology, becoming the first official attempt to develop a multidimensional measure not only in Latin America, but also in the world. The official measure includes the following dimensions: [1] Income per capita; [2] education lag; [3] Access to health services; [4] Access to social security; [5] Quality and living spaces; [6] Access to basic services in housing; [7] Access to food; and, [8] Degree of social cohesion.

In parallel, scholars all around Latin America were implementing the advances in the field to their countries and, in some cases, to the governmental requirements. During the last years, the empirical literature has mainly followed 4 different methodologies: [1] Integrated method; [2] subjective poverty; [3] Synthetic Indexes[5] ; [4] Fuzzy sets; and, [5] axiomatic indexes. The following table presents a summary of the most important empirical works in Latin America covering fuzzy set [F], synthetic [S] and axiomatic indexes [A]:

---

[4] In parallel, scholars have used the capability approach in different areas in Latin America. Among others, in Costa Rica (Deneulin, 2005) analyses welfare using the Sen approach and, in Brazil, (Bourguignon, Ferreira, & Menendez, 2007) evaluate inequality of opportunities and income (Nunez & Tartakowsky, 2007) replicate the methodology for Chile). Using Mexican census data (2000), (Foster, López-Calva, & Miguel Szekely, 2005) evaluate the distribution of the Human Development Index (HDI) in Mexico.
[5] Mainly based on principal component analyses and simultaneous latent variables.

Table 1: Multidimensional Measurement in Latin America

Country	Author	Short Description
Argentina	Programa Observatorio de la Deuda Social Argentina[6]	[S] Index of deprivation on **housing conditions, health and subsistence**, aggregated using principal component.
Brazil[7]	(Barros, Carvalho, & Franco, 2006)	[A] Index of multidimensional poverty and average deprivation by family from Chakravarty, Mukherjee & Ranade (1998) using **vulnerability education, employment, income, child protection and housing conditions**.
	(D'Ambrosio & Rodrigues, 2008)	[S] Indexes of non-income deprivation (**Housing conditions, education, employment and income**) and perceptions in the São Paulo Districts concluding that neighborhood heterogeneity (polarization) affects negatively levels of deprivation.
Bolivia	(Krishnakumar & Ballon, 2008)	[S] Model with simultaneous latent variable based on the capability deprivation of children in two dimensions: **education (knowledge) and living conditions**. Authors report a intuitively reasonable strong interdependence between dimensions.
Colombia	(Robles & Vélez, 2008)	[A] Self-reported well-being is compared with an index of multidimensional poverty that includes the following dimensions: **security-violence, income-poverty, and education**.
Mexico	(López-Calva & Chamuss, 2005)	[A] Analysis of the "exclusion error" in targeting when a monetary measure is adopted instead of a multidimensional one including **education, child labor, housing conditions, basic assets and access to social security as dimensions**.
	(M. A. Morales Ramos	[F] Application of the fuzzy set approach for

[6] Serial publications from the "Programa Observatorio de la Deuda Social Argentina" of the "Pontificia Universidad Católica Argentina" since 2004. See more details at
http://www.uca.edu.ar/index.php/site/index/es/universidad/investigacion/programa-observatorio-de-la-deuda-social-argentina/publicaciones/informes/

[7] Several other scholars have tried to analyze Latin-American poverty from a multidimensional perspective but excluded from this list for the approach that they are covering. For instance, (Lopes, Macedo, & Machado, 2003) develop a composite indicator including income, infrastructure (access to public goods), education and employment for Brazil. In Guatemala (Berumen, 2004) calculates a composite index (Physical Quality of Life Index) using child mortality, life expectation & analphabetism and census data of 2002. More recently and using variations of the integrated method, (Kageyama & Hoffmann, 2006) measure poverty using housing conditions and (López-Calva & Ortiz Juárez, 2009) with a set of basic need (Education, Health, Housing conditions, Violence, Economic Shocks and other characteristics) to compare union vs. intersection approach.

& E. Morales Ramos, 2008)[8] (Berenger, Villarreal, & F Celestini, 2009)	multidimensional poverty using **education, housing conditions and income**. [F] Estimate level of multidimensional poverty using the fuzzy set methodology developed by (Berenger & Franck Celestini, 2006) including **durable goods, other property, housing conditions, income**.

Only few papers have attempted to evaluate the evolution of multidimensional poverty in Latin America; this works are mainly based on the exploration of changes between repeated cross sectional surveys. (Conconi & Ham, 2007) present results for Argentina (1998-2002) implementing factor analysis for the identification of each dimension and the (Bourguignon & Chakravarty, 2003) family of measures for the aggregation. They calculate a relative measure of poverty based on the median deprivation in 4 dimensions: education, income, labour and shelter's quality represented by 9 indicators (see Table 1: Dimensions & Indicators). The results expressed only as headcount ratios shows and increase in the level of multidimensional poverty apparently leaded by the increase in labour an income deprivation[9].

In 2007, (Arim & Vigorito, 2007) evaluates the levels of multidimensional poverty using Uruguayan household data (1991-2005), the (Bourguignon & Chakravarty, 2003) family of indexes and considering education, housing conditions and access to resources as dimensions. Since the main goal of the study is to compare the influence of monetary and non-monetary variables on children welfare, they only comment on general patterns of poverty evolution. The authors conclude that income indicators are more volatile representing short run changes (economic crises and changes in the pension system in this case).

(Ruano, Canibal, & Prado, 2009) evaluates multidimensional poverty between 1995 and 2005 in Honduras. Using, principal component analyses, the authors obtain 16 indicators (from 40 initial) grouped in 4 dimensions (Demographic Characteristics, Human Capital Achievements, Dwelling's Quality and Income level). The orthogonal indicators are obtained using a final list of 16 indicators (see Table 1: Dimensions & Indicators) and these results are aggregated in a weighted measure according the relevance of each dimension on the total variance. Then the national population is divided in quartiles and classified by region in: Extreme Poverty, Moderate Poverty, Relative Poverty and non-poverty. The authors evaluate regional changes concluding that there is a consistent reduction in extreme poverty and they identify basic services, education, employment and health access as the key variables to reduce poverty.

---

[8] Lopez, Vallejo & Fonseca (2009) extend the fuzzy set analyses for rural areas.

[9] Since income & labor deprivation are increasing and education & shelter's quality are decreasing, authors can conclude the higher relevance of the two first dimensions. However, they are not able to explain further changes.

Finally, (Santos et al., 2010) compare unsatisfied basic needs and multidimensional approaches in six Latin American countries (Argentina, Brazil, Chile, El Salvador, Mexico and Uruguay). The authors implement the (Bourguignon & Chakravarty, 2003) and (Alkire & Foster, 2010a) measures between for cross sectional survey in the period 1992-2006. Results reflect a heterogeneous behaviour, the majority of countries have reduced importantly their levels of multidimensional poverty (El Salvador, Brazil, Mexico and Chile), however in the rest was less important and insignificant (Uruguay and Argentina, respectively). However, across countries there is a significant reduction in the average level of deprivation or multidimensional poverty intensity. Similarly to previous studies, authors suggest that short run changes of income were counteract by the stability of the other indicators. The following table summarizes dimension and indicators used by the previous scholars to obtain multidimensional measures and subsequently describe evolution of poverty.

Table 2: Selection of Dimensions & Indicators in relevant previous literature

Dimension	Indicators	(Ruano et al., 2009)	(Conconi & Ham, 2007)	(Arim & Vigorito, 2007)	(Santos et al., 2010)
Demographic	Demographic Dependency	+			
	Life Expectancy	+			
	PGB per capita	+			
Education	Access to Education	+			+
	Analphabetism		+		
	Schooling	+	+	+	+
Employment	Employment Category	+	+		
	Job Formality		+		
	Rate of Dependency	+			
	Working Hours	+			
Health	Access to Health	+			
	Nutrition	+			
Housing	Floor Quality	+	+		
	Roof Quality		+		
	Walls Quality	+	+		+
Income	Income	+[10]	+	+	+
Living Standards	Access to water	+	+		+
	Electricity		+		
	Overcrowding	+		+	
	Set Of assets			+	
	Toilet Quality		+		+

---

[10] Divided by first and second job.

From the publication of the international multidimensional poverty index (MPI) (United Nations Development Programme, 2010), studies on multidimensional poverty are increasing all around the world. However, mainly due to data limitations, dynamics of poverty through panel data are still in an incipient stage. To our knowledge only the works of (Amarante, Arim, & Vigorito, 2008) and (D'Ambrosio, Deutsch, & Silber, 2011) have used panel information to describe multidimensional poverty[11].

Using child panel data (Ururguay 2004-2006), (Amarante et al., 2008) compare Bourguignon & Chakravarty (2003) indices, the fuzzy sets approach, and the stochastic dominance approach by Duclos, Sahn, & Younger (2006). The authors include only one variable for each one of the following dimensions: Health (z scores of height for age); Participation (No member of the household participates in at least one activity); Education (Educational attainment of household adults); Housing (Overcrowding); and, Income Per capita. Results are consistent among the different methodologies especially when income is included: the number of poor decreases leaded for a reduction in the deprivation of the social participation dimension. Additionally, the authors suggest that multidimensional indexes have smoother changes than income due to the inclusion of less volatile indicators.

Using data from European Community Household Panel (Belgium, France, Germany, Italy and Spain), (D'Ambrosio et al., 2011) compare levels of absolute poverty and similarities of identification by two multidimensional approaches: fuzzy set and axiomatic[12]. The dimensions considered were income, financial situation[13], quality of accommodation[14], ownership of durables[15], health[16], social relations and satisfaction. They estimate logit regressions to test 5 types of explanatory variables (size of the household, age of the head of the household, her gender, marital status and status at work). Among their findings, there is a U-shaped relationship between poverty and the size of the household and the age of the individual. Unemployment seems to be correlated with poverty; however, the probability to be poor is higher among paid workers than self-employed. Married (males and females) have a lower probability to be poor, but is extremely sensitive to the country and the approach. Additionally, they decompose (Shapley) their results to determine the exact marginal impact of each of the categories of explanatory variables. The authors find consistent result (across countries

---

[11] Additionally, (L. M. Asselin & Anh, 2009) and (Bouillon & Yanez-Pagans, 2011) present works with panel data but with different purposes and approaches. The First one present composite index for Vietnam and the latter, analyze targeting policies using a multidimensional identification versus a income based strategy.

[12] The authors also include a third approach: information theory. However, we did not include this in our revision since it uses relative measures to define poverty.

[13] Including minimum resources: to make ends meet / to afford a week's annual holiday away from home / to buy new clothes / to afford meat, chicken or fish every second day / to pay last 12 months' rent, mortgage or utility bills

[14] Including: having baths or shower / overcrowding levels / quality of the walls, floor and foundations.

[15] Car or van for private use, colour TV, telephone

[16] Individual's perception and level of hampered by any physical or mental health problem, illness or disability

and measures) that marital status and employment condition have the greatest marginal impact on poverty.

In the following empirical sections a new decomposition technique for repeated cross sectional and panel data will be implemented using Chilean data between 1990 and 2009 extending the work of (Santos et al., 2010). Finally, complementing the work of (Amarante et al., 2008; D'Ambrosio et al., 2011) the evolution of multidimensional poverty will be analysed (and compared with income poverty) using Chilean panel data (1996-2006).

3. From unidimensional to multidimensional poverty

Traditional public economics literature suggests that "social utility is usually postulated as a function of the ordinals described personal utility levels attained by each of the individual members of the society" where a welfare's increase implies that least one individual raised his own utility while none is reduced (Leontief, 1976). This approach to understand social welfare is denominates by (Sen, 1979a) as Pareto-inclusive welfarism. However, the author criticizes this approach due to [1] the imposition of general consensus (ordinarily and interpersonal comparisons); [2] the exclusion of non-utility information (values) even with rich information available; and, [3] the impossibility of comparison with a focus in exclusion and the poor (Sen, 1979a). From this criticism emerges a new understanding of social welfare, usually denominated non-welfarism or more recently (from health economist) extra-welfarism.

The welfarist approach assumes that individuals are independent and rational maximazers of their own happiness (Ravallion, 2008). Consequently, societies will try to maximize in a pareto-efficient manner the utility of each individual according to a set of initial endowments assuming the technology available, competitive markets, perfect information and no externalities, public goods or non market commodities[17] (Duclos & Araar, 2006). Among others, rising issues of the approach are: [1] the data requirements in terms of revealed preferences; [2] the assumption of homogeneous individuals[18] in terms of characteristics (and needs), but, different in terms of the subjective transformation of economic well-being utility[19].

The welfarist approach assumes that a certain expected level of consumption (based on the income level) provides to the individual or household the option to reach a level of utility. Consequently, poor are those individuals not able to earn a minimum income level that guarantee a predefined level utility. In poverty measurement, individual's

---

[17] (Atkinson, 1999) directly connects utilitarism with decision-making trough welfarism. The author argues the utilitarian approach can be understood based on: "[1] act consequentialism: decision are evaluated according to their results; [2] wefarism: Decisions are according to a social welfare function defined over the level of individual utility; and, [3] sum-ranking: in that the criterion is the sum of rankings" (p. 175)
18 And Households
19 But, anyway, comparable.

results are aggregated in pareto efficient function (only among the poor[20]) to obtain a indicator of the level of poverty in the society.

Once the indicator and the poverty line (minim level) are defined (usually using food baskets); the aggregation process is straightforward. One of the most popular income measure, the FGT family of measures proposed by (Foster, Greer, & Thorbecke, 1984), follows an axiomatic approach based on Sen (1976) recommendations. The individual i poverty level is generally measured by the normalized gap (g_i) defined as:

$$g_i(y_i) = \begin{cases} \dfrac{(z - y_i)}{z} & \text{if } y_i < z \\ 0, & \text{otherwise} \end{cases} \tag{1}$$

where z is the poverty line and y the income indicator. The aggregated can be expressed as:

$$FTG_\propto = \frac{1}{n} \sum_{i=1}^{n} g_i^a \tag{2}$$

When $\alpha = 0$, the FGT is the headcount measure, where all poor individuals are counted equally. And it can be understood as the percentage of poor individual over the total. When $\alpha = 1$, the measure is the poverty gap, where individuals' contribution to total poverty depends on how far away they are from the poverty line. The aggregated interpretation is the amount or resources necessary to allocate everyone (poor) out of poverty. Finally, for $\alpha = 2$, the measure is the squared poverty gap, where individuals receive higher weight the larger their poverty gaps are higher.

The approach has been extended to changes over time and the analyses of vulnerability. The literature of poverty dynamics could be organized in three big trends. First, literature that computes and models transition probabilities into and out of poverty (Cappellari & Jenkins, 2004; Jenkins, 2000; Petesch, 2007). Second, literature that provides measures of chronic versus transient poverty (Bossert, Chakravarty, & d' Ambrosio, 2010; Foster, 2009; Foster & Santos, 2009; Hoy, Scott B., & Zheng, 2010). And, third, literature that tests for poverty traps (Azariadis, 2006; Azariadis & Stachurski, 2005; Bowles, Durlauf, & Hoff, 2006).

The income poverty literature has increased our understanding of the poor despite its conceptual and practical limitations. Among the conceptual limitations, we found that [1] individuals are not able to maximize their own utility due to market imperfections (mainly information); [2] there are absolute minimum levels of consumption that must be realized and not only have access to them; and, [3] there are not value judgments included in the aggregation of utilities. In practical terms, despite its straightforward

---

[20] To satisfy one of the desired conditions of any poverty indicator. The axiom of focus stands that changes among the non poor should not be reflected in a poverty measure (Sen, 1976).

techniques some assumption and criteria has been under examination: the basket composition, representativity and its binary behavior[21], the application of scales and the calculation of the non-food basket, among other.

The non-welfarist approach is the denomination used for the movement – leaded by Sen - that emerged as a contraposition to the welfarist framework and its conceptual limitations. The author argues that even with perfect information (to compare individuals), the welfarism is not able to deal with the fact that "underlying principles – like liberty, discrimination, exploitation, or entitlement to social security- tend to give non-utility information a role of its own" (Sen, 1979a)

In general terms the non welfarist approach allows [1] the use of outcomes other than utility; [2] the use of alternative sources of valuation (different from the own individuals); [3] the use of weighting of outcomes according to principles [4] interpersonal comparisons of well-being in a variety of dimensions, thus enabling movement beyond Paretian economics (Brouwer, Anthony J Culyer, van Exel, & Rutten, 2008).

The work of (Rawls, 1971; Tobin, 1970) are example of early attempts to enlarge the traditional conception of welfare[22]. The former recognizing the notion of basic goods or "things that every rational mans presumed to want" and the later in terms of the human desire of equality. However, it is the seminal work of Sen and the capability approach the most important support of the non-welfarism. Following Rawls and Sen, the poverty measurement in the non-welfarist approach is expressed in two main forms: unsatisfied basic needs and the capabilities approach, respectively.

The unsatisfied basic needs focus its attention in the satisfaction (or non satisfaction) of a bundle of goods and services that are constituent elements of well-being and considered as a minimum to reach a good life. "Basic needs may be interpreted in terms of minimum specified quantities of such things as food, clothing, shelter, water and sanitation that are necessary to prevent ill health, undernourishment, and the like" (Streeten, 1981).

The capability approach (developed by Sen) suggests that the wellbeing (and poverty) is defined by the set of functioning that an individual or household is able to achieve. In simple terms, a functioning is an achievement or the current state of the individual; and a capability is the ability to achieve or the set of opportunities available. "Capability is, thus, a set of vectors of functionings (beings and doings), reflecting the person's freedom to lead one type of life or another" (Sen, 1992, p. 40). Also in Sen (2009)).Thus, poverty is defined according to the lack of a set of certain basic capabilities. (Sen, 1979b, 1980) states that there is a core set of basic capabilities that are intrinsic to all member of

---

[21] Partially corrected by the Fuzzy set approach proposed by (Cerioli & Zani, 1990)

[22] (Brouwer et al., 2008; A J Culyer, 1971) include the work of Musgrave that in 1959 explore the relevance of meritorious goods as utility generators and not simple consumption good with externalities.

the society based on their own common values[23]. So, the lack of these capabilities might imply poverty without any subjective reasoning[24].

Methodologically, the non welfarist approach can be subdivided according to the number of times (stages) that an individual is identified as poor or deprived (Pattanaik, Reddy, & Xu, 2007) . For composite indicators, like the Human poverty index, only one stage is required in each dimension. In other words, first sums across individuals are obtained, to form a dimension-specific index across all individuals, and then combines all the one-dimensional indices to yield a multidimensional poverty measure. On the other hand, the indexes of unsatisfied basic needs and those based on the work of Atkinson and Sen include a second stage according to the number of deprived dimensions. Hence, it combines the multiple indicators of deprivation for each individual, and then aggregates these across the individuals.

An individual i has the following vector of achievements $X_i = (x_i^1, x_i^2, ..., x_i^D)$ in D different dimension and $Z = (x^1, x^2, ..., x^D)$ defines the vector of poverty lines for each dimension and common for all the individuals. The individual i is poor in the basic need (dimension d) if the indicator x_i^d is lower than the deprivation line (z_d).

$$g_i^d(x_i^d) = \begin{cases} 1 & \text{if } x_i^d < z_d \\ 0, & \text{otherwise} \end{cases} \tag{3}$$

In practical terms, once decided the basic need (dimension), its representative indicator, and a deprivation level, poor can be identified in a way similar to the unidimensional measures (See 2). For one stage measures (composite indexes), the following procedures are straightforward and involve the aggregation in a headcount measure by dimension (basic need) [25]. The percentage of people with deprived in dimension d are represented by:

$$H^d = \frac{1}{n} \sum_{i=1}^{n} g_i^d(x_i^d) \tag{4}$$

Finally, the aggregated level of poverty us represented by a weighted sum of the results of each dimension:

---

23 For instance, from psychology, (S H Schwartz, 2007, 2009; S. H. Schwartz et al., 2001) define a set of human values including power, achievement, hedonism, stimulation, self direction, universalism, benevolence, tradition, conformity and security.

24 However, he agrees that for superior or societal requirements is more difficult to keep a descriptive position (in line with the (Orshansky, 1969) arguments).

25 (Pattanaik et al., 2007)show that even column-first two-stage procedures are insufficient to incorporate the correlation between dimensions and to satisfy several axioms.

$$P = \left[\sum_{d=1}^{D} (w_d H^d)^\theta \right]^{1/\theta} \tag{5}$$

where $w_1 + w_2 + w_3 = 1$ and $\theta \geq 1$ (Anand & Sen, 2004). The most popular poverty composite indicators is the Human Poverty Index (HPI) released by the United Nations Development Program in 1997 including 3 dimensions and 4 indicators[26] and $\theta = 3$. From 1997, new advances had been proposed not only for the HPI. For instance, a second poverty index (HPI-II) for developed countries. Among others, the measure does not satisfy the monotonicity axiom, neglects other dimensions, allows unlimited substitution between indicators, provides only average results (independent of its distribution), there is not a clear weight definition, and, it does not provide clear interpretation nor policy recommendations.

The two stages measures are based in a similar structure. But it requires two cutoff decisions: first, as in previous cases, the dimension specific poverty line, and then, the number (or percentage) of deprived dimensions required to be considered poor.

The first stage was performed on (3) defining who is deprived or not in each dimension. Then, using (3) as input, the weighted sum of the deprived dimensions (c_i) of individual i can be calculated as follows:

$$c_i = \sum_{d=1}^{D} w_d \ g_i^d\left(x_i^d\right) \tag{6}$$

Where D is the total number of dimensions, w_d the weight of dimension d. Subsequently, in the second stage, the number of equivalent dimensions required to be poor are defined and those individual without that condition are censored. Consequently, $g_i^d(k)$ captures the information of the individual i that is deprived in dimension d and at the same time is deprived in a total of at least k dimensions.

$$g_i^d(k) = \begin{cases} \left[\dfrac{z_d - x_i^d}{z_d} \right] & , \ \&\text{if } x_i^d < z_d \ \text{and } c_i \geq k \\ 0 & , \qquad \text{Otherwise} \end{cases} \tag{7}$$

When $k = 1$, only one deprived dimensions is required to be considered poor and it is denominated union approach. On other extreme, when k=D (intersection approach) only individuals with all dimensions deprived are considered as poor. Any intermediate point is denominated intersection approach.

---

[26] Wellbeing: Probability (rate) at birth of not surviving to age 40 x 100; Knowledge: Adult illiteracy rate; Standard of living: Percentage of population not using an improved water source and percentage of children under weight-for-age

The following represent the headcount ratio for a multidimensional measure in two stages:

$$H(k) = \frac{1}{n} \sum_{i=1}^{n} \left[\sum_{d=1}^{D} g_i^d(k) \right]^0 \tag{8}$$

The multidimensional headcount ratio simply measures the percentage of the population that is multidimensionally poor. The method of the unsatisfied basic need is a restricted version of the Alkire and Foster methodology since it only includes the headcount ratio based exclusively on the union approach. Additionally, it considers that all dimension are equal, so $w_d = 1/D$. Since the headcount does not fulfill the poverty axioms (monotonicity and transference), it is considered a non axiomatic and reductionist[27] approach.

A second relevant indicator is the average number of deprivations A as a proportion of the maximum number of possible deprivations suffered by the multidimensionally poor:

$$A(k) = \frac{1}{nHD} \sum_{i=1}^{n} c_i \left[\sum_{d=1}^{D} g_i^d(k) \right]^0 \tag{9}$$

Conscious of this problem, (Alkire & Foster, 2010a) proposed a generalized measure that follows the structure of the FTG measures proposed for unidimensional measures.

$$M_a(X;Z) = \frac{1}{nD} \sum_{i=1}^{n} \sum_{d=1}^{D} w_d \left[g_i^d(k) \right]^\alpha \tag{10}$$

In simple terms, for those multidimensionally poor individuals, the measure aggregates first at the individual level the number of deprived dimensions with a specific level of poverty aversion α. (α can take any value among the positive natural numbers and, when $\alpha = 0$ the adjusted headcount ratio is obtained). Then these results are aggregated for the whole population.

The adjusted-headcount ratio, M_0 quantifies the weighted average number of deprivations (as a proportion of the maximum number of possible deprivations) across the population, but censoring the deprivations of those deemed to be non-poor multidimensionally: Note that $M_0 = H x A$.

Different prom measures literature, the indicator satisfy an important set of multidimensional axioms like: Anonymity (Symmetry), Replication Invariance, Scale Invariance, Normalization, Focus (Poverty & deprived attributes), Weak

---

[27] Boltvinik (1998, 2003) in (Berenger et al., 2009)

Monotonicity, Subgroup Consistency, Subgroup Decomposability, Strong Monotonicity (for $\alpha > 0$) and Transfers ($\alpha > 1$).

Previous literature had proposed similar strategies in the first stage, but with focus on union or intersection approach (Bourguignon & Chakravarty, 2003; Chakravarty, Mukherjee, & Ranade, 1998; Tsui, 2002) but in general failing in the second stage and in the decomposability of the indexes[28]. For instance, (Bourguignon & Chakravarty, 2003) includes a double identification including substitution between dimensions (CES) and union approach in the first and second stage, respectively. Moreover, the aggregation is characterized for an index of multidimensional poverty aversion[29]. Consequently, the inclusion of non independent dimensions limits the decomposability of the measure[30] and the union approach increases the chances of type I error. Finally, the (Bourguignon & Chakravarty, 2003) measures are a restricted version of the (Alkire & Foster, 2010a) measures in the identification, but the opposite in the aggregation.

In this paper we focus only on M^0, A and H because we might use mainly ordinal variables and Alkire-Foster measures based on $\alpha > 0$ are sensitive to positive powers of the poverty gaps. As it should be clear, the poverty gaps of ordinal variables are not meaningful.

4. Decomposition of changes

Following Apablaza and Yalonetsky (2012), changes on multidimensional poverty indicators from the Alkire and Foster Family in cross-sectional and panel datasets can be decomposed as follows in

$$\Delta\%_a M^0(t) = \Delta\%_a H(t) + \Delta\%_a A(t) + \Delta\%_a H(t) \times \Delta\%_a A(t) \qquad (11)$$

Where $\Delta\%X(t) = \frac{x(t)-x(t-a)}{x(t-a)}$. In other words, a percentage change in M^0 can be decomposed into the percentage change in the number of multidimensionally poor, the percentage change in the average number of deprivation of the multidimensionally poor, and a multiplicative effect. The Figure 1: Normalized Decomposition of Changes in the Multidimensional Poverty Indicator illustrates this decomposition. Assuming normalized values for H and A in t (and subsequently $M^0(t) = 1$), a reduction in poverty could be drawn as a smaller area $M^0(t-a)$ which is a fraction of the original level of poverty. This reduction is composed by the reduction in the number of poor $\Delta\%_a H(t)$ from

---

[28] For a full summary of the multidimensional measures, see (Kakwani & Silber, 2008a, 2008b)

[29] In (Alkire & Foster, 2010a) the aversion was referred to the deprivation in each dimension.

[30] Unless the multidimensional poverty aversion is equal the index of substitutability between dimensions. In that case, results under the (Bourguignon & Chakravarty, 2003) and (Alkire & Foster, 2010a) equivalent.

$H(t)$ to $H(t - a)$ plus the reduction in the average deprivation of the poor $\Delta\%_a A(t)$ from $H(t)$ to $H(t - a)$ plus the interaction between both terms[31].

Note that $\Delta\%_a H(t)$ and $\Delta\%_a A(t)$ are not independent, but there are circumstances in which a change in one may not necessarily produce a change in the other. For instance, in the extreme case of identifying the poor by the intersection approach, by definition $\Delta\%_a A(t) = 0$ and so $\Delta\%_a M^0(t) = \Delta\%_a H(t)$. Another circumstance, in which a change in one element may not necessarily produce a change in the other element, is when the proportion of the multidimensionally poor remains the same, but their number of deprivations increases. For this to happen it is necessary that $k < D$.

In simple terms, this simple step allows the researcher and the policy maker to understand change on the multidimensional indicator by using the headcount and the average deprivation. Two communities, regions or countries can experienced the same change in terms of the multidimensional poverty however, these count be determined for a change in the name of poor people in a society or because those who are poor are less poor. This strategy by first time with several (10) countries in (Apablaza, Ocampo, & Yalonetzky, 2010).

Figure 1: Normalized Decomposition of Changes in the Multidimensional Poverty Indicator
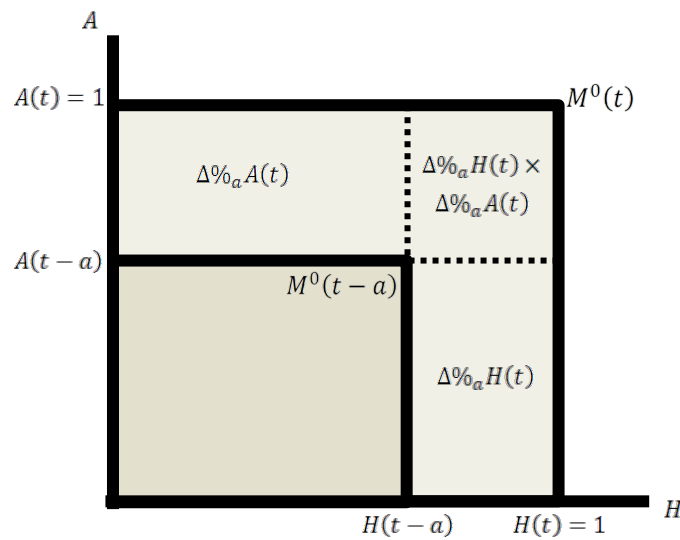
Using repeated cross-sectional data or panel data; result can be further expanded by decomposing both $\Delta\%_a H(t)$ and $\Delta\%_a A(t)$. In the case of changes in $H(t)$, it might be of interest to decompose it in terms of changes in the multidimensional headcount for different groups of society specifically into changes in the composition of the

---

[31] Please note that if $\Delta\%_a H(t)$ and $\Delta\%_a A(t)$ are negative, the product of both of them should be positive and so on.0

population, changes in the percentage of the multidimensionally poor within each group and a multiplicative effect.

Similarly $\Delta\%_a A(t)$ can also be decomposed. As it was discussed previously, $A(t)$ represents the average distance between the number of deprived dimension and the cut off k (number of dimensions required to be considered poor) among the multidimensionally poor individuals. $A(t)$ can also be expressed as the weighted average of the percentage of the multidimensionally poor deprived in each dimension.

The decomposition of changes in the headcount allows the analysis for different populations according to any predefined characteristic (sex, geographic areas, etc). Additionally, the decomposition by dimension could provide a clear idea of the areas of improvement of the population.

In the case of panel data, the same individuals are tracked along the different time periods. Therefore, for instance, $\Delta\%_a H(t)$ can be decomposed into the transition probabilities of moving in and out of multidimensional poverty and $\Delta\%_a A(t)$ can also be further decomposed, in terms of the headcount and the censored headcount and, then, using poverty transition probabilities

In figure 2, the links between the probabilities of transition and the Alkire and Foster statistics are summarized. The simple probabilities of entry and exit are the main determinant of changes in the headcount. Subsequently, changes in the headcount affect directly the multidimensional indicator and indirectly the average deprivation. On the other hand, probability entry and exit from dimensional poverty[32] define changes in the censored headcount. Finally, both changes in the headcount and the censored headcount characterize the variation in the average deprivation and in the multidimensional poverty indicator.

Figure 2: Changes in the adjusted multidimensional headcount based on transition probabilities

---
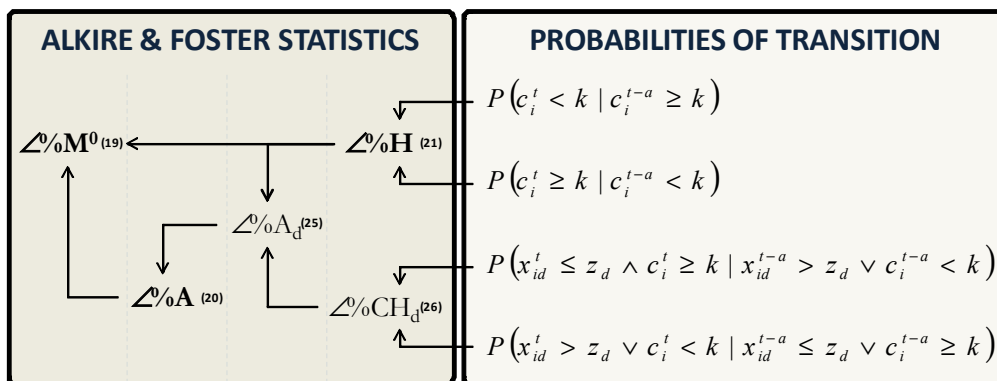
[32] Multidimensionally poor and deprived in the specific dimension.

Changes in the censored headcount ($\Delta\%_a CH_d(t)$) are defined as the adjusted probability of individual i to be multidimensionally poor and deprived in dimension d in time t conditional to being non deprived (in dimension d) or non poor in time $t-a$; minus the probability of being non deprived (in dimension d) and non poor in t for those individuals who where multidimensionally poor and deprived in d. In other words, the change in the censored headcount can be understood as the adjusted probability of entry in deprivation and poverty from those who were not (poor and deprived) minus the probability of exit from deprivation among those who were poor and deprived in d.

To summarize, the change in the proportion of the poor deprived in variable d, A_d, depends on a complex interplay between the transition probabilities into and out multidimensional poverty and the transition probabilities into and out of multidimensional poverty coupled with deprivation in variable d.

In simple terms, the Alkire and Foster measure is equivalent to the sum of headcounts of any different cut-off over k divided by the number of dimensions considered and multiplying the first term by the initial value of k. Since, this calculation aggregates all the information of multidimensional poverty for each level of the cut-off k, it can provide some insights about the distribution and dominance between two regions or countries.

5. The case of Chile

The study of wellbeing in Chile started in early fifties (Larrain, 2008) manly with work on income distribution. However, the work of (Ahumada, 1958) in 1958 is the isolated first attempt to quantify the number of poor households in Chile defining minimums level of basic necessities as nutrition (food), education and shelter. It is not till the seventies that poverty measurement becomes more popular not only at the academic level but also for policy makers. In this period, unidimensional and multidimensional measures complemented the poverty understanding. The former one represented by the basic needs basket and the latter by the unsatisfied basic need method.

The Instituto de Economia & ODEPLAN developed in 1974 one of the first attempts to develop a poverty map based in the unsatisfied basic need method. Using information from the 1970 census, the authors consider minimum levels on housing, command over certain assets and educational level of the household members as starting points concluding that 21% of the population was poor over a union approach. Twelve years later, (Mujica & Rojas, 1986) update the previous results concluding that poverty by basic need reached the 14%. In parallel, (Altimir, 1979) develops and quantify, by first time, a basic basket concluding that income poverty was 17% and extreme poverty 6% in 1970. His results were the beginning of a series of papers re-defining the basket and, consequently, the level of poverty (Torche, 1987).

In 1990, Economic Commission for Latin America and the Caribbean build a food basket based on the caloric requirement of different industries (type of work) and geographic. These requirements were computed and valued using the household budget

survey of 1987 and define an important group of public policies. Twenty years later, the same standards are implemented in the income poverty measurement.

To complement information of income poverty with other approaches have an intrinsic value not only from academic point of view but also in terms of definition of public policies. Additionally the discussion of the current standards could generate a fruitful debate about the technical update of the poverty measures.

5.1. Data

The Survey of Economic Characterization (CASEN) is the official instrument to measure income poverty and general household conditions in Chile. Implemented by first time in 1987, it covers the entire territory and it is based on the censual information. Since 1990 till 2006, the survey was administrated by the University of Chile and from 2009 by the University Alberto Hurtado.

In 2009, the survey included than 225,997 individuals in 69,693 households. Coincidently with the Chilean structure[33], in average a 86% of the population lives in urban areas. Additionally, due to the selection the indicators and the consistency in the questionnaires across years, the number of missing observations is relatively small.

Finally, since administrative structure of the country was reorganized in the last years by creating 2 new regions, these regions were artificially created based on the municipalities member of each department. In terms of Municipalities it covers the 96,6% of the smallest administrative area.

Table 3: Summary statistics CASEN Survey

| Year	Observations	Urban	% Missing	Regions	Provinces	Municipalities
1990	170,361	85%	0.5%	13	47	151
1992	177,972	86%	0.6%	13	47	218
1994	183,288	86%	0.3%	13	48	244
1996	190,755	86%	0.1%	13	51	204
1998	195,404	86%	0.7%	13	50	243
2000	199,137	85%	0.1%	13	51	303
2003	207,244	86%	0.2%	13	51	312
2006	214,344	86%	0.7%	13	52	334
2009	225,997	87%	0.0%	15	52	333
Total	**1,764,502**	**86%**	**0.4%**			

5.2. Income Poverty

---

[33] The 1992 census reports that 83,5% of the population lives in urban areas. In 2002, this percentage reaches the 86,6%.

During the last 20 years, Chile has experienced a consistent reduction in income poverty with exception of the last period (2006-2009). Researchers highlight the successful Chilean story during the first the last decade of the previous century not only in terms of income poverty (Gasparini, Gutiérrez, & Tornarolli, 2007) reaching the millennium development goal of halving poverty by 2015 (Gasparini & Cicowiez, 2005). This pattern contrast with the results in the region.

Until 2000, scholars have concentrated their attention in the macroeconomic links between growth and poverty. Several authors coincide that the main reason of the wellbeing increases were based on the growth of the region and specifically some specific countries, for instance Chile (Janvry & Sadoulet, 2000; J L Londono & M Szekely, 2000) however, they highlights that income distribution has not been altered in recent years (Berry, 1997; Birdsall & Juan Luis Londono, 1997). However, in the recent decade, with lower levels of growth due to crises and structural adjustment, evidence have been more concentrated on micro patterns basically in terms of the quality and consequences of public policies (Foxley, 2004) as new "forms of social assistance emerging in the region, especially conditional and unconditional income transfers and integrated anti-poverty programmes" (Barrientos & Santibáñez, 2009)

Using two years averages the Figure 3 shows the patterns of poverty in Latin America for those countries with repeated survey for at least 10 years. Despite the general reduction in almost every country (except Paraguay) this changes has been strongly influenced not only by internal decision but also by the international context (Murray, Kousary, & Barton, 2009).

Figure 3: Evolution of headcount poverty in Latin-America (National Poverty lines)[34]
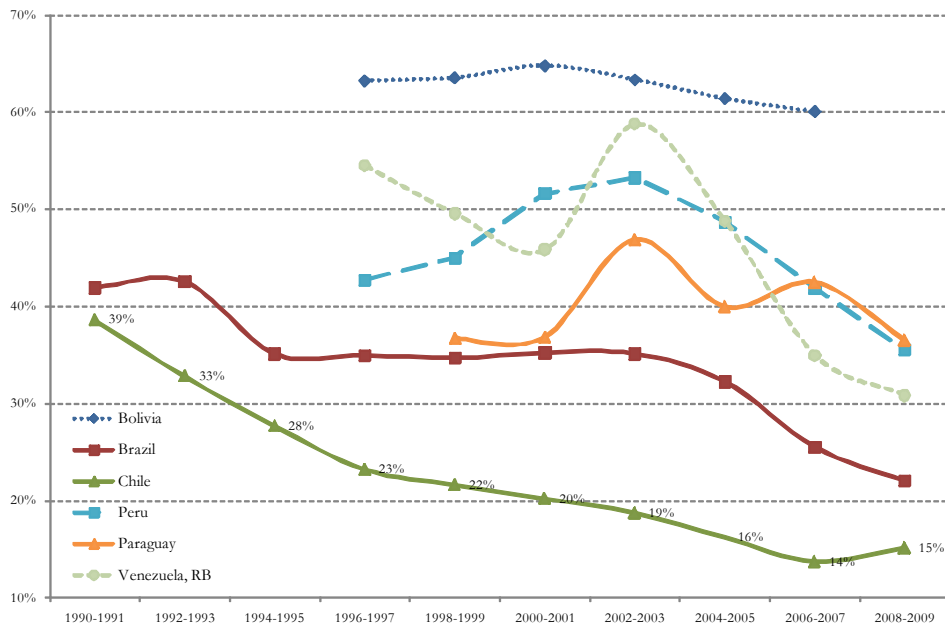
In the case of Chile, in 1990, income poverty rose the 38.5% with a poverty gap of 14.8%. Despite that in absolute terms poverty was concentrated in urban areas the percentage of poor people in both each area were similar. Nineteen years later, in 2009, the headcount reached the 15.1% of the population and the poverty gap 6.2%. Additionally, and from 2006, urban poverty became more relevant than in rural zones.

Scholars have identified the mix of between a pro growth agenda and a set of social public policies as one of the main reason of the successful trend (Contreras, 2003; Contreras, Osvaldo Larrañaga, & Litchfield, 2001; Murray et al., 2009) at the end of previous century. However, the reduction in the growth rates, the modification of targeting plans, and presence of a harder unidentified poverty have reduced (and even reverse) the speed of the poverty alleviation in the last decade. The following table shows the evolution of these critical indicators based on the poverty line of each year as described in the annexes:

Table 4: Income poverty indicators

	1990	1992	1994	1996	1998	2000	2003	2006	2009
Headcount	38.6 %	32.8 %	27.7 %	23.2 %	21.6 %	20.2 %	18.7 %	13.7 %	15.1 %
Poverty Gap	14.8 %	13.8 %	11.7 %	9.6%	9.2%	8.8%	6.2%	4.3%	5.1%

---

[34] Constructed by the author based on World developed indicators 2011.

Severity x100	7.94	7.17	6.31	4.96	4.94	4.87	3.17	2.16	2.70

Evidence shows that there is constant reduction on the number of poor individuals at the national level; the only exception is the last period, which not only reflects an increase in the headcount ratio but also in the intensity and severity of the poverty. However, governmental results were under the academia criticism due to the update of the basic basket. Discrepancies between the Economic Commission for Latin America and the Caribbean (ECLAC) and the Planning Department (in change of the official poverty statistics) generated a discussion not only about the updating methodology but also in terms of the need of complementary measures. Income levels for urban and rural areas in each year are represented by the following cumulative frequency distributions:

Avoiding the selection of a poverty line, the cumulative function for urban areas shows clear patterns in terms of income poverty regarding the headcount ratio. In urban areas, there is a reduction of poverty except between 1998 and 2000. In rural areas, there is an unambiguous reduction of poverty in the last years despite the unclear patterns in the previous decade. However, there is not a clear pattern for those individuals with incomes lower than $20.000 Chilean pesos of 2009.

Figure 4: Truncated cumulative frequencies of total income percapita (2009 prices)

Urban Areas Rural Areas
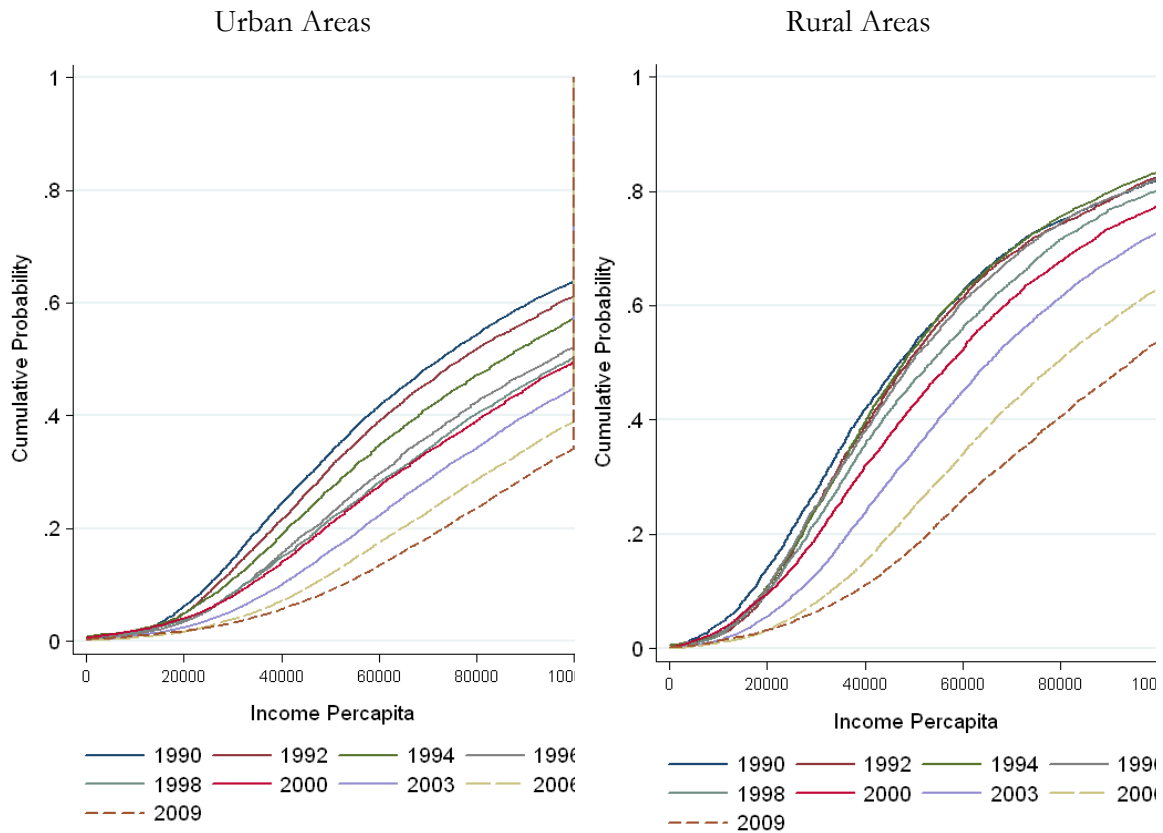
5.3. Multidimensional Poverty

The study of well-being in Chile started in the early fifties (Larrain, 2008) based on income distribution analyses. However, the work of Ahumada in 1958 is the isolated first attempt to quantify the number of poor households in Chile defining minimum levels of basic necessities as nutrition (food), education and shelter. It is not until the seventies that poverty measurement becomes more popular, not only at the academic level, but also, among policy makers. During this period, unidimensional and multidimensional measures complemented the poverty understanding. The former represented by the basic needs basket and the latter by the unsatisfied basic needs method.

The Instituto de Economia & ODEPLAN (1974) developed one of the first attempts to develop a poverty map based on the unsatisfied basic needs method. Using information from the 1970 census, the authors considered minimum levels of housing, command over certain assets and the educational level of the household members as starting points concluding that 21% of the population was poor using a union approach. Twelve years later, Mujica & Rojas (1986) updated the previous results concluding that poverty by basic needs had reached 14%. In parallel, Altimir (1979) developed and quantified, for

the first time, a basic basket concluding that income poverty was 17% and extreme poverty 6% in 1970. His results were the beginning of a series of papers re-defining the basket and, consequently, the level of poverty (Torche, 1987).

In 1990, the Economic Commission for Latin America and the Caribbean built a food basket based on the calorific requirements of different industries (types of work) and geography. These requirements were computed and valued using the household budget survey of 1987 and defined an important group of public policies. Twenty years later, the same standards are being implemented in income poverty measurement.

To complement information of income poverty with other approaches has an intrinsic value, not only from an academic point of view, but also in terms of the definition of public policies. Additionally the discussion of the current standards could generate a fruitful debate about the technical update of poverty measures.

5.4. Data

The Survey of Economic Characterization (CASEN) is the official instrument used to measure income poverty and general household conditions in Chile. Implemented for the first time in 1987, it covers the entire territory and is based on the censual information. From 1990 until 2006, the survey was administrated by the University of Chile and from 2009 by the University Alberto Hurtado.

Table 5: Summary Statistics CASEN Survey

Year	Observations	urban	% Missing	Regions	Provinces	Municipalities
1990	170,361	85%	0.5%	13	47	151
1992	177,972	86%	0.6%	13	47	218
1994	183,288	86%	0.3%	13	48	244
1996	190,755	86%	0.1%	13	51	204
1998	195,404	86%	0.7%	13	50	243
2000	199,137	85%	0.1%	13	51	303
2003	207,244	86%	0.2%	13	51	312
2006	214,344	86%	0.7%	13	52	334
2009	225,997	87%	0.0%	15	52	333
Total	**1,764,502**	**86%**	**0.4%**			

In 2009, the survey included 225,997 individuals in 69,693 households. Coincidently with the Chilean structure[35], an average of 86% of the population lives in urban areas. Additionally, due to the selection the indicators and the consistency in the questionnaires

---

[35] The 1992 census reports that 83.5% of the population lives in urban areas. In 2002, this percentage reached 86.6%.

across years, the number of missing observations is relatively small. Finally, the administrative structure of the country was changed in 2007 creating 2 new regions based on the municipalities member of each department; however, for the purpose of this essay this municipalities were maintained in the original region In terms of Municipalities it covers the 96, 6% of the smallest administrative area.

5.5. Income Poverty

During the last 20 years, Chile has experienced a consistent reduction in income poverty with the exception of the most recent period (2006-2009). Researchers have highlighted the successful Chilean story during the last decade of the previous century, not only in terms of income poverty (Gasparini, Gutiérrez, & Tornarolli, 2007) but in reaching the millennium development goal of halving poverty by 2015 (Gasparini & Cicowiez, 2005). This pattern drastically differs from the performance of the rest of the countries in the region.

Until 2000, scholars concentrated their attention on the macroeconomic links between growth and poverty. Authors agree that successful cases of absolute well-being improvements in Latin America were mainly based on growth (de Janvry & Sadoulet, 2000; Londoño & Szekely, 2000) but increasing inequality, or, as in the Chilean case, due to income distribution stagnation (Berry, 1997; Birdsall & Londoño, 1997). However, in the recent decade, new micro policies has been implemented(Foxley, 2004) as new "forms of social assistance emerging in the region, especially conditional and unconditional income transfers and integrated anti-poverty programmes" (Barrientos & Santibáñez, 2009)

Using two years averages, Figure 3 shows the patterns of poverty in Latin America for those countries with repeated surveys for at least 10 years. Despite the general reduction in almost every country (except Paraguay) these changes have been strongly influenced not only by internal decisions but also by the international context (Murray, Kousary, & Barton, 2009).

In the case of Chile, income poverty reached 38.5% with a poverty gap of 14.8%. Despite poverty being concentrated in urban areas, in absolute terms the percentage of poor people in each area were similar. Nineteen years later, in 2009, the headcount reached 15.1% of the population and the poverty gap 6.2%. Additionally, and from 2006, patterns of poverty were also changing, for instance with the increase in urban poverty (the percentage of poor people in urban areas became higher than in rural zones) and the toughening of extreme poverty.

Figure 5: Evolution of Headcount Poverty in Latin-America (National Poverty Lines)[36]
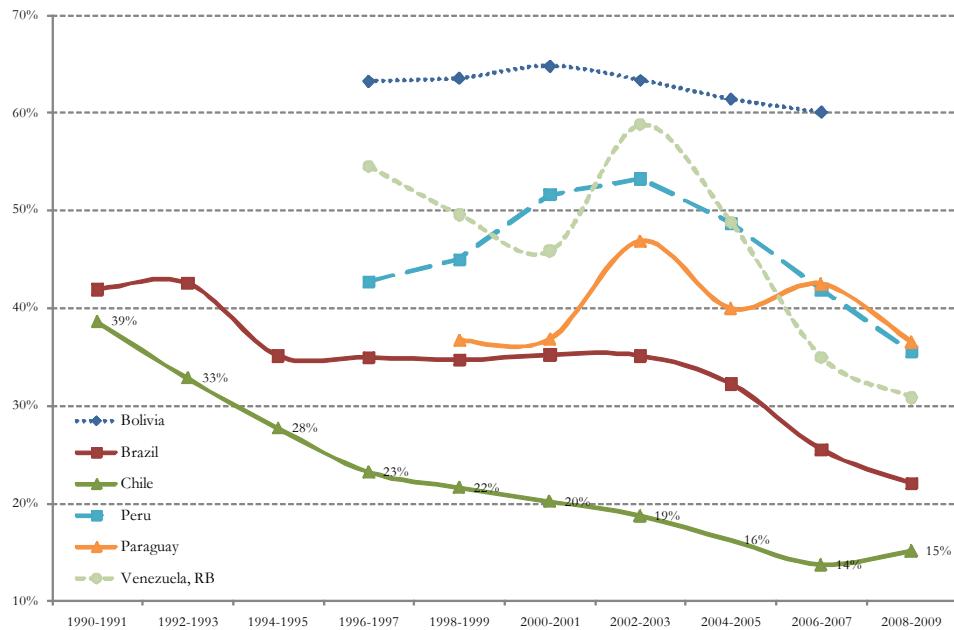
Scholars have identified the mix between a pro-growth agenda and a set of social public policies as one of the main reasons for the successful trend (Contreras, 2003; Contreras, Larrañaga, & Litchfield, 2001; Murray et al., 2009) at the end of previous century. However, low growth rates, misleading targeting policies, and the presence of a harder to identify vulnerable population have reduced (and even reversed) the speed of the poverty alleviation in the last decade. The following table shows the evolution of these critical indicators based on the poverty line of each year as described in the annexes.

Table 6: Income Poverty Indicators

	Headcount (P0)	Poverty Gap (P1)	Severity x100 (P2)
1990	0.386	0.148	7.94
1992	0.328	0.138	7.17
1994	0.277	0.117	6.31
1996	0.232	0.096	4.96
1998	0.216	0.092	4.94
2000	0.202	0.088	4.87
2003	0.187	0.062	3.17
2006	0.137	0.043	2.16
2009	0.151	0.051	2.7

---

[36] Constructed by the author based on World Developed Indicators 2011.

Evidence shows that there is constant reduction in the number of poor individuals at the national level; the only exception is the last period, which not only reflects an increase in the headcount ratio but also in the intensity and severity of the poverty. However, due to the update mechanism of the basic basket, governmental results were under political and academic criticism. Discrepancies between the Economic Commission for Latin America and the Caribbean (ECLAC) and the Planning Department (in charge of the official poverty statistics) generated a discussion not only about updating the methodology; but also, the need for complementary measures. Income levels for urban and rural areas in each year are represented by the following cumulative frequency distributions:

Figure 6: Truncated Cumulative Frequencies of Income Percapita (2009 prices)
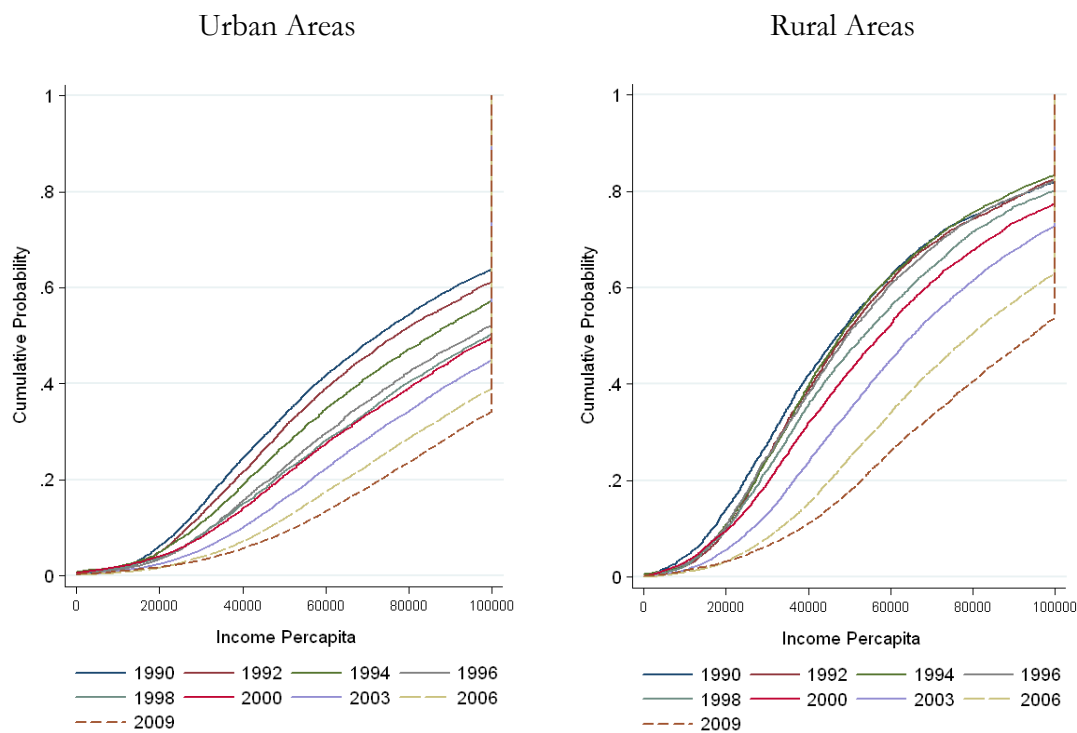
Avoiding the selection of a poverty line, the cumulative function for urban areas shows clear patterns in terms of income poverty regarding the headcount ratio. In urban areas, there is a reduction of poverty except between 1998 and 2000. In rural areas, there is an unambiguous reduction of poverty in the last years (1998-2009) despite the unclear patterns in the previous decade. However, there is not a clear pattern for those individuals with incomes lower than $20,000 Chilean pesos at 2009 equivalence.

5.6. Multidimensional Poverty

Since late 2010, there has been continuous criticism of the income measures in Chile based on the arbitrary definition of the poverty line, its adjustments and updates. Additionally, there are increasing requirements from policy makers to have more

appropriate tools to understand and reduce poverty. One attempt to complement unidimensional poverty measures is use the multidimensional approach, with the Alkire and Foster model being one of the most popular approaches,. The Latin American experience has been fruitful in recognizing the benefits and limitations of a measure of this type. Programmes in Mexico (since 1997) and in Colombia (since 2011) have increased the interest in a multidimensional measure for Chile.

The Chilean interest is based on domestic efforts from the civil society, and a renewed interest in spatial and disaggregated techniques and with former successful strategies to control poverty in Chile (poverty maps based on the basic needs approach). From early 2000, governmental and non-governmental institutions have tried to define the requirements to reach a minimum level of welfare in the Chilean context. The "Fundación para la Superación de la Pobreza" have defined thresholds in several dimensions that complement the goals of a reduction in income poverty. Minimum standards in areas like education, health, employment and housing have been explored based on the work of experts and key actors in society. Subsequently, the new "poverty lines" per dimension have been socialized and enriched through discussion in different spheres.

This work is the starting point of the multidimensional poverty measure developed in this section. Despite the fact that this work is based on the capabilities approach, the implementation in terms of the selection of dimensions seems to be closer to a basic needs perspective, however; as Alkire (2002) suggests, these basic needs are also at the core of Sen's ideas[37]. Moreover, definitions in this section were implemented under the framework of Nussbaum (1999, 2001) and Nussbaum & Glover (1995) with a focus on those relevant for the long term analyses (Hulme, 2003). The following dimensions will be considered and implemented in a set (19 from 1990 to 2009) of households surveys:

- Housing
- (Material) Living Standards[38]
- Education
- Employment
- Income

The selection of dimensions is based on the recommendations of Alkire (2002) in terms of the irreducibility and incommensurability of the dimension. Additionally, the dimensions reflect complementarily and relatively similar relevance. However, due to data limitations several other dimensions of poverty are not considered, among others, empowerment, food security and health. In each dimension several indicators were

---

[37] Sen suggests that the difficulties in the creation of a standard list of capabilities is mainly due to the fact that capabilities and functioning are related to the specific context of each group of society (Robeyns, 2001).

[38] Following the International Multidimensional Poverty Index (Human Development Report 2010), Living standards will be understood as material minimum commonly associated to services in the dwelling.

included attending to the same requirements and limitations[39]. These dimensions and indicators are presented in the following table:

Table 7: Dimensions, Indicators and Deprivation Cut-offs

Dimension	Indicator	Deprivation Cut-off
Housing	Shelter (Walls[40]/ Floor[41] / Roof[42])	At least two deprived indicators
	Overcrowding	More than 3 individuals per room
	Tenancy	Illegal settlement
Education	Illiteracy	At least one member over 17 illiterate
	Enrolment	At least one member between 6 and 16 not enrolled
	Schooling	No members older than 17 with more than 8 years of education
Living standards	Water	No system inside the house
	Electricity	No electricity
	Toilet	Box over black well, irrigation ditch or no system
Employment	Unemployment	All members over 17 in unemployment or with sporadic paid activities
	Security	At least one member over 17 has not signed contract
	Overwork	At least one member works more than 84 hours per week
Income/Nutrition	Basic Basket	Earnings lower than those required to buy the basic basket for rural/urban areas.

Mixed strategies were implemented in the definition of the dimension indicators, and, then, as was previously mentioned, evaluated according to the data availability and consistency. As Alkire (2001) and Comim, Qizilbash, & Alkire (2008) suggest, normative statements and data limitations were combined with legal requirements (national and international law), participatory methods, previous literature and consensus to define the pertinence of each dimension and indicator.

For instance, the definition of the living standards and education minimum requirements are based on the Millennium Development Goals (Deaton, 2003; Departement of Social and Economic Affairs, 2009), the Universal Human Rights, Children Rights, Chilean

---

[39] Among others, due to data limitations, assets indicators and direct measures of nutrition were not included.

[40] Deprived Walls: adobe, wall without interior protection, mud, thatch, artisanal construction, rubbish, cardboard, tin and rubber.

[41] Deprived Floor: earth.

[42] Deprived Roof: clinkstone, straw, bulrush, rubbish, cane.

Law; housing characteristics, on the previous literature on multidimensional poverty (Alkire & Santos, 2010; Santos et al., 2010); and employment, based on the perception of individuals in poverty[43] (Narayan, Walton, & Chambers, 2000; World Bank, 1999), International Labour Organization recommendations and the Human Freedoms (Desai, 1991). All dimensions, indicators and cut-offs were contrasted with the proposals of the "Fundacion Nacional para la Superacion de la Pobreza" (1999, 2006, 2009) to define realistic parameters for the Chilean context.

Additionally, a proxy for health and specifically nutrition is included. Due to data limitations a monetary indicator will be implemented as an indicator. Due to the limitation of income as a sole measure of the nutritional status of the household and the possible correlations of double counting of the second basket, only the food (basic) basket is recognized as satisfactory for the minimum nutritional requirements. Those households with an income inferior to this amount cannot satisfy their nutritional basic needs. Moreover, differently from the Mexican experience, income is not treated as a censor dimension where its deprivation defines total poverty.

Finally, following the same structure of income poverty measures the household will be defined as a unit and an individual will be considered in per capita terms (in the case of income). This decision not only has a comparative (practical) purpose but it also corresponds to a normative decision. The presence of scale economies and externalities not only applies to the case of income but also in other dimensions like education. Basu & Foster, (1998) and Foster & Handy (2008) suggest that the entire household benefits from other members are in schooling (effective literacy) where some members can experience the external capability. Moreover, in the case of Chile, qualitative and empirical evidence suggest that policies of poverty alleviation should focus on the household and the interactions more than on the individual to have a real long term impact (Serrano, 2005).

The situation of each indicator is represented in the following radial graphs. Deprivation headcount ratios are presented by indicator only for 1990, 2000 and 2009[44]. In general, the deprivation headcounts are falling in all indicators except unemployment. In grey, the indicators associated with housing conditions show important levels of deprivation for overcrowding and the quality of the walls. In education (green), deprivations seems to be concentrated in schooling and, then, in illiteracy.

---

[43] In 2010, The "Fundacion Nacional para la Superacion de la Pobreza" performed focus groups to individuals in poverty conditions following the international structure of "Voices of the Poor" presented in the World Development Report 2000/2001. Results support the relevance of employment in the self evaluation of the poor.

[44] Headcounts per each year are presented in **Error! Reference source not found.**.

Figure 7: Raw Headcounts of Deprivation (Selected Years)
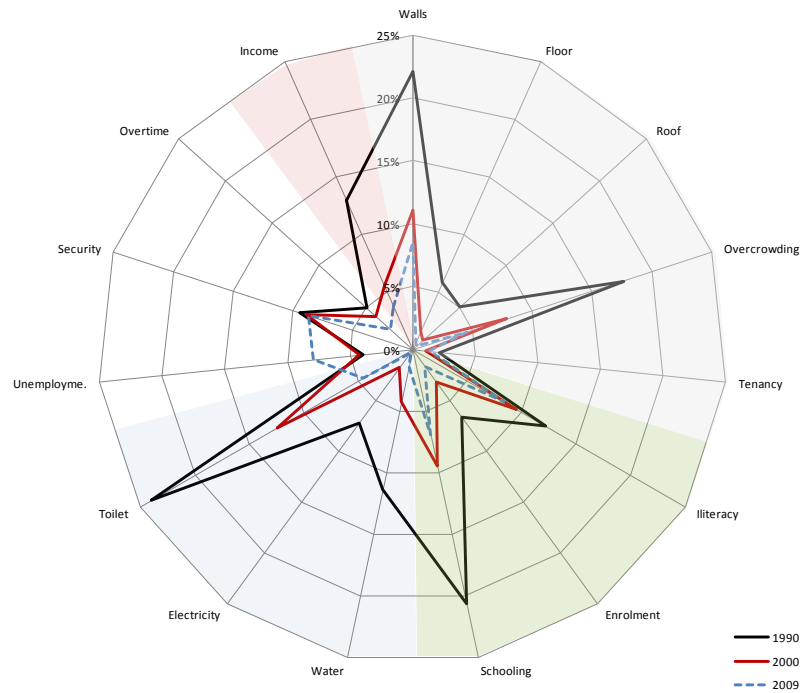
The indicator toilet shows the highest levels of deprivation among the living standard indicators. Employment indicators seem to be the most irregular; unemployment, after a reduction in 1992 increases in the following period 1998-2003 (4%) to decrease again in 2006 (2%) and to reach a peak of 8% in 2009. On the other hand, job security first drops reaching 8% as a minimum (1992) to increase again reaching 13% in 1998. From that moment it fluctuates between a 9% and a 12%. Finally, income (as a measure of capacity to buy food) shows a regular pattern consistent with the information provided in the previous section.

When the headcounts are analyzed by rural and urban area (see

Figure 22), despite the relative patterns across indicators seeming to be similar, indicators are always higher for rural households. In relative terms, walls, overcrowding, schooling, toilet and security are the key drivers of changes in each dimension, respectively. Only water seems to be of special and relevant significance in the living standard dimension, but only in rural areas.

On the other hand, Ravallion (2010b) suggests that these results might be enough to define public policies without the need to "mash them up" in an aggregated indicator. Despite the relevant information provided for these kind of indicators, it avoids the evolution of joint distributions (Stiglitz et al., 2009).

Additionally, the preliminary results show the insufficiency of income as a sole indicator of welfare. Figure 8 shows the levels of deprivation decomposed by those individuals in income poverty (poverty nine). Nevertheless, it can appreciate that a range between 42% and 83% of deprived families are non-poor.

**Figure 8: Raw headcounts of deprivation by income poverty condition (Average all years)[45]**

---
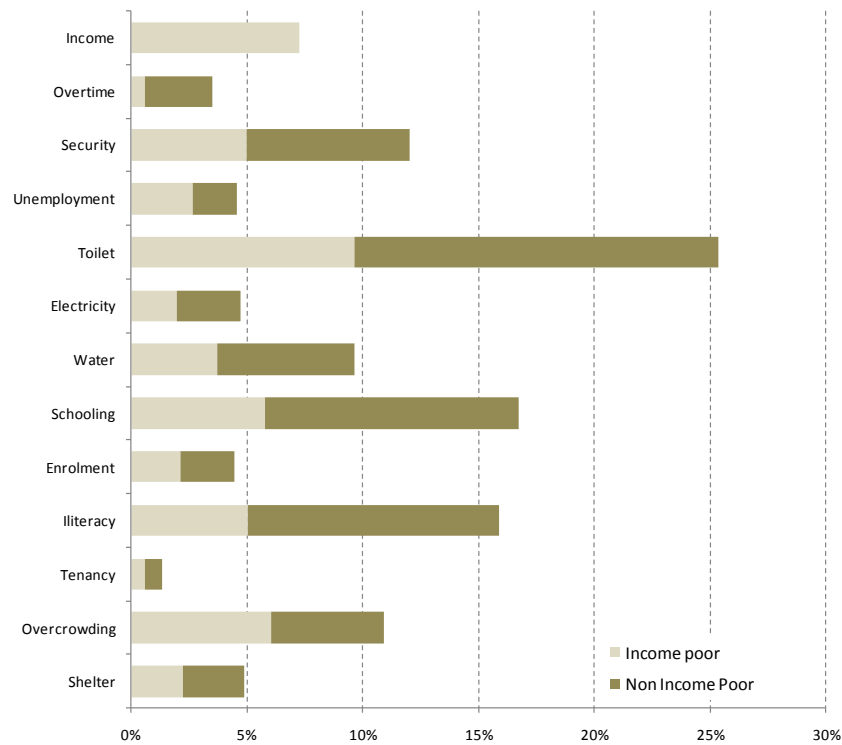
[45] The Income poverty condition is defined based in the total poverty line and the income indicator only reflects those deprived in the food basket.

5.7. Cross-Sectional Results

In this section, cross-sectional results will be presented with a focus on those comparable to uni-dimensional measures. There is mainly a reduction in the poverty level regardless of the poverty cut-off. However, dominance is not clear for the last period. In all other cases, the adjusted headcount ratio falls in an important range of deprivations.

Graphically, Figure 9 shows the evolution of the aggregated multidimensional measure (Adjusted Headcount ratio) according to the different cut-off levels (k). For instance, if a cut-off of 10% is considered, it means that all individuals with at least 10% of their dimensions deprived are considered poor. However, using this poverty line defines as poor some individuals or households with less than one deprived dimension[46].

**Figure 9: Adjusted Headcount Ratio (M0) by Poverty Cut-off**
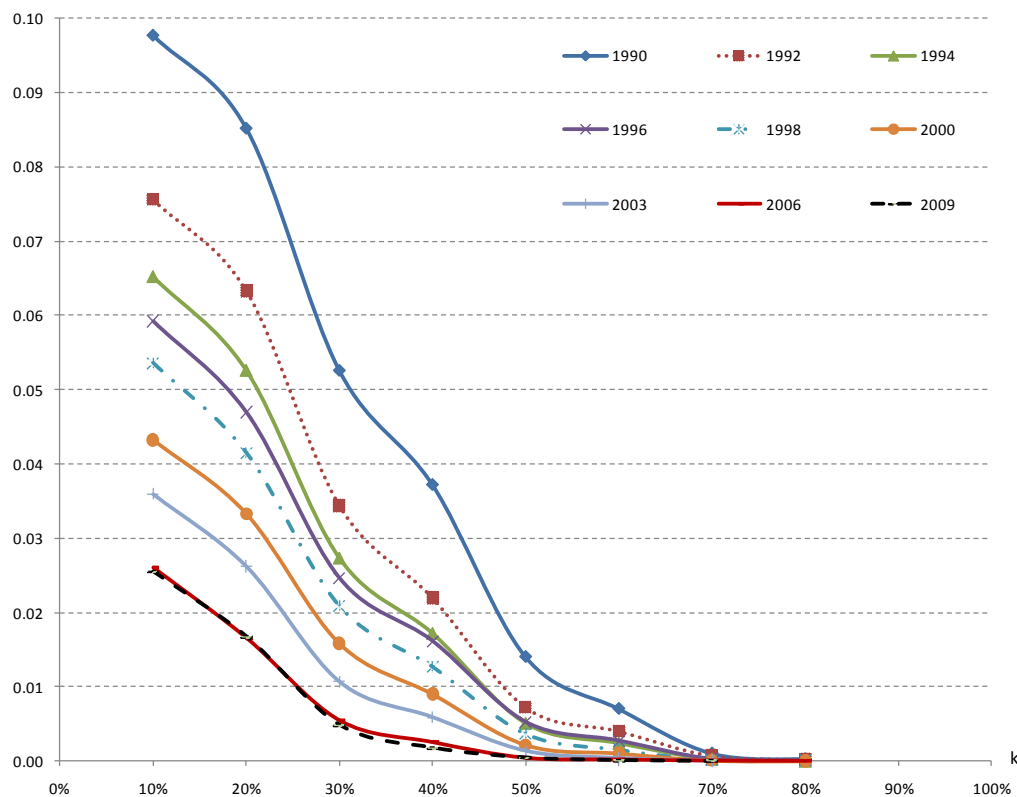
When 20% is defined as a cut-off, a clear pattern of reduction in multidimensional poverty is found except for between 2006 and 2009 where the aggregated indicator is

---

[46] Since each dimension is weighted at the 20%, a combination of indicators could be higher than 10% and not necessarily represent multidimensional poverty. For instance, an individual could be deprived at the same time in overcrowding and shelter implying that he is deprived in 13.3% of his weighed indicators but still in only one dimension (housing).

0.017[47] in both periods. A parallel approach could be analyzed using the properties of dominance defined in equation (27). Figure 10 presents the poverty in each year based on the headcount ratio under the union approach; however, it includes information about the percentage of deprivations in each subgroup[48]. The first part of the bar represents those individuals with at most 20% (or at least 1 equivalent) of dimensions deprived, then, those individuals that are deprived in 20% to 40% of the possible dimensions, and successively.

Across years there is a reduction in the percentage of individuals in higher levels of deprivation, however, the percentage of individuals with at most 20% of their dimensions deprived remains relatively constant. Additionally, a constant reduction in the percentage of individuals in the second group can be observed (excluding the last period). Finally, the proportion of individuals with a higher level of deprivations (80% and above) seems to be only marginal; however, it is important to highlight the fact that only in 1990 are there individuals with the highest level of deprivation (80%-100%). Detailed information can be found in the annexes in Table 16.

Figure 10: Multidimensional Poverty by Percentage of Deprived Dimensions
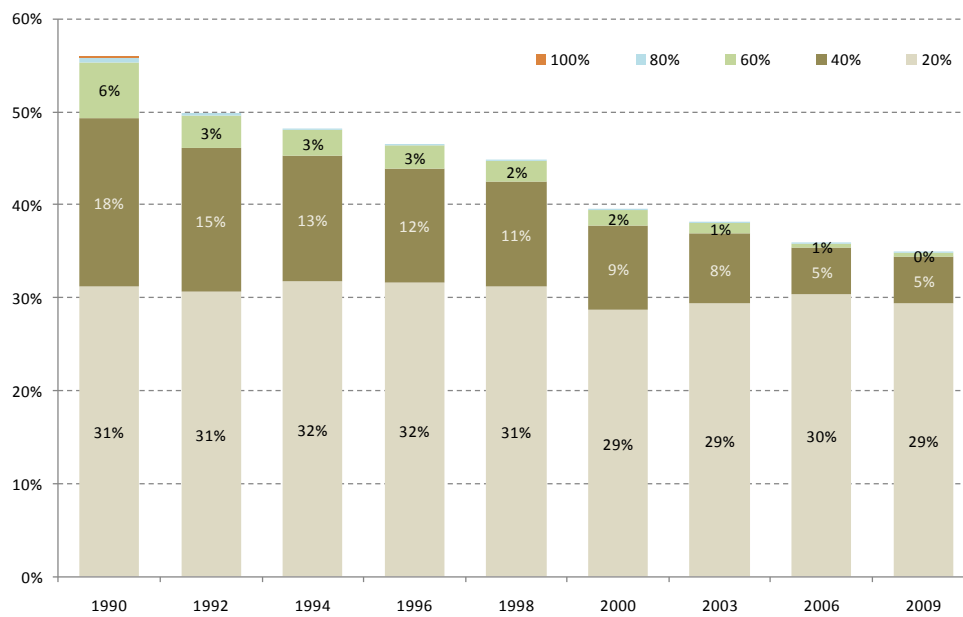
The evolution of the headcount ratios complements the previous information. The headcount ratio simply shows the percentage of people deprived in at least a certain percentage of dimensions as it was defined previously in equation (8). For instance in 1990, 36.05% of the population was deprived in at least 10% of the dimensions

---

[47] Full results are presented in the annexes in Table 15.

[48] This figure does not necessarily represent the headcount results presented in further sections, since it includes as poor those individuals with 6.7% of their dimensions deprived (equivalent to 1 indicator) and headcount results are organized starting at 10%.

considered (Note that the difference between 36.5% in Table 8 with the high of the first bar in Figure 10 is explained by 19.8% of the population with only one indicator deprived corresponding to the 6.7%[49])

Table 8: Headcount ratios according to different poverty cut-offs

	1990	1992	1994	1996	1998	2000	2003	2006	2009
10%	36.1%	30.3%	27.3%	25.0%	23.3%	19.1%	16.9%	13.5%	13.1%
20%	26.7%	21.0%	17.8%	15.8%	14.2%	11.7%	9.6%	6.4%	6.6%
30%	12.5%	8.4%	6.8%	6.0%	5.2%	4.1%	2.8%	1.5%	1.3%
40%	7.9%	4.7%	3.7%	3.5%	2.8%	2.0%	1.3%	0.6%	0.4%
50%	2.4%	1.2%	0.9%	0.9%	0.7%	0.4%	0.2%	0.1%	0.1%
60%	1.1%	0.6%	0.4%	0.4%	0.2%	0.2%	0.1%	0.0%	0.0%
70%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
80%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
100%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

---

[49] Details can be observed in Table 16.

Figure 11: Average deprivation among the poor by poverty cutoffs
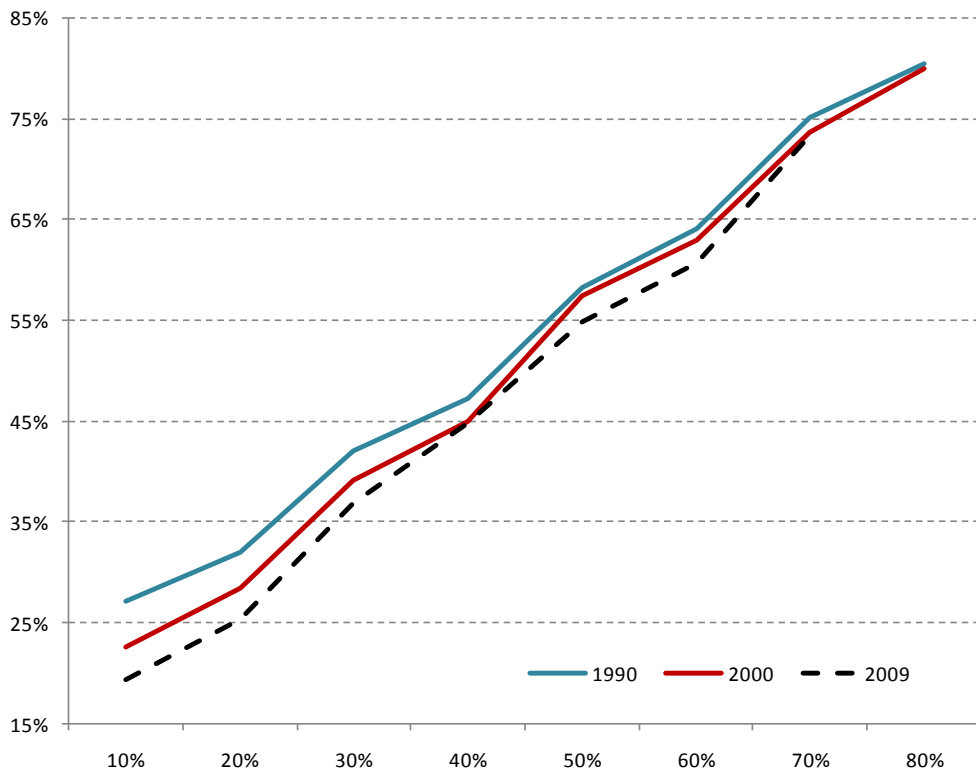
Finally, the national results for the average deprivation support the previous conclusions. Regardless of the poverty cut-off, the intensity or percentage of deprived dimensions among the poor has fallen when considering the 3 selected years (1990, 2000 and 2009). This implies that, for instance, if the poverty cut-off is 20%, the intensity of the poverty among the poor in each respective year is lower in 2009 compared with 2000 and this last one is also smaller compared with 1990[50].

5.8. Decomposition of Changes

In this subsection, cross-sectional results will be decomposed longitudinally and horizontally at the regional level. First, only for descriptive purposes, a cut-off of 20% will be selected, since it will include as poor all individuals in a household with at least one equivalent deprived dimension. Additionally, the analyses of robustness suggest that

---

[50] For comparisons between each survey please refer to Table 17 in the annexes.

cut-offs between 20% and 40% are the most consistent in terms of sub regional rankings[51], changes in the weights and exclusion of variables.

Three strategies were followed to check the robustness of the results in the range 20%-40%. First, one variable at a time was excluded (starting with income), results were consistent in terms of changes over time and in terms of horizontal differences (across regions) 12 out of 15 keep their ratings[52]. Then, different weights between and within dimensions were assigned with similar results. Finally, standard errors were calculated using the properties of the survey[53].

Figure 12: Decomposition of Changes Multidimensional Poverty (k=20%)
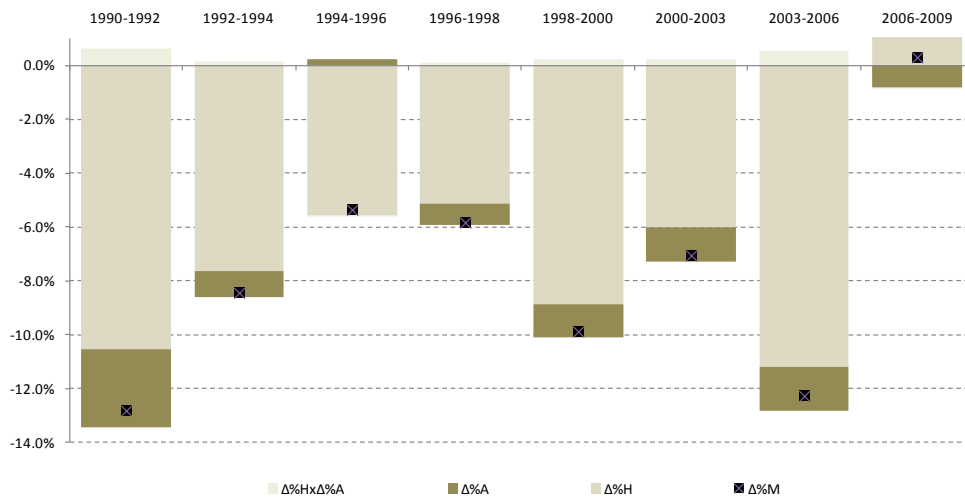
As it has seen before, there is a reduction in the multidimensional poverty in all years except the last period. This change is mainly based on the reduction of the percentage of individuals in poverty. The intensity also tends to reduce levels of multidimensional poverty, however in the period 1994-1996 counter changes can be found. Finally, the last period (2006) shows a different pattern, for the first time, the average deprivation is falling while the headcount ratio in increasing. This last pattern might be explained by the entry into poverty of individuals extremely close to the poverty line who increase the headcount, but, at the same time, reduce the intensity (average deprivation) of the multidimensional poverty. Figure 12 shows annualized results in a comprehensive way, reflecting our results in equation (16).

---

[51] 66.3% of the estimations keep the same regional ranking compared with a cut-off of 20%

[52] Additionally, income tends to increase the variability of the results. In line with previous literature (Feres & Mancero, 2001), it seems that income reflects more the short terms changes in well-being among the poor while the other dimensions are more consistent with long term patters.

[53] Confidence intervals for all multidimensional poverty statistics with k=20% are presented in the annexes.

Using this information, 4 periods can be identified: first, during the early nineties there is a strong and decreasing reduction in poverty led by the headcount ratio, then, the decade finishes again with poverty reductions close to 10% per year. The first part of the new decade also shows a reduction of poverty especially in the period 2003-2006.

Between 2006 and 2009, for the first time, there is an increase in multidimensional poverty led by the higher ratio of poor people. A standard error analysis suggests that results in 2006 are not significantly different from results in 2009 breaking the patterns of poverty reduction of the previous years. The impact of the recent economic crises seems to affect strongly the individual's welfare mainly due to the increase in the percentage of people in poverty.

Additionally analytical standard errors of the transitions were calculated. Results suggest a clear link between the multidimensional indicator (M0) and the headcount ratio as was identified in the decomposition above. All changes in the multidimensional poverty indicator and the headcount ratio are significant except between 1994 and 1998 where the rate reduction is similar. At the same time, it reveals the low significance of changes in the average deprivation. Despite there being a significant reduction in the intensity of multidimensional poverty at absolute levels, the yearly changes tend to be insignificant. Detailed results can be found in Table 19 in the annexes.

Figure 13: Standard Errors of Changes in National Results (k=20%)
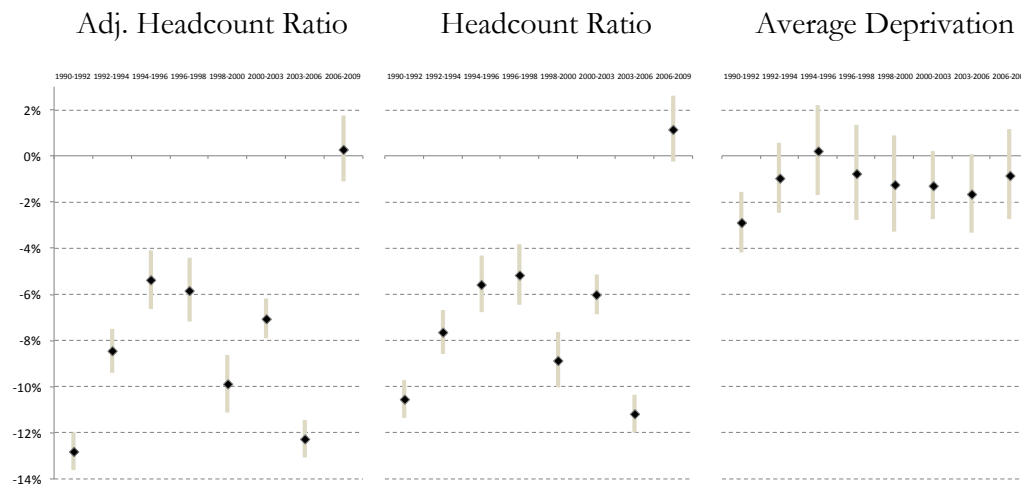
Following the decomposition, results at any geographical level, area, region, province and municipality can be obtained. For instance, using a regional decomposition, changes across regions can be identified and compared. Figure 14 shows the average evolution of multidimensional poverty indicators per administrative region for the entire period. Two main patterns can be identified: first, there is an unambiguous reduction in multidimensional poverty with extreme dissimilar patterns, for instance the rate of

poverty reduction in the region of Antofagasta is three times higher than the geographically contiguous region of Tarapaca. Secondly, changes are mainly explained by reductions in the percentage of poor people and, secondly, by the level of deprivation.

Figure 14: Decomposition of yearly changes in poverty Statistics across regions (1900-2006)
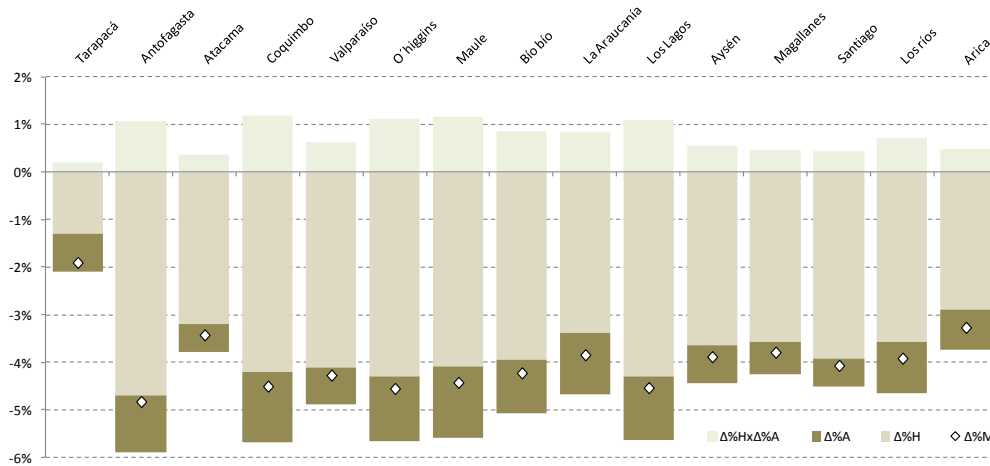
Using the decomposition by headcount ratio, presented in equation (19), it might shed lighter on inter temporal changes. Aggregating, for simplicity, by rural and urban areas, Figure 15 shows that the reduction in the ratio of poor individuals is mainly due to the reduction in the poverty in urban areas. At the extremes, between 1994 and 1998 the level of poor individuals in rural areas remains almost constant adjusted by the changes in the population as described in (19). At the other extreme, for the last period, it is clear that there is an increase in the number of households in urban areas and a reduction of the poverty ratio in rural areas.

Figure 15: Decomposition of Changes in the Headcount Ratio
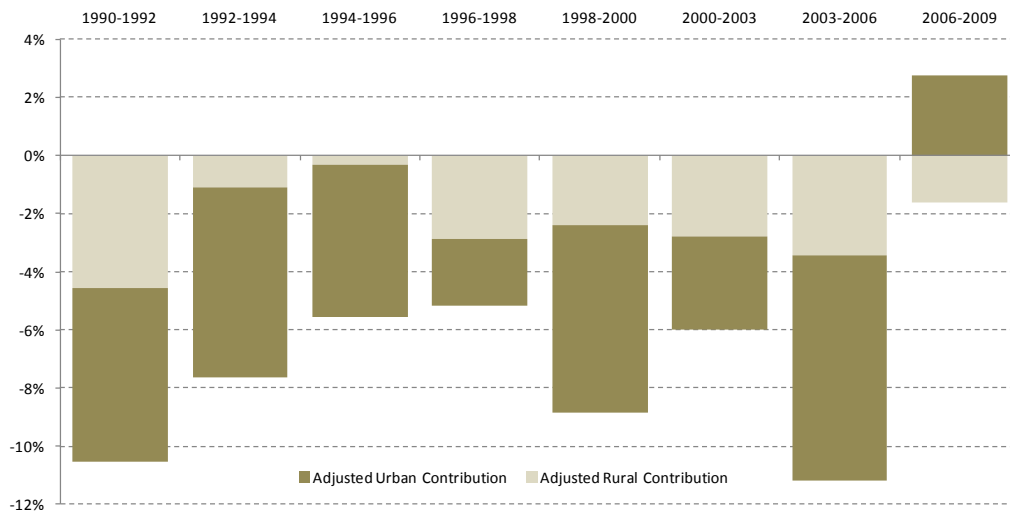
Despite the surveys from recent years being representative at the municipal level, the results presented in this section are at the national and regional level. However, some of the local results have already been used by the "Fundación Nacional de Superación de la Pobreza" to define human resources policies.

A second group of decompositions can be performed with repeated cross-sectional surveys exploring the impact of each dimension[54] of indicators in the total poverty. Figure 16 shows the relevance of each dimension on the multidimensional poverty indicator[55]. In simple terms, it represents the contribution of those individuals who are poor and deprived in a specific dimension (censor headcount) over the total poverty.

As previous unidimensional literature suggests, there is a decrease in the relevance of the income indicator during the first decade, mainly due to the economic boom. However, from the late nineties, and in parallel with the Asian crisis and the reduction in the growth rates, its relevance has increased constantly to become by far the most important determinant of multidimensional poverty. Quality of employment has marginally increased its relevance mainly due to the increase in informal employment during economic crises (1998 and 2003). On the other hand, after unstable behavior in the early nineties, there is a consistent reduction in the relevance of material living standards, mainly as a consequence of a mix of programmes of standardization of basic services with others focused on income poor households.

---

[54] These results can be decomposed at the level of indicators, providing relevant information for public policies. In this case, results by dimension were preferred to increase comparability.
[55] Results are expressed in percentages of the adjusted headcount ratio; consequently, they are insensitive to changes in the poor population.

Education seems to be the most stable contributor among the dimensions. On the one hand, there is a reduction in the percentage of individuals deprived in enrolment and attendance; however, there is a permanent increase in the number of illiterates. Despite the percentage of households with at least one illiterate individual falling for the whole society, among the poor (who are fewer each year) this percentage becomes more important. Finally there is a reduction of 7% in the contribution of those individuals who are poor and deprived in the housing conditions dimension.

Figure 16: Contribution of each dimension to total multidimensional poverty per year
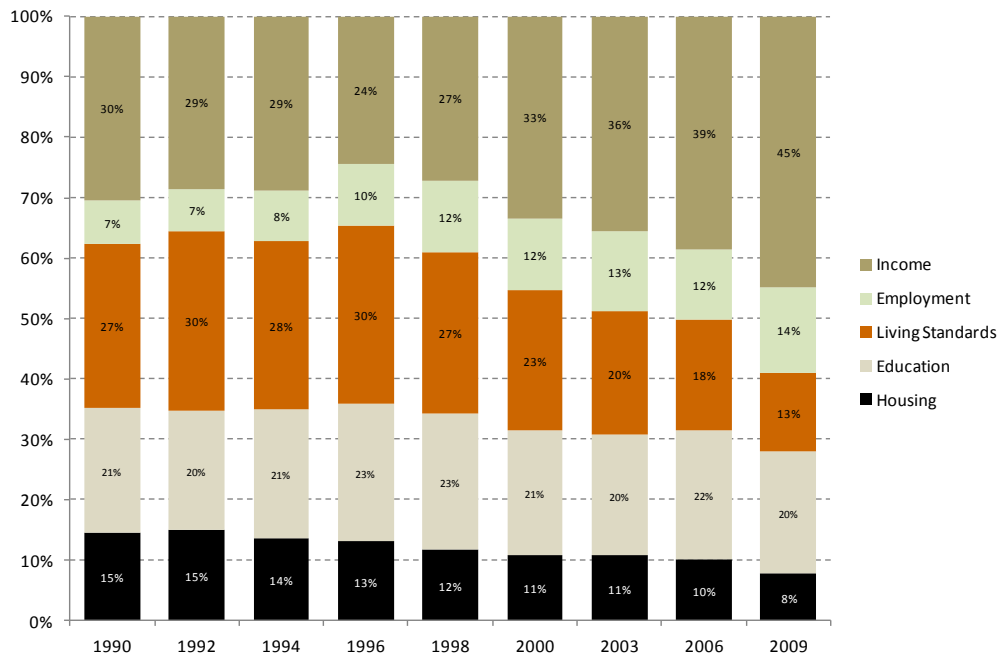
Following equation (20), changes in the average deprivation were decomposed by dimension. In simple terms, Figure 17 presents the contribution of each dimension to changes in the intensity of poverty regardless of the number of poor individuals. Each color represents the relevance of each dimension to explain how poor are the poor; for instance, between 2006 and 2009, the reduction in the intensity of poverty ($\Delta\%A$) is mainly explained by housing, living standards and education improvement minus the detrimental changes in employment and income. As was mentioned before, this is consistent with the capacity of these indicators to capture short run changes, in this case derived from the worsening economic conditions.

Figure 17: Decomposition of Changes in the Average Deprivation (Δ%A)
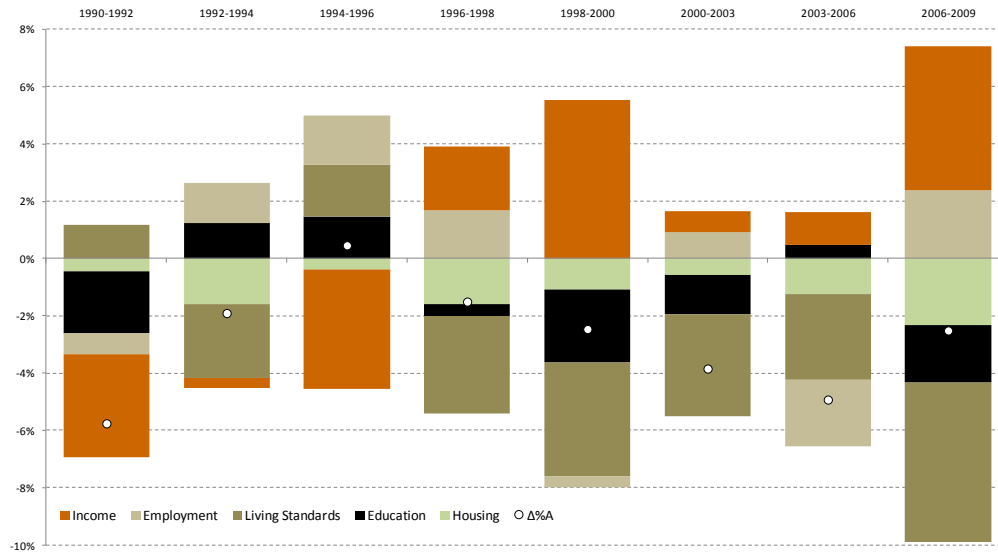
As it was described before, the income dimension seems to play a crucial and opposite role across the years. While in the early nineties it was an important contributor in reducing the average deprivation, after the Asian crises its role was the opposite. Untill1996, in a flourishing economic context, income seems to be a promoter of the improvement in the average deprivation. This role is the opposite with lower growth rates that characterized the following years.

At the same time, it can observe the low positive correlation between the income dimensions with other dimensions. Additionally, only the housing dimension shows a consistent reduction in all periods and, being increasingly relevant during the last decade. Finally, the contribution of living standards during the last decade is consistent with the public policies implemented in the period and described previously.

In this section, unidimensional and multidimensional measures were compared, with surprisingly similar results in terms of evolution, but with different cross-sectional levels of poverty. In terms of the changes across time, both approaches find continuous reductions in the poverty levels until 2006 and a process of stagnation for the last period. In the cross-sectional analyses, levels of multidimensional poverty are between 7% and 12% lower than income poverty results. Using information from the last survey (2009), 15.1% of the population was income poor (3.7% in extreme poverty) meanwhile the population in multidimensional poverty reached 6.59% considering a poverty cut-off of 20%.

Figure 18: Evolution of Income and Multidimensional Headcount Ratios k=20%
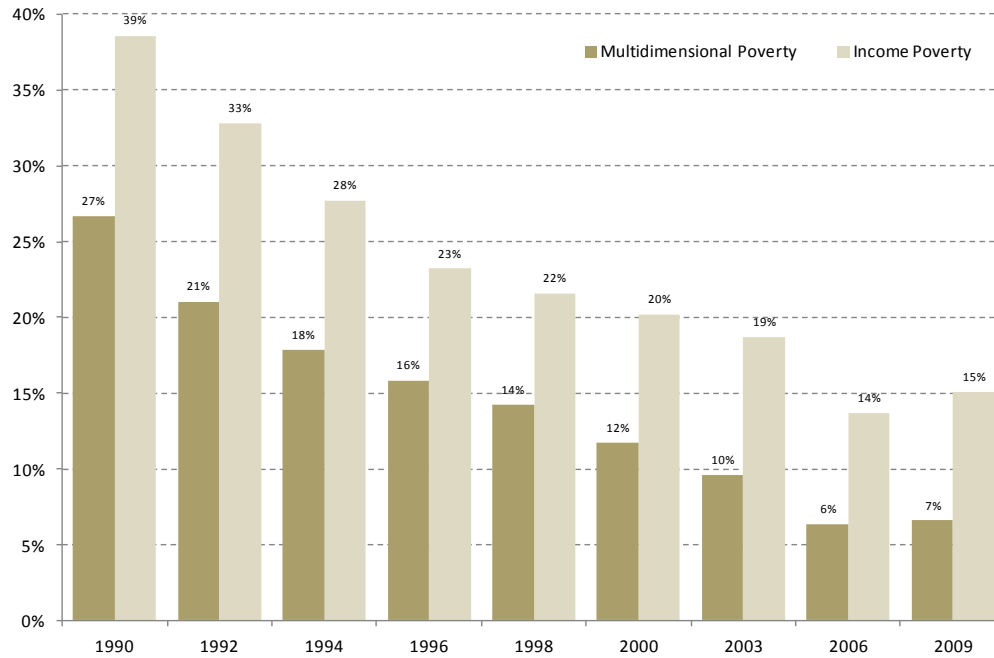
Additionally, differences between both measures were well established. Neither the income nor multidimensional approaches are able to provide, by themselves, a full idea of the poverty condition. Table 9 shows the distribution of the population by different poverty conditions. Only 9.2% of the population is identified as multidimensionally and income poor at the same time, 13.7% only as income poor and 4.7% only as multidimensionally poor. Consequently, mix techniques are suggested in order to identify the poor and identify consistent policies.

Table 9: Distribution of the population according to the poverty condition

	Income & Multidimensional	Only Income	Only Multidimensional	Non-Poor
1990	19.2%	19.4%	7.5%	53.9%
1992	13.9%	19.0%	7.2%	60.0%
1994	11.8%	15.8%	6.0%	66.3%
1996	9.7%	13.5%	6.2%	70.7%
1998	8.7%	12.9%	5.5%	72.9%
2000	7.7%	12.5%	4.0%	75.8%
2003	6.4%	12.3%	3.2%	78.1%
2006	4.0%	9.7%	2.3%	84.0%
2009	4.4%	10.8%	2.2%	82.7%
Total	9.2%	13.7%	4.7%	72.4%

In terms of evolution, headcount of income poverty has fallen in total by 60.9% (3.2% per year) meanwhile multidimensional poverty has dropped by 75.3% (4% per year) in the same period (1990-2009). Moreover, 65.5% of the reduction in income poverty is explained by changes in the period 1990-1998 in the case of the headcount for multidimensional poverty this period only explains 53.9% of the poverty reduction. This phenomenon can be understood by the sensitivity of income measures to the economic context increasing its volatility in the short run. On the other hand, and despite the higher reduction in multidimensional poverty these changes were similarly distributed across years absorbing not only changes in terms of income, but also, in terms of new policies targeted at the poor.

At the same time geographical decomposition is an alternative analysis in several aspects. It allows the policy maker to define local requirements and their evolution over time. For instance, for the last period 3 pairs of regions seem to have the same patterns of change[56]. The first two reduced the level of poverty by 5.2% however; it is clear that in the case of the second region this change is mainly accounted for by a reduction in the number of poor people. The second pair show increases in poverty for two regions based mainly on a higher level of deprivations, however, the number of poor is increasing in the first (O'Higgins) and decreasing in the second. Finally, in the last set both regions are increasing in poverty by 5.4% yearly but only in one is the intensity of the poverty falling.

Figure 19: Yearly Decomposition of Changes in Selected Regions 2006-2009
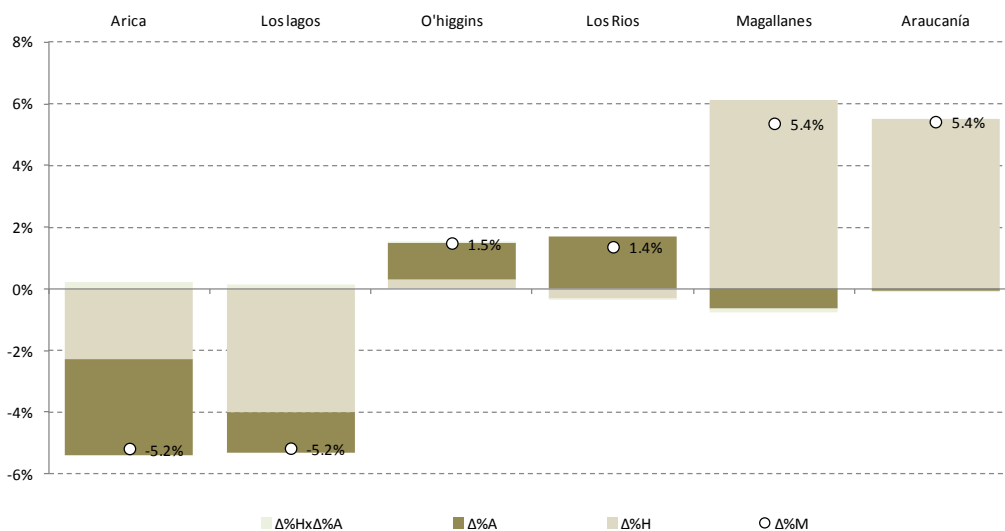
Sub sequential decompositions can be analyzed according to the characteristics of the sample. Surveys CASEN 2006 and 2009 have representativity at the municipality level.

---

[56] On average there were 16,461 observations per region and 739 per municipality in 2009.

Using these properties the following maps (Figure 20) were constructed to show the changes in each one of the multidimensional poverty determinants where no change is represented by ▭[57].

There is a clearly stronger reduction in multidimensional poverty in the period 2003-2006 that is distributed across the entire country. Only 33 municipalities (out of 282) increased their levels of multidimensional poverty concentrated in the regions of Arica, Coquimbo, Valparaiso and Santiago. A critical case is the municipality of Caldera (Coquimbo region) increasing the headcount ratio from 2.3% to 7.0% due to a deterioration of the employment and educational conditions. At the other extreme, the municipality of Calama reduced poverty by 29% based on improvements in employment, living standards and housing conditions. Additionally, for the same period, an important group of municipalities (34%) increased the average deprivation relatively faster than the change in the headcount ratio.

---

[57] Any color hotter (redder) than ▭ implies a positive change. Any colder (whiter) color implies a negative change.

Figure 20: Municipal decomposition of changes in the Multidimensional poverty 2003-2006-2009 k=20%

2003-2006

2006-2009

Δ% M	Δ% H	Δ% A
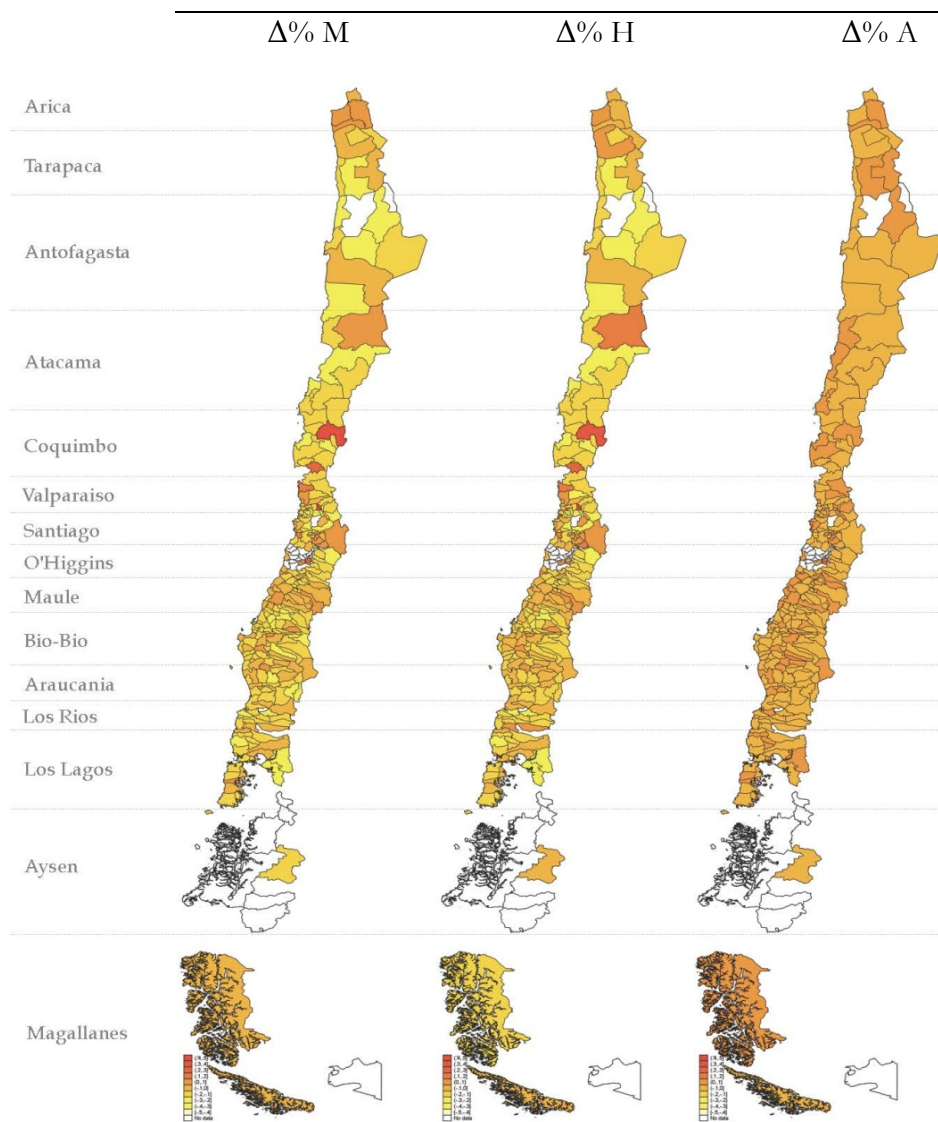
In the second period (2006-2009), the changes are mainly defined by changes in the headcount ratio of the municipalities. 45% of the municipalities present multidimensional impoverishment at an average of 18.6% that generates the increase in national multidimensional poverty during the period. A similar situation occurs in the case of the headcount ratio. However, in the case of the average deprivation, more populated municipalities (intensively urban) reduced the intensity. On the other hand, a higher number of less dense municipalities increased their intensity marginally.

Figure 21: Spatial distribution of Municipalities 2003-2006-2009

2003   **2006**

2009
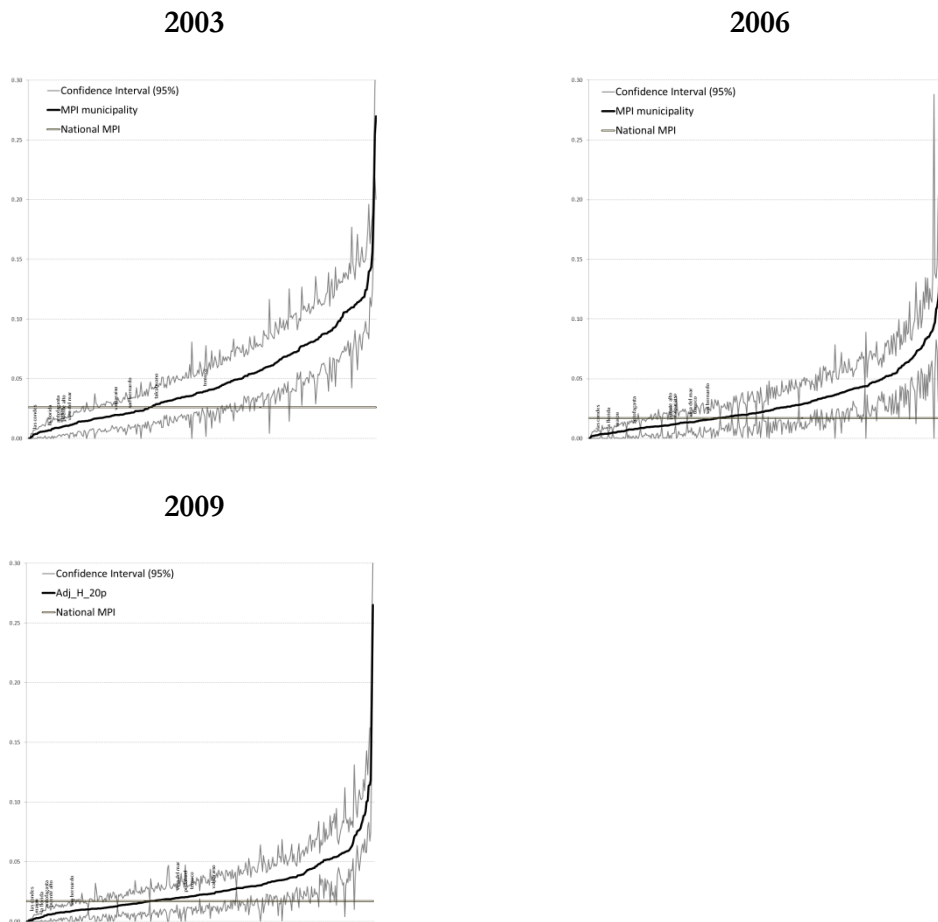
At the extremes, the municipality of El Quisco reduced multidimensional poverty by 30.8% mainly based on the reduction of the headcount (30%) and only marginally due to a reduction in intensity (2.9%) based on improvements of living standards, education and income (nutrition). On the other hand, the community of Machali seems to be the most affected, increasing their poverty levels form 3% to 11.2% based on changes in education, living standards and housing conditions.

Finally, decomposition techniques developed in the second section of this paper generate new information about the patterns of changes in the multidimensional poverty indicator. Previous literature focuses its attention on changes in the aggregated indicator, however, more information can be obtained by evaluating at the same time changes in the headcount ratio and the average deprivation. Additionally, decomposition strategies were useful to understand these changes using horizontal decompositions (by geographic area for instance) or by dimension. The first one facilitates the understanding and

targeting of public policies in a defined subgroup. The latter, on the other hand, informs the kind of change that the sub group is developing.

6. Conclusions

The literature is consistent in recognizing that during the last years it has been necessary to introduce new alternative measures to understand an individual's welfare. Among these measures is poverty. At the same time, the capabilities work of Sen provided a framework in which these new ideas could be explored and extended. It is in this context that new understandings of multidimensional measures of poverty have flourished. After the development of several alternative strategies, Alkire and Foster (2010) have proposed a simple but insightful measure of multidimensional poverty, combining: Sen's framework; the suggestions of the counting approach; and, the new requirements from the policy makers.

The main purpose of this essay is to extend the new multidimensional framework proposed by Alkire and Foster (2010) to the analysis of dynamics across time in a theoretical and empirical manner.

First a literature review was presented with a focus on the evolution of multidimensional measures in the last 4 years and their application to Latin America. Then, multidimensional poverty and their dynamics were implemented in cross-sectional (1990-2009) data from Chile. Changes across years were computed and patterns were compared with income results. Additionally, and using the properties of the CASEN (low levels of aggregation) a spatial distribution of poverty is included[58]. Additionally, technical advances have been implemented such as the calculation of analytical standard errors for the first time (in this case for the second time) in an empirical application.

Results confirm the necessity to develop a multidimensional poverty measure able to guide policy makers dealing with social issues. The complementarity of a multidimensional measure with the traditional monetary analysis will provide information about not only current situation of the most vulnerable population, but also regarding the design and evaluation of policies.

---

[58] Including local hetereogeneity and fitting with local public policy requirements (Agostini, Brown, & Góngora, 2008).

7. Annexes

Table 10: Poverty lines per geographical area in current prices (Chilean pesos)

Poverty Line	1990	1992	1994	1996	1998	2000	2003	2006	2009
Urban	18.594	25.75	30.1	34.272	37.889	40.562	43.712	47.099	64.134
Rural	12.538	17.362	20.295	23.108	25.546	27.328	29.473	31.756	43.242

Table 11: Poverty lines per geographical area in 2009 prices (Chilean pesos)

Poverty Line	1990	1992	1994	1996	1998	2000	2003	2006	2009
Urban	55.533	57.253	54.849	54.174	54.038	53.883	54.201	53.85	64.134
Rural	37.446	38.603	36.982	36.527	36.434	36.303	36.545	36.308	43.242

Table 12: Headcount of Deprivations Per Year

	1990	1992	1,994	1996	1998	2000	2003	2006	2009
Walls	22%	21%	17%	15%	14%	11%	10%	10%	9%
Floor	6%	5%	3%	3%	2%	2%	1%	1%	1%
Roof	5%	4%	3%	2%	2%	1%	1%	0%	0%
Overcrowding	18%	15%	13%	11%	10%	8%	7%	6%	5%
Tenancy	2%	1%	1%	2%	1%	1%	1%	1%	1%
Illiteracy	12%	12%	11%	11%	11%	10%	9%	9%	8%
Enrolment	7%	5%	5%	5%	4%	3%	2%	2%	2%
Schooling	21%	13%	15%	13%	11%	10%	8%	7%	7%
Water	11%	10%	7%	7%	6%	4%	3%	2%	1%
Electricity	7%	6%	4%	4%	3%	2%	1%	0%	0%
Toilet	24%	23%	20%	19%	16%	12%	10%	7%	5%
Unemployment	4%	2%	2%	2%	4%	4%	4%	2%	8%
Security	9%	8%	11%	12%	13%	9%	12%	10%	9%
Overtime	5%	4%	4%	4%	4%	4%	3%	4%	2%
Income	13%	9%	8%	6%	6%	6%	5%	3%	4%

Figure 22: Raw Headcounts of deprivation by area (Selected Years)
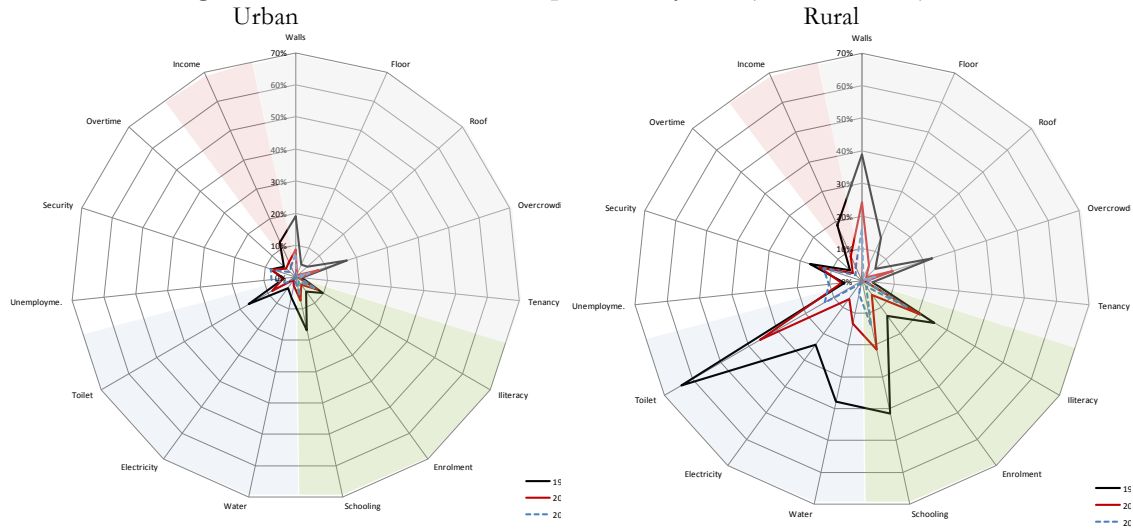
Table 13: Deprivation level only among the non-poor

	1990	1992	1,994	1996	1998	2000	2003	2006	2009
Walls	5.4%	6.4%	6.0%	4.1%	4.4%	4.4%	2.7%	2.0%	1.2%
Floor	9.4%	9.3%	8.5%	8.9%	8.4%	6.7%	5.3%	4.8%	3.6%
Roof	1.7%	0.9%	0.7%	1.6%	0.9%	1.0%	1.1%	0.7%	1.2%
Overcrowding	12.5%	14.9%	14.4%	14.2%	13.9%	16.5%	14.9%	14.8%	13.2%
Tenancy	5.3%	5.3%	4.5%	4.2%	3.5%	3.2%	2.4%	2.1%	1.5%
Illiteracy	19.3%	16.7%	18.4%	14.6%	13.9%	16.5%	13.8%	12.7%	12.1%
Enrolment	13.4%	15.6%	12.7%	9.1%	8.3%	9.6%	5.8%	4.8%	3.0%
Schooling	8.4%	9.5%	6.0%	5.7%	3.6%	4.5%	2.5%	1.4%	0.7%
Water	26.2%	31.7%	29.7%	24.6%	22.4%	26.5%	20.5%	15.0%	9.6%
Electricity	1.5%	1.1%	0.9%	1.0%	1.4%	2.6%	1.5%	1.2%	8.2%
Toilet	7.1%	7.7%	10.1%	9.9%	11.4%	7.7%	11.2%	8.8%	8.9%
Unemployment	5.8%	4.1%	3.9%	4.6%	5.2%	4.1%	3.1%	3.8%	2.7%
Security	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Overtime	5.4%	6.4%	6.0%	4.1%	4.4%	4.4%	2.7%	2.0%	1.2%
Income	9.4%	9.3%	8.5%	8.9%	8.4%	6.7%	5.3%	4.8%	3.6%

Table 14: Correlation between indicators all years											
	(She)	(Ove)	(Ten)	(Ili)	(Enr)	(Sch)	(Wat)	(Ele)	(Toi)	(Une)	(Sec)	(Ove)
Shelter	1.00											
Overcrowding	0.46	1.00										
Tenancy	0.29	0.25	1.00									
Illiteracy	0.34	0.14	0.11	1.00								
Enrolment	0.28	0.35	0.19	0.24	1.00							
Schooling	0.41	0.17	0.16	0.47	0.29	1.00						
Water	0.56	0.32	0.33	0.35	0.35	0.46	1.00					
Electricity	0.53	0.31	0.27	0.34	0.36	0.49	0.78	1.00				
Toilet	0.63	0.40	0.34	0.40	0.37	0.49	0.86	0.76	1.00			
Unemployme.	0.06	0.03	0.05	0.14	-0.02	0.21	0.04	0.07	0.07	1.00		
Security	0.16	0.16	0.08	0.15	0.16	0.13	0.17	0.13	0.22	-0.66	1.00	

Overtime	-0.04	0.02	-0.04	-0.09	0.00	-0.15	-0.09	-0.08	-0.12	-1.00	-0.03	1.00
Income	0.29	0.42	0.19	0.11	0.28	0.23	0.24	0.26	0.31	0.53	0.23	-0.15

Table 15: Adjusted Headcount Ratio (M0) per year and cutoff (k)

k	1990	1992	1994	1996	1998	2000	2003	2006	2009
10%	9.8%	7.6%	6.5%	5.9%	5.4%	4.3%	3.6%	2.6%	2.5%
20%	8.5%	6.3%	5.3%	4.7%	4.1%	3.3%	2.6%	1.7%	1.7%
30%	5.3%	3.4%	2.7%	2.5%	2.1%	1.6%	1.1%	0.5%	0.5%
40%	3.7%	2.2%	1.7%	1.6%	1.3%	0.9%	0.6%	0.3%	0.2%
50%	1.4%	0.7%	0.5%	0.5%	0.4%	0.2%	0.1%	0.0%	0.0%
60%	0.7%	0.4%	0.2%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%
70%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
80%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
100%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 16: Incidence ratio according to different cutoff levels

	1990	1992	1994	1996	1998	2000	2003	2006	2009
0%	44.1%	50.2%	51.7%	53.4%	55.2%	60.5%	61.9%	64.1%	65.2%
1%-10%	19.8%	19.6%	21.0%	21.5%	21.6%	20.4%	21.2%	22.4%	21.7%
11%-20%	11.5%	11.0%	10.8%	10.1%	9.7%	8.3%	8.1%	8.0%	7.7%
21%-30%	12.1%	10.8%	9.7%	8.9%	8.3%	6.8%	6.0%	4.0%	4.1%
31%-40%	6.0%	4.7%	3.8%	3.3%	2.9%	2.3%	1.6%	0.9%	1.0%
41%-50%	4.1%	2.5%	2.1%	1.8%	1.7%	1.3%	0.9%	0.4%	0.3%
51%-60%	1.9%	1.0%	0.7%	0.7%	0.5%	0.3%	0.2%	0.1%	0.1%
61%-70%	0.4%	0.2%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%
71%-80%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
81%-90%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90%-100%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 17: Average deprivation (A) according to different poverty cutoffs

	1990	1992	1994	1996	1998	2000	2003	2006	2009
10%	27.1%	25.0%	23.9%	23.7%	23.0%	22.6%	21.3%	19.3%	19.4%
20%	31.9%	30.1%	29.5%	29.7%	29.2%	28.5%	27.4%	26.0%	25.4%
30%	42.1%	40.8%	40.3%	40.9%	40.0%	39.1%	38.8%	37.6%	36.8%
40%	47.2%	46.8%	46.0%	46.4%	45.9%	45.0%	44.7%	44.1%	44.8%
50%	58.2%	58.7%	58.0%	58.2%	57.2%	57.5%	55.6%	57.5%	54.9%
60%	64.1%	63.9%	64.1%	63.6%	63.5%	62.9%	62.0%	63.7%	60.7%
70%	75.1%	75.1%	73.9%	75.1%	75.8%	73.7%	73.3%	74.1%	73.3%
80%	80.5%	80.0%	80.0%	80.0%	80.0%	80.0%		80.0%	

Table 18: Confidence Intervals for the Alkire and Foster statistics with k=20%

year	Adjusted Headcount (M0) Mean	95% Conf. Interval		Headcount Ratio (H) Mean	95% Conf. Interval		Average Deprivation (A) Mean	95% Conf. Interval	
1990	0.085	0.084	0.086	0.267	0.264	0.269	0.319	0.315	0.324
1992	0.063	0.063	0.064	0.210	0.208	0.213	0.301	0.297	0.305
1994	0.053	0.052	0.053	0.178	0.176	0.180	0.295	0.290	0.300
1996	0.047	0.046	0.048	0.158	0.156	0.161	0.297	0.290	0.303
1998	0.041	0.041	0.042	0.142	0.140	0.144	0.292	0.286	0.298
2000	0.033	0.033	0.034	0.117	0.115	0.119	0.285	0.278	0.291
2003	0.026	0.026	0.027	0.096	0.094	0.097	0.274	0.268	0.280
2006	0.017	0.016	0.017	0.064	0.062	0.065	0.260	0.253	0.268
2009	0.017	0.016	0.017	0.066	0.064	0.067	0.254	0.246	0.262

Table 19: Confidence Intervals for Changes in the Alkire and Foster statistics with k=20%

	Δ% Adjusted Headcount (M0) Mean	95% Conf. Interval		Δ% Headcount Ratio (H) Mean	95% Conf. Interval		Δ% Average Deprivation (A) Mean	95% Conf. Interval	
1990-1992	-12.8%	-12.0%	-13.6%	-10.5%	-9.7%	-11.4%	-2.9%	-4.2%	-1.5%
1992-1994	-8.4%	-7.5%	-9.4%	-7.6%	-6.7%	-8.6%	-1.0%	-2.4%	0.6%
1994-1996	-5.4%	-4.1%	-6.6%	-5.6%	-4.3%	-6.8%	0.2%	-1.7%	2.2%
1996-1998	-5.8%	-4.4%	-7.2%	-5.2%	-3.8%	-6.5%	-0.8%	-2.8%	1.4%
1998-2000	-9.9%	-8.6%	-11.1%	-8.9%	-7.6%	-10.1%	-1.2%	-3.3%	0.9%
2000-2003	-7.1%	-6.2%	-7.9%	-6.0%	-5.1%	-6.9%	-1.3%	-2.7%	0.2%
2003-2006	-12.3%	-11.5%	-13.1%	-11.2%	-10.4%	-12.0%	-1.6%	-3.3%	0.1%
2006-2009	0.3%	1.8%	-1.1%	1.2%	2.6%	-0.2%	-0.8%	-2.7%	1.2%

8. References

Ahumada, J. (1958). *En vez de la Miseria*. (Editorial del Pacifico, Ed.) (7th ed., p. 192). Santiago de Chile. Retrieved from http://www.memoriachilena.cl/temas/documento_detalle.asp?id=MC0037114

Alkire, S. (2001). Operationalizing Sen's Capability Approach.

Alkire, S. (2002). Dimensions of Human Development. *World Development*, *30*(2), 181-205. doi:10.1016/S0305-750X(01)00109-7

Alkire, S., & Foster, J. (2010a). Counting and multidimensional poverty measurement. *Journal of Public Economics*, (doi:10.1016).

Alkire, S., & Foster, J. (2010b). Counting and multidimensional poverty measurement. *Journal of Public Economics*. doi:10.1016/j.jpubeco.2010.11.006

Alkire, S., & Foster, J. (2011). Understandings and misunderstandings of multidimensional poverty measurement. *The Journal of Economic Inequality*, *9*(2), 289-314. Springer Netherlands. doi:10.1007/s10888-011-9181-4

Alkire, S., & Santos, M. E. (2010). Acute multidimensional poverty: A new index for developing countries.

Alkire, S., Santos, M. E., Seth, S., & Yalonetzky, G. (2010). Is the multidimensional poverty index robust to different weights?

Altimir, O. (1979). *La Dimension de la Pobreza en America Latina*. (CEPAL, Ed.) (p. 95). Santiago, Chile.

Amarante, V., Arim, R., & Vigorito, A. (2008). Multidimensional poverty among children in Uruguay 2004-2006. Evidence from panel data. *Meeting of the LACEA/IADB/WB/UNDP Network on Inequality and Poverty, Universidad Catolica de Santo Domingo. Santo Domingo, Rep�blica Dominicana.*

Anand, S., & Sen, A. (2004). CONCEPTS OF HUMAN DEVELOPMENT AND POVERTY: A MULTIDIMENSIONAL PERSPECTIVE. *Readings in Human Development: Concepts, Measures and Policies for a Development Paradigm*, 228. Oxford University Press, USA. Retrieved from http://www.clas.berkeley.edu/Academics/courses/center/fall2007/sehnbruch/UNDP Anand and Sen Concepts of HD 1997.pdf

Apablaza, M., & Yalonetzky, G. (2011). Measuring the dynamics of multiple deprivations among children : the cases of Andhra Pradesh, Ethiopia, Peru and Vietnam. Oxford.

Apablaza, M., Ocampo, J. P., & Yalonetzky, G. (2010). *Decomposing changes in multidimensional poverty in 10 countries*. Oxford.

Arim, R., & Vigorito, A. (2007). Un analisis multidimensional de la pobreza en uruguay. 1991-2005. *Serie Documentos de Trabajo*.

Asselin, L. (2009). *Analysis of Multidimensional Poverty: Theory and Case Studies*. Ottawa, ON, CAN: IDRC Books. Retrieved from http://site.ebrary.com/lib/uon/docDetail.action?docID=10342576

Asselin, L. M., & Anh, V. T. (2009). Dynamic poverty analysis in Vietnam 1993-2002: multidimensional versus moneymetric analysis. In L.-M. Asselin (Ed.), *ANALYSIS OF MULTIDIMENSIONAL POVERTY: Theory and Case Studies*. Ottawa: Springer/IDRC 2009.

Atkinson, A. (1999). The Contributions of Amartya Sen to Welfare Economics. *The Scandinavian Journal of Economics*, *101*(2), 173-190 CR - Copyright © 1999 The Scandinavi. Blackwell Publishing on behalf of The Scandinavian Journal of Economics. Retrieved from http://www.jstor.org/stable/3440691

Atkinson, A. (2003a). Multidimensional Deprivation: Contrasting Social Welfare and Counting Approaches. *Journal of Economic Inequality*, *1*(1), 51-65-65. Springer Netherlands. doi:10.1023/A:1023903525276

Atkinson, A. (2003b). Multidimensional deprivation: contrasting social welfare and counting approaches. *Journal of Economic Inequality*, *1*, 51-65.

Azariadis, C. (2006). The Theory of Poverty Traps. *Poverty traps*, 17. Princeton University Press.

Azariadis, C., & Stachurski, J. (2005). Handbook of Economic Growth. In P. Aghion & S. Durlauf (Eds.), (Vol. 1, pp. 295-384). Elsevier Science.

Bandura, R. (2008). A Survey of Composite Indices Measuring Country Performance: 2008 Update. New York. Retrieved from http://www.undp.org/developmentstudies/docs/indices_2008_bandura.pdf

Barrientos, A., & Santibáñez, C. (2009). New Forms of Social Assistance and the Evolution of Social Protection in Latin America. *Journal of Latin American Studies*, *41*(01), 1-26. Retrieved from http://journals.cambridge.org/abstract_S0022216X08005099

Barros, R., Carvalho, M., & Franco, S. (2006). Pobreza Multidimensional no Brasil. *Discussion Papers*. Instituto de Pesquisa Econ�mica Aplicada-IPEA. Retrieved from http://econpapers.repec.org/scripts/redir.pf?u=http%3A%2F%2Fwww.ipea.gov.br%2F%2Fsites%2F000%2F2%2Fpublicacoes%2Ftds%2Ftd_1227.pdf;h=repec:ipe:ipetds:1227

Basu, K., & Foster, J. (1998). On Measuring Literacy. *The Economic Journal*, *108*(451), 1733-1749. doi:10.1111/1468-0297.00369

Beccaria, L., & Minujin, A. (1985). *Metodos alternativos para medir la evolucion del tamano de la pobreza. Documento de trabajo* (p. 17). Buenos Aires.

Bendezu, L., Denis, A., Sanchez, C., Ugalde, P., & Zubizarreta, Jose Ramon. (2007). *La Encuesta Panel CASEN: Metodología y Calidad de los Datos*. Retrieved from http://www.osuah.cl/documentacion_encuestapanelcasen/La_encuesta_Panel_CASEN_-_Metodologia_y_Calidad_de_los_Datos.pdf

Berenger, V., & Celestini, Franck. (2006). French Poverty Measures using Fuzzy Set Approaches. In A. Lemmi & G. Betti (Eds.), *Fuzzy Set Approach to Multidimensional Poverty Measurement* (Vol. 3, pp. 139-154). Springer US. doi:10.1007/978-0-387-34251-1_8

Berenger, V., Villarreal, C. C., & Celestini, F. (2009). Modelling the Distribution of Multidimensional Poverty Scores: Evidence from Mexico. *Estudios Economicos*, *24*(1), 3-34. El Colegio de M�xico, Centro de Estudios Econ�micos.

Berry, A. (1997). The Income Distribution Threat in Latin America. *Latin American Research Review*, *32*(2), 3-40 CR - Copyright © 1997 The Latin America. The Latin American Studies Association. Retrieved from http://www.jstor.org/stable/2503865

Berumen, S. A. (2004). Construccion y analisis del Indice de Calidad de Vida en Guatemala. *Estudios Economicos de Desarrollo Internacional*, *4*(2). Euro-American Association of Economic Development.

Bhagwati, J. (1988). Poverty and public policy. *World Development*, *16*(5), 539-555. doi:10.1016/0305-750X(88)90184-2

Birdsall, N., & Londono, Juan Luis. (1997). Asset Inequality Matters: An Assessment of the World Bank's Approach to Poverty Reduction. *The American Economic Review*, *87*(2), 32-37 CR - Copyright © 1997 American Economi. American Economic Association. Retrieved from http://www.jstor.org/stable/2950879

Boltvinik, J. (1990). *Pobreza y necesidades básicas: conceptos y métodos de medición* (p. 64). Caracas: PNUD, Caracas.

Boltvinik, J. (2001). Opciones metodologicas para medir la pobreza en Mexico. *Comercio Exterior*, *51*(10), 869-878. Banco Nacional de Comercio Exterior.

Boltvinik, J., & Laos, E. H. (2000). *Pobreza y distribución del ingreso en México* (Ciudad de ., p. 354). Siglo Veintiuno. Retrieved from http://books.google.com/books?id=QtNDAAAAYAAJ

Bossert, W., Chakravarty, S., & d' Ambrosio, C. (2010). Poverty and Time.

Bouillon, C., & Yanez-Pagans, P. (2011). Dynamic Consistency of Multidimensional and Income Targeting: An Application for Mexico Using Panel Data Information. *RES Working Papers*. Inter-American Development Bank, Research Department.

Bourguignon, F., & Chakravarty, S. (2003). The Measurement of Multidimensional Poverty. *Journal of Economic Inequality*, *1*(1), 25 - 49. Retrieved from http://ideas.repec.org/a/kap/jecinq/v1y2003i1p25-49.html

Bourguignon, F., Ferreira, F., & Menendez, M. (2007). Inequality of opportunities in Brazil. *Review of Income and Wealth*, *53*(4), 585-618.

Bowles, S., Durlauf, S. N., & Hoff, K. R. (2006). *Poverty traps*. Princeton University Press.

Brouwer, W. B., Culyer, Anthony J, van Exel, N. J. A., & Rutten, F. F. H. (2008). Welfarism vs. extra-welfarism. *Journal of health economics*, *27*(2), 325-38. doi:10.1016/j.jhealeco.2007.07.003

Cappellari, L., & Jenkins, S. P. (2004). Modelling low income transitions. *Journal of Applied Econometrics*, *19*(5), 593-610. doi:10.1002/jae.778

Castro, R. (2011). Getting Ahead, Falling Behind and Standing Still: Income Mobility in Chile. *Estudios de Economia*, *38*(1), 243.

Celhay, P., Sanhueza, C., & Zubizarreta, J R. (2010). Intergenerational Mobility of Income and Schooling: Chile 1996-2006. *Revista de Analisis Economico*, *25*(2), 43-63. SciELO Chile.

Cerioli, A., & Zani, S. (1990). A fuzzy approach to the measurement of poverty. *Income and Wealth Distribution, Inequality and Poverty, Springer Verlag, Berlin*, 272-284.

Chakravarty, S., Mukherjee, D., & Ranade, R. R. (1998). On the family of subgroup and factor decomposable measures of multidimensional poverty. *Research on Economic Inequality*, *8*, 155-174.

Comim, F., Qizilbash, M., & Alkire, S. (2008). *The capability approach: concepts, measures and applications*. Cambridge Univ Press.

Conconi, A., & Ham, A. (2007). Pobreza Multidimensional Relativa. Una Aplicacion a la Argentina. *Working Papers*. La Plata: CEDLAS, Universidad Nacional de La Plata.

Contreras, D. (2003). Poverty and Inequality in a Rapid Growth Economy: Chile 1990-96. *Journal of Development Studies*, *39*(3), 181-200. Routledge. doi:10.1080/00220380412331322871

Contreras, D., Larrañaga, Osvaldo, & Litchfield, J. (2001). Poverty and Income Distribution in Chile: 1987-1998 New Evidence. *Latin American Journal of Economics-formerly Cuadernos de Economía*, *38*(114), 191 - 208. Retrieved from http://ideas.repec.org/a/ioe/cuadec/v38y2001i114p191-208.html

Corbo, V., & Schmidt-Hebbel, K. (2010). The International Crisis and Latin America: Growth Effects and Development Strategies. *Universidad Catolica de Chile, manuscript*. World Bank.

Cortés, F. (1997). Determinantes de la pobreza de los hogares. México, 1992. *Revista Mexicana de Sociología*, *59*(2), 131-160. Universidad Nacional Autónoma de México. Retrieved from http://www.jstor.org/stable/3541165

Culyer, A J. (1971). Merit Goods and the Welfare Economics of Coercion. *Finances publiques*, *26*(4), 546-572.

Deaton, A. (2003). How to monitor poverty for the Millennium Development Goals. *Journal of Human Development*, *4*(3), 353-378. Taylor & Francis.

Deneulin, S. (2005). Development as Freedom and the Costa Rican Human Development Story. *Oxford Development Studies*, *33*(3-4), 493-510. Routledge. doi:10.1080/13600810500199327

Departement of Social and Economic Affairs. (2009). *The millennium development goals report*. (D. of S. and E. Affairs, Ed.). New York: United Nations.

Dercon, S., & Shapiro, J. S. (2007, March). Moving On, Staying Behind, Getting Lost: Lessons on poverty mobility from longitudinal data. GPRG. Retrieved from http://economics.ouls.ox.ac.uk/12987/

Desai, M. (1991). Human development Concepts and measurement. *European Economic Review*, *35*(2-3), 350-357. doi:10.1016/0014-2921(91)90136-7

Duclos, J.-Y., & Araar, A. (2006). *Poverty and equity: measurement, policy and estimation with DAD*. (J. Silver, Ed.) (p. 393). New York: International Development Research Center. Retrieved from http://books.google.com/books?hl=en&lr=&id=KOwnYw4qvW4C&pgis=1

Duclos, J.-Y., Sahn, D., & Younger, S. (2006). Robust multidimensional poverty comparisons. *The Economic Journal*, *116*(514), 943-968.

D'Ambrosio, C., & Rodrigues, R. (2008). Deprivation in the São Paulo Districts: Evidence from 2000. *World Development*, *36*(6), 1094-1112. doi:10.1016/j.worlddev.2007.10.007

D'Ambrosio, C., Deutsch, J., & Silber, J. (2011). Multidimensional approaches to poverty measurement: an empirical analysis of poverty in Belgium, France, Germany, Italy and Spain, based on the European panel. *Applied Economics*, *43*(8), 951-961. Routledge. doi:10.1080/00036840802600129

Feres, J. C., & Mancero, X. (2001). El metodo de las necesidades basicas insatisfechas (NBI) y sus aplicaciones en America Latina. *DOCUMENTOS DE INVESTIGACION*. Santiago: CEPAL NACIONES UNIDAS. Retrieved from http://www.eclac.cl/publicaciones/Estadisticas/1/LCL1491P/lcl1491e.pdf

Foster, J. (2009). A Class of Chronic Poverty Measures. *Poverty Dynamics* (pp. 59-77). Oxford Scholarship Online Monographs. Retrieved from http://www.ingentaconnect.com/content/oso/3275317/2009/00000001/00000001/art00005

Foster, J., & Handy, C. (2008). External Capabilities. In K. Basu & R. Kanbur (Eds.), *Arguments for a Better World: Essays in Honor of Amartya Sen* (Vol. 1, pp. 362-375). Oxford: Oxford University Press. Retrieved from http://www.ingentaconnect.com/content/oso/3392429/2008/00000001/00000001/art00023

Foster, J., & Santos, M. E. (2009). Measuring Chronic Poverty.

Foster, J., Greer, J., & Thorbecke, E. (1984). A class of decomposable poverty measures. *Econometrica*, *52*(3), 761-766.

Foster, J., López-Calva, L. F., & Szekely, Miguel. (2005). Measuring the distribution of human development: methodology and application to Mexico. *Journal of Human Development*, *6*, 5-29.

Foxley, Al. (2004). *Successes and failures in poverty eradication: Chile.* Retrieved from http://www.hawaii.edu/hivandaids/Successes_and_Failures_in_Poverty_Eradication__Chile.pdf

Fundacion Nacional para la Superacion de la Pobreza. (1999). *Propuestas para la futura politica social.* Santiago: Fundaci�n Nacional para la Superaci�n de la Pobreza.

Fundacion Nacional para la Superacion de la Pobreza. (2006). *UMBRALES SOCIALES 2006: Propuesta para la Futura Política Social.* Santiago. Retrieved from http://www.fundacionpobreza.cl/EditorFiles/File/Umbrales/presentacion.pdf

Fundacion Nacional para la Superacion de la Pobreza. (2009). *UMBRALES SOCIALES PARA CHILE: Hacia una Politica Social.* Santiago, Chile. Retrieved from http://www.fundacionpobreza.cl/articulo-det.php?cat=11&id_articulo=38

Galasso, E. (2011). Alleviating extreme poverty in Chile: the short term effects of Chile Solidario. *Estudios de Economia*, *38*(1), 101.

Gasparini, L., & Cicowiez, M. (2005). Meeting the Poverty-Reduction MDG in the Southern Cone. *CEDLAS, Universidad Nacional de La Plata.* CEDLAS, Universidad Nacional de La Plata.

Gasparini, L., Gutiérrez, F., & Tornarolli, L. (2007). Growth and income poverty in latin america and the caribbean: evidence from household surveys. *Review of Income and Wealth*, *53*(2), 209-245. doi:10.1111/j.1475-4991.2007.00231.x

Glick, D., & Menon, N. (2009). Public programs pare poverty: Evidence from Chile. *Bulletin of Economic Research*, *61*(3), 249-282. doi:10.1111/j.1467-8586.2009.00312.x

Hernandez, E. (2001). Retos para la medicion de la pobreza en Mexico. *Comercio Exterior*, *10*(51), 860-868. Retrieved from http://books.google.com/books?id=QtNDAAAAYAAJ

Hoces de la Guardia, F., Hojman, A., & Larranaga, O. (2011). Evaluating the Chile Solidario program: results using the Chile Solidario panel and the administrative databases. *Estudios de Economia*, *38*(1), 129.

Hoy, M., Scott B., T., & Zheng, B. (2010). Empirical Issues in Lifetime Poverty Measurement. Retrieved from http://ideas.repec.org/p/unu/wpaper/wp2010-73.html

Instituto de Economia, U. C. de C., & ODEPLAN, O. de N. de P. (1974). *Mapa de la extrema pobreza en Chile.* El Instituto.

Janvry, A. de, & Sadoulet, E. (2000). GROWTH, POVERTY, AND INEQUALITY IN LATIN AMERICA: A CAUSAL ANALYSIS, 1970-94. *Review of Income and Wealth*, *46*(3), 267-287. doi:10.1111/j.1475-4991.2000.tb00843.x

Jenkins, S. P. (2000). Modelling household income dynamics. *Journal of Population Economics*, *13*(4), 529-567. Springer Berlin / Heidelberg. doi:10.1007/s001480050151

Kageyama, A., & Hoffmann, R. (2006). Pobreza no Brasil: uma perspectiva multidimensional. *Economia e Sociedade*, *15*(1), 26.

Kakwani, N., & Silber, J. (2008a). *Quantitative approaches to multidimensional poverty measurement*. New York: Palgrave Macmillan. Retrieved from http://www.palgraveconnect.com/pc/doifinder/10.1057/9780230582354

Kakwani, N., & Silber, J. (2008b). *The many dimensions of poverty*. New York: Palgrave Macmillan.

Kaztman, R. (1989). *La heterogeneidad de la pobreza: una aproximacion bidimensional*. Montevideo.

Krishnakumar, J., & Ballon, P. (2008). Estimating Basic Capabilities: A Structural Equation Model Applied to Bolivia. *World Development*, *36*(6), 992-1010. doi:10.1016/j.worlddev.2007.10.006

LOPEZ, A., VALLEJO, J. R., & FONSECA, C. (2009). Descomposicion de la pobreza multidimensional mediante el enfoque de conjuntos difusos: Una aplicacion para el Mexico rural. Toluca.

Larrain, F. (2008). Cuatro millones de pobres en Chile: actualizando la linea de pobreza. *Estudios publicos*, *Verano*(109), 101-148.

Larrañaga, O, & Herrera, R. (2008). Los recientes cambios en la desigualdad y la pobreza en Chile. *Estudios Públicos*, *109*, 149-186.

Leontief, W. (1976). *Essays in economics: theories and theorizing* (Vol. 1, p. 252). New York: Oxford University Press.

Londono, J L, & Szekely, M. (2000). Persistent Poverty and Excess Inequality: Latin America, 1970-1995. *Journal of Applied Economics*, *3*, 93-134. Universidad del CEMA.

Lopes, H. M., Macedo, P. B. R., & Machado, A. F. (2003). Indicador de pobreza: aplicacio de uma abordagem multidimensional ao caso brasileiro. Cedeplar, Universidade Federal de Minas Gerais.

López-Calva, L. F., & Chamuss, L. R. (2005). MUCHOS ROSTROS, UN SOLO ESPEJO: RESTRICCIONES PARA LA MEDICIÓN MULTIDIMENSIONAL DE LA POBREZA EN MÉXICO. Mexico City. Retrieved from http://www.sedesol2009.sedesol.gob.mx/archivos/801588/file/Docu_20_2003.pdf

López-Calva, L. F., & Ortiz Juárez, E. (2009). Medición multidimensional de la pobreza en México: significancia estadística en la inclusión de dimensiones no monetarias. *Estudios económicos*, (1), 3-33. Retrieved from http://dialnet.unirioja.es/servlet/articulo?codigo=3003827&info=resumen

Morales Ramos, M. A., & Morales Ramos, E. (2008). La teoría de conjuntos difusos como una opción para medir la pobreza. El caso de México. *El trimestre económico*, *LXXV (3)*(299), 641-662. Retrieved from http://dialnet.unirioja.es/servlet/articulo?codigo=2692547

Mujica, R., & Rojas, A. (1986). *Mapa de la extrema pobreza en Chile: 1982. Documento de Trabajo.*

Murray, W., Kousary, L., & Barton, J. (2009). Land of miracles?: A critical analysis of poverty reduction strategies in Chile, 1975–2005. *International Development Planning Review*, *31*(2), 127-163. Retrieved from http://dx.doi.org/10.3828/idpr.31.2.3

Narayan, D., Walton, M., & Chambers, R. (2000). *Crying out for change (voices of the poor).* Oxford University Press.

Neilson, C., Contreras, D., Cooper, R., & Hermann, J. (2008). The Dynamics of Poverty in Chile. *Journal of Latin American Studies*, *40*(02), 251-273. Retrieved from http://journals.cambridge.org/abstract_S0022216X08003982

Nunez, J., & Miranda, L. (2011). Intergenerational income and educational mobility in urban Chile. *Estudios de Economia*, *38*(1), 195.

Nussbaum, M C. (1999). *Sex and social justice.* Oxford University Press, USA.

Nussbaum, M C. (2001). *Women and human development: The capabilities approach* (Vol. 3, p. 312 pages). Cambridge Univ Press.

Nussbaum, Martha C, & Glover, J. (1995). *Women, culture and development: a study of human capabilities.* Clarendon Press.

Núñez, J., & Tartakowsky, A. (2007). DESIGUALDAD DE RESULTADOS VS. DESIGUALDAD DE OPORTUNIDADES EN UN PAÍS EN VÍAS DE DESARROLLO: UN ANÁLISIS EXPLORATORIO PARA CHILE. *Estudios de economía*, *34*(2), 185-202. doi:10.4067/S0718-52862007000200004

Orshansky, M. (1969). How Poverty Is Measured. *Monthly Labor Review*, *92*, 37-41. Retrieved from http://heinonline.org/HOL/Page?handle=hein.journals/month92&id=173&div=&collection=journals

Pattanaik, P. K., Reddy, S. G., & Xu, Y. (2007). On procedures for measuring deprivation and living standards of societies in a multi-attribute framework. Retrieved from http://ssrn.com/abstract=1081226

Petesch, P. L. (2007). *Moving Out of Poverty: Cross-disciplinary perspectives on mobility* (p. 368). World Bank Publications. Retrieved from http://books.google.com/books?hl=en&lr=&id=GQ022BXpYFkC&pgis=1

Ver Ploeg, M., & Citro, C. F. (2008). Poverty Measurement: Orshansky's Original Measures and the Development of Alternatives *. *Review of Agricultural Economics*, *30*(3), 581-590. Oxford University Press. doi:10.1111/j.1467-9353.2008.00432.x

Ravallion, M. (2008, January 1). On the welfarist rationale for relative poverty lines. *Policy Research Working Paper Series*. New York: The World Bank. Retrieved from http://econpapers.repec.org/RePEc:wbk:wbrwps:4486

Ravallion, M. (2010a). On Multidimensional Indices of Poverty. Retrieved from http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2011/02/28/000158349_20110228142416/Rendered/PDF/WPS5580.pdf

Ravallion, M. (2010b). Mashup Indices of Development.

Rawls, J. (1971). *A Theory of Justice. Book* (Vol. 12, p. 607). Harvard University Press. doi:10.2307/2504913

Robeyns, I. (2001). SEN'S CAPABILITY APPROACH AND GENDER INEQUALITY: SELECTING RELEVANT CAPABILITIES. *Feminist Economics*, *9*(2), 61-92. Routledge. doi:10.1080/1354570022000078024

Robles, C. E., & Vélez, M. (2008). Determining the Parameters of Axiomatically Derived Multidimensional Poverty Indices: An Application Based on Reported Well-Being in Colombia. In J. Kakwani, N., & Silber (Ed.), *Quantitative approaches to multidimensional poverty measurement*. New York: Palgrave Macmillan. doi:http://www.palgraveconnect.com/pc/doifinder/10.1057/9780230582354

Ruano, M. M., Canibal, O. O., & Prado, B. R. (2009). La evolucion de la pobreza en Honduras, 1995-2005. *Analisis Economico*, *24*(55).

Santos, M. E., Lugo, M. A., López-Calva, L. F., Cruces, G., & Battistón, D. (2010). Refining the basic needs approach: A multidimensional analysis of poverty in Latin America. In J. Bishop (Ed.), *Studies in Applied Welfare Analysis: Papers from the Third ECINEQ Meeting* (p. 266). Emerald Group Publishing. Retrieved from http://books.google.com/books?hl=en&lr=&id=YXwIMZNgXgcC&pgis=1

Schwartz, S H. (2007). Basic Human Values: theory, methods, and application. *RISORSA UOMO*, *2*. FrancoAngeli Editore.

Schwartz, S H. (2009). Basic human values. *sociologie*, *42*, 249-288. Retrieved from http://www.ccsr.ac.uk/qmss/seminars/2009-06-10/documents/Shalom_Schwartz_1.pdf

Schwartz, S. H., Melech, G., Lehmann, A., Burgess, S., Harris, M., & Owens, V. (2001). Extending the Cross-Cultural Validity of the Theory of Basic Human Values with a Different Method of Measurement. *Journal of Cross-Cultural Psychology*, *32*(5), 519-542. doi:10.1177/0022022101032005001

Scott, C. D. (2000). Mixed fortunes: A study of poverty mobility among small farm households in Chile, 1968–86. *Journal of Development Studies*, *36*(6), 155-180. Routledge. doi:10.1080/00220380008422658

Sen, A. (1976). Poverty: An Ordinal Approach to Measurement. *Econometrica*, *44*(2), 219 - 31. Retrieved from http://ideas.repec.org/a/ecm/emetrp/v44y1976i2p219-31.html

Sen, A. (1979a). Personal Utilities and Public Judgements: Or What's Wrong With Welfare Economics. *The Economic Journal*, *89*(355), 537-558 CR - Copyright © 1979 Royal Economic. Blackwell Publishing for the Royal Economic Society. Retrieved from http://www.jstor.org/stable/2231867

Sen, A. (1979b). Issues in the Measurement of Poverty. *The Scandinavian Journal of Economics*, *81*(2), 285-307. Blackwell Publishing on behalf of The Scandinavian Journal of Economics. Retrieved from http://www.jstor.org/stable/3439966

Sen, A. (1980). Description as Choice. *Oxford Economic Papers*, *32*(3), 353-369 CR - Copyright © 1980 Oxford Univers. Oxford University Press. Retrieved from http://www.jstor.org/stable/2662796

Serrano, C. (2005). *Familia como unidad de intervencion de politicas sociales. Notas sobre el Programa Puente Chile solidario* (p. 312 pages). Santiago. Retrieved from http://www.cepal.org/dds/noticias/paginas/2/21682/Claudia_Serrano.pdf

Stiglitz, J., Sen, A., & Fitoussi, J.-P. (2009). *Report by the Commission on the Measurement of Economic Performance and Social Progress*. Paris. Retrieved from http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf

Streeten, P. (1981). *First things first: meeting basic human needs in the developing countries*. Published for the World Bank [by] Oxford University Press. Retrieved from http://books.google.com/books?id=bJU4P2rUxcIC

Tobin, J. (1970). On limiting the domain of inequality. *Journal of law and Economics*, *13*(2), 263-277. JSTOR.

Torche, A. (1987). Distribuir el ingreso para satisfacer las necesidades basicas. In F. Larrain (Ed.), *Desarrollo Economico en Democracia: Proposiciones para una Sociedad Libre y Solidaria*. Universidad Catolica de Chile.

Tsui, K.-yuen. (2002). Multidimensional poverty indices. *Social Choice and Welfare*, *19*(1), 69-93. Springer Berlin / Heidelberg. doi:10.1007/s355-002-8326-3

United Nations Development Programme. (2010). *The Human Development Report*. New York. Retrieved from http://hdr.undp.org/en/reports/global/hdr2010/

World Bank. (1999). *Consultations with the Poor National Synthesis Reports, Informal publications series prepared for Global Synthesis Workshop: Consultations with the Poor*. Washington.