UNIVERSITY OF
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Measurement of Income Inequality in Mexico:

Methodology, Assessment and Empirical Relationship with Poverty and Human Development.

A thesis submitted for the degree of

Doctor of Philosophy

Scottish Graduate Programme in Economics
Department of Economics
University of Stirling

By

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June, 2008

DECLARATION

In accordance with the Regulations for Higher Degrees by Research, I hereby declare that the whole thesis now submitted for the candidature of Doctor of Philosophy is a result of my own research and independent work except where reference is made to published literature. I also hereby certify that the work embodied in this thesis has not already been submitted in any substance for any degree and is not being concurrently submitted in candidature for any degree from any other institute of higher learning. I am responsible for any errors and omissions present in the thesis.

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Abstract

The intended contribution of this work is to systematically discuss a selection of methodological topics and some of the empirical and technical issues that have been driving the measurement of inequality in Mexico so far. This discussion has two strands: firstly, the general case, and second, the particular case of Mexico. The general case include some philosophical concerns, along with a review of the traditional inequality measurement, the most common operational decisions in empirical calculations, and the recent methodological contribution of development literature that is mostly centered around the capability approach of Sen (1985b). The philosophical part contrasted with other approaches and rejected the Marxist view of economic inequality, which is mostly viewed as an outcome of exploitation. The distributional judgments are compared with more ancient schools of thought in regards to justice. Another methodological issue is such that social inequality, approximated by income inequality, might be considered as an additional functioning that measures the degree of social cohesion in the country, this finding is an implication that comes from the definition of functionings within the capability approach; then, social inequality is a functioning that is different in nature from other measures of destitution, and it is also different from the destitution that is captured by absolute poverty measurement. Our general case includes a review of the most popular ways to measure inequality, such as normative and pragmatic inequality measures that are mentioned with their properties, with their rankings of the distributions provided by the use of stochastic dominance and quantile comparisons, and the construction of statistical models and some graphic representations of income economic inequality; the approach of

inequality concerns included in the measurement of relative poverty is rejected for the sake of clarity. Then this general view would guide us to a better understanding of the Mexican literature for the consideration of income distribution. The measurement of destitution provided by governmental offices is necessary to discuss, because there might be some lack of coherence between the design of the measurement and the complex legal system in Mexico. We also consider a set of regulatory concerns that might not be unique to the Mexican law, but may be generalized for developing countries as a whole. Some of the methodological discussions that show how the Mexican research has been influenced by the international literature about human destitution will be good to clarify, looking at the value judgments that have been automatically accepted by the researchers. A sensitivity analysis was performed to the empirical calculation of inequality in Mexico, so the measurement showed to be different in regards to a variety of operational concerns: the recipient unit, the different data from income and consumption-expenditure surveys, various non-responses and underreported biases, the inclusion of a regional price index, among other things. In this work was also covered the reasons why it might be the case that destitution and poverty assessment was studied more deeply than inequality itself, so the possible ambiguity of inequality with poverty measurement is challenged in this work with a variety of theoretical remarks and empirical arguments. The final topic for the particular case of Mexico is to shed light in regards to the context of the capability approach and the use of equivalence scales, because these methodological approaches consider respectively directly and indirectly the assessment of distributional judgments. This discussion is followed by an empirical assessment of inequality measures that is

related with a set of functionings and services, where a direct relationship of measures of inequality with other measures of destitution is made clear.

To Mercedes, in the memory of Don Jorge…

Acknowledgments

It is difficult to thank properly all the people embedded in a long process, such as this PhD. dissertation. It is difficult to remember with precision each person that contributed to this task, and the extent of such help; I am apologizing in advance because my memory might fail. The pursuit of this dream represented for me a long project that took me away from my 'normal' life, and then many friends, relatives and acquaintances, besides the academic professional people, were helping me. Paradoxically, this is a lonely process that is surrounded by many people.

First of all, I want to thank Jesus, he gave me a new life and strength during the course of this work. Thanks to him, the son of God, he has been with me all the time even difficult.

Not all the people that I want to thank are here, and I am referring particularly to my father, Don Jorge. During the last stage of my dissertation, he passed away the 22nd of September of the year 2007. I had the wish to tell him the news about the completion of my studies, but I will not be able to do that. He is gone. Fortunately, soon before he departed, he gave me his blessing, and that encouraged me to do my best. My mom was always besides him, so I want to honor her because she is a very brave woman, she did not let me give up ever. With such appreciation, I want to dedicate this small piece of work to her, remembering my father as well. My closer family has also been supporting me: thanks to Laura, I am sorry because of her difficult time understanding all the burden of my life during the course of these studies, thanks for the effort and the numerous good moments. I want to thank also my son and daughter, Naomi and David: with very cute

details they were always letting me know their support and care, I will remember that forever.

During the course of this work, I had the blessing of knowing Professors, friends, and special people that helped me a lot on my weaknesses. Many thanks for the guidance and care of Dipak Ghosh. I wanted to call him ‘Dr. Ghosh’, but he never allowed me to do so. Dipak became here my second father. I have no words that can express the feeling of gratitude I do have for taking care of me, of my needs and also for the needs of my family. Thanks to Sheila Dow and her guidance in my research, she opened my eyes to a variety of methods to do research. Professor David Bell, always busy, but always with me in the very important moments, thanks for the advices and the financial support that he approved in the name of the department. Thanks to Prof. Bob Hart and the financial support that he allowed me to earn. I also want to thank Prof. Brian Loasby, a very wise and funny man, the same as Prof. Robin Ruffell, providing the teaching fellowships, also to the friendship and comments of Dr. Ariel Bergmann, Michael Finus, Prof. David King, Prof. Nick Hanley, Alberto Montagnoli and Frans de Vries. The staff support was always great: Mary Mason, Deirdre Kennedy, and Lorraine Annand, the last one, unfortunately because of her trouble, I could not see her anymore. I wish the best for all of them, but particularly for Lorraine, wishing that she recovers completely.

I want to mention specially to the person that encourage me to pursue this career years before, Prof. Eduardo Flores K., I appreciate that he believed in me. Thanks also to a very good Professor, Dr. Jorge Mendoza, he warned me (and I was reluctant to believe) about all the process that is a PhD., but later on he gave me very short and precise advices in important times. Thanks to Alan Krauze, Dustin Chambers, Heather Tierney, Emre and

Zeynep Yoldas, Serhat Kologlugil and his partner Funda, Charles Mutsalklisana, the encouraging words of Ernestio Rattia-Lima, Francisco Figuereido, Rev. Russell Gordon, Lopa, Anirban and Kazuo. Thanks to David Fairris, Robert Russell, JT Guo, Anil Deolalikar, Aziz R. Khan, Marcelle Chauvet, Stephen Cullenberg, Mindy Marks and Xu Xeng. Thanks to Salvador Mercado and his wife Raquel. I am personally grateful to my in-laws Marco Polo and Zenaida, all the members of the Rotary Club in Chihuahua, especially to the support of Pedro Lurueña, Fernando Cano, Jesús Valdéz, Gustavo Alvarado and Raul Heiras. My friends in Chihuahua, Carlos Rivera and Luis Garma. My brothers, especially to Jonathan and Daniel. For a variety of reasons, I want to thank to the personnel of the Center of Economic and Social Information in Chihuahua, also to Ernesto Hermosillo S., Juan Carlos Noble Ayub, Jaime Almanza, Nora y Marcelo Vázquez, Less and Bruce Garner, Elizabeth Roberts, Cliff Barnard, John Holwell, Hamish Wishart, all the membership of the Cornton Baptist Church in Stirling, the people in Chihuahua that was constantly praying for me, my friends in Stirling, especially to Mavra and her constant talk, I will miss her and the rest of my friends in the department as well. An anonymous person that provided me the data set… thanks a lot.

Finally, thanks to Jaehee, thanks for the help through the abundant stimulating talks, the encouraging words and affection. During this time I could learn and understand many things about life itself, so the future should be constructed ahead without fear.

The financial support of CONACYT is acknowledged, and the people of this office: Martin Winocur, Georgina Mendez, Veronica Barrientos and David Mendez. The use of Wikimedia Foundation sources for quick references (Wikipedia© and

Wiktionary©) is acknowledged. A paper-version of the chapter 4 of this research has been already submitted for publication to the *Review of Income and Wealth*.

I want to recognize the academic contributions on each of the chapters in the following way, all errors remain mine:

Chapter 1: Sheila Dow, Dipak Ghosh, Brian Loasby and Gabriel Orea. Chapter 2: David Bell, Anil Deolalikar, Sheila Dow, Dipak Ghosh, Azizur R. Khan. Chapter 3: Harminder Battu, David Bell, Anil Deolalikar, Sheila Dow, Dipak Ghosh, Azizur R. Khan. Chapter 4: David Bell, Dipak Ghosh, and also appreciate the comments and remarks by Harminder Battu, Sheila Dow, Nick Hanley, Bob Hart, Azizur R. Khan, Ernesto Rattia-Lima, Robin Ruffel, Jaehee Son, the attendees of the 2007 SES and ECINEQ 2007 annual conferences. Chapter 5: Dipak Ghosh, Monica Orozco, Araceli Ortega. Chapter 6: Dipak Ghosh, Jaehee Son, and also to the comments and remarks of the people attending the Stirling and the UC Riverside presentation seminars (Fall 2007). Chapter 7: David Bell, Sheila Dow and Dipak Ghosh. Chapter 8: David Bell, Dipak Ghosh, David King, Alan Tello, and the people attending the workshop at Stirling (Spring/2008), a stimulating set of discussions with Jaehee Son on the setup of the model is also acknowledged. Final Conclusion: Dr. Joseph Assan for helpful comments about the structure of the concluding chapter.

I appreciate final comments to my examiners Prof. Sheila Dow and Prof. Prasanta Pattanaik.

BRIEF CONTENTS

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• Part I. General Introduction

A variety of recent inequality studies in Latin America show an increasing concern for this subject matter, as it is evidenced by the publication of De Ferranti et al. (2004), published by the World Bank, where the issue of inequality, as a separate aspect of destitution is discussed along with the serious consequences of this phenomenon. But for Mexico in particular, the present decade has been devoted to the study of absolute poverty measurement and human development assessment (CTMP, 2002, Székely, 2005, Lopez-Calva and Székely, 2006). During the recent years, the measurement of income inequality has been indirectly addressed in Mexico, or has been tried to be included in more complex measures, such as poverty measures or human development indices. In these types of measures, the consideration of inequality is done through distributional sensitiveness analyses. These gaps on the research about economic inequality in Mexico have provided the reason for this dissertation. So, the consideration of the unequal distribution are been increasingly studied again in Mexico with a renewed interest as in the past, but now the emphasis is different than of liberalization issues or the effects of crises.[1]

It is the interest of this work to shed light on some of the distributional concerns in regards to the inequality measurement in Mexico, focusing on the descriptive part of inequality, and this will be done following two general strands, first a general view, and second, the particular Mexican case. The general view is necessary to study in order to highlight the value judgments, the traditional ways to measure inequality and the operational decisions that need to be made for an accurate calculation of income

[1] As is done by Székely (1995, 1998).

inequality. The case of inequality measurement in Mexico is addressed not only in regards to the legal system that defines the ways to measure destitution, but also considering the variety of traditions on inequality assessment, and also including the relationship of inequality measures with other measures of deprivation. Both approaches, the general view and the particular case of Mexico, are discussed either through narrative exercises, theoretical discussions or empirical analyses, whatever seems to be more appropriate.

I Motivation.

The measurement of social inequality is a recent concern in our society. Economists are usually asked for their opinion about the consequences of higher levels of social inequality and the best way to measure it. François Bourguignon, as a Chief Economist and Senior Vice President of the World Bank, commented in a seminar in Spain in 2006 that highly ranked authorities of the Chinese government were deeply concerned about the effects of high inequality in their society. We know that the attitude of the Chinese is similar to each government's concern in the rest of the countries, mostly because of the link that social inequality itself has with rebellion and social problems (Sen, 1973; 1999). Not only governments are concerned with the effects of high inequality in the society, but also a number of very influential non-governmental institutions, such as the case of the Roman Catholic Church. In a series of worldwide media interventions in 2008,[2] the Catholic Church announced a set of seven new 'sins'

[2] This new was widely circulated around the world, so all the sources cited the comments of the Bishop Gianfranco Girotti, an Official of the Apostolic Penitentiary. He made his comments during an interview with the Vatican's official newspaper L'Osservatore Romano. He said that priests must take into account

through the Supreme Tribunal of the Apostolic Penitentiary.[3] These new sins not only include issues such as drug abuse, environmental pollution or genetic manipulation, but also, for our interest, these also include three additional 'obscene' practices that are related with destitution, such as causing poverty, social inequality and injustice, and accumulating excessive wealth. The latter 'sins' have direct implication with issues of inequality measurement.

The present concern of the Catholic Church about justice matters was ratified by Pope Benedict XVI on April of 2008 in his speech to the United Nations, specifically addressing the desire of eliminating the gap between the rich and the poor among groups and countries.[4] This and the previous reference from the Catholic Church should not be taken lightly. On the one hand, the influence of the Catholic Church on the stipulation of social norms accounts with hundreds of millions of followers. On the other hand, this issue makes an historical shift from the ancient definition of morals developed during the Middle Ages and maintained until now. The categorization of sin was historically made in two kinds: mortal and venial sins; this proposal was originally made by Pope Gregory I during the 6th century, and later on was supported by the work of Thomas Aquinas (1274) in his *Summa Teologica*, which is the most quoted source in this regards (O'Neil, 1912). The seven mortal sins are known to be: pride, avarice, gluttony, lust, sloth, envy and anger. The newer definition of sin mentioned above might replace rather than enlarge the understanding of what is wrong. In this case, it might be considered an individual

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"new sins which have appeared on the horizon of humanity as corollary to the unstoppable process of globalization" (CNN, 2008, among many others).

[3] The role of this institution includes the definition of sin, the practice of excommunication and the rules for the dispensation of forgiveness (Ojetti, 1912).

[4] "The promotion of human rights remains the most effective strategy for eliminating inequalities between countries and social groups, and for increasing security" (Pope Benedict XVI, 2008).

responsible for social injustice more sinful than an individual committing the sin of lust (e.g. a pornographer). The fact that the Catholic Church is emphasizing other sources of evil is noticeable. So we will expect that the discussion of inequality issues will include not only scientific background, but also moral, ethical and religious concerns.[5]

Within economic science, there are traditions that in fact seem to ignore the consideration of social inequality, and they see this issue as a process that should be indirectly resolved with the efficient use of resources, so problems with income distribution should be solved as the long run consequence of economic growth, as is argued by Kuznets (1955). Institutions from developed countries sometimes are overconfident in indirect benefits of economic growth in developing economies, so they rely on the 'trickle down' effect. In this sense, the institutions put their faith in the better distribution of income due to the automatic mechanism of the market, so they focus the effort of measurement of well-being on growth rates rather than on welfare analysis. However, growth is not always a solution for impoverishment or for high inequality, as has been argued by several authors since some time ago (Chenery, 1974, p. xviii; Ahluwalia, 1974, p. 3; Ghai, 1977, p. 2), so inequality measurement should be important *per se*, and not only as the undesired 'natural' part of the process of economic growth.

The present concern of economic science with the higher levels of income inequality is because of a vicious circle of underdevelopment: there is an entangled relationship that needs to be understood, where higher levels of inequality do impact negatively on the spreading of growth benefits to the more destitute, and also high

[5] We do not know yet to what extent the concern of the Catholic Church relies in their care for the individual well-being rather than in their lost power attached to the accumulation of wealth because of the increasing secularization of society. It has been known that the Catholic Church has found its power, among several things, on the political provision of material accumulation (Durant, 1950).

inequality levels prevent the effectiveness of poverty alleviation programs (De Ferranti et al. 2004, p .25; Bourguignon, 2002, among others). It has also been shown that higher levels of inequality in certain countries obstruct the benefits of economic growth for the most destitute (Bourguignon, 2002; among others). For both previous reasons, the level of inequality can be considered as some kind of indicator of how much economic growth is affecting people at the lower end of the distribution. Inequality can also be the measure of 'efficiency' of poverty alleviation programs. That is one of the reasons we care not only about inequality as a social phenomenon, but as a phenomenon that has to be measured.

II The Methodological Side.

Trying to narrow down the discussion about inequality, some authors have constrained the study of social inequality to economic science, in the sense that they focus their attention on the study of inequality mostly on the income space (Sen, 1973, p. 2).[6] Even thinking only in economic grounds, it is difficult to separate economic inequality from other important human and social perspectives. As an example, an income distribution *x* might be suggested with an 'equal' allocation for two persons, we can say one unit for each individual. If there are only two units available in this economy, the economic researcher might assume that this is a desirable allocation of resources looking through the lenses of the egalitarian perspective. If we include a personal

[6] Similarly, destitutions has been tried to be measured in the space of capabilities, where income is only a particular space of the whole set of vectors. Sen (1980), in his *Equality of What?*, is more devoted to reject the Utilitarian and the Rawlsian approach, rather than to define an space for inequality measurement. His main concern is to claim that the measurement of destitution should be done in the 'capability' space, taking as given that all the goods should be distributed in an 'equal' manner, regardless the space of consideration (Sen, 1992, pp. ix-x). The consideration of inequality as a special destitution will be discussed along this work.

characteristic, saying that one of these persons is blind, the ‘equal’ allocation of resources seems to be unfair in this very simple income distribution. The traditional economic framework usually remains silent about the fairness of such distribution. This is just an example. On the implications of fairer distributions, the responsibility of who should be in charge of making the transfers of unfair allocations is questioned: usually the government is held responsible. There is no responsibility attached to the individuals that belongs to society, because those are assumed to be self-interested individuals that are resource-maximizers. Altruism, social responsibility or justice affairs seem to be out of the scope of traditional economic science, but this practice in the research is not desirable. If we expand the understanding of the traditional economic framework, digging in some of the assumptions in regards to justice, we might look at the philosophical foundations embedded in this setting, such that the economic researcher can be able to say something to the policy maker. The first part of this work sheds light on the measurement of inequality, not proposing new things, but exploring the philosophical traditions that have been so widely used on the consideration of inequality, touching on the issue of justice and fairness. Economic science has been relying on a set of ‘fixed’ value judgments used for a long period of time, so there is no reason that prevents us from exploring these value judgments, and realize that these assumptions are not outside the economic science, as it is usually argued.

a) **Philosophical issues.**

There are several strands in the methodological consideration of social inequality, because inequality is a concept that has a relationship with many forms of human deprivation. The first idea that is usually attached to discussions of inequality is related to some sense of justice. On these grounds, the legacy of the Marxist tradition, which is one of the most referred beliefs in the context of social deprivation, explains the existence of social inequality as a product of a continuous process of exploitation from the rich to the poor. That view includes a value judgment that has an underlying consideration of inequality as unfairness, a view that has been followed in the justice and economics literature by Rawls (1971) and Sen (1973, 1992, 2000) respectively. On the mathematical side, inequality is a phenomenon that can be measured in a variety of spaces; inequality uses suitable methods of comparison in order to make a relation between different measurement values attached to at least two different entities. The apparently simple rules embedded in the mathematical foundations have some limits, so these foundations neither explain social concerns, nor can consider economic implications and historical reasons related with the processes of social inequality altogether.

In order to level our ground for the discussion of economic inequality, in the **first chapter** of this work, we use the methodological definition of economic inequality contained in Wright (1987), in order to separate theoretical components of inequality. We focus on the possible spaces of inequality, its processes, and the value judgments that are embedded in such comparisons. The first term might be expressed as a mathematical idea, once the space is defined. The processes tell the story of how inequality arises and

the theoretical interactions among the different factors related to such a process. The value judgments are intrinsically related with the perception of inequality made by a society and by the researcher. This last discussion has deep implications in the philosophical arena; such implications have been largely discussed many centuries ago by a variety of traditions of thought. The most evoked implication of inequality is in regards to social justice, and as I mentioned, a sense of unfairness strongly tied with inequality is assumed. In this view, inequality is usually rooted in the existence of social classes, but this epistemological approach misses the presence of natural inequalities present in every day life –though sporadically this theme is mentioned, and also misses the fact that inequality should be seen as a responsibility of every individual in the society, and not only as the responsibility of the government. Poverty alleviation programs needs the function of the government in order to allocate the poorest in the community, but the alleviation of inequality is different in the sense that this could be a task for everyone, because as long as each person detects another person in a worse-off condition, that is a matter of opportunity to help.

The right understanding of the value judgments is important. The effort of obtaining lower inequality for the sake of doing so might have some problems. A pragmatic approach for inequality assessment is not sufficient. The Marxist understanding of inequality has been used with drastic negative consequences. The eleventh point of the *Nationalist Socialist Program* held by the Nazi party contemplated the abolition of unearned (work and labor) incomes,[7] mostly referring to the wealth accumulated by the Jews, which were seen for Hitler as a menace. The socialist movement led by Hitler required also equality in other senses, such as equality of

[7] US Office (1946).

thought,[8] or equality of race;[9] but this movement had disastrous consequences rooted in the inability to recognize natural individual heterogeneity. Lenin focused on the Marxist understanding of the source of injustice on the unfair allocation produced by all the rich people in the world: "It is not the Jews who are the enemies of the working people. The enemies of the workers are the capitalists of all countries" (Lenin, 1919).[10] These points of view seem to see the existence of capital accumulation as a disease that should be abolished. Because of the previous examples, economic science can not blindly trust in fixed interpretations of certain ideologies, which are made by policy makers in order to build 'equal' societies. For instance, these ideals might lead again to a misunderstood desire for equality of race or to an absurd egalitarian possession rather than to the pursuit of equality of rights for every individual. The existence of inequalities in the world should not be seen anymore as a problematic disease, but as a measure of social responsibility held by every person in the community. In this sense, the issue of inequality might be philosophically understood, in the Confucian context, as the harmless care of not doing badly to the people around ourselves, but more than that, in the helpful and effective behavior towards neighbors in the same way that every individual wants to be treated, as the ancient Golden rule of Jesus stated. So, the inequality concept rather than to lead to rebellion, should lead to an idea of opportunity. There is only one person that might not be responsible for that task, and that person is the poorest person in the

[8] "Only when we in the party, with the cooperation of everybody, make it the highest embodiment of National Socialist thought and spirit, will the party be an eternal and indestructible pillar of the German people and of our Reich. Then, eventually, the magnificent, glorious army, those old, proud warriors of our nation, will be joined by the political leadership of the party equally-tradition-minded and then these two institutions together will educate and strengthen the German man, and carry on their shoulders the German state, the German Reich." (Hitler, 1934, emphasis added).

[9] In the US Office's (1946) document, point 2 and 4.

[10] The effect of the Marxian philosophy also influenced the government of Stalin, but Marxists believers usually disentangle their creeds from the age of terror of Stalin, and imputes the responsibility of all wrongdoing to Stalin's own personality.

community, the rest of the people have the obligation to share in order to alleviate the issue of inequality.

b) **Economic Methodology.**

The **second part of the first chapter** touches on two main concerns in regards to social inequality that are taken as axioms in economic science: these axioms might make things problematic and are enumerated here. The first issue was tackled by Sen (1980), among others, with the critique of the utilitarian space on the consideration of well-being; the space of measurement used to be defined only in regards to the hedonic view of Bentham (1789). The second issue was the motivation underlying the concept of inequality. The deep influence of Rawls (1971) and his consideration of justice as fairness was a legacy of passiveness in issues of inequality, looking at inequality mostly as a Kantian device for moral reflection (Sen, 2000). It is true that in Rawls ideology, each individual is responsible to be part of the formation of a just city, taking the Platonic ideal of the construction of a just *polis*, but, as Sen argues, this concern lacks of pragmatic application. Therefore, even though there is a much defined normative framework that compels every individual to share with the most destitute, this framework remain silent about what should happen when individuals are not taking their responsibility in the alleviation of injustice seriously enough to act. Summing up, economic science deals with a space that was challenged by Sen, knowing that neither utility, nor income, would be an appropriate space in order to measure social inequality, but remains the issue of individual responsibility in the hands of the government, taking

over the task from people's hands to put into practice, and putting the government in a position to be criticized every time that inequality is not alleviated. On the pragmatic sense, and for the consideration of the following part, the measurement of inequality has been done in income space, which is the starting point for most of the empirical work in recent years.

III Inequality Formulae, Operational and Technical Decisions of Data Sets.

Traditional inequality measurement focuses on the monadic and relative attributes of the usual income space. Even with these theoretical restrictions, there are a variety of considerations that might change the perception of inequality shown by the different traditional inequality measures. The **second and the third chapter** of this work focus on social inequality, using the measure of inequality contained in the income space as an approximation.

a) **Formulae.**

The **first part of the second chapter** describes the variety of inequality measures in standard literature. Considering the seminal work of Atkinson (1970) and Sen (1973), among many others (Foster and Sen, 1997, Dutta, 2002, Cowell, 1995), we consider the usual definition of measures in the normative and the pragmatic sense. The Gini coefficient and the Theil Index are reviewed, highlighting some of their individual properties. Properties such as population independence, scale invariance and sub-group consistency are discussed. Going beyond the 'completeness' of these inequality measures

(Sen, 1973, p. 47), which might impose severe restrictions on the measurement, the inequality ranking embedded in the stochastic dominance is discussed as well (Foster and Sen, 1997). This tool will allow the introduction of a set of more general ranking tools that would allow distribution comparisons.

b) **Poverty vs. Inequality.**

The **last part of the second chapter** touches upon an important issue in regards to inequality as a measure of destitution, because a similar concept of distributional judgment is somehow induced by measures of relative poverty. In economic science, particularly in welfare economics, poverty alleviation has been the main target for the solution of human underdevelopment. It is argued that there is no sense in caring about the egalitarian distribution of Rolls Royce in the community if there are people still lacking basic goods for subsistence. The school of the 'absolutist' poverty measurement usually maintains that the consideration of inequality as a measure of destitution does not account with basic subsistence judgments, among other things. Authors that try to find some resemblance between poverty and inequality measurement might be more flexible using formal arguments to prove that as long as inequality measures include some sort of transfer 'sensitiveness', such that transfers done at the lower end of the scale are the most important, inequality consideration should be as important as the transfers made for poverty alleviation, under particular circumstances (Foster and Shorrocks, 1988a).

In some European traditions, inequality concerns are usually embedded in the measurement of relative poverty. The use of the fraction of the median (or the mean) as a

cutoff point for the definition of who is poor, and the endogenous consideration of the income distribution when this is done, may send the signal to the inexpert reader that measuring poverty in this way also takes into consideration some sort of inequality measurement. This might be so in abstract terms, but inequality is a pragmatic aspect of deprivation that is tackled fully neither by relative nor by absolute measures of poverty. In the articulated consideration of inequality and poverty measurement it is shown that, through the Sen-Townsend discussion, the consideration of relative poverty neither tackles the issue of human destitution clearly, nor enlightens the shape of social inequality with accuracy.

The argument of this paper is not to privilege the use of inequality as 'the' measure of destitution; this paper argues that inequality measurement has practical implications that differ from poverty measurement. Inequality is a social phenomenon that shows a different face of human destitution, so it is better treated separately from poverty measurement. On the one hand, poverty alleviation programs can indeed be a measure of governmental efficiency, as long as poverty consistently decreases. On the other hand, the usefulness of inequality measurement tells us which sectors within a society should be provided with the opportunity to benefit from a fairer distribution; in extreme cases, very high levels of inequality warns the society about social unfairness and injustice, with the possibility of rebellion (Sen, 1973, p. 1).

c) **Operational Decisions.**

Once an empirical approach is selected for the measurement of social inequality, there are a variety of decisions to be made in regards to the treatment of the information in the data set. That is the purpose of the **third chapter** of this work. The information provided by the survey data usually comes from three sources: census data, income (employment) surveys, and consumption-expenditure surveys. These data sets have their own properties and limitations, so our approach discusses the benefit of measuring inequality using income data that comes from employment surveys. The limitations are mentioned as well, such as possible problems in the calculations due to a variety of biases (e.g. non-response, underreporting, or selection issues, among others), so these issues affect the measurement of inequality. Other implications of the methodology of the survey are also considered, such as the inclusion of regional prices, the choice of sub-groups on the reports of the calculations, and the different treatment between individual and household measurement through the use of equivalence scales.

IV The Case of Mexico.

Some things had changed since the start of this dissertation. This thesis started with a concern about the possibly neglected literature in regards to the assessment of inequality in Mexico. When the author of this work started to inquire about these issues in 2004, the literature was centered around poverty measurement rather than about the assessment of distributional judgments. The effort of the Mexican government for the definition of a reliable poverty measurement took almost five years to be completed,

since the first round of seminars organized by the Secretariat of Social Development (SEDESOL) in the year 2000 (CTMP, 2002, Cortés, 2005). Nowadays, the focus of the attention is on the measurement of multidimensional deprivation with the use of Human Development Indices (Székely, 2006), and there is some inclusion of distributional sensitiveness in these type of measurement that is applied for the case of Mexico (Foster et. al. 2005). The present multidimensional focus is mainly due to the influence of Sen and his capability approach, and the multidimensional measurement also follows the tradition of Human Development Reports that started to be published by the United Nations in the year 1990. Nowadays, there is a lot of interest in Mexico in multidimensional measurement with the use of the principal component analysis methodologies, and also the use of geospatial tools available through the use of GIS (Geographical Information Systems) technology. The National Population Council (CONAPO) has been working hard in the production of marginalization indices and geospatial maps in order to assess destitution using the philosophy of social exclusion. SEDESOL has been also busy on the proper allocation of resources to the poor. Among other things, they have been selecting with increasing efficiency a variety of technical tools to target the 5 million households that receive governmental transfers from the program OPORTUNIDADES.

Unfortunately, Mexico belongs to a tradition where the levels of inequality are so high and pervasive that it makes development difficult, as is the case for almost all Latin American countries. The **next five chapters** discuss the consideration of income distribution for Mexico, where several gaps in the area of research can be seen. This research is not trying to be comprehensive, because the amount of effort in order to cover

all the possible issues in regards to inequality measurement is very vast. This work only highlights what according to this author are the more important issues that are pertinent in the consideration of inequality, and because of that, in the assessment of social inequality that might be considered to be a separate side of human welfare.

The **fourth chapter** presents a sensitivity analysis of inequality measurement, considering some of the different operational and technical procedures. This chapter provides an intuition for the researcher that the consideration of measures of inequality should be treated with caution. The reported Gini coefficients, which are usually presented in every source of development literature, vary in regards to the operational decisions taken to measure them, but unfortunately, as it is common for every Latin American country, which methodology is considered for the assessment of those inequality results is not usually spelled out explicitly (Medina, 2001). The empirical exercise proves that inequality measurement is sensitive to the recipient unit chosen, is sensitive to regional price consideration, is also sensitive to the type of survey data used (e.g. income vs. expenditure surveys), and varies in regards to the survey coverage, which is a function of the budget spent on the survey, among other things. This exercise should not discourage the measurement of inequality, but it should compel the researcher to make the assumptions clear in order to provide not only good, but comparable estimates of inequality 'across papers'.

The **fifth chapter** explains the natural disarray of measurement of destitution that is common in developing countries. The particular case of Mexico shows a variety of measures of destitution that are stipulated in several regulations in the Mexican legal system. The measurement that follows the Foster-Greer-Thorbecke (1984) approach is

the official measure, but it is not the only one, there are other measures that consider the principal component analysis methodology or some ad-hoc measurement in order to allocate federal resources. In the same chapter is discussed the political implications for the measurement of poverty, the resource allocation that are related with these kind of measurement, and the possible conflicts between governmental offices that measure human destitution. On the technical side, the type of measures chosen might pose a problem in order to make the results comparable, but more than that, these measures would give a different view of where and how many the most destitute are in a community, and will also give a different idea of the intensity of these destitutions, so, the allocation of resources for them might become a discretionary issue, with the danger to leave out from governmental programs specific sections of the most destitute population.

There are some reasons that have been clearly identified behind why inequality measurement was not included in the recent research agenda in regards of destitution assessment in Mexico. These issues are tackled in detail in the **sixth chapter**. The Mexican literature referred to an ambiguous relationship of inequality with the main indicator of destitution, which is poverty measurement (CTMP, 2002). Referring to the work of recognized Mexican researchers (Cortes and Rubalcava, 1991), they discussed that it was possible that inequality levels could decrease with an increase in the number of the poor people. It is argued in this work that the finding of this ambiguous relationship is difficult to support controlling for the mean income. It is difficult to support this finding in the light of newer techniques for inequality assessment, and also with the use of better data sets. The finding was based on an empirical analysis with the constraint of having

only an aggregated data set, and the analysis was done relying on the intuition provided by sociological literature of that time explaining awkward behavior of householders during crisis. With the use of theoretical relationships and a variety of empirical correlation tests it is shown that the empirical finding of Cortes and Rubalcava (1991) could be misguided. The main issue here would be that the supposedly ambiguous relation of poverty and inequality found in CTMP (2002) would be a product of a set of measurement errors on the information available; therefore, the introduction of inequality judgments in the Mexican income distribution should be included again on the research agenda.

The **seventh chapter** is not entirely devoted to the case of Mexico in particular, only the last part. The first part of the chapter touches on the definition of inequality measurement in the context of the capability approach of Sen, and also touches the consideration of natural intrahousehold inequality with the theory of equivalence scales, which assigns weights to each individual in regards to their gender, age, and also in regards to the number of individuals within the household. The discussion of the capability approach centers the attention on the definition of the destitution spaces, with a proper identification of dimensions. In the light of the right that any community has in order to define what is good for them, the fixed approach of Nussbaum (2000) is rejected, and the 'incomplete' definition of functionings of Sen (1992) that is enlarged by Robeyns (2005b) seems to be more appropriate, but in both approaches, the consideration of inequality as a destitution is clearly defined. As we have said, the last part of the chapter discusses the Mexican literature, but contextualized on the inequality considerations included both in the capability approach and also in the equivalence scales literature. The

Mexican literature has progressively included these inequality concerns in the research, and it is normal that some concepts have been misunderstood, but this is understandable because the development literature in these regards is not yet conclusive.

The **eight and final chapter** is an empirical application of the capability approach using Mexican data, comparing inequality levels with the different functionings in the community. The main argument is that inequality levels, when those are rightly measured, are related in such a way that whenever there is deprivation on other functionings it is expected that the levels of inequality would be higher as well. Our exercise proved that in a more unequal community it is expected to see higher levels of deprivation in regards to income, services, and overall higher levels of destitution. The results are statistically significant with the construction of an empirical model using traditional OLS, followed by a variety of robustness checks, and the results are also clear with the graphical interface provided by dispersion analysis charts.

V Conventions of this work

In economic literature, there are several terms that are interchangeably used to describe the concepts of well-being. Following Sen (1985b, pp. 2-3; 1985d, pp. 1-2) literature, I will refer to the use of the word ‘welfare’ in a broader sense, not only in the utilitarian framework. Welfare is mostly related to individuals or households. The word ‘well-being’ might be used interchangeably with ‘welfare’ as well. The word ‘well-being’ is also used in psychology literature, referring to mental states, but in order to stress the difference and to avoid the confusion, any subjective perception would be specifically addressed as ‘subjective well-being’ or ‘subjective welfare’, such as the terminology used

to define happiness. Another idea that has been used in this dissertation is ‘the standard of living’; we will assume that standard of living considers the overall welfare of the community, particularly focusing on the quality of life. The reverse phrase, which is ‘the living standard’, would communicate the idea of a certain characteristic of welfare attached to some particular state of an individual.

Part II. Chapters

1 Inequality and Distributive Justice: Methodological Definition and Ethical Views in Economics.

1.1 Abstract.

Four components of inequality are explored using the Methodology of Wright (1987): attributes, processes, space and value judgments. Exploring those components might help us to understand why the perception of inequality can not be 'objectively' described, but only 'subjectively' perceived. To understand the link between the perception of inequality with that of fairness is important, because they are closely associated. Certain typologies in the methodological study of inequality are very important to understand the plurality of ideas in regards to inequality, such as those used in the Marxian or the Rawlsian theory, both related with Kantian philosophy, and also the approach explored nowadays of Capabilities and Functionings of Professor Sen. The present concept of inequality comes from some branch of the Greek tradition, and in this chapter is contrasted with other approaches within the same Greek tradition and with other ancient backgrounds, such as the one developed in the Jewish literature. It is argued here that the importance of the sense of injustice attached to the idea of inequality relies, not in the very existence of classes as the Marxian theory suggests, but in the artificial modification of the natural conditions and the responsibility of the inhabitants in this matter, as is argued in the Jewish literature.

1.2 Introduction.

This chapter discusses the methodological basis of inequality measurement, and tackles the issue of the perception of inequality as unfairness. There are practical implications that are derived from the philosophical foundations of inequality, and it is argued that the sense of justice attached to inequality might be related to the chosen foundational system of thought. This concept also varies in regards of how the ancient traditions conceptualize the issue of justice and unfairness. More recently, the Marxian inheritance has been proven to be very influential in our present concept of inequality, based on the conception of historical materialism, but it is argued that it is not necessary to endorse this doctrine in order to urge both the government and the society about the pervasive and negative effects of high inequality in the society. In order to make some positions clear, other traditions in regards of justice assessment say that it is not only responsibility of the government sector to solve the problem of an unequal society; to solve the issue it is required social participation in order to break the vicious circle of an unequal society. A corollary of these positions is that the government should focus on artificial changes that produce inequality such that those artificial processes might be prevented, leaving to individuals their responsibility in order to tackle the issue of inequality, which can also come from normal processes. But before making policy recommendations, it is necessary to define clearly what the foundations of inequality assessment are.

There are several reasons for considering the issue of economic inequality. In policy analysis, higher degrees of inequality are usually associated with social problems

or with people's discontent (Sen, 1973, p. 1; 1999, p. 93). The sense of deprivation might not be related only with the lack of basic necessities expressed as in a certain representation of the poverty line, but also with the assessment that every individual makes when s/he compares his/her own well-being with others (Foster and Sen, 1997, p. 185). This made us think that the study of inequality is important by itself, and not only because it is related to other kinds of deprivation or because the value judgment is used to assess deprivation. One of the most cited quotes on the idea of inequality in economics can be traced back to Adam Smith. In 1776, in the *Inquiry into the Nature and Causes of the Wealth of Nations*, Smith emphasized the role of commodities as 'necessities', being the same in nature but varying from culture to culture depending on the customs:

> "By necessaries I understand, not only the commodities which are indispensibly necessary for the support of life, but whatever the custom of the country renders it indecent for creditable people, even of the lowest order, to be without. … . The poorest creditable person, of either sex, would be ashamed to appear in public without them". (1776, *WN*, 5.II).

The perception of some basic goods can only be understood when they are taken into account within the environment and within the community where the individual lives. So in the community, it happens that the pattern of consumption is influenced by the income of others. Therefore, the assessment of the individual to appear in public without shame, can be understood if and only if we think that she is able to compare herself with others, and for that we assume that she possesses certain value judgments to

make those comparisons. The fact is that people make comparisons using their own criteria, and this matters since this is an important social phenomenon. That is the reason why social inequality has been a matter of concern not only for the economists or politicians, but for the sociologists and philosophers as well. Inequality is a form of deprivation that, in some particular spaces, might even be 'objectively' measured, but regardless of these precise measurements, inequality will always be subjectively perceived, because we do not know for sure how much inequality is harmful to society. To sketch some ideas of how people make those comparisons and which basis they use is the purpose of this chapter.

Once we know the importance of the study of inequality, it is necessary to explore the definitions and the roots of this concept. The linguistic nature of the word inequality might give rise to a variety of ideas, so it is necessary to define the context of the discussion. That word inequality usually has attached to it certain value judgments, and also philosophical positions. Inequality is not only an issue of mathematical comparisons. If the meaning of the concept is explored, it is possible to level the ground to avoid linguistic confusion for discussion. For instance, it can be the case that some people argue about the causes that produce inequality, stressing the underlying relationships, but there might be others who may think on inequality as a 'bad' thing by itself, not looking at the causes but about the ethical values behind it. We might consider the question: '*Inequality of what?'*, thinking on the space where inequality is measured, or the alternative question: '*Inequality among whom?'* Because it should not be forgotten that inequality is something that is contextualized to a recipient unit, where the social unit might be individuals, groups of individuals (e.g. households), countries, communities, or

geographical groups within a society, just to mention some examples. It is discussed in this chapter why it is very frequently taken as given that the value judgment assumed is that inequality is a 'bad' thing, always a social disease, following the Marxian tradition. Sometimes the strong position, that emphasizes the struggle among classes, makes it difficult to understand that inequality might come from natural differences. The artificial change of those conditions might explain the unfair and undesired inequality, but not the very existence of those conditions. In the rest of the chapter, it will not be assumed that the concept of inequality is 'equally' understood by all. It will be explained, using a particular methodological framework: the dissection of the inequality concept of its attributes and processes under certain value judgments.

- Overview

The definition of inequality is first addressed in section **1.3**, followed by the theoretical components of inequality, which are separated in section **1.4**, as are a) its attributes or dimensions, and b) what generates inequality and due to which process. The suitable space where inequality is calculated is discussed in section **1.5**. The ethical and moral values underlying the concept of inequality are mentioned and opened for discussion in section **1.6**. Using the previous discussions, the approach of traditional economic theory is analyzed in section **1.7**, finalizing with some concluding remarks in the light of the material presented.

1.3 Definition.

There are several issues in regards to 'inequalities', so it is appropriate if we try first to define what inequality is. The root is the Latin word *in-* + *aequalis* (equal), meaning 'non-equal', or "Lack of equality, as of opportunity, treatment, or status".[12] Inequality does not have a meaning by itself, so it is a negation of another word. So in order to pursue this further, it can be convenient to look instead at the definition of 'equality' rather than inequality. Equality means that the object of appreciation corresponds among some particular group of objects, persons, processes or circumstances, sharing at least one specific attribute. A stronger version of this word will be 'identity' (total correspondence of the object to the other(s) object(s) in all attributes), and a weaker version could be 'similarity', a partial correspondence (Gosepath, 2007). Identity implies equality, and equality implies similarity, but not the other way around. Inequality means, in this sense, a non correspondence to some degree in at least some of the attributes. In economics, we can think that the word inequality entails in its notion some preconception of a non-balanced ideal situation, so inequality arises when this model changes due to a certain process, as will be discussed later. How the 'ideal' situation is preconceived in this model is a matter of philosophical debate, and it will be commented upon in detail in section **1.6**.

Equality and inequality are ideas that need some kind of context. It is important that an author mentions clearly what kind of inequality or equality she is making reference to, in order to avoid confusion. For instance, income inequality explores the non-correspondence among particular groups of people or households (called recipient

[12] *The American Heritage Dictionary of the English Language (2000)* and *Wiktionary*. (2008).

units). Those groups share the particular attribute of having access to some particular amount of earning, usually called income. On the epistemological context, the use of the term inequality is for our purposes, mostly descriptive rather than prescriptive. But it is possible to discuss the prescriptive use of this term if we touch on the ethics and morals behind the concept of inequality. In the same setting, ethical value and the morality of inequality are closely linked with concepts of justice and fairness. Now that the etymological concept is defined, in the following section some particular attributes of inequality will be explored in the context of economics.

1.4 Typology of inequality: Inequality as an abstract concept.

I Inequality Attributes.

The typology of inequality in economics, as described by Wright (1987), can be helpful to explain two of its components: a) the attribute of social inequality and b) the kind of process that leads towards that state of inequality. This typology will be convenient for two purposes, to shed light over the space where inequality is calculated, and maybe the unit measure, and also to separate the observed value of inequality from the process that generates it. The study of the typology will also make clear another difference: that inequality is always making reference to a relevant group in the society and to a relevant attribute as well, so that every group (individual, community, etc.) might have a different amount of some of this attribute (income, weight, power, etc.). It will be shown that when this distribution is the same for all units, this leads to equality, and when

not, to inequality. It will be explained which form the attributes can take, and later, how these processes can take place, in other words, how inequality arises.

The attributes can be divided into two kinds: 'monadic' and 'relational'. The former are the ones that, in order to describe their magnitude, should not need reference to anything else. The latter might have a reference (or a relation) to something else. Monadic attributes can be, for instance, food or material goods; their quantification does not need a reference to anything else.[13] The same happens to the consideration of personal characteristics, such as gender, weight, size, and similar things, which do not need reference to anything else. On the other hand, the 'relational' attributes have reference to something else; this can be the idea of freedom, which might be narrowly defined by the absence of constraints on opportunities. Another example of a relational attribute is power, which might be possessed in large amounts by politicians in a society, but in a very limited amount by the rest of the individuals. It is difficult to define power, but if we define it as the ability to obtain things from others, power is a 'relational' attribute, which depends on the number of people that are controlled by the one with power.

Now it can be understood better that when income is emphasized as the space of inequality, the argument is done with respect to a 'monadic' attribute, because the attribute is usually focused in terms of material goods, food, or the equivalent in money. However, we know that income does not capture all the people's well-being, so it is difficult to find in this space other things that, though necessary, are not in the goods

[13] We could think that material goods are quantified in terms of money, and that could be related with relative prices, or the exchange value of money, so in that sense, the 'monadic' characteristic of the attribute would be violated because of its reference to 'something else'. Knowing that is needed to have a starting point, it assumed that prices are given, and because of that, material goods are well defined in that space.

market. For the definition of some of the non-monetary goods, such as democracy or freedom or access to education, we do not need a monadic focus on attributes, we need to focus on the 'relational' attributes, as it can be clear that such examples of human rights make reference to something else. It is possible to have a mixture of relational and monadic spaces, for instance, the capability approach of Sen that uses a variety of spaces. This approach recognizes the complexity of the space where well-being is measured. The (achieved) functioning bundles are mostly related with monadic attributes (e.g. food, clean water supply, access to education), and capabilities (or freedoms) are mostly related with relational attributes (e.g. democracy, participation, etc.). Now let's go to the processes.

II Inequality Processes.

The classification of the processes goes in the same fashion as the attributes: we have monadic processes and relational processes. In the monadic processes, the unit in consideration relates to self-contained processes, in other words, the attribute in the monadic process is not related with any other process that drives inequality. It is difficult to find a pure monadic process, but for instance, if we consider the distribution of air that is breathed in a community, it is a function of the amount of the required air only by individuals in regards to their needs. The individual's life cycle can be considered, but the amount of air required is not constrained by something else, there is plenty of it. Following the same example, the quantity of air that is breathed by a small baby is not the same as that for an adult; the quantity changes according to personal characteristics of the

individual.[14] It is important to understand the role of personal characteristics, because those are usually attached to monadic processes. Each individual possess a number of characteristics that are not related to something else, personal characteristics only belong to each person. Understanding this link, it can be clear for the government that some distribution of services will depend on each person's characteristics. For instance, the distribution of health services has a part that is intrinsically related to personal characteristics (e.g. maternal care, child vaccination), and because of that, the distribution of health service can be seen as a monadic process.

As opposed to the monadic process, we have relational processes that are related to some other process or attribute. Using the same health service example, a relational process that is associated with something else is a transferable disease, because we need to think in terms of a distribution of health care that it is due to some (negative) interaction among the people. In this case, the form of health care distribution will be a function of the interaction between the members of the community, and the likely spreading of some particular microorganism. In this case, part of the health distribution is a relational process.

Both relational and monadic processes can produce changes in relational and/or monadic attributes. For instance, a poor health distribution (relational and monadic process) might produce a more unequal income distribution (monadic attribute), because of lack of opportunities (relational attribute). Some relational processes are self reinforced. If we think on power as a process and not only as an attribute, the person that has been gaining power over others, in the meantime he/she will be more powerful if

[14] In this case we should ignore that the amount of people in the community is related with the interactions of reproduction among them, and we also ignore the influence of others personal characteristics such as genetic inheritance, so none of this is considered for our monadic ideal definition.

nothing stops this process. This will produce a more unequal distribution of the attribute as well. If we think in a different example, the number of income transfers (monadic process) from the rich to the poor might be considered a self-propelling mechanism to alleviate the unequal distribution (monadic attribute), because the poor might be feeling compelled to make transfers to the poorest as well.

III Monadic and Relational Issues in Modern Measurement.

Using the typology described above, if we deal with the historical reasons that are behind the causes of inequality, we will be dealing with the 'relational' process of inequality, while if we focus in the personal characteristics, and how those show today the levels of inequality, we will be dealing with the 'monadic' process of inequality. Finally, it is clear that a mixture of these processes can occur. A suitable example might be gender inequality. In this case the 'monadic' processes, due to the natural sexual personal characteristics, and the 'relational' processes, due to the customs and norms enacted by the society in regards to this differentiation, both can explain the overall process of inequality in a particular space.

Having in mind the two dimensions of the typology of inequality (its attributes and its processes), we know that the traditional measurement of income inequality deals with the study of its 'monadic' attributes that come mostly from a 'relational' process. Because of practical issues, inequality measurement usually focuses on the measurement of the monadic attribute, but not on the relational process that causes it. For the sake of clarity, we can see in **Table 1-1** some examples that are based on the classification just

presented (Wright, 1987). The types of inequality that are usually studied in the assessment of welfare are highlighted in bold letters, which is the focus of most of the empirical research on inequality.

		Form of the unequal attribute		
		Relational	Relational/Monadic	Monadic
Form of the distribution of Processes	Relational	Power, Status	Participation	**Income**
	Relational/Monadic	Authority based on achievement (democracy).	**Functioning Bundles and Capabilities.**	**Income with equivalence scales, Epidemiology.**
	Monadic	Natural Talent.	Personal Achievment	Personal Health, Weight, Height.

Table 1-1. Typology of Inequality

It is necessary to know the limitations of the inequality type of measurement. For instance, on the one hand, when we deal with traditional formulations that calculate income inequality, such as the Gini coefficient, it can only be possible to explore the monadic attribute of income that is measured in cardinal units. The relational process that caused inequality might be explored at some extent with Entropy measures, because the regional composition is feasible to explore with such a measure, but on the Gini coefficient that process is not visible. On the other hand, another way to consider inequality is the use of equivalence scales, which consider individual heterogeneity. In this case the same monadic attribute of income is considered, but now focusing on the monadic processes that are due to the personal characteristics of individuals. Nowadays there is no type of measure that can explore all forms of distribution processes and all

unequal attributes at once because the data is not available, but a multidimensional measure might serve as a beginning.

When income inequality across some period of time is studied, we explore the processes that drive the course of the distribution of income. This relationship is not usually captured in full by the standard measures, such as the Gini coefficient or Theil index. In this standard measurement, we can not see which might be the cause that is driving the cited inequality, which likely comes from a mixture of 'relational' and 'monadic' processes. In spite of the focus on the monadic attributes of income, it is possible to use some discovered characteristics of the standard measures in order to explore the relational process embedded in income, doing this through certain properties such as decomposability, either by population subgroup or by income source. The 'subgroup consistency' is more a relational property, which says how much inequality affects each group of people; this is clearly a relational implication. The decomposition by income source also tells which of the reasons behind inequality are, and how assets, savings, and other sources affect directly or indirectly the 'motion' of inequality across households. These properties allow the researcher to explore some of the reasons which are beyond the scope of the superficially observed income inequality, and allow her/him to think about how those reasons contribute to the overall phenomenon. Going beyond technical specifications, we are going into the terrain, not very firm, of inequality measurement, so we discuss the space for calculations that may be seen as an extension of the attributes just mentioned.

1.5 Space for calculations.

The discussion about the space where inequality shall be measured is not short. This question has been addressed by many, but recently in economics by Amartya Sen in his *Equality of What?* (1980).[15] In that paper he rejected the ethical views of both the utility maximization approach and Rawls' justice. He contrasted those two approaches with his own approach of capabilities and rejected them. Afterwards, the literature became very broad on the definition of the space where to measure deprivation. That literature includes discussions with regards to the appropriate space to measure welfare, such as non-income spaces, multidimensional capability vectors, various types of functioning bundles, and a mixture of those views.[16] In spite of methodological discussions, there are issues of a practical nature that are yet to be completely resolved, for instance when only income is chosen from the plethora of spaces available (Cowell, 1995, p. 4). Therefore, it is clear that the discussion dealing with the suitable space to measure well-being is broad. This paper focuses on the approaches that struggle with issues of welfare, and particularly with inequality measurement.

I Utilitarian Space.

Considering the appropriate space where inequality shall be calculated, we find that most modern economists reject the utilitarian aggregated space in the sense of Bentham, when he considered the social welfare through the aggregation of every

[15] See also Sen (1992, 2000).
[16] See for instance the Mexican case (CTMP, 2002, pp. 24-32).

personal utility (Sen, 1973, p. 15; 1980; Foster and Sen, 1997**,** p. 112). The strong assumption that avoids interpersonal comparisons, assuming that all individuals obtain the same utility from the same basket of goods, makes things problematic (Sen, 1973, p. 12; 2000, p. 67). In this view it is necessary to assume identical individuals, with identical levels of satisfaction that come from the enjoyment of a particular good. Defending this approach, authors like Harsanyi (1987, p. 955), saw this problem not as a serious one, saying that it is only difficult to do the formalization of this approach because of the embedded philosophical complexity of the measurement, arguing that every person has access only to her own mental inwardness, and not to the others. We need to keep in mind those controversies on the measurement of well-being, particularly when it is necessary to impute a numerical value to every recipient unit (e.g. person) and their utility. When we think that people's income is the expression of their 'utility', or more than that, if we think that utility is a good approximation of their welfare, there are many underlying assumptions made, much more if we want to believe that each person enjoys the same level of utility with the same amount of money spent (either looking to utility as a 'pleasure', in the hedonistic view, or as a satisfaction from the consumed good, in the modern view).[17]

One utilitarian challenge that was not properly solved was the incommensurability of human pleasure (Welch, 1987). It is important for us to know a bit about the reason for the limitations of interpersonal comparisons in the utilitarian framework, and because of that, the limitations on inequality assessment in such framework. If we assume that all individuals possess an identical utility function, this has the consequence of having the social welfare function defined over the set of individuals and their orderings, which

[17] See Sen (1973, p. 16, n. 21).

makes the task of considering the income distribution very difficult from the very beginning: cardinality is a problem (Sen, 1973, p. 13). As early as 1879, the professor of jurisprudence, T. E. Cliffe Leslie, wrote:

> "There is an illusive semblance of simplicity in the Utilitarian formula… it assumes an unreal concord about the constituents of happiness and an unreal homogeneity of human minds in point of sensibility to different pains and pleasures … Nor is it possible to weigh bodily and mental pleasures and pains one against the other; no single man can pronounce with certainty about their relative intensity even for himself, far less for all his fellows". (1879, pp. 45-6).

This and other critiques undermined the hedonistic utilitarian framework. Later other ('non-welfaristic') approaches were progressively replacing it. We discuss some of these approaches below.

II 'Commodities' and the Basic Needs Approach.

As a reaction against the utilitarian-hedonic view in the assessment of welfare, a popular school during the 70's was the Basic Needs Approach (BNA). It was a popular and influential approach in development economics. It emphasized the right of every individual to have access to certain 'basic' goods. Those goods were not only very basic, such as food, shelter, clothing, or community services (water, public transportation, or health access), but also include the participation of people in the decisions in regards to

their own well-being (Ghai et al. 1977, p. 9). The problem with the BNA is that it went to the other extreme, in the sense that it was far away from subjective considerations, so it overemphasized commodity needs.[18] The first Human Development Report, issued in 1990, criticized the BNA in the following way: "the basic needs approach usually concentrates on the bundle of goods and services that deprived population groups need: … It focuses on the provision of these goods and services rather than on the issue of human choices" (UNDP, 1990, p. 11). At that time, most of the BNA welfare assessments used only income as the appropriate space for the calculations, given some particular basket of 'basic' goods.

Sen tried to generalize this framework, extending the scope of the BNA to a wider range (Alkire, 2002, p. 19). Sen wrote that it was necessary "to take the basic needs approach out of the arbitrarily narrow box into which it seems to have got confined. To see it as just one part of the capabilities approach—to which it is motivationally linked—would do just that" (Sen, 1984, p. 515). He criticized the lack of philosophical foundation of the BNA, and its usefulness only for very poor countries. He offered the idea of capabilities as an active concept, instead of the passive concept of 'needs' (Sen, 1984, pp 512-514). In any case, what is true is that the use of income, as a suitable space to calculate welfare, is rooted in the BNA School. Income is still widely used because of one practical issue: it is usually the only data source available in many surveys. So, even remembering that the BNA was rejected by the subsequent approach of capabilities, BNA can not be ignored as a useful, and some times the only, practical approximation for the assessment of welfare.

[18] Alkire (2002) refers to this as 'commodity fetishism' (p. 14, n. 58), bibliography and discussion of BNA in Alkire (2002, pp. 166-167).

III Functioning bundles and the Capability Approach.

Sen is usually held responsible for introducing a new space for the assessment of well-being: functionings and capabilities. I will quote two important paragraphs that describe both the root and the present understanding of capabilities and functionings concepts. The first one is due to Sen in 1985. At that time he formally described his rejection to utilitarianism that he wrote previously in his third Hennipman Lecture.[19] He mentioned the problems of well-being definitions when interpersonal comparisons are taken into account. Moreover, he questioned the problems of having just income as the sole space for the measurement of poverty, as we can see in the following part with his famous bicycle example:

> "In judging the well-being of the person, it would be premature to limit the analysis to the characteristics of goods possessed. We have to consider the 'functionings' of persons. While the ownership of commodities is a personal matter, and thus the command over the characteristics of goods owned is also a personal matter, the quantification of characteristics does not vary with the personal features of the individual possessing the goods. A bicycle is treated as having the characteristic of 'transportation', and this is the case whether or not the particular person happening to possess the bike is able bodied or crippled. In getting an idea of the well being of the person, we clearly have to move on to 'functionings', to

[19] Methodologically discussed (Sen, 1985b, Ch. 3), and previously rejected in Sen (1973, p. 15-9).

wit, what a person succeeds in doing with the commodities and characteristics at his or her command" (Sen, 1985b, pp. 9-10).

He was referring to the 'functioning' idea contained in Aristotle's *Nicomachean Ethics*, where it was necessary to understand the human final (and best) good that drives people's seeking of their own well-being (Sen, 1999, p. 73). This idea has been formalized and surveyed by various authors.[20] I think the next paragraph resumes the abstract idea of the capability approach because of the new developed terminology of 'capabilities', 'functionings', 'functioning bundle', and 'capability set':

"The functionings approach to the notion of living standards is an important recent development in welfare economics. The core of the approach, initiated by Sen … and Nussbaum …, consists of the idea that the notion of the standard of living should be formulated in terms of functionings (i.e., the 'doings' and 'beings' that have 'intrinsic value' for people and capabilities rather than in terms of utility or commodities). Several related approaches stem from this central idea. First, we have the approach where a person's standard of living is assumed to be determined exclusively by his achieved functioning bundle. An alternative approach is based on the assumption that a person's standard of living depends exclusively on his capability set (i.e., the set of all mutually exclusive functioning bundles available to him), which reflects the opportunities available to the person. Lastly, we have a more general conceptual framework where a person's standard of living is determined by his capability set and / or the functioning bundle belonging to his

[20] A good survey might be found in Robeyns (2005).

capability set, which he actually achieves. It is clear that the first two frameworks are special cases of the third" (Pattanaik and Xu, 2007, introduction).

The proposed space is broad for the calculations of inequality and for any standard of living, because of the inclusion of both relational and monadic attributes. This approach tries to explore the implications of any possible space where destitution might take place. But it is not the purpose of this chapter to discuss the validity of this approach, even though has been proven very useful.[21] The purpose in this section is just to mention that the capability approach offers an alternative space where well-being can be measured.[22] The challenge that faces the capability approach is related with the formalization of its multidimensional setting, problem that is not shared by the utilitarian framework. Sen itself proposed some ways to formalize the welfare dimensions, for instance, using the fuzzy approach, but this issue is still under research.[23]

1.6 Ethics: Inequality as a value judgment.

Suppose I live in a simple house in the side of a hill overlooking a lake, in the town of Medina, Washington; just besides the mansion of Bill Gates (if that would be possible). If I observed that he is very rich compared to me, without thinking that that is unfair, I am just acknowledging inequality. On the other hand, if I think his wealth is 'providential' because of his charity organizations, or if my perception of his money

[21] See Robeyns (2005, p. 93) and the references therein.
[22] A discussion will be tackled in chapter **7**. Some basic references can be found in Basu and Lopez-Calva (2002), Alkire (2002) and Robeyns (2005), among others.
[23] See Foster and Sen (1997, p. 121, n. 17) and Sen (2000) among many others.

makes me feel 'sick', it is clear that I am making some kind of value judgment. People often make value judgments in regards to their own beliefs, but for our purpose it is necessary to formalize this exercise. So if we want to say that inequality is rather normal or bad, we need to use some kind of evaluation. Our evaluations might be related with traditional social justice theories.[24] Looking more carefully at those theories and their philosophical foundations, it might help us to understand better and to analyze the income distribution in the community (Sen, 2000, p. 60). The ethical judgment is explored, not only because it is needed to know 'how much' inequality exists, but also because we want to know if that inequality is 'bad' and to what extent it might be harmful to society.

The comment in this section is that fairness judgment, when perceived in a pejorative sense, is external to the scientific model. The fairness judgment is based on the pure belief, or the conviction that a person (or his society) has in some philosophical theory. The perception of 'unfairness' can be enhanced by social convention and institutionalized by law, involving ideas "of what is good and proper, and what is shameful, inexcusable or intolerable" (Sen, 2000, p. 60). Because of the different ideas about what is good, some kind of theory survey is needed in regards to justice. For instance, there are some people who think that some 'unequal' distribution is necessary if the society wants cheaper and vast quantity of goods that are produced by firms benefiting from economies of scale. These people think that some of the individuals in the society must have the right to possess more than others, because this generates efficiency. On the opposite side, others might think that all goods and money 'must' be distributed 'equally', if we want to consider the distribution 'fair', with the aim of living

[24] The term justice, in regards to economics, is usually related with 'distributive justice', different from the concept of justice 'as a virtue'. In this paper both meanings are used, and that can be clear in regards to the context.

in an ‘egalitarian’ society. The previous examples enter inescapably into the territory of ethics and value judgments.

I Utilitarianism.

Even though utilitarian philosophy considers the well-being of each individual, and the right of each to be treated fairly, having the same value under the law, the consideration of the whole community poses some problems. The famous principle “The greatest happiness for the greatest number”, spelled out for the first time by Bentham in his *Fragment on Government* in 1776, is well known in the utilitarian literature. The goal was to maximize the whole, but it was not clear if the distribution within the whole was important. There was a clear value judgment that treats a whole group as privileged rather than some part of it, rather than the individual. Bentham and his hedonistic view of humans in economics as pleasure-seekers or pain-avoiders, was very pervasive during the 19th century, due particularly to the spreading of his ideas by James Mill and his son, John Stuart Mill. In those principles, Bentham stated that, a) the individual well being should be the end of moral actions, b) that each individual has the same value under the eyes of the law, and, the most important, that c) the aim of society should be the pursuit of the greatest possible happiness for the greatest number. It took almost a hundred years before his critics really undermined the posture proposed in his *An Introduction to the Principles of Morals and Legislation* (1789).

There were several reasons to criticize this approach. One of them was related with the conceptualization of the human being and their desires. This particular view,

which is clearly beyond traditional science, affected the way utilitarians conceived society and its goals. Bentham with his *felicific calculus* was following the British branch of the Enlightenment period, which stated a dual composition of humans by passions and reason, but putting greater emphasis on the emotional side (Welch, 1987, p. 771). Bentham was most probably influenced by the empiricism embedded in the *tabula rasa* of Locke and/or by David Hume's words: "Reason is, and ought only to be the slave of the passions" (*THN*, 2.III.3).[25] That the individual was conceived as a 'sentimental' subject controlling her own reason is clear, therefore, the hedonistic view of a pleasure-seeker fitted perfectly with the utilitarian view of Bentham. It was argued that the composition of human nature is not something believed to be a scientific truth, but beyond the scope of science.[26] Therefore, it might be reasonable to understand why other philosophical theories questioned deeply the pure hedonic nature of humans. In the case of the Continental side of the Enlightenment, that followed Descartes and Kant, the rational side of human nature was seen more as the driving force in the search for truth (Descartes, 1637). This Continental school was influenced by the Aristotelian conception in the pursuit of the best good,[27] and not just looking to fulfill pleasurable desires.

Criticizing also the utilitarian principle, some authors focused on its foundations. Robbins (1932, 1938) mentioned that in order to make a statement about human homogeneity, the applied value judgment could not come from scientific truth, but from

[25] David Hume, the Scottish philosopher, said about the self and its conception (in spite of the Jewish tradition which includes the concept of 'soul' as a separate entity of reason and sentiments) that the self was partitioned in two, the first one as sentiments, like sensations, passions or emotions, and the second as ideas (*THN*, 1.I.1), such as memory and imagination (*THN*, 1.I.3). Both sentiments and ideas are acquired in a complex way through experience (*THN*, 1.III.14) and because of the pure effect of social convention (*THN*, 1.II.13).

[26] Hume saw a close connection of sciences and human nature (*THN*, Introduction), but the terminology I am using here is the one of Descartes and his scientific method.

[27] See section **1.6 IV a)**.

some ethical basis outside of economics. Then he raised his famous question: "Would it not be better, I asked myself, quite frankly to acknowledge that the postulate of equal capacity for satisfaction *came from outside*, that it rested upon ethical principle rather than upon scientific demonstration, that it was not a judgment of fact in the scientific sense, but rather a judgment of value…?" (1938, p. 637, emphasis in the original). From outside scientific scope, the utilitarian approach might also be considered non-ethical for the following reason: as long as the amount of suffering by some is compensated by the enjoyment of others, it is possible that overall welfare of the community might increase.[28] It is very likely that people who suffer are usually the poorest in the community. That raises the question again of the necessity of some sort of interpersonal comparison among members (see section **1.5 I**), in order to decide whether one state is better or worse than the other, as it was expressed again by Sen (1973, p. 15-18; 1980), and not only assuming that everyone should be the same. Finally, another critique was based on the absence of desert-based principles.[29] Desert-based principles are founded in the account of exceptional contributions of individuals to their society, taking into account the effort expended in those activities. The critique of utilitarianism by the desert-based principles was such that there is no account of individual actions and some kind of reward for contributions of individuals, nor a compensation due to their work activity, as was discussed by authors like Miller, Sadurski or Dick, based on the writings of Locke (in Lamont and Favor, 2007). Then the utilitarian view offer a contestable value judgment in

[28] They defended the point arguing that those cases were very unlikely to happen, and arguing that such cases provide 'rules of thumb', providing only moral information, but not theoretical arguments (Lamont and Favor, 2007).
[29] Those are also known as merit-based principles.

regards to distributive justice and mostly claims an egalitarian view only as a normative value in their principles.

II Rawlsian Justice.

Inequality and the idea of 'Justice as fairness', developed by Rawls (1958, 1971), is one of the most frequently used frameworks in recent discussions. His figure of the 'original position' using a theory of social contract is based on the writings of Locke, Rousseau and Kant (Rawls, 1971, p. 11).[30] He justifies the idea of the original position with the aim to produce a fair procedure, where "any principles agreed to will be just" (Idem., p. 136),[31] resembling the well known Kantian 'categorical imperative'.[32] This original position "is understood as a purely hypothetical situation characterized so as to lead to a certain conception of justice" (Idem., p. 12), where the individual is engaged in

[30] He acknowledged the similarity of Harsanyi's (1953) work, but he said that Harsanyi's was used to develop a utilitarian theory (Rawls, 1971, p. 137, n. 11).

[31] The original position of Rawls has been contested in a variety of ways. For instance, the supposed original position, using the idea of the 'veil of ignorance', it assumes that no individual in the society knows his own position or status, but in order to make decisions, those individuals are assumed that they should be not only 'rational', but also 'self-interested' rational (Wolff, 1990, p. 114). In that sense, the 'veil of ignorance' is only a partial veil, because the starting point is the individual rationality; a truly original position should be such that the individual did not know neither if he/she is rational in the self-interested sense. Other criticism for the original position is the assumption that all individuals think that all judgment resides in the brain, as a mental inwardness, as does the preconception of Descartes axiom '*cogito ergo sum*' (1637, part. IV), but that mental preconception is only one of the particular systems of thought, it is not clear what should be revealed to the individual that particular framework of thought and not others.

[32] The saying of Rawls "For by a categorical imperative Kant understands a principle of conduct that applies to a person in virtue of his nature as a free and equal rational being" (1971, p. 253), added up the idea of 'freedom', which is not in the original quotation of Kant. What Kant literally said was that "There is therefore but one categorical imperative, namely, this: Act only on that maxim whereby thou canst at the same time will that it should become a universal law." (1785, Section II). Kant supposedly upgraded the so called Golden Rule, so he wrote "Let it not be thought that the common "quod tibi non vis fieri, etc." could serve here as the rule or principle. For it is only a deduction from the former, though with several limitations; it cannot be a universal law."(1785, Sec. II). He was referring to the one saying "Do not do to others what you do not want done to yourself", but this is not the Golden Rule. The Golden rule of Jesus says "et prout vultis ut faciant vobis homines et vos facite illis similiter" ("Do to others as you would have them do to you". (*Holy Bible (NIV):*Luke. 6:31). This is rather different because this do not entail the 'limitations' that Kant argues, only implies actions and responsibility. The Golden rule in 'negative' sense is attributed to Confucius (6 BC, *Analects*, 15:23 http://www.confucius.org/lunyu/ed1523.htm).

a process of self reflection on who she is in the society, which characteristics she has, the things that she possesses, and so on.

For our consideration of inequality, in regards to justice and institutions, Rawls offered two important principles that shall be taken into account: "First Principle[,] Each person is to have an equal right to the most extensive total system of equal basic liberties compatible with a similar system of liberty for all. Second Principle[,] Social and economic inequalities are to be arranged so that they are both: (a) to the greatest benefit of the least advantaged, consistent with the just savings principle,[33] and (b) attached to offices and positions open to all under conditions of fair equality of opportunity". (1971, p. 302). As a matter of clarification, some rules follow these predicates, which enhanced the priority of the first principle in regards to liberty, 'allowing liberty to be restricted only for the sake of liberty', while the second stressed justice over efficiency and welfare (Kukathas and Pettit, 1992, p. 44).[34]

The Rawlsian ideal of the perfect state of justice is based on the Marxian concept of equality in the utopian egalitarian communism: "Rather a society in which all can achieve their complete good, or in which there are no conflicting demands and the wants of all fit together without coercion into a harmonious plan of activity, is a society in a certain sense beyond justice" (Rawls, 1971, p. 281).[35] He explains that when this

[33] This is the intergenerational care that the present generation should offer to the subsequent (Rawls, 1971, p. 284-298).
[34] See also Sen (2000, pp. 70-71).
[35] There are several ancient roots of the concept of inequality justified in regards to people's needs. A very old one is found in the Jewish tradition, where in the *Torah (*1200 B.D), is told the story about the Israelites during the exodus from Egypt, they were miraculously fed with 'manna', a kind of bread that came from heaven, and how it was established the 'unequal' but fair distribution of necessities depending on people's needs. It is written in the manuscripts that they were ordered to take just as much as they need, nothing more, nothing less: "The Israelites did as they were told; some gathered much, some little. And when they measured it by the *omer*, he who gathered much did not have too much, and he who gathered little did not have too little. Each one gathered as much as he needed." (*Holy Bible (NIV)*: Ex. 16:17-18)

communist idealistic state is reached, the principles of justice are no longer necessary (Tucker, 1969, ch. I &, II). In this sense, inequality is justified solely on the basis that each member of society obtains exactly the equivalent to his/her needs: “It is even possible to elevate one of these precepts, or some combination of them, to the level of a first principle, as when it is said: from each according to his ability, to each according to his needs” (Rawls, 1971, p. 305). Rawls was quoting one of the fundamental Marxian ideas in the *Critique to the Gotha Program* (1875).

Now that we have been mentioning Marxist thought several times, we can explain that the Marxian ‘equality’ is the ‘fair’ distribution of all kind of necessities among the ‘unequal’ natural human needs. In this framework, the inequality will disappear as long as the private ownership of the means of production is completely abolished, then [surplus] value and exchange value must also disappear, so production should become only for the use and satisfaction of the communal society (Mandel, 1987, p. 382). The Marxian tradition is clear about its belief in the idea of a supreme [enforced] equality in society, noted in *The Communist Manifesto,* when it demands “[a]bolition of property in land and application of all rents of land to public purposes”, and also demands “[e]qual liability of all to labour” (1848, Part II). They thought that inequality was maintained by the possession of the social surplus by the ruling class, which maintained the ‘superstructural’ activities that unfairly entailed them with the means of production (Mendel, 1987, p. 369). Therefore, if classes were abolished, at least in theory, unfair inequality must disappear due to a full satisfaction of needs in this idealistic progressive system. It is clear that the Rawlsian definition of justice based on the Marxian tradition sees inequality as a ‘bad’ itself, as a disease that should be prevented.

Coming back to Rawls' proposition, the hypothetical exercise of the original position, using the powerful idea of the 'veil of ignorance', assumes that every person should be able to ignore his/her own characteristics and possessions as a starting point, as if they were born in the lower end of the distribution. That exercise will produce a sense of empathy with the most destitute. Thus, this initial consideration might be helpful to illuminate the persons that are privileged, gifted and rich, about their responsibility with their society. The problem arises as there is no mechanism to force the irresponsible person to follow this ideal. People 'should' be fair, that is the thought of Rawls. In regards to institutions, it is said that if people are fair, the institutions will be fair as well: "It follows that if the basic structure of society is just, or as just as it is reasonable to expect in the circumstances, everyone has a natural duty to do what is required of him" (Rawls, 1971, p. 334). [36] That is the case for the privileged. On the other side of the coin, we can not see a very clear advice from this framework when people find themselves in very impoverished conditions, for instance, when an individual considers herself in a 'position' that is 'revealed' to her as a person with mental or physical disabilities, as a part of a discriminated group, and very poor. The Rawlsian principles can not explain to this person why other people are not behaving 'properly'. She might think: 'Why do others not respect the social contract?' An unsatisfactory answer for this question might only emphasize her anger against society, enforcing her envy as well.[37] Then, it might be sensible for her to rebel instead, as the Marxian beliefs invite her to do. Therefore, it is understandable why this exercise should be mostly considered as a 'device for moral

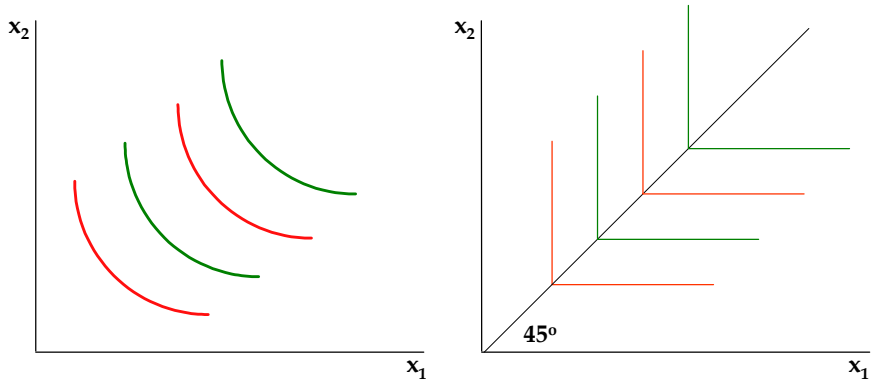
[36] The root of this idea can be traced to Plato and his conception of the just city, discussed in section **1.6 IV a)**.

[37] The idea of fairness and envy is mentioned in Sen (1987b, p. 1041), where 'equity' arises if no one wishes to have or preferred a bundle of goods that belongs to the other person instead of his own, see references therein.

reflection and political discussion' (Sen, 2000, p. 61, n. 2), more than being considered as a practical solution for the problem of unfairness.

The Rawlsian concept of equality has implications in economic theory, and that issue has been exposed (and rejected) in this framework.[38] If we talk about the space of 'social preferences', where in both axes are represented the well-being of two individuals x_1 and x_2, such that one of them should be the most deprived in the society, in the 'difference principle approach' of Rawls, there will be no gain for the society unless both of them gain together, jumping to the next upper level of welfare, as is noted in part b) of **Figure 1-1**. As a comparison, on the left hand side in part a) we have the utilitarian view, which will reach higher levels of social utility when the total utility is maximized subject to the (social) budget constraints, regardless of the welfare of the utility of each individual that is considered separately. In that view, the form of the preferences is more important than the achieved levels of utility of each individual. In that sense "[a] classical utilitarian … is indifferent as to how a constant sum of benefits is distributed" (Rawls, 1971, p. 76-7).

[38] But there are other criticisms, see Lamont and Favor (2007).



a) Utilitarian b) The Difference Principle

Figure 1-1. The Utilitarian view vs. the Difference Principle.

As we just saw above, Rawls rejected the Utilitarian principle because of the unethical aggregation of utility. But both the Rawlsian and the Utilitarian arguments just presented here were criticized by Sen (1973, pp. 17-18, 22-23), even though when he allowed those approaches to include interpersonal comparisons.[39] Using a very simple graphical argument, it was shown how difficult it is to use the utilitarian framework, precisely for being non egalitarian: "As a framework of judging inequality, utilitarianism is indeed a non-starter, despite the spell that this approach seems to have cast on this branch of normative economics." (Idem. p. 18). More formally, in order to show the inconsistencies of the utilitarian approaches and the deficiencies of the Rawlsian framework, he constructed the Weak Equity Axiom (WEA), which with very mild conditions,[40] it rejected the utilitarian principle and pointed out the inconvenience to assume a very strict Rawls's 'maximin' rule.

[39] This approach was widely used by Marshall, Pigou, and Dalton, among others (Sen, 1973, p. 16, and note 21).
[40] Taking a Social Welfare framework, it was assumed a two persons unequal world and strict concavity.

In the light of the previous arguments, there are reasons to believe that Rawlsian theory can not be considered as a unmovable basis for fairness or justice nor as a universal rule in distributive justice concerns; this approach has problems in order to be theoretically consistent with weaker approaches. On the other hand, other critiques of Rawls complain that the difference principle is not sufficiently strong in regards to the initial distribution of the endowments, and leaves this issue of unequal endowments as an open question. This was pointed out by authors that support resource-base theories, which attach a stronger sensitivity to inequality at the beginning of the distribution, even to the distribution of natural inequalities (Dworkin in Lamont and Favor, 2007).

III Sen's Concept of Justice in his Capability Approach.

Sen is interested not only in inequality as such, but about the repercussions of high inequality in society. There are, according to him, economic, social and political problems that might be related to inequality. Those problems are, for instance, unavailability of food, lack of democracy,[41] people's discontent, or disapproval given poor economic conditions.[42] He also considers the negative effects because of inequality which causes the erosion of relationships among the members of a society,[43] so that might be an important factor that boosts unstable movements such as rebellion.[44] His approach is very different from the Rawlsian sense of justice (though Sen build up some of his

[41] "Inequality has an important role in the development of famines and other severe crises. Indeed, the absence of democracy is in itself an inequality…" (Sen, 1999, p. 187).
[42] "In assessing the likelihood of discontent or protest or disapproval, or the political feasibility of particular policies, … it can be useful—indeed crucial—to have some understanding of the ideas of justice that command respect in the society in question." (Sen, 2000, p. 60).
[43] "Furthermore, the sense of inequality may also erode social cohesion" (Sen, 1999, p. 93)
[44] "The relation between inequality and rebellion is indeed a close one, and it runs both ways" (Sen, 1973, pp. 1 & 6).

thought in Rawls contribution) because Sen is trying to encompass a practical view of social phenomena, not only tries to explain a mental exercise.

Sen considers inequality as to some sort of poverty, always related to some sort of destitution. That can be proved by the fact that his poverty measure definition (1976) includes the Gini coefficient on it. He has been emphasizing the role of capabilities and functionings as the suitable space for calculation of welfare, so it can be credible that, in his account, inequality might be considered also as a type of destitution, though he uses the value of equality as a universal value judgment (Sen, 1992, 1980). Sen's value judgment has the same Marxian basis than Rawls' justice. The only difference is that Sen's justice does not use categorical imperatives, as Rawls does, but formal arguments and mathematical rhetoric to convince the reader that inequality is bad itself. Sen emphasizes the Marxian approach of distribution, with the subtle difference of using 'need' rather than 'desert' in the terminology (Sen, 1973, pp. 80-81, 105). Sen refers to Marx in detail, using Marx's famous quote: "From each according to his ability, to each according to his needs!" (Marx, 1875, p. 23, in Sen, 1973, p. 88-89)

In his view of capabilities and functionings he tried to establish a definition of 'justice', or what he thought should be the focus for the assessment of the standard of living. He mentioned this concept in 1983: "neither commodities, nor characteristics (in the sense of Gorman and Lancaster), nor utility, but something that may be called a person's capability" (Sen, 1983, p. 160). He was referring again to the idea, based on Aristotelian philosophy,[45] of capability to freely choose among some functioning bundles (Atkinson and Bourguignon, 2000, p. 49). The idea of capabilities is mostly related to the

[45] From Aristotle's *Nicomachean Ethics* (335 BC [1980], book I, Section 7), Sen discusses man's ability to function as a premise to assess what is good for him (Sen, 1999, p. 73).

methodological rejection of the income space as the only way to measure overall deprivation in following a broader space for the consideration of distributive justice, because income is only an instrument to achieve 'something else' (Sen, 2000, p. 81). He claims that other necessities of life are crucial for the well being of any individual. Those goods, such as education, or health, or goods that provide the individual the right to appear without shame in society, are not expressed correctly in the income space. When only income is considered, not all those goods are well captured in measures of inequality or poverty. This is the reason he came up, along with other issues, with his idea of capabilities and functionings.[46]

Amartya Sen (2000) discusses the issue of distributional justice in a chapter included in the *Handbook of Income Distribution*. Before Sen introduce his definition of distributive justice, which is his capability approach, he tried first to 'generalize' the problem with the definition of social justice. He considered as given that inequality is undesirable. He discussed justice first, with a descriptive theory that defined justice's 'informational basis', giving a "systematic understanding of different concepts of justice" (2000, p. 61). He later applied this categorization to his own approach, because he thought that those different concepts of justice were the relevant theories in regards to the assessment of fairness. He acknowledged the plurality of ideas about justice, because of the intrinsic linguistic nature of the concept (Idem., p. 62). He leveled the ground of the discussion in order to explain which inequality judgments should be used according with his criteria. The different factors of theories of justice are, according to his typology: a) the basal space, b) the focal combination and c) the reference group. He explained that the basal space is composed of the variables that are considered to be important, the focal

[46] For detail see part **1.5 III** and **7.3 I.**

combination is the way to ‘discriminate’ among the many value judgments available, and the third factor, that is the reference group, is appropriate if some consideration of sub-groups within the society is needed in order to explain overall social injustice. This is clearly a very mathematical approach to a very non-mathematical concept that is justice. Using these tools, he reclassified the utilitarian view of justice, libertarian theories, Rawlsian justice, and finally his own view about functionings and capabilities.

When Sen is trying to generalize the ‘informational basis’ of social justice, he does that with a clear and subtle objective: he is trying to persuade the reader that all definitions of justice have the same structure, but his own, of capabilities, is better. He considered his approach better because of its focus on the destitution of the most deprived in several dimensions. His intention is truly honest: he cares about the poor as it can be clear in his entire contribution to economics, but the premise that all justice systems have the same structure can not be sustained. It is shown in this chapter that different definitions of distributive justice come from a variety of philosophical ideas. Not all definitions of justice have the same structure: On the one hand, Rawls’ approach is a mental exercise that takes as a basis a Kantian premise as a Universal law of judgment, this premise is applied to economic justice focusing at some extent in primary goods and liberties; on the other hand, utilitarianism is a mental metric of pain and pleasure that assumes every person in the society with a standardized utility function in order to maximize the utility of all the inhabitants. Therefore, Sen’s approach seems to be very narrow because he focuses on the space where this approaches pointed out, and not in the philosophical background of the justice concept.

There are not sufficient grounds to justify encompassing all justice matters in one monolithic structure. Philosophers usually try to generalize systems of justice, as Marx or Rawls tried, but this is hard to do, so we will prefer a pluralistic view of this matter, as Sen himself argues in other part of the same paper (2000, pp. 60-61). The mathematical and simplistic framework of Sen is also biased, because it offers a pure 'rationalistic' view of justice, which is a clear Aristotelian conception of the Western world applied to the concept of fairness (Sen, 2000, pp. 73 & 77).[47] On the other hand, most of the efforts of Sen about the concept of justice lie in the discussion about the 'space' where inequality and poverty are assessed. We know that Sen is mainly concerned, in traditional economic theory, with pointing out the limitation that the space of income has in order to express all people's necessities. In this light, his approach of social justice became only an instrumental device to support, in a 'philosophical' way, his capability approach, but we believe this exercise is incomplete.

The consideration of Sen referring to justice is still useful for understanding some insights into the relationship among justice, inequality and the space of measurement from the point of view of welfare economics. The modern economics literature discusses normative, descriptive and prescriptive issues related to income distribution. So the assessments of inequality, and because of that, of justice, can be helpful for understanding their value judgments.

[47] See the Greek influence on justice in section **1.6 IV a).**

IV Other approaches.

In spite of the view of inequality as a social problem, where the society has a belief that ‘inequalities’ are ‘bad’, and in some cases ‘wrong’, there might be some considered as ‘natural’, neither bad nor good, just a normal thing. For instance, wage income across time, which at the beginning of every individual’s career is low, rises later with age and experience. The determination of available resources related to the individual’s country of origin might be another example. Yet another example might be the consideration of sex or gender. There are some physical differences that naturally drive people’s behavior, because of the role of nature (if sex type is not artificially changed, of course). In this case, the epistemological focus to inequality might have other philosophical views, which can see inequality in a different way, maybe as an opportunity, as will be explained below. These philosophical views have a different conception of power relations, and they might link the explanation of inequality with a preconceived [exogenous] order, that is attained due to the exercise of authority. Therefore, the variety of philosophical traditions have as a result some value judgments, that either might be a root of a present concept of inequality, or might be a different view, as can be the consideration of inequality as an opportunity for altruism. Some of the well known philosophical traditions will be commented briefly.

a) **Justice and the Greeks.**

The inheritance of the Greek tradition is vast. Rawls (1971, p. 3) takes his belief that justice is "the first virtue of social institutions" from Plato. In *The Republic*, Plato (360 BC [1892]) conceives a dual understanding of justice, first on the individual that is just, and second, in the creation of a 'just' city, which is organized according to the law made by the 'just' individual. His cosmopolitan approach of justice was probably influenced by Protagoras and the sophist school (Nussbaum, 1986, p. 102). According to Plato, the individual is just as long as he/she is guided by a vision of the 'Good', a vision that is achieved through the acquisition of knowledge (Slote, 2006). Plato thought that philosophers are the most likely to attain that vision. Plato also claimed that philosophers, rather than the guardians or workers, were better prepared to find the 'Good', because of their constant looking for knowledge. In this case, the virtuous person, that had not only justice as a virtue, but also temperance, wisdom and courage, became a 'harmonious' soul, then the city, if it is ruled by this virtuous person's laws, it would enjoy the best possible status, a just status. The critique of Plato's approach is very similar to that of Rawls, that it is deficient to explain how this harmony would be reached, and leaves this approach as an intellectual exercise. This approach also poses problem to the perhaps discriminatory treatment of the person that is not 'looking for knowledge', there are in fact very wise persons (e.g. guardians or workers) that do not talk very much and are more virtuous that the so call philosophers.

Aristotle in his *Politics* takes a different strand in regards to justice. Deeply influenced by Protagoras' anthropocentric view, he might be one of the first credited for

taking away the matters of justice from divine hands (Nussbaum, 1986, pp. 246, 304, and 102, n.33). So he supported the issues of justice according to every person's merits, in order to increase his/her own happiness (*eudaimonia*). This might be the oldest account of desert-based justice (Slote, 2006). One of the important influences in regards to justice is that he supported each person's development in order to construct a just city (*polis*).[48] He attached value to the process of development itself, not looking at this only as an instrumental exercise: "But we must now add that Aristotle believes the political participation of the citizen to be itself an intrinsic good or end, without which a human life, though flourishing with respect to other excellences, will be incomplete" (Nussbaum, 1986, p. 349). The participation method, which is rooted also in the idea that humans are essentially social 'animals' and part of a whole,[49] has recently been influencing welfare literature, as is the capability approach of Sen (2000, p. 73). It is clear that for Aristotle, the nature of justice was very important indeed. He took another step in his *Nicomachean Ethics,* saying that the virtue of justice could in such a way be related with other virtues such that without justice, none of the others virtues would make sense (Nussbaum, 1986, p. 353).

b) **The Jewish Tradition.**

An older account of Justice can be found in the Jewish Tradition. Different from the Greek tradition, more than a philosophical or psychological treatment, it has a

[48] As long as they were neither females nor slaves (Aristotle, 335 BC [1999], Book I, Part XIII). Discussed in Nussbaum and bibliography therein (1986, p. 499, n. 51).
[49] "…the human being is by nature a political animal,…" in his *Politics* (Aristotle, 335 BC [1999], Book I, Part II).

practical value. It is rooted in the continued behavior of individuals according to the following of the God-given Law (*Torah*): "What stands out in the entire development of Jewish ethical formulations is the constant interpenetration of communal and individual obligations and concerns" (*EB*: 'Judaism', p. 419).[50] Justice is not an end but a result. In this tradition, inequality is not viewed as a 'social disease', but as an opportunity. Each person can be entitled to receive more or less, according to their needs and as a sign of reward for good behavior. This ideal includes both resource-based and desert-based entitlements.[51] It is very important to clarify that 'good behavior' was never related with 'abstinence from bad things' only, as the Catholic tradition emphasizes, but to the pursuit of justice through the constant following of good works, in the spirit of God's commandments.[52] In the Jewish tradition, justice is based on faith in the unique and supreme God,[53] and that should be both a necessary and a sufficient condition to inspire good behavior, this being a non-Kantian 'categorical imperative'. 'Justice', which is a term that in the Jewish literature is also translated as 'righteousness', is also the product of all the actions and attitudes of humans, which, if those are good, will produce 'God's Justice',[54] otherwise just 'human justice'.[55]

To explain inequality in this tradition, if an individual receives more than others, that would simply imply the responsibility of that individual to share with his/her

[50] See also Abrahams (1921), p. 14;
[51] See *Holy Bible (NIV):* Desert based examples in 2 Sam. 12:7-8 and 1 Kings 3:3-15; general cases in 2 Cron. 7:14, healing as a result of people's loyalty to God, also in Deut. 28:1-3; for desert-based entitlements see note **35**.
[52] *Holy Bible (NIV)*: Is 56:1-2.
[53] *Holy Bible (NIV)*: Gen. 15:6; Prov. 2:1-9.
[54] "The LORD commanded us to obey all these decrees and to fear the LORD our God, so that we might always prosper and be kept alive, as is the case today. And if we are careful to obey all this law before the LORD our God, as he has commanded us, that will be our righteousness." (*Holy Bible* (NIV), Deut 6:24-5), righteousness also means justice.
[55] *Holy Bible (NIV):* Deut 9:4-6; also Deut. 6:25.

proximate fellows. Starting with the immediate family, followed by the neighbors and the foreigners,[56] and always paying special attention to the poor.[57] The pragmatic Justice of the Jew is then a "series of virtuous acts—honoring parents, deeds of steadfast love, attendance twice daily at worship, hospitality to wayfarers, visiting the sick, dowering brides, accompanying the dead to the grave, devotion in prayer, peacemaking in the community and in family-life—and concludes by setting study of Torah as the premier virtue" (*EB*: 'Judaism', p. 419). The Jewish law was enhanced also by following the *oral tradition*. This set of commandments were first 'orally' transmitted, as the name suggests, but later one those were written, from the 5th to the 7th century (AD), in the book that is known as the *Talmud*. This *oral tradition* gave a more detailed expression to the established canon in the *Torah*, and it made more explicit the commands that normal people should follow, particularly in regards with their fellows.

The Christian tradition of the first century, having a clear Jewish inheritance, it narrowed (or extended) this view of justice to a simple command. The so called Golden Rule of Jesus stated to behave with good attitudes with their fellows as a reflection of loving God with all the self.[58] This view neither lost the sense of exogenous commandment, nor lost its expression through positive actions to the other fellows: "Christian writers … were downplaying another central element in Christian thought and morality, the emphasis on agapic love [, such] love seems to be a matter of motivationally active feeling rather than of being rational." (Slote, 2006). The sense of evident inequality in the earlier Christian tradition was also viewed as an opportunity to share with their fellows. For instance, Paul (57 AD) wrote in his letter to the Corinthian people the

[56] *Holy Bible (NIV):* Deut 10:18;
[57] *EB*: 'Judaism', p. 382; *Holy Bible (NIV):* Psal. 41:1; Prov 14:21,
[58] *Holy Bible (NIV):* Matthew 22:36-40;

following: “Our desire is not that others might be relieved while you are hard pressed, but that there might be equality. At the present time *your plenty will supply* what they need, so that in turn their plenty will supply what you need. *Then there will be equality*” (*Holy Bible (NIV):* 2 Cor. 8:14, emphasis added). He was quoting the same history of the manna in the *Torah* (see note **35**). On other issues, the responsibility for the head of the household always existed, the same as in the tradition of the *Torah*, both to provide for his own people and also for his extended family,[59] with particular emphasis on his parents.[60] It was normally viewed that some individuals would receive less and some others more, but the rich have more responsibility to share than the poor.[61] With the following of these commands, the existent inequality could be alleviated through the following of good justice.

In the Jewish tradition, the role of the government was not supposed to be the enforcement of law, as is common for Western culture to assume that the government has that duty, which such enforcement is usually a burden for the common citizen. In theory, the Jewish law was not supposed to be an undesired load for the inhabitants: “[Law and commandments] were their very love and their very life” (Schechter, 1909, p. 148). The concept of government arose in the Jewish tradition because of the people’s need to be rescued from the harsh treatment of their neighbors (*EB*: ‘Judaism’, p. 383), and that popular demand was viewed as the rejection of the ‘kingship of God’. So the government, in the Jewish tradition, was not responsible for alleviating poverty or reducing inequality. That was something that should be resolved by all the inhabitants through the

[59] “If anyone does not provide for his relatives, and especially for his immediate family, he has denied the faith and is worse than an unbeliever.” *(Holy Bible (NIV):* 1 Tim. 5:8)
[60] *Holy Bible (NIV):* Mark 7:9-13.
[61] *Holy Bible (NIV):* 1 Ti 6:17-8.

accomplishment of the commandments within the given law. The government had the role to judge people's behavior, obviously to punish the bad person through human judgment in order to obstruct evil works.[62] However, the existence of common problems of avarice was acknowledged, the same as love of money and the selfishness of rich people, but that was criticized as a sign of people's reluctance to follow God's law,[63] and not as a failure of the government. In that sense, 'equality' was not a 'communal' responsibility, nor the government's responsibility, but it was everyone's task.

1.7 The view of traditional economic theory.

Traditional economics deals more with the issue of efficiency, rather than of the issue of inequality. Taking one of the most recurrent frameworks in this tradition, which is the perfect competitive market, individual preferences and initial endowments are taken as given. Achieved efficiency is good as long as the distribution is Pareto-efficient, where it is not possible to shift somebody's welfare to a better condition without decreasing the welfare position of somebody else. If there is some intervention for redistribution, it should be done following the Kaldor-Hicks criterion, where the welfare of the society is raised if it is possible to change conditions such that the winners can compensate fully the loss of the losers, and still gain. Following the utilitarian framework, the things that determine equilibrium are the individual rationality and the form of their utility preferences. Traditional economics steps aside from the definition of social or distributive justice. A very standard quote in this sense claims: "Nothing we

[62] *Holy Bible (NIV)*: Rom. 13:1-4, 1 Pet. 2:17
[63] *Holy Bible (NIV)*: Luke. 21:1; Stg. 2:6; 5:1.

have argued so far should lead us to believe that [Walrasian Equilibrium Allocations (WEA)] are necessarily "socially optimal" if we include in our notion of social optimality any consideration for matters of "equity" or "justice" in distribution." (Jehle and Reny, 1998, p. 300). The coverage of this framework is bounded by ruling out the allocations that are not Pareto-efficient, which are not even likely to be candidates for being socially optimal. Given some set of additional restrictions, a candidate for a socially just distribution must be the set of the (existent) WEA.

One of the links provided as a mechanism to enhance a more equal social welfare, is the Second Welfare Theorem, which states that every Pareto-efficient allocation can be supported by a Competitive Equilibrium Allocation (**Figure 1-2**), but this framework has some limitations. The redistribution of initial endowments from **e** to **e*,** should lead this economy to achieve a socially superior competitive equilibrium allocation, which is $\bar{x}$ rather than x'. Assuming zero transaction costs, if the society previously defined that $\bar{x}$ was a better result, the new redistribution allocation gives a chance for government intervention. This framework does not need a central planner in order to guarantee a competitive equilibrium, but a third-party is still needed to reallocate the initial endowment.[64] Social Choice and Welfare theory faces other challenges (due mainly to the puzzle represented by Arrow's impossibility theorem), but definitely gives up the choice of the best social state, and reassigns that responsibility to ethical grounds: "your choice of social welfare functions is a choice of distributional values and, therefore, a choice of ethical system" (Jehle and Reny, 1998, p. 356).

[64] It is also possible to change this equilibrium with post-equilibrium transfers of income, or through some artificial change on prices (pre or post equilibrium) through subsidies or taxes (Adelman and Robinson, 1989, p. 970).

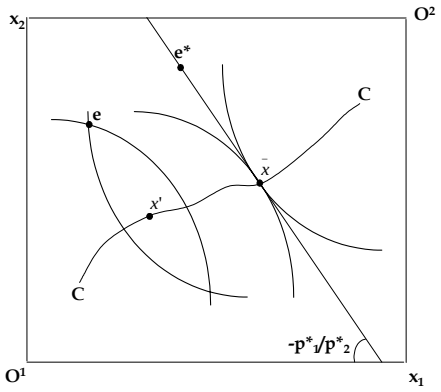


Figure 1-2. Efficiency and social optimality in a two-person economy.

By the same token, it is said by Coleman that "The concept of 'equality' has no place in positive economic theory" (1987, p. 170). He explains that the very essence of what he called 'equality of result' would imply a distribution process that would be the antithesis of the market. On the other side, normative economics tries to compensate for the absence of the equality concept within the utilitarian welfaristic framework. Pigou (1938) came up with the, perhaps contestable, idea that because of the decreasing marginal utility of money, the maximization of social welfare was inevitable, and indeed, that would lead to equality of incomes. That did not happen. This approach was rejected by Robbins (1938) with the critique of interpersonal comparisons of Jevons. As early as in 1897, Edgeworth pointed out before Robbins that equality of means would lead forcefully to an unequal distribution. Again, traditional economic theory does not fully contain the important issue of inequality, so the theory still remains incomplete: "…, the very programme of welfare economics –not to speak of the foundations for a policy designed to bring equality – is emasculated" (Coleman, 1987, p. 170).

In economic theory as well, both Rawls and Sen followed the justice value judgment of Marx, who is credited to be the first classical economist to introduce ethical value judgments into the theory of distribution (Adelman and Robinson, 1989, p. 968). It is argued in this paper that the Marxian criticism of classes is inconvenient, in the sense that the Marxian setting assumes a predetermined perennial negative social framework, which is the inheritance of the theory of historical materialism (Mandel, 1987, p. 369). For the follower of this tradition, it will never be possible to conceive of a clear advance in regards to inequality; the very existence of inequality will be a proof that something is wrong. Using that value judgment it is easy to lose the valid search for real unfairness, legitimizing and exacerbating only people's envy (Simmel, 1922; in Coleman, 1987, p. 170). Not surprisingly, traditional economic theory only looks at (income) differences, assuming them to be undesirable, following with precise calculations that ignore the processes that cause them. It is always assumed that the cause of all inequality is "exploitation of labor" (Adelman and Robinson, 1989, p. 968). Unfortunately, traditional economic theory gives the same treatment to the poor person who has been sick for years as it does to the poor whose poverty is due to some vice or because of irresponsible spending. The researcher in both cases will recommend to the policy maker some transfer from the rich to the poor, regardless of the reasons behind the status of poverty. In this case, the consideration that some inequalities might come from natural processes or from merit-based reward issues is lost. Then the pure consideration of inequality as unfairness shall be rejected.

1.8 Concluding remarks.

For most theoretical frameworks, the definite and indubitable relationship of inequality as unfairness goes beyond the scope of scientific discourse. The discussion of morals and ethics enters. For this reason, it should not be surprising to know that inequality, even though it might be measured with 'objective' mathematical precision, will always be subjectively perceived in regards to the value judgment used.

The typology of the inequality concept helps us to discuss with an organized methodology, centering our attention on the important issues. On the one hand, the attributes of inequality make clearer the thing that is measured in reality, so studying the attributes is a good premise for looking into the definition of the suitable space for measurement. On the other hand, the processes driving inequality recognize the causal relationship between inequality and its historic composition. It can be comprehensible why inequality measurement goes beyond the simple analysis of dispersion of income, asset or wealth distribution. For instance, some of the properties of inequality measurement identify the sub-group composition of inequality, looking not only at the big picture, but at the underlying composition of inequality measurement, which is a relational attribute.

The space of inequality has been a matter of debate in welfare economics, because of the problematic narrow view of having just income as the expression of well-being. It was shown that the utilitarian framework inherited a one-dimensional space, which was approximated by income. The Basic Needs Approach discussed the possibility of a multidimensional space, but because of practical issues, it measured welfare again on the

income space that was needed to buy a basic basket of goods. It will be taken from this school of thought the pragmatic value of the income space, such that many of the computations of inequality measurement will be done in data that come from income surveys. The space of capabilities and functionings tries to capture the multifaceted nature of human welfare, including not only food or material things, but also issues like freedom, opportunities, education and health. The capability approach explains the serious limitations in welfare measurement, making clear that it would be best to have a more expanded space. But many times the researcher will still need to use the available (income) data, while the government institutions developed other mechanisms of data collection. For this research, some functionings will be available in the form of data sets, so those will be used in the computations in order to know the degree of deprivation that is related with high values of inequality.

A good part of the discussion of inequality is around value judgments; this paper clearly shows that these judgments are not 'neutral' or value free. Some of the previous frameworks in regards to inequality and justice have penetrated into our present concept of economic theory. The Rawlsian principles, the Utilitarian maximizing rule, or Sen's Capability approach are clear and well known examples, but these examples are not the only ones. The philosophical foundations of the traditions mentioned above clearly go beyond 'scientific truths', because they deal with individual and social motivations, and these traditions enter into the blurred non-falsifiable scenario of morals and ethics. Our reason to show other schools that are clearly known as 'non scientific', such as the Greek or the Jewish tradition, is twofold. First, to show the influence of those schools on modern economic theory, and second, to make the reader aware that the discussion of

justice and inequality could not be reached with full certainty in old frameworks, but neither is it possible with modern exercises. Even the self-evident reasonability of the equality concept, as discussed by Isaiah Berlin in his *Equality* (1961), could not do that. It only brought to science another mental exercise that was tautologically based on fairness and aesthetics.[65]

In regards to value judgments, we do not need to assume a perennial Marxian set-up in order to study inequality. The pejorative view of inequality, regardless its nature, which is seen on the Rawlsian inheritance or the Capability approach, takes as given the Marxist view of inequality as unfairness. In that sense, there is no separation between natural inequalities from inequality as a component of deprivation. The existence of classes is not a problem by itself, but rather the artificial conditions that are unfairly changed. This has some implications. We can still try to measure inequality, as a social disease, mostly as a lack of people's responsibility for their fellows, rather than as the existence of classes itself. It is necessary to include all people, and not only the government in discussing the matter of inequality alleviation. The government, addressing the problem, might explore the artificial rise of inequality, issue that is usually responsible for unhelpful situations. Those situations are also responsible for persistent effects of unfairness. The government can also focus not only in transfers of money from the rich to the poor, but also on the understanding of the causes that enlarge and enforce this process.

[65] "… an equal distribution of benefits for that is 'natural', self evidently right and just, and needs no justification, since it is in some sense conceived as being self justified … The assumption is that equality needs no reasons, only inequality does so; that uniformity, regularity, similarity, symmetry,… need not be specially accounted for, whereas differences, unsystematic behavior, changes in conduct, need explanation and, as a rule, justification." (Berlin, 1961, p. 131).

Some useful and practical advices can be taken from old traditions. The Jewish tradition suggests both a resource-based and a merit-based approach to inequality, and it provides the government some practical advice, as it is to make the whole population aware that everyone is entitled to justice matters, not just to the rich or to the bureaucracy. If someone criticizes this suggestion as ‘non scientific’, it can be said that it is much more practical than the mental exercise suggested by Rawlsian Platonism. The Jewish tradition explains that there are natural (or at least exogenous to humans) causes of inequality, therefore it is a duty of each person to try to balance that situation because they care for their fellow human being. Following also the old traditions, it might also be helpful to take some of the Aristotelian suggestions, as in the case of social participation. As long as the community is aware of other communities around them, they can make good decisions that take into account a more global environment by giving voice to all groups. It is clear that participation shall address in the first place the rights of the poor by not allowing for any kind of discrimination, which might be the source of real inequality and injustice.

2 Inequality Measures: Traditional Indices and Their Properties.

2.1 Abstract.

Going further on the question of Sen about “Equality of What?” we can also ask the question: ‘Which Equality of What?’ In order to answer that question we need to make a review of the variety of methods available to measure inequality in economics. The focus of the research about measurement of inequality has been mostly concerned with the analysis of the money-income distribution, using mathematical formulations and statistical tools. The variety of methods and measures contains a series of assumptions and properties that has been explored extensively in the past decades. The purpose of this chapter is to mention the most popular inequality measures in order to support the use of Gini coefficient, Theil Index and Lorenz ranking in the next chapters. The context will explain how those measures are constructed and which are the benefits and limitations that certain inequality measures provide. Besides the traditional inequality measurement, it is unavoidable to put in context the debate of the calculation of relative vs. absolute poverty, because of the embedded inequality consideration in the calculation of relative poverty, so it will be argued that it is better to compute separately inequality and poverty measurement. Finally, some inequality and dispersion measures that come from labor tools and econometrical theory will be mentioned as well.

2.2 Introduction.

Using the definitions described on chapter **1**, the traditional research usually focuses on the monadic attributes of the income space, neither in the relational attributes, nor in the processes. There is some sense of pragmatism in this decision, money-income data are available in several surveys, so that fact makes it easier to focus on the monadic attributes of inequality. Some of the processes on the measurement of inequality would be possible to include, dealing with the causes that produce inequality. The historical shifts that could make inequality increase or decrease might be explored as well, but there is usually a data constraint. The decomposition by income source of the inequality measurement will not be the focus of this research, because this property is attached mostly to the relational and monadic processes. Thus, the exercise later on will be mostly descriptive because of the focus on the attributes of the inequality measurement. With the inequality measures discussed, it can be said where the inequality is, or how big is that inequality and at which extent its measurement is consistent across the different methods of calculations. The interpretations of those indicators will be left to the researcher or to the policy maker. The income space will be used even though that the theoretical gap between the meaning and the representation of income as a representation of individual welfare is acknowledged.

2.3 Indices and tools to measure inequality.

As early as in 1920, Dalton noted that the reduction of inequality in society was desirable, but "it is not generally agreed how this inequality should be measured" (1920, p. 48). Things have not changed very much almost a hundred years later. Now that we are comparing incomes of individuals in the society, we want to know what kinds of measures to use to make those comparisons. Atkinson divided the classification of inequality measures between 'conventional' measures and indices based upon 'social welfare functions' (1970, pp. 252-7). Sen also stated a classification of two kinds: 'objective' or 'positive' vs. 'normative' measures (1973, pp. 2 & 24).[67] While the former is applied without any use of social welfare concerns using statistical methods of income variation, the normative measure does consider social welfare and ethical judgments. The 'normative' term of Sen will be used in this chapter, because of the predefined social consideration that is needed in the utilitarian setting, but the 'pragmatic' terminology of Kuklys (2005, p. 61) will be used for the 'objective' or the 'conventional' measures. The pragmatic definition is statistically intuitive, and it does not run into problems to explain what is 'objective' or what 'conventional' is. Following with the classification of Kuklys (2005),[68] the entropy measures will be considered separately because of their own unique properties; the most remarkable property being the decomposability by population sub-

[67] Recently Cowell (2000, p. 110) made a non-mutually exclusive categorization among measurement approaches, as is (1) 'ad hoc' procedures (i.e. Gini), (2) measures base on axiomatic user's demands, and (3) measures based on SWF.

[68] Kuklys (2005, p. 61) defined a classification that accounts with a) pragmatic measures (decile ratios, variance, Gini coefficient), b) Social Welfare Functions (Atkinson measure) and c) measures derived from a set of desirable properties(Theil index or the mean log deviation). On the other hand, Authors like Dutta (2002) have a unique classification of inequality measurement, classifying all of them as 'normative', explaining the foundation of each of it, but Sen's interpretation might see to disagree with this general approach, claiming that the motivations underlying the pragmatic measures are quite different (Sen, 1973, p. 43).

group. After the consideration of the normative and pragmatic measures, where the list of measures can be huge, there is a more general way to consider inequality if it is relaxed the assumption of 'completeness'. Assuming very mild conditions, the ranking of two distributions through the tool of stochastic dominance will be mentioned as well.

I Criteria

In order to show the criteria that divide our inequality measures, let's mention a simple example. If we assume a given distribution, which is a set of numerical values (e.g. income) of *n* persons arranged in a vector form representing individual's earnings, we can have the following distribution:

$$x = <1,1,3>$$

such that *x* denotes the income of a population of three individuals, because *n*=3, where each of them x_1, x_2 and x_3 earn or possess 1, 1 and 3 unit values respectively. On the other hand, let's define the distribution *y* in a similar way:

$$y = <1,2,2>$$

With a simple eye inspection, it is easy to see that the distribution *y* is more egalitarian than distribution *x*, so we say that *y* is preferred to *x*. We might be applying directly a measurement of inequality like the variance or the Gini coefficient; these kind of direct measures are, roughly speaking, a) 'pragmatic' inequality measures. On the other hand, if we want to consider the numerical values of the distribution as the seeds of a social welfare utility function, we will be doing a b) 'normative' measurement, like the Atkinson family of indices. Using a set of assumptions and properties, inequality

measurement can be done using c) 'entropy' measures, but that makes more sense to do when sub-groups within the distribution are considered.

In order to make a difference among different indices, we need to think on the d) properties of the inequality measures. Some people might argue that we are implicitly considering some properties in the ranking of distributions *x* and *y*, as it is the non-transformation to the numerical values of income. If we use measures that apply logarithmic transformations to these incomes, it is conventionally agreed that we are still talking about pragmatic measures, like the standard deviation of logarithms, but it is true that the ranking might be different using a transformation. On the other hand, in regards of inequality measure properties, we might see a problem if we consider the following distribution:

$$w =< 1, 2, "." >$$

Where "." represents a missing value in the survey data. We can think that either the person, that was the subject of the interview, was not present at the moment of the survey, or his/her questionnaire was mishandled by the institution that makes the surveys. The ranking will be done depending on how the researcher treats that missing value. w can be considered sometimes as $w' =< 1, 2 >$, such as the distribution has different number of people than *x* or *y*, or it might be considered as $w" =< 1, 2, 0 >$, with different mean income and with the same number of people as distribution *x* or *y*. Using the Gini coefficient as an example, the ranking of *x* with *w'* is different from the ranking of *x* with *w''*. So both the technical decisions and the properties used in the inequality measurement do matter. [69]

[69] Technical decisions for the calculation of inequality are available in the following chapter.

In the previous cases, both pragmatic and normative measures rely on the assumption of 'completeness' of the ranking distribution (Sen, 1973, pp. 5-9 & 47). To consider a counter example, let's consider the following distribution

$$z =< 1, 2, 2, 1, 2, 2 >$$

For an inexpert reader, it might be sensible to compare distribution *y* with distribution *z*. Indeed, a pragmatic measure like the Gini coefficient will give the same value to either distribution *y* or *z*, so it is possible to say that we remain indifferent between each distribution, but this is not formally correct, unless we make some important assumptions, as it is to consider that the inequality measure has to be able to compare distributions with different number of people. In the same venue, if we consider the distribution $y' =< 2, 4, 4 >$, we might be tempted to rank the distribution of *y* and *y'* as equal, but we might need another assumption, such as the independence of the measure from the mean income. The mean independence of the measure or the population consideration, along with other characteristics, can be expressed formally in order to generalize the ranking distribution: this is known as e) stochastic dominance. The most known dominance method that relaxes the assumption of a total ranking is the Lorenz dominance condition, but this is only a particular case of stochastic dominance.

It is necessary to say that not all the times the criteria expressed above allow us to make a definitive classification of measures.[70] For instance, Sen includes entropy measures into the pragmatic inequality measures. On the other hand, there are some inequality measures that touch more than one classification. For instance, Gini coefficient is a pragmatic measure, but it is also related with stochastic dominance because of its

[70] An elegant and rigorous classification of measures, based on their properties, might be found on Dutta (2002).

intrinsic graphical representation with the Lorenz curve. Other case is the entropy family of indices, which might be considered as a pragmatic way to measure inequality, but in a particular case those indices became a special form of indices that resemble Atkinson's measure (Shorrocks, 1980), but Atkinson's is considered a normative type of measure, and so on. Thus, having a general panorama of the inequality measurement, and before to start the formal definition, let's define some notations.

II Notations

Let *I* be any general inequality measure. Let *n* be the number of persons, where every person is indicated by *i*=1,…*n*. Let *y* be the income vector, so y_i is the income of person *i*. The number of groups within population are *k*=1,…*K*., such that $n = \sum_{k=1}^{K} n_k$. The average overall level of income is μ , such that $\sum_{i=1}^{n} y_i = n\mu$, and the relative share of income of person *i* is x_i, such that $y_i = n\mu x_i$. Average and share group income are defined analogously for every group *k*. When *x* and *y* are given income distribution vectors, then $I(y)$ and $I(x)$ will be the correspondent degrees of inequality measures for those income distributions. The weight of a sample is w_i , such that $N = \sum_{i=1}^{n} w_i$, based on this $f_i = \frac{w_i}{N}$ (when data is unweighted $w_i = 1 \forall i$, so $N = n$).

III Pragmatic measures

The most basic pragmatic measures are the variance ($V = \frac{1}{n}\sum_{i=1}^{n}(\mu - y_i)^2$), the coefficient of variation ($C = \frac{V^{1/2}}{\mu}$), and the relative mean deviation ($M = \sum_{i=1}^{n}|\mu - y_i| \cdot n\mu$), which are well known and used in modern studies on economic development.[71] Some of their properties, as the transfer principle, were studied and later on included in more complex measures, (Sen 1973, p. 27), but it is known that there are some limitations for these measures.

The pragmatic measure that is most widely used is the Gini coefficient. The discussion was motivated by French and Italian concerns about achieving better income distribution (Dagum, 1987, p. 529-32). Corrado Gini (1910, 1912) developed this method in order to refute Pareto's research (1896, 1897). He used as a basis the work of Lorenz (1905).[72] The Gini coefficient satisfies the intuitive criteria that if all the people have the same income, we should have a "perfect" distribution. There are several ways to calculate this ratio, and different formulae give us a different intuition or different 'welfare interpretation' (Sen 1973, p. 31). A well known way to measure the Gini coefficient is the following:

(1) $$I_G = G = 1 + \left(\frac{1}{n}\right) - \left(\frac{2}{n^2\mu}\right)\left[y_1 + 2y_2 + ... + ny_n\right]$$

[71] The continuous version of these measures are found in Cowell, (1995, p. 142).
[72] For an account of the Gini coefficient literature see Xu (2004).

where $y_1 \geq y_2 \geq ... \geq y_n$. (Sen 1973, p. 31)

The formula used in Jenkins' software (1999, p. 9) that considers weights for the sample data is the following:

(1') $$I_G = G = 1 + \left(\frac{1}{N}\right) - \left(\frac{2}{N^2 \mu}\right) \sum_{i=1}^{n} (N - i + 1) y_i$$

This formula assumes also a ranking in ascending order. On the other hand, Stuart (1954, 1955) firstly noted that Gini's mean difference could be expressed as a function of the covariance between variate-values and ranks (Xu, 2004, p. 17). Based on that stochastic property, Anand (1983, p. 315) wrote down a nowadays used formula of the Gini index, which is the following:

(1'') $$G = \frac{2}{n\mu} \operatorname{cov}(i, y_i)$$

This formula can be used conveniently with statistical software packages, because of the expression that is a function of the covariance of the related variables.[73]

As it was mentioned before, the Gini Coefficient and the Lorenz curve are closely related. In 1914, Gini proved the important theorem that his inequality measure could be expressed as the ratio of two of the areas in the Lorenz diagram. This will be explained in **Figure 2-1**.

[73] This measure is explored in detail in Dutta (2002), and references therein.

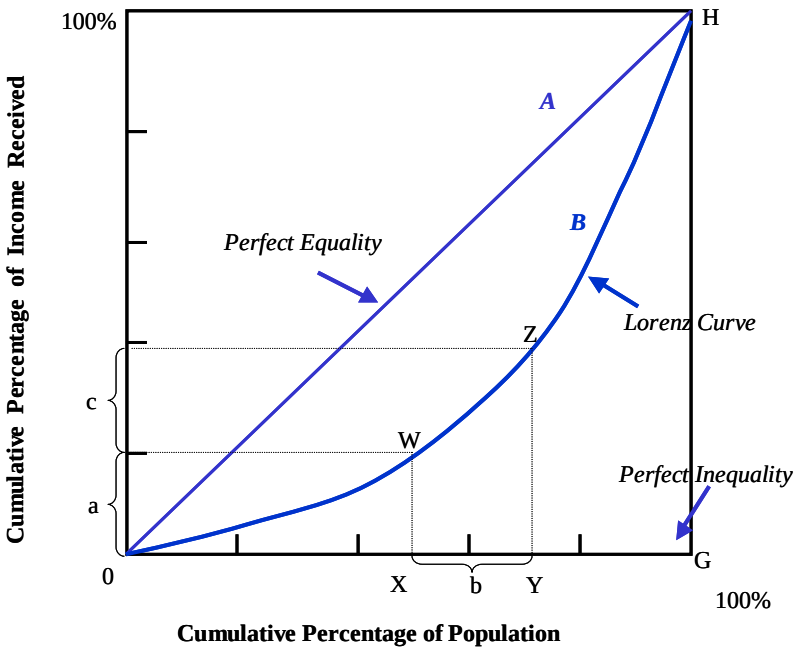


Figure 2-1. The Lorenz Curve and the Gini coefficient

The vertical axis measures income (in percentage) of the recipients, while on the horizontal axis we measure the cumulative percentage of population. The population is ordered from the poorest to the richest, from the left to the right respectively, and the line traced by OX is the percentage of total population in the poorest groups, which receives an "a" percent of the income, and so on. The Lorenz Curve is shown with the letter B. Complete equality occurs only if "a" percent of the population receives "a" percent of the income, as is shown by the line named with the letter A. Complete inequality is given by the "curve" OGH, where only the richest person in the community receives all the income. The area above the Lorenz curve (B) and below the line of complete equality (A) is known as the concentration area, or area of inequality. The sum of all the trapezoids, like the one formed by the area WXYZ, composes the area below the Lorenz Curve;

therefore this quantity subtracted from the unit is the area of inequality (Loehr & Powelson, 1981).[74] Gini proved an important theorem, that his Gini coefficient can be expressed as two times the concentration area; this is the relationship with the Lorenz curve (Dagum, 1987, p. 530).

IV Normative measures

The concept of Pareto optimality,[75] which was presented as the basis of the traditional economic theory, refrains from judgments in regards to the distribution of income. It was considered later that the ranking of possible 'social' states could be a better option in order to measure social welfare, assuming additive individualistic utilities. Accounting to that restriction, a social welfare function that ranked different states of the distribution was proposed later; even when all kind of functions are considered Pareto optimal. This social consideration gave one of the first attempts in modern economic literature in order to consider distributional judgments within the society.[76] There are issues associated with the normative ranking that are still to be solved. In the first instance, this ranking depends on the property of the social welfare function chosen, so this measurement had some degree of arbitrariness in that regards; second, it has exercised the efforts of many people to solve the problem posed by Arrow's (1951) impossibility theorem, in that case the mentioned ranking is virtually

[74]The Gini coefficient method has some problems capturing some degrees of inequality within the population, as can be shown in the Appendix **2.7 I**. It has tried sometimes to be formally rejected by authors like Blackorby and Donaldson (1980, p. 122) or Atkinson (1970, p.262).
[75] Discussed in the previous chapter.
[76] A discussion in Sen (1973, p. 5-9).

impossible. Regardless of the previous criticisms, the most common normative measures will be mentioned: Dalton's measure and Atkinson's measure. These indices have their own characteristics and problems.[77]

On the practical side, normative measures started with the classical contribution of Dalton (1920). He chose a homogenous representative agent with a strictly concave utility function that is with diminishing marginal utility of income (Sen, 1973, p. 37). His measure of inequality assumed this form:

(2) $$D = \frac{1}{n}[\sum_{i=1}^{n} U(y_i)] \cdot U(\mu)$$

Dalton assumed that all utility levels should be positive. It is clear that the value of this measure depends on the functional form of the utility function, and various criticisms related to the cardinality associated to this measure have been spelled out in welfare literature (Sen 1973, p. 37). For instance, Atkinson considers this measure 'not very useful' (Atkinson, 1970, p. 250).

As we know, Atkinson criticized pragmatic measures saying things such that measures like the Gini coefficient, "serve to obscure the fact that a complete ranking of distributions cannot be reached without fully specifying the form of the social welfare function" (1970, p. 262). He argued in favor of the use of normative measures, so he proposed a measure that solved Dalton's problem of cardinality. Atkinson's measure claim to be not invariant with respect to positive linear transformations of the utility function, so the formula became

[77] More normative measures in Cowell (1995) or Dutta (2002).

(3) $A = 1 - (\frac{y_e}{\mu})$

Where $y_e = y|[nU(y) = \sum_{i=1}^{n} U(y_i)]$, so y_e could be considered the "*equally distributed equivalent* level of income" (1970, p. 250).[78]

Atkinson said that his measure has, among other convenient properties, to lie in the range between 0 and 1, this range make him claim that his measure has an 'intuitive' appeal. Shorrocks pointed out that the Atkinson measure could be seen as part of his generalization of entropy measures (1980, p. 622, n. 6), and we can see criticisms of this measure in Sen (1992, p. 95-101). In general, these kinds of measures have been subject of scrutiny because of the degree of arbitrariness attached to the form of the utility function chosen. The selected form might introduce more subjective judgments to the measurement that are difficult to interpret to the average researcher, much more difficult to understand for the policy maker.

V Entropy measures

Assuming the satisfaction of the Pigou-Dalton condition, the same as other basic assumptions, entropy measures have been defined as 'characterized theorems' (Dutta, 2002, p. 612), such that adding up additional restrictions to inequality measures, as the decomposability by population sub-group, a particular set of indices can be developed. Drawing on the notion of entropy in information theory, Theil (1967) developed an

[78] The function used in this measure was based on the risk bearing theory of Pratt (1964) and Arrow (1965) (in Sen, 1997, p. 70).

interesting type of measure,[79] later on, Theil measure was generalized by Shorrocks (1980).[80] The resultant family of measures for positive incomes (satisfying mean independence and population replication) given a particular value of *c* is such that:

$$\textbf{(4)} \qquad I_{GE(c)}(y) = \frac{1}{n}\frac{1}{c(c-1)}\sum_{i=1}^{n}\left[\left(\frac{y_i}{\mu}\right)^{c} - 1\right], c \neq 0,1$$

$$\textbf{(5)} \qquad L = I_{GE(0)}(y) = \frac{1}{n}\sum_{i=1}^{n}\log\frac{\mu}{y_i}, c = 0$$

$$\textbf{(6)} \qquad T = I_{GE(1)}(y) = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\mu}\log\frac{y_i}{\mu}, c = 1$$

where *T* is better known as the *Theil measure*, while *L* is the mean logarithmic deviation, also known as a Theil's 'second' measure (Shorrocks, 1980, p. 622; Sen, 1973, pp. 34; Foster and Sen, 1997, pp. 140 & 156). The definition of this family of indices makes it possible to include even Atkinson's normative family of indices, as was pointed out by Shorrocks (1980, p. 622, n. 6). The re-expression of these measures considering carefully the property of sub-group decomposability is explored in Appendix **2.7 II**.

Two comments in regards of this measure: a convenient property of measures that uses logarithmic transformations is that they attach greater importance to the distribution at the lower end of the scale (Sen, 1973, p. 28). This happens with measures *L* and *T*,

[79] For the intuitive explanation of the entropy approach, see Theil (1996, Appendix A).
[80] Shorrocks credited Cowell for having a 'similar' contribution (1980, p. 615, n. 5). Cowell credited himself as the source of this generalization in 1977, not to Shorrocks (Cowell, 2000, p. 110).

which are increasingly used in modern development studies. On the other hand and also because of the logarithmic transformation, entropy measures are difficult to see as 'purely pragmatic'. Even Sen mentions that "This is a rather peculiar welfare function, and the other measures could be justified in normative terms rather special representations of social welfare" (1973, p. 43).

VI Properties of inequality measures.

One can ask why there is not a uniform way to measure inequality, or why some authors prefer one type versus another. The answer lies in the properties of the measures, because not all measures have the same properties. It will be convenient to enumerate the most common properties.[81] According to Anand (1983, p. 306), the most desirable properties of any inequality index are **a)** *The Pigou-Dalton condition* known as the *principle of transfers* (Dalton, 1920, p. 351; Pigou, 1912, p.24), **b)** *mean or scale independence* and **c)** *independence of population*.[82] For Sen, **d)** an '*ordinal' scale* is desirable because that makes the measure free of the numerical representation, idea that is very close to the concept of a ranking (1973, p. 3-4). Sen also adds a property that comes from an ethical judgment, which it is called in this chapter **e)** '*poor sensitiveness'*, which consist in to attach importance to transfers at the 'lower end of the scale' of the

[81] For a long review see Cowell (1995, pp. 54, 66 &139**),** Sen (1973, Chapter 2**),** Anand (1983, Appendixes**)**, and Dutta (2002**)**.

[82] The detail of the Symmetry Axiom for Population is in Sen (1973, pp. 59-60), and the theorem of the Population Principle in Dutta (2002, p. 610). A similar property is named 'Replication invariance' in the normative framework, such that if we have $x = (y, \ldots, y)$, it will imply $W(x) = W(y)$ (Foster and Sen, 1997, p. 133, n.31).

population, as it happens when logarithmic transformations are used (1973, pp. 29).[83] Finally, **f)** *symmetry* is another desirable property (Foster and Sen, 1997, p. 139).[84]

There are other characteristics that come from ethical judgments, for instance, **g)** *non-positive sensitiveness*, which is to include the very destitute such as people with no income. The Gini coefficient satisfies not only this condition, but also considers negative income (Dutta, 2002, p. 615); however this is not the case for measures like *T* and *L*. There is a contested property **h)** that judges if it is good or not to have a SWF within the inequality measure, which to some authors is a desirable property but not to others. For Sen, it is a good characteristic if a measure does not need any consideration of a SWF, (1973, p. 33-4),[85] property that authors like Atkinson (1970**)** or Newbery (1970**)** disagree with. Another demanded property of inequality measures is **i)** *Decomposability by population sub-group*; it requires consistency between the size of population sub-group and the meaning of the index within population (Cowell, 1995, pp. 55 & 57). Other property is another kind of decomposability, and is called **j)** *decomposability by income source*, where in the same fashion overall inequality can be expressed as the relationship among the impacts of the source components.[86] For some people is important if **k)** the interpretation of the measure is intuitive, for instance, if the range of the measure lies between the range of 0 and 1, as Atkinson does with his family of indices (1970). As we know, Gini coefficient also satisfies this condition, and we can not deny that most popular inequality measures have this intuitive property. Not only being in the range of 0

[83] It is known the flaw of the logarithmic transformations that are unable to handle zero values, also this property can be inconvenient when violates the transfer principle in some cases (Sen, 1973, pp. 32).
[84] Symmetry is also known as 'anonymity', where for any permutation of income vector y, named y', $I(y) = I(y')$ (Litchfield , 1999, p. 2**;** Foster and Sen, 1997, p. 133, n. 31).
[85] He slightly change his argument when in 1997 comment on 'Transfer sensitivity' (Sen and Foster, 1997, p. 144), giving room to discuss Atkinson measures.
[86] A classical theoretical paper is Theil (1979), but the literature has largely increased recently.

and 1 makes the type of measure intuitive, another way to be intuitive is to consider ranking comparisons, like using quantiles or decile ratios, but again, because of the ethical and practical judgments, there is no agreement in which of these rankings should be used, therefore, there is no consensus about way to express the importance of the property of being intuitive in this sense (Cowell, 1995, p. 67).

After mentioning all these properties, the literature usually agrees on the first three, so it is common to see inequality measures satisfying **a)**, **b)**, and **c)** properties. If we include property **f)**, those measures are called relative measures (Foster and Sen, 1997, p. 140; Anand, 1983, pp. 339-40). It can be noticed that after considering those four characteristics, the ethical judgment shape the discussion about the rest of the properties. Looking at the variety of properties described above, it is not difficult to see that usually those properties can be in conflict, and then the associated ranking of the measures of inequality might not always be always the same.

VII Incomplete Rankings.

For the use of the pragmatic and the normative measures, in the same way as the use of entropy indices, it is assumed that every pair of income distributions can be totally compared under any of the mentioned methods. A total 'complete' ranking imply that a set of distributions *x*, *y*, *z*, etc., with a given inequality measure *I*, which is a function of any of the given distributions, it will map into the set of real numbers $I(x)$, $I(y)$ or $I(z)$ that are representing the true degree of inequality. Then any pair of inequality measures of the mentioned distributions can produce a comparable ranking in the form

of $I(x) > I(y)$, $I(x) < I(y)$ or $I(x) = I(y)$, because these are just real numbers (Sen, 1973, p. 47). Once the assumption of 'completeness' is relaxed, then it becomes another set of inequality comparisons, which Sen has described as 'quasi-orderings' in his literature (Sen, 1973, p. 63), but it is more common to use the notion of *dominance*, or *stochastic dominance* (Dutta, 2002, p. 607). Following the standard notation, the α degree of stochastic dominance is known as D_α, where the first degree is $\alpha = 0$. The idea of dominance starts with very basic conditions. It is assumed that all rankings and all measures of inequality should satisfy certain properties, and the ranking of the dominance condition is given by the properties that are satisfied. On the following three paragraphs the dominance relationship will be touched on, finalizing with other ways to rank distributions through the intuitive tool of quantile comparisons and graphical tools.

a) **First Degree Stochastic dominance.**

The first degree stochastic dominance relation (D_0) implies unanimity for all symmetric, population-invariant, and monotonically increasing welfare functions (Foster and Sen, 1997, p. 137-138), it is also called quantile comparison (Cowell, 2000, p. 102), or 'Anonymous Pareto Dominance' (Zheng, 2000, p. 435). This is equivalent to say that our first ranking should satisfy our properties **c)** independence of population, and **f)** symmetry. We can not see very often the application of this ranking method, because it does not take account of the transfer principle, which is central to almost all inequality measures.

b) **Second Degree Stochastic dominance.**

As it is expected, the second degree stochastic dominance (D_1) includes also, besides **c)** independence of population and **f)** symmetry, the **a)** Pigou-Dalton condition or the transfer principle. The comparison is equivalent to the Lorenz dominance,[87] assuming that the mean income is the same for both distributions.[88] Graphically, in **Figure 2-2** it is clear that *x* Lorenz-dominate *y* (*x L y*), the same as *z* Lorenz-dominate *y* (z *L y*), because for both distributions *x* and *z* lie above *y*. Using this dominance condition, it is not very much clear which distribution should be chosen if we just consider only *x* and *z*, we do not know if *x L z* or if *z L x*. So, Lorenz domination is helpful for the comparison of two income distributions, but it does not always have a definitive ranking, as we can see in this case when two income distributions intersect.

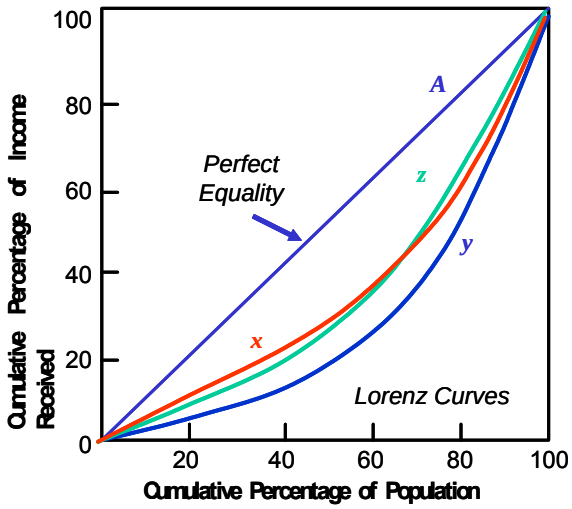


Figure 2-2. ***Lorenz dominance*** **diagram.**

[87] See Lemma 3.1 and Theorem 3.1 of Dutta (2002, p. 608-609).
[88] It can also be assumed that the income levels are normalized by the mean (Foster and Sen, 1997, p. 146).

The second degree stochastic dominance has a restrictive framework, because it assumes that the mean income of the two distributions should be the same. In practical terms, it is difficult to find this condition, but we can get rid of this restriction with a generalized assumption. For this, there is an extension of this theorem: Shorrocks (1983**)** generalized this theorem as the *Generalized Lorenz dominance* (*GL*) which is the same Lorenz curve but scaled up by the mean income (Dutta, 2002, p. 610). In graphical terms (**Figure 2-3**), we can see that the vertical axis goes from 0 to μ instead of from 0 to 1 (Cowell, 1995, p. 42). The generalization is helpful, because *Lorenz dominance* only applies to comparisons between two income distributions with the same mean income, as it was mentioned before (Dutta, 2002, p. 609). Therefore, the extended definition of this theorem is exactly analogous to Lorenz dominance criteria. Saying that one distribution *x* *Lorenz dominate* other distribution *y* in the generalized sense (*xGLy*), it will imply higher welfare associated with distribution *x*. In the normative setting, this will be equivalent to say that if we have two welfare functions such that $W(x) > W(y)$, is exactly equivalent to say that *Generalized* Lorenz curves do not intersect (*xGLy*), because GL_x lies above of GL_y (Foster and Sen, 1997, p. 135), as is shown below.

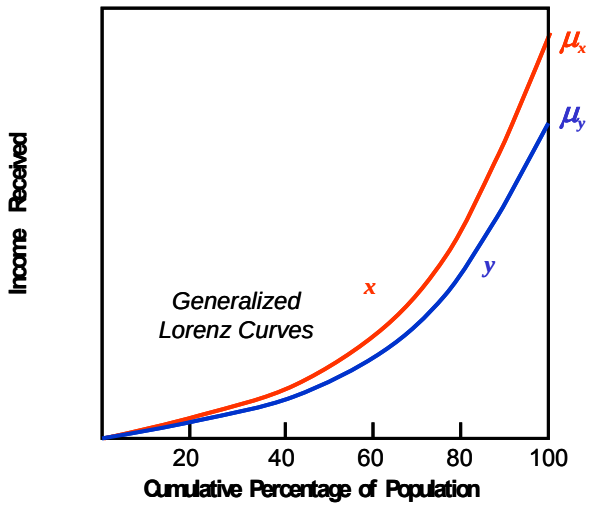


Figure 2-3. *Generalized Lorenz dominance* diagram.

The explanatory power of the theorem about *Lorenz dominance* and its generalization is limited as it does not always solve our concerns: the curves representing the distribution sometimes intersect. If we are rigorous, we can neither say that we prefer some distribution over another, nor that we are indifferent between the two, simply we cannot rank them (being x and y suitable distribution vectors, happens that $x \perp y$) (Cowell, 2000, p. 107). In empirical analysis, is true also that the Lorenz curves intersect, it is possible to apply the Generalization of the Lorenz criteria in this case, and sometimes the problem disappears (Cowell, 1995, p. 43). But if that is not the case, it will be necessary to apply methods that consider some form of the Social Welfare Function, as it is done by the Atkinson family of indices, or we can apply a higher definition (e.g. third degree) of dominance.

The link of the Lorenz dominance with the normative measurement was developed by Atkinson (1970). He proved an important theorem based on the Lorenz

ranking using the normative approach. He said that if we compare two income distributions, *x* and *y*, and if we assume the existence of some social welfare function *W* composed by the sum of all individual *U's*, where $W(y) = \sum_{i=1}^{n} U(y_i)$, and *U* is a concave function of income ($U' > 0, U'' \leq 0$), then those two distributions compared in the sense of $W(x) > W(y)$, is exactly equivalent to say that the Lorenz curves do not intersect (xLy), because the Lorenz curve of one of the distributions (*x*) lies above of the other (*y*) , so L_x lies above of L_y. The implication of the theorem is such that the comparison can be done without necessarily knowing the particular form of *U* at all (Atkinson, 1970, pp. 246-7; Sen, 1973, pp. 48-49; Cowell, 1995, pp. 41-3 & 55). In other words, if there is Lorenz dominance, that is a guarantee that the ranking is free of the particular form attached to the (utility) function *U*.

c) **Third Degree Stochastic dominance.**

Finally the third degree stochastic dominance relation (D_2) includes 'transfer sensitivity', which attaches greater importance to the transfers at the lower level of the distribution. In other words, it is 'poor sensitive' (Foster and Shorrocks, 1988, p. 176; Foster and Sen, 1997, p. 138; Cowell, 2000, pp. 102-103; Dutta 2002, p. 608-612). Therefore, our third degree stochastic dominance relation includes not only conditions **a), b), c)** and **f)**, but also condition **e)**. This will mean that a third degree stochastic dominance will consider a transfer from a middle-class person to a poor person more valuable, than the same transfer from a rich person to a middle class person. The rationale is that transfers done at the lower end of the scale are more likely to reduce poverty.

d) **Quantiles and Share Ratios.**

Another way to assess a ranking between a pair of income distributions is using a type of 'intuitive' measures that considers cutoff points on the frequency distributions. We can consider the population dividing the amount of income over a fixed population share in equal proportions. A quantile division takes intervals from the cumulative distribution, such that is measured an income value given a fraction or percentage of the distribution. The division of the distribution in certain proportions is arbitrary, but the most common are the quintiles (5 shares of 20% each, or 5 quantiles), quartiles (4 quantiles) or deciles (10 quantiles) (Cowell, 1995, p. 28). The purpose of this

simplification is usually seen in regards to the simplicity of the results. For some people, it might be intuitive to follow the relationship of how much the lower 10 percent ($Q_{0.1}$) of the population has in relation to the whole distribution, or as another example, it can be questioned how much this amount can be related with the richest 10 percent of the population ($Q_{0.9}$). The relationship of these proportions is the starting point for the share ratios. For instance, a common measure of inequality is how much the lowest 20 percent of the population has in contrast with the richest 10 percent, this ratio is known as the R 10/20 ($Q_{0.1} / Q_{0.8}$). Some people consider the ratio of the first quintile (the poorest 20 percent of the population) over the richest quintile, which is the usual $Q_{0.2} / Q_{0.8}$ ratio, and some others like to compare each quintile in relationship to the median income of the distribution ($Q_{0.2} / Q_{0.5}, Q_{0.4} / Q_{0.5,}$ …). These last set of ratios are considered measures of poverty, because there is a notion of a 'poverty' gap on the deviation of certain quantile over the median of the population, but this poverty measure is indeed a measure of 'relative' poverty, and that approach will be rejected in a following section for the sake of clarity. What is true is that the possible combinations of these ratios can grow exponentially (Cowell, 1995, p. 29). On the one hand, it is very simple to understand these proportions, but, on the other hand, there is no convention in order to use one ratio over the other. Then, the comparison of results across papers is difficult, unless a big tradition on the use of one of these ratios has been already established beforehand.

2.4 Other ways to assess inequality.

Besides the above-mentioned methods, inequality might be measured in other ways. One is through graphical methods and the other is through the construction of statistical models. On the statistical side, we might assume the existence of a density function that represents the income distribution, so this function might be subject to exploration, because the income vector contains a characteristic shape, the vector is sufficiently regular and more information is usually available about it (Shorrocks, 1987, p. 822). The study of this branch of research has been traced to Pareto (1897) and his universal law of the (log-normal) income distribution (Shorrocks, 1987, p. 823; Cowell, 1995, p. 71). The result was that income distribution was seen as a process that was governed by the stochastic laws, so the link with the statistical theory, and the assessment of income distribution in that particular framework was imminent. In the stochastic framework, it is possible to observe income inequality through the approximation of income differentials. The basic equation that describes this relationship is the following:

(7) $$\ln w = \alpha_1 P + \alpha_2 J + R$$

Where *w* represents wage income; because of Pareto's research, *w* is usually presented in the logarithmic form. *P* are personal characteristics, *J* are job characteristics, and *R* is a random term. Parameters α_1 and α_2 are estimated 'market prices' in the equation. In this setting, it is assumed that income differentials can be explained by the differences in personal characteristics, job characteristics/opportunities and a random

term. In the general case, the true inequality can be observed after controlling for the mentioned characteristics (Shorrocks, 1987, p. 824). It will be vain to comment on the vast possibilities that the assessment of income distribution provides in this framework, particularly when we consider the intertemporal dimension or the panel data analysis. The statistical modeling is mentioned here in order to acknowledge the existence of the variety of density functions and ad-hoc methods with simultaneous equations. On the measurement of the variability of income, a set of robustness checks are available, and the changes on inequality are subject to measurement through the decomposition of the variables that are part of the model. For a glance of this methodology see Cowell (1995, chapter 4), but any econometric analysis textbook might be of help as well.

Finally, on the graphical side, the possibility to analyze inequality through the plot of income distributions is also known. It can be done through a plotting of the related density functions that comes from statistical methods. A glance of that kind of measurement can be seen as in Cowell (1995, p. Chapter 5).

2.5 Inequality and the Relationship with Absolute and Relative Poverty

Knowing that in development economics the issues of poverty, inequality and welfare altogether are matters of primary concern, it is necessary to make some clarifications, much more when some authors consider the measurement of relative poverty as a good approximation of human deprivation. This issue needs to be considered with care. The mathematical definition of relative poverty is simple. Rather than assuming a fixed poverty line (z), which is exogenously required by the measurement of

absolute poverty, a relative poverty measurement uses a *z* that is endogenously defined by the income distribution. In the relative definition, *z* is usually a fraction of the mean or of the median of the population's income (Ravallion, 1996, p. 1330; Foster, 1998a, p. 336). The relative measurement of poverty challenges the basic assumption of measurement of absolute welfare, where "[t]he starting point is the canonical consumption problem in which a household chooses the consumption of individual goods to maximize utility within a given budget and at given prices" (Deaton and Zaidi, 2002, p. 6). The consideration of relative poverty clashes against the absolute definition of the basic basket of goods and services, where the discussion about the definition of the basket is vastly covered by development literature.

The concept of relative poverty might elevate the issue of inequality to the highest ranking in the assessment of deprivation; however it is not the intention of this research to support that approach. Unfair inequality, as different from natural inequality, is a shape of deprivation, with different causes and consequences than poverty itself. On the one hand, inequality considerations urge normal individuals to make transfers to a worse off persons, because they can be easily targeted. On the other hand, a normal altruistic citizen would require much more effort to know where the poorest person is, because sometimes the answer is not obvious. Thus, it is assumed that targeting the poor through alleviation programs should be a task of the government. The intrinsic relationship of these two destitutions can not be denied; both in the theoretical and in the practical side (Foster, 1998a, p. 337). On the practical side, the common sense says that if the government has only one dollar available for either a program for alleviating poverty or one for inequality reduction, poverty reduction should be chosen. In fact, in theoretical terms, the

dichotomy of alleviating poverty rather than reducing inequality should not exist; it will be supposed to be the same issue (Anand, 1983, p. 344-345); recalling the third degree stochastic dominance criterion, the most valuable transfer is the one done to the poorest person. [89] The problem with relative poverty is the resultant mixture of concepts that have different practical implications, so it is difficult to recognize which problems belong to inequality, and which problems belong to poverty. In practical terms, a relative notion of poverty might lose track of the poorest people "by anyone's reckoning" (Ravallion, 1996, p. 1330).[90]

- Debate between Sen and Townsend.

In fact, the discussion about the relative and the absolute notion of poverty can be first understood outside of the formal framework. Almost three decades ago, Amartya Sen argued in favor of an absolute definition of poverty: "ultimately poverty must be seen to be primarily an absolute notion" (Sen, 1983, p. 153). He was challenging the sociological literature of his time, which maintained that poverty issues should be discussed from a sociological perspective rather than using the science of economics. He was clear in saying that focusing on relative poverty had some meaningful implications, because around the end of the 19th century, some studies based on absolute measures were suggesting an unfounded optimism in poverty alleviation (Sen, 1983, p. 154). In the same line of thought, he said that the relativist notion of poverty started to point out

[89] Foster (1998a, p. 337) recognizes that using a relative definition of the poverty line is not to measure inequality, but under certain circumstances, the connection is very strong, there are almost the same (See theorem 6 in Foster and Shorrocks, 1988a).
[90] Foster (1998a) commented on a hybrid (relative-absolute) poverty line based on empirical applications. His results are inconclusive. This hybrid possibility was previously rejected by Zheng (1994).

problems with wrong absolute assumptions, as it was pointed out by the empirical research of Townsend (1962) in the UK.

On the other hand, Sen (1983) criticized the problems with measurement of poverty in relative terms, as he did criticize the main thesis of Townsend (1954, 1962) in terms, first, of the fixity of necessities over time that were confused with 'absoluteness of needs'; and second, the confusion of inequality deprivation with the concept of absolute destitution *because of inequality*: "there is a difference between achieving *relatively less than others*, and achieving *absolutely less because of falling behind others*" (1983, p. 155, emphasis in the original). One of the implications of the relative view was that this view was so rigid, such that poverty could not be seen as a target for elimination, as it was argued by the work of Fiegehen et al. (1971, in Sen, 1983, p. 156).[91] Sen also criticizes the extreme focus of the egalitarian point of view of sociologists like Miller and Roby (1971, in Sen, 1983, p. 157), where they claimed that inequality should indeed be *the* measurement of poverty, a position that was contested not only by Sen (1983) but by Townsend (1979a) as well. Another implication of the relative view is about the policy to locate the changing poverty line that might have a perverse effect. For instance, Sen criticized the practice in the UK of using Supplementary Benefit scale as the poverty line, similar to the method that used to be used by the US government in 1969. The perversity of the results came from the possible manipulation of the definition of what should be considered a need (Sen, 1983, p. 158).

Townsend's reply to Sen was focused on the sociological aspects of poverty, saying that Sen misunderstood behavior with motivation (Townsend, 1985, p. 660). He

[91] Atkinson (1975) argued in favor of a relative notion, saying that 'the adoption of a relative poverty standard does *not* mean that the poor are always necessarily always with us' (p. 189), but the reasons explained there are not convincing for this author.

questioned the ability of persons to see their own poverty: “People may be in poverty when they believe they are not and vice versa” (Idem, p. 661), and ‘other’ actors might be ‘conveniently’ interested in changing these points of view. Townsend said that sometimes hunger is a signal and not a cause, for instance, hunger might be a signal of coercion, then looking only at hunger, as it was the argument of Sen, the important link of a cause of destitution could be missed. In regards to the identification of the needs, he mentioned that not all needs can be perceived by the government side: “certain kinds or degrees of human need may not be perceived by any powerful group in a society—either because their own self-interest precludes it or because fashion or customs are such that it does not seriously obtrude upon their attention” (Idem, p. 665). And finally, he questioned the framework that Sen was using: “His [conceptualization] is a sophisticated adaptation of the individualism which is rooted in neo-classical economics” (Idem, p. 668). He went further: “[t]hat theoretical approach will never provide a coherent explanation of the social construction of need, and hence of the real potentialities which do exist of planning to meet need” (Idem.).

In order to finalize this debate, Sen was clear that his 1985 paper was not devoted to Townsend’s work but mostly to others, as Townsend seems to understand in his ‘rejoinder’ (Sen, 1985, p. 669). He clarified that, when people were going below some basic absolute level of fulfilling of capabilities, is to be ‘absolutely’ poor, regardless the fact that others within the same society might also be destitute. Sen recognize that need might vary from society to society, or from time to time, but that was not an issue in order to claim that need is ‘relative’: “The characteristic feature of “absoluteness” is neither constancy over time, nor invariance between different societies, nor concentration

merely on food and nutrition. It is an approach of judging a person's deprivation in absolute terms…, rather than in pure *relative* terms vis-à-vis the levels enjoyed by others in the society" (Sen, 1985, p. 673, emphasis on the original). Among other criticisms, Sen primarily pointed out Townsend's misunderstanding of the capability approach (Idem, p. 674-675), something that can be understood because Townsend might not be familiar with Sen's economic literature. Summing up, the 'relative' notion of poverty did not come up with better defendants, and the debate produced an 'externality'. It seems to be that after this discussion, the focus of the human development studies was definitively shifted to economic science; a trend which some people found to be disturbing.

2.6 Concluding Remarks.

As it can be clear with this measurement survey, there are several ways that inequality measurement can be done. The variety of indices depends on the characteristics attached to their properties. There are also practical reasons to decide to use certain inequality measures, mostly related with the data constraint. For our purpose, the use of the Gini coefficient is supported in this work, since it is a standard inequality measure, because it is necessary to provide understandable measures to other policy makers and researchers in developing countries. The interpretation of the Gini coefficient is intuitive as well. Besides the standard measurement, the Gini coefficient has properties associated with a second degree stochastic dominance condition that ensures the link with the ranking that considers the transfer principle, symmetry, and the population principle. The consideration of the mean income provides a generalized Lorenz ranking that is

useful in the ranking of different distributions. The graphical representation of the Lorenz curve also helps us to focus on the stochastic dominance of the distributions, so the ranking of these distributions would be more meaningful. The challenges of the Gini coefficient and the Lorenz dominance ranking are not ignored, but the options available are both complicated and sometimes not very intuitive.

There are other properties that are important for the measurement of inequality. The Theil Index was chosen because it is 'poor sensitive' and it is also decomposable by population sub-group. The first is an ethical judgment that cares more about the poor in the distributional setting, and the second is a practical implication that provides a tool in order to target inequality better. The property of decomposition by population sub-group is not entertained by the Gini coefficient, and that compelled us to focus on a measure from the family of entropy measures. On the other hand, though the consideration of normative inequality measurement seems to be important, the conflict that poses the arbitrariness on the form of the social utility function makes the results difficult for interpretation. The use of 'incomplete' rankings is important itself, not only because of the link with other inequality measures, but also because some of the tools available are intuitive, so it is better the communication between the researcher and the policy maker. As the last way to assess inequality considered in this chapter, we have, on the one hand, that the use of stochastic models have been proven fruitful in modern research, but some times the data constrains the empirical analysis. On the other hand, the use of graphical representations of inequality is useful, and its use is considered in the following chapters.

Even though it is acknowledged the sense of deprivation that comes from an unfair unequal distribution, it is better to separate inequality measurement from other

kind of measures of destitution, as the latter is a measure of income relative poverty. So the inequality embedded in the measurement of relative poverty should not be considered together, because it might not be clear which destitution comes from an unfair distribution and which deprivation comes from the absence of basic goods. The theoretical similitude of poverty and inequality definitions was discussed, but the practical implications embedded in both topics are different, so it is better to maintain them separated. There are still technical decisions that need to be taken in regards to inequality measurement once a particular measure of inequality is chosen, and those decisions, which are mostly related with limitations of the data sets, will be explained in the next chapter.

2.7 Appendix.

I Problems of Gini coefficient

There are some problems regarding the calculation of the Gini Coefficient (Loehr and Powelson, 1981) as follows:

a) There is no algebraic formula for the calculation of the Lorenz curve, and then, a simple integration for the exact area under the curve is very difficult.

b) Some computations understate the real value of the trapezoids under the Lorenz curve.

c) It is possible in some income distribution, that the Gini ratio can be insensitive to some changes (i.e. due to growth). It is also possible to have an increase of number of people under the poverty level without the respective increase for the Gini coefficient

(used as a proxy of income distribution). Suppose we have a traditional Lorenz curve, in order to calculate the Gini ratio we use the area below labeled as B in the formula of the Gini ratio= A/(A+B). Where A is the area below the line of perfect equality (**Figure 2-4**)

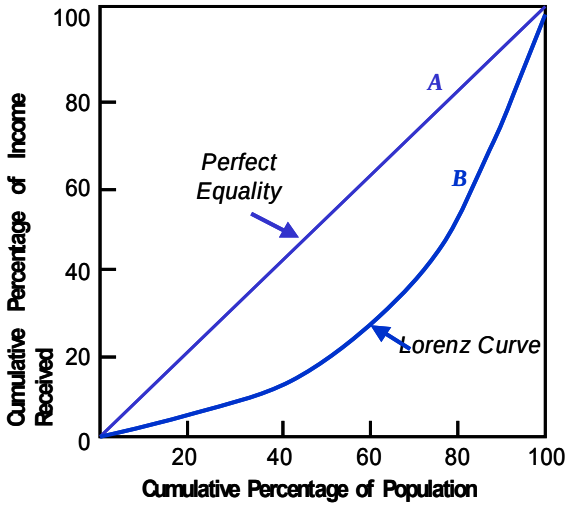


Figure 2-4. The Lorenz Curve

Now, assuming an increase in income (due to growth), is possible to face a hypothetical case, where everybody gets in the same proportion the share of income, then the area below the Lorenz Curve remains unchanged, in this case, is logical to assume that even though the income of everybody changes, the inequality does not, because all the changes were proportional. But if this change occurs in some strange way such that the increase in income for some of the highest income earners became proportionally the same (in the opposite direction) for some of the lowest income earners, is possible that the area below the Lorenz Curve remains the same, obtaining the same Gini coefficient, but with the wrong conclusion that the inequality remain the same, because the shape of

the Lorenz Curve (as shown in **Figure 2-5**) changes, resulting in a highest proportion of poor population (the poor are more poor).

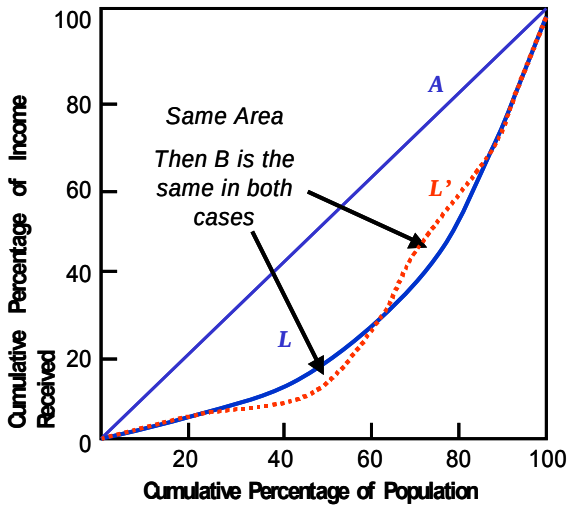


Figure 2-5. Change in the shape of the Lorenz Curve, not in the area below.

II Decomposability by population sub-group.

Using the convenient property of decomposability of entropy measures (Shorrocks, 1984; among others), we can see the contribution to inequality of each region to the whole inequality in the country. The intuition of decomposability, that is said to be traced to the '*analysis of variance*', can be found in Foster and Sen (1997, pp. 149-53). Using suitable shares of income and population overall inequality can be calculated, as is expressed by Dutta: "an inequality measure is decomposable if it is possible to express overall inequality in a population as a function of the inequalities within major subgroups" (2002, p. 612). Tables and graphics are consistently used to show levels of inequality among countries, the same as its composition by within-group and between-group, depending on how groups are defined.[92] Other kinds of graphic tools help us to show the contribution of inequality per region, the same as other intuitive interpretations for indices of inequality (Conceição and Ferreira, 2000).

To make understandable our measures considering weights and groups, let's rewrite our original formulas in this sense:

(4') $$GE(c, y) = \frac{1}{c(c-1)}\left[\sum_{i=1}^{n}\left[f_i\left(\frac{y_i}{\mu}\right)^c\right]-1\right], c \neq 0,1$$

(5') $$L = GE(0, y) = \sum_{i=1}^{n} f_i \log\frac{\mu}{y_i}$$

(6') $$T = GE(1, y) = \sum_{i=1}^{n} f_i \frac{y_i}{\mu}\log\frac{y_i}{\mu}$$

[92] Review in Theil (1996, Chapter 2).

Now, additive decomposability is written as follows:

(4'') $GE(c,y) = GE_w(c,y) + GE_B(c,y)$.

From this equation, we have two terms, within-group and between-group inequality. Within-group inequality is written

(8) $GE_w(c,y) = \sum_{k=1}^{K} V_k^{1-c} S_k^c GE_k(c,y)$,

where $V_k = \frac{N_k}{N}$, also known as the subgroup population share. Analogously S_k is the subgroup income share. $GE_k(c,y)$ is the same inequality measure as **(4')**, with the difference that the subgroup is considered a separate population (i.e. $i = 1...n_k$ rather than $i = 1...n$).

The second term, between-group inequality ($GE_B(c,y)$), is obtained substituting $y_i^k = \mu^k \forall i$ in **(4')**, meaning that every person in the population receive the same income as its own sub-group. (Shorrocks, 1983; Jenkins, 1999, p. 8).

3 Practical Issues in Measuring Inequality: Operational Decisions with Survey Data Sets.

3.1 Abstract.

In order to compute indices of inequality, there are operational decisions that are to be made beforehand. The literature supports the fact that inequality measurement, the same as poverty measurement, is sensitive to some of the decisions. The information provided by consumption-expenditure surveys is different from the information that comes from employment income surveys. In both cases it is possible to compute measures of welfare, but the results are to be considered with specific reference to the recipient unit chosen, different measurement errors from underreported and misreported income, and the use of equivalence scales. Going further, the consideration of non positive incomes needs to be tackled, much more if there is a possibility that those values represent the poorest people. There are other issues that also affect the measurement of inequality, for instance, the issue of regional prices, regional classification of groups, or the representativeness of the sample in the survey; such discussions are mentioned in this chapter as well.

3.2 Introduction.

After doing the methodological analysis and the review of inequality measures, there are some insights that shall be discussed before going to the calculations of income

inequality. The information available in survey data provides the means for deprivation measurement. When we are ready to do the measurement using statistical packages and suitable software, it is noticed that some operational decisions are needed to be taken. The researcher needs to make sure that the measurement of inequality is independent of these operational decisions taken, or he/she need to be aware of how much those decisions will change the level of inequality measured. The process of a correct description of inequality is important, not only because the result of the measurement is more accurate, but also because the expression of the technical decisions can make the research comparable with the present and future literature. Therefore, this chapter is mostly concerned with the operational decisions in regards to empirical calculations of inequality, focusing on the descriptive part of the measurement. Even though the purpose of this research is a descriptive exercise, an understanding of the property of population sub-groups can give a hint of where the inequality comes from, or where it is more concentrated; this property might be giving rise to not only the descriptive measurement, but also to its underlying causation. In general, after a proper descriptive exercise, using different tools that acknowledge the complexity of the phenomena, the extent of inequality within the country or among the regions will be known. Knowing this, inequality measurement will serve as a proxy of social inequality, which to some extent is the measure of individual deprivation in the social context.[94] The intention of this chapter is to introduce the reader into the operational decisions dealing with survey data, in order to build up proper indicators in regards to the decisions taken.

[94] It is recognized that inequality is one of the possible human destitutions, but that functioning might be related with deprivation in other dimensions. That relationship is assessed for the case of Mexico in chapter **8**.

3.3 Survey considerations.

There has been a recent improvement in availability of data in developing countries, but not all data are collected using the same methodologies (Atkinson and Bourguignon, 2000, p. 27). If we know a little bit more about the basis of the data collection, it will also be easier to understand and fully exploit the information contained in the data and hence, these can be used more properly. In the literature about income inequality, most of the discussion lies in the type of measure that shall be used (e.g. Gini coefficient, Atkinson measure, etc.), or in the properties of these measures, but it happens often that other kind of practical problems are not addressed when the computations are done. It is common that "it is omitted in the analyses to make reference to operational procedures that are behind the comparative indicators and it is taken for granted as if all estimations were generated with the same statistical quality, and all inequality calculation methods are provided from a standard algorithm…" (Medina, 2001, p. 29). It is common to see in developing countries literature that there is no formal definition of the operational decisions for the measurement of inequality. However, this is not the case for poverty measurement, which is explored in more detail (World Bank, 2004, p. 8). Because of the lack of explanation of operational procedures in development literature, it is difficult to compare the inequality measurement 'across papers', so it is not easy to know with certainty 'what' among 'whom' is calculated , as Atkinson and Bourguignon (2000, p. 41) observed.

The following paragraphs are intended to provide some light on the technical decisions, showing the operational considerations of different inequality measures, the

different epistemological positions taken, and also the computational problems that arise when the analysis is done.

I Quality of survey data.

One of the immediate questions arises about the concern of the reliability of survey data; this issue used to be a big problem some decades ago. The role of income-money coming from expenditure or consumption surveys was questioned as the representation of the household's welfare. Given that developing economies are by definition subject to more chaotic environments, the question about the data reliability is more important. The accuracy of sample estimates as representative of the population used to be a big concern in development literature, for instance it was said that "[m]any available estimates of income distribution are derived from samples that are statistically inadequate in these respects with the result that sample estimates are both biased and have a large variance" (Chenery, in Chenery et al., 1974, p. 5). These authors were pointing out more problems of the survey data, mostly in regards to improper design, lack of an adequate sampling frame, or the failure to consider inaccessible regions. Now, things have improved since those early days, so that almost 30 years later, authors such as Atkinson and Bourguignon concluded something different: "One of the conclusions which the reader will rightly draw from the Handbook is that there has been a very considerable improvement in the availability of data about the distribution of income." (2000, p. 27). They mentioned advances made in the representativeness of the surveys, because of countries from developed and developing economies have increased the

budget for this purpose. Besides that, progressive improvements in the methods used to perform the data analysis have been made.

Approximating social inequality with income inequality can be sometimes problematic. While considering social inequality and measurement of poverty, some institutions are concerned with the reality of the assumptions made in the calculations. It has been argued that it is difficult to assume a simplistic framework in developing economies, because of their higher level of complexity (Chenery, 1974, in Chenery et al., 1974, p. xvi). The limitations of survey data can point towards other limitations as well, like to focus research only to income-money-wage in the case of income surveys, or to focus only on the money value of consumption, as is the case of expenditure surveys. It is assumed that each of the types of surveys mentioned would work well to measure social deprivation. There are opinions about the mainstream measurement of welfare, criticizing its unavoidable reliance on household surveys, such that those measurements are built up in 'soft' grounds (Ghai, 1977, in Ghai et al., 1977, p. 49); such that these critiques mention some sort of pre-existing inter-related patterns of prices that are expressed in the household income. These perhaps endogenous patterns might be biasing the patterns of distribution. It is obvious that some critiques focus also on the problem of non-measured demonstration effects, and the non inclusion of services or benefits such as public goods is also pointed out. Another sort of limitation of the survey data is the periodical stability in their collection. It was argued that in developing economies, information cannot always be collected on a regular basis, such that political or social events might disturb the institutions that produce data. Summing up, it is necessary to be aware of the probable limitations of the use of survey data, though that should not be a constraint to measure

this important aspect of welfare. Income data is most commonly used because these are readily available, and might be complemented with other information as soon as newer one, such as other functionings rather than income or subjective information, is ready. The fact is that, in order to approach the problem of measurement of inequality and poverty, there are not many substitutes for income or consumption surveys.

II Recipient Unit and Welfare Source for Inequality.

There are two discussions that are usually connected, one is the issue about income vs. expenditure surveys and the other is the argument that comes from household vs. the individual focus. Both issues are closely related and it is difficult to disentangle them. On the one hand, usually expenditure surveys try to capture consumption that is approximated from household expenditure and it has the household as the recipient unit. The household might be composed of one or more families, and each of the families might be composed of one or more individuals. On the other hand, income surveys (e.g. employment surveys), even though they collect the information by household, they focus more on individuals. It is difficult to assess individual well being in a household survey, since for that it is necessary to assume a theoretical framework, for instance, a framework which attach some weights to individuals within the household (e.g. equivalence scales), among other considerations. With regard to income surveys it is difficult to 'isolate' the individual from his/her surroundings, assuming that s/he is answering just with reference to his or her own wages and earnings when s/he is interviewed. This view might introduce a measurement error that is not easy to detect. The issue of income vs.

expenditure survey discussion will be tackled first, followed by the consideration of household vs. individual focus. In order to address certain questions, the understanding of both issues at the same time will be necessary.

a) **Income vs. Consumption-Expenditure Surveys.**

In order to construct indicators of welfare, such as poverty or inequality, the use of (wage) income or consumption data might imply a decision, which can be both a practical issue and a conceptual challenge (CTMP, 2002, p. 34). Both expenditure and labor incomes are usually available in many surveys, but there are some basic limitations when we want to use them to make indicators of welfare. On the consumption side, there are some practical issues in regards to its measurement: the first problem is the difficulty to obtain a reliable quantification of consumption, which is approximated in theory by the recorded expenditure in household surveys. If we are interested in the individual approach on a consumption-expenditure survey, the kind of weights attached to every individual within the household is important, because the household is used regularly as a recipient unit: this is the link with the household vs. individual approach. In consumption-expenditure surveys there are other problems, such as the role of public goods, which are difficult to include in the household expenditure. On the other hand, we also have different things to consider in regards to income data, like the different kinds of income sources. Income surveys usually contain information only about money-wage income. Other sources, such as capital or asset income, are not included very often neither are the non-money-wage incomes.

An advantage of an income survey is such that usually it has a bigger number of observations in the survey data; more households are surveyed because this information is not as expensive to collect as on the expenditure surveys. Focusing on the problems of income surveys, we can not ignore the problem of underreported and misreported income, limitations that are usually criticized in development literature. Now, in both consumption and income survey data, different kinds of fluctuations of income or consumption should be considered. That consumption-expenditure income has a smoother behavior through time is assumed. The use of monetary representations to both approaches might also be considered for criticism, issue that has been considered very narrow with reference to the capability approach of Sen. All the previous issues have different and ambiguous impacts on the measurement of real inequality and real poverty, but this should not be a definitive obstacle to make an assessment on the size of the biases.

i) Traditions.

There are different traditions of collecting data, and those traditions can lead us to different assessments of poverty or inequality. In the present literature, a strong tradition of collecting consumption data in Asian countries from expenditure surveys is mentioned, while it is generally known that Latin American countries collect information mostly from income surveys (Deaton and Zaidi, 2002, p. 13; De Ferranti et al. 2004, p. 36). Poverty measures show a different level of welfare using consumption-expenditure data rather than information from income surveys, so the number of poor people might change in regards to the methodological practices of collecting data sets from different countries (Székely et al. 2000, p. 12). These differences are important for Latin America: the

percentage of poor people changes by up to 7 percent, depending on the country. The referred literature can make us think that the number of poor people will be reported differently depending on the source of the data sets, so we would expect different reported levels of inequality as well.

ii) Approximating Welfare: Different Sources.

In the literature is assumed the validity of using proxy variables that characterize the satisfaction of individual preferences. The sources might be either labor income or consumption. The particular standard of living of the individual is supposed to be approximated with these sources. On the one hand, when only labor income is taken into account, it is assumed that labor income is equivalent to consumption. This assumption is theoretically feasible in a model with a single period of time, if the entire income is consumed at once within the period. In such a way the mentioned income represents the entire earning sources of individuals within the household (Deaton and Zaidi, 2002, p. 13). We know that such simplistic assumption might be rather narrow, because in reality, labor income is neither consumed in one period of time, nor does represent the only earning source for the necessities of the household. On the other hand, consumption data have also the problem that it does not always account for all kinds of expenditures, because some kinds of expenditure are not always recorded or is not possible to know them easily. For instance, the measurement of consumption leaves behind the considerations of public goods. The problem with public goods and their measurement on deprivation indices is that those goods are usually consumed by the poor in a relatively higher proportion, and the exclusion of those goods might bias the measurement of deprivation downward.

Income does not come only from labor, but from other sources as well. Capital income might not be very common, but rent that comes from ownership of property in many cases is.[95] In this case, the proportional rent represented by the owned asset might be considered a particular kind of capital income as well. In a similar way that happens to the treatment of capital income, rent is difficult to evaluate as well. Capital income is difficult to evaluate even in developed economies: "capital income is generally paid on a less regular basis than earnings and therefore more difficult to observe in data sources other than income tax returns" (Atkinson and Bourguignon, 2000, p. 37). We see that, in practice, capital income is not always considered in developing economies, and it might be an important component of well-being for the people in the household; this important information might be inappropriately considered. Estimating the proper amount of value associated to the 'rent' of such asset as a house, would give a better measure of well-being, so the poverty or inequality indices would have a better foundation in their accuracy.

iii) Valuation.

The valuation of consumption is both a theoretical and a practical challenge. The practical difficulty relies on the complete inclusion of basic goods in the basket, with a process that is a continuous search for the particular items that satisfy people's needs according to their changing tastes. The challenge might come from the correct consideration of prices (Deaton and Zaidi, 2002, p. 13). Regional prices have another

[95] An explicit form of capital income is available in some expenditure surveys or in some questionnaires of census data, but it is not very common to find on income surveys. Despite of this fact, sometimes the information of capital income might be partially approximated indirectly from income surveys, as long as some information of the house ownership is available. The value imputed to this asset might be approximated with the quality of the construction, if that information is available.

problem, which is the *de facto* assumption that all sectors in the economy are fully monetized, so all the goods consumed within the household are accurately measured in terms of money, but this issue is not always the case (Ghosh, 1986); for example, when wages are paid in kind, as often the case in a not fully monetized economy, goods consumed do not reflect the market price, making the assumption of measuring consumption by its money value of limited use in the context of say, poor rural areas. When only wage income is considered, the price definition has certain constraints that are usually related with data availability (discussed in section **V** of this chapter). But when a basket of consumption goods is needed to be valued, the problem is much more complicated, because of the consideration of the variety of goods rather than considering income from wages alone (Deaton, 1997, Section 5.2). In this case, it is more difficult to know the right set of prices in the consumption-expenditure surveys, rather than in the consideration of wage income that is available in income surveys.

iv) Seasonal Variation.

There is an argument that claims that welfare is better measured with consumption-expenditure surveys. The argument is that consumption is subject to less variation than income over periods of time (Deaton, 1997, p. 148). It is explained that in developing countries, which are subject to a more unstable macroeconomic situation, consumption is less variable than income itself, so the former might be a better approximation for evaluation of well being. Deaton and Zaidi (2002, p. 14) commented about this process, which is known as 'smoothing', saying that "consumption is not closely tied to short-term fluctuations in income, and that consumption is smoother and less-variable than income". They also said that "there is a good evidence that consumers

can smooth out income fluctuations in the short term, certainly over seasons, and in most cases, over a few years" (Idem). In spite of this argument, it can be said that consumption might be seasonal. If we consider that the community enjoys periodic festivals or holidays, that consideration might introduce a bias if the time of the survey coincides with such period of time that does not represent the normal pattern of consumption. This information is difficult to know with certainty. In general, however, it is agreed that the size of this last bias introduces less noise than the advantage of the smoother variability of consumption that is captured in consumption-expenditure surveys.

v) Measurement error.

A problem that is always present in survey data collection is the accuracy of the information. The bias in the information can come from a variety of sources, such as misreported and underreported information. In the case of consumption-expenditure surveys, we have the case of misreported non-monetary income, such as self-consumption or payments in kind, etc. (Székely et al., 2000, p. 13). When gains from consumption from payments in kind are considered, we have the immediate issue of how to distribute those gains, which are usually imputed to the head of the household. Anand noted that "There is a problem with imputing income from jointly owned assets such as land or a family house. In practice, such income is likely to have been attributed wholly to the household head, and unpaid family workers, for example, would not count as income recipients unless they were in receipt of income from other sources. This should be borne in mind in the interpretation of some of the findings…" (1983, p. 187, note 2).[96]

[96] There also a discussion of including non-monetary items, as assets, into the income or wealth aggregate, in Cowell (1995, p. 100).

So the evaluation of different sources of income is a bias that introduces a measurement error in the evaluation of consumption.

In the case of income surveys, it is known that income data is usually underreported for the lower deciles, and misreported for the higher deciles. The story behind the underreported income is that people hope to get some help from the government as long as they report a poorer condition. People usually think that surveys are connected in some way with government alleviation programs. The underreported income in poor regions might also exists because of the natural tendency of the people to declare just the income flow, and might also be related with the naive ignorance of the surveyed individuals, who can be giving false information unintentionally about what really happen in the household (CTMP, 2002, p. 45).[97] The underreported income might also come from the difficulty of evaluating income from self-employment and the production for own consumption as well. It is argued that it is very difficult to gather accurate data for income from self-employment, either from small business or from agricultural environments. But this information is hard to get not only for developing economies, but in developed ones as well (Deaton and Zaidi, 2002, p. 14). The problem of misreported and underreported income in higher levels might be both a matter of personal safety and the fear to incur in higher tax liability (CTMP, 2002, p. 35, Chenery et al. 1974, pp. 4-5). The problem of misreported income in higher deciles it is not a problem for poverty measures, but definitely it might be for inequality assessment.

[97] Others argue that people in lower end of the distribution report higher levels of income, because those represent their aspiration preferences or because there are ashamed to say to the interviewer his/her real situation. In any case, only an empirical application can give an idea of the direction and the size of the bias in the measurement error.

Once that we saw the possible measurement errors in both consumption-expenditure surveys and also in income surveys is important to see what the literature say about this issue, and what would be the possible effect of this bias on the calculations of poverty or inequality. We understand that the discussion in the literature about the possible misrepresentation of inequality and poverty measures is not conclusive, and sometimes contradictory. For instance, De Ferranti et al. (2004) opine the following: "Is "real" inequality lower or higher than the estimates derived from household surveys? Unfortunately, the answer is not clear. Some factors lead to an underestimation of inequality (for example, misreporting of capital incomes or the absence of very rich people in the surveys), while others result in an overestimation (for example, using monthly income instead of permanent income or consumption)." (p. 53). From a different point of view, Deaton (1997) points out the problem of getting information from the household as a recipient unit, a practice that is very common in consumption-expenditure surveys, so when the consumption of each individual need to be considered, there is a propensity to understate poverty and inequality: "… the assumed equal distribution within the household could be reached from the unknown but true one by a system of equalizing transfers, so that any welfare measure that respects the principle of transfers will be overstated (or understated if a poverty measure) using household [consumption] data" (p. 150, [comment added]). So, using consumption based surveys, the measurement error in poverty and inequality indices could be bigger than using income surveys.

vi) Family Interactions.

One of the limitations of the consumption-expenditure surveys is such that because of the household approach, the focus of the survey remains on the head of the

household. In this case, consideration of the aggregated income raises the question whether all individuals make decisions over the pooled income. If the decision within a household is usually made by the head of the household only then it becomes difficult to know the satisfaction of preferences by persons who are not making the decisions, so the reported levels of deprivation might not be representative of the whole population. On the other hand, an income survey focuses on individuals rather than centering the attention on aggregates. It is true that the information is more limited, but the isolation of the individual is more appropriate for income surveys. If the consumption survey provides information about the characteristics of the family individuals, then it is possible to attach some 'weight' to each individual, because of the clear heterogeneity within the household, this is discussed in the next section as the issue of equivalence scales (**3.3 II b) i)**).

vii) Spatial aggregation

Income surveys are more useful for considerations of measurement of inequality when we consider the issue of the levels of spatial aggregation. This feature of income data, which generates data with greater level of detail, can be a source of crucial advantage for the researcher and the policy developer in the construction of regional analysis. It is known that information from expenditure surveys is more expensive to collect by household units, if we compare the cost with that of income surveys. Besides that, the information on expenditure surveys usually takes more time in order to be collected (Deaton and Zaidi, 2002, p. 15). In order to collect a reliable expenditure survey, it can take more than two weeks per household, because of the necessity to record detailed information on consumption spending. On the other side of the coin, asking

about labor income and employment information usually takes a few hours in a single visit. In this regards, for a given budget, income surveys provide relatively more observations. The higher sample size is a useful tool for the researcher. For instance, a higher sample size is more useful when we try to measure levels of poverty per region using the related statistics. Labor income is also preferred when it is used in the representation of welfare levels with spatial analysis tools.[98] However, when the assessment is done at the country level, expenditure data is preferred. In that case, it is obvious that what usually matters is the country as a whole and not the individual regions, so the precision of the sources of income rather than the variety of the disaggregated data seems to be more important.

viii) Measurement of Welfare Using Income Surveys.

The previous discussions of income vs. consumption-expenditure surveys tell us that the measurement of welfare is possible and the results are meaningful, even though imperfect with the use of income surveys. On the one hand, the higher sample size provides information for interregional comparisons, with the possible use of inequality and poverty maps. Atkinson (2006) mentioned that income might be related with potential capabilities and minimum rights, rather than just consumption of food that reflects the standard of living (2006**).** It is argued by several authors that if we want to measure poverty or destitution, it is better served by an expenditure survey, where the amount of goods with the proper prices will be giving us some minimal basket of goods consumed (De Ferranti et al., 2004, p. 36), however, in this case availability of data is a problem. When data availability is a constraint, we can support the use of income as the

[98] The spatial aggregation of census data is the most detailed, but its main constraint is the long period of time that takes to collect one survey in regards of the other.

measure of welfare (Székely et al., 2000, p. 12). It has been traditionally supported for Latin American countries that income is used as an approximation of welfare, so "the implicit assumption is that current household income, as measured in household surveys, is highly correlated to individual opportunities and intertemporal living standards" (De Ferranti et al., 2004, p. 36).

ix) Differences on inequality and poverty measurement

The effect on the measurement of inequality might be ambiguous in regards to the source of the survey data. We can explore the direction of the effect of using survey data on the inequality measure. For instance, if the measurement error has zero mean but introduces a higher dispersion to the values on the income distribution, the measurement of inequality that satisfies the principle of transfers will be artificially higher (Deaton, 1997, p. 151). On the other hand, if the measurement error is equally distributed on the population, such that the same proportion of income source is regularly unreported across the whole population, the measure of inequality would be unaffected because of the property of scale invariance. The Gini coefficient and the Theil Index are both scale invariant, so the measurement error might not seriously affect the reported levels of inequality in this case (see section **3.3 V**), but in the case of a higher dispersion of the distribution, the inequality measure that satisfies the principle of transfers will be affected. If the change of misreported income has some bias, for instance, that the poor people consistently fail to report self-employment income, the lower end of the scale will suffer from underestimation, therefore the levels of inequality would be overestimated. The opposite effect on inequality levels comes from underreported income by the richer people; the effect will be such that the distribution will be softened at the higher end of

the scale, so the reported inequality will be lower than real inequality. Other effect that might be ambiguous is when the inequality indices have the property of 'poor sensitiveness',[99] the reported level of inequality would be higher if the income at the lower end of the scale is underestimated, but the reported inequality will be lower if the problem arises from the misreported or underreported income in higher deciles. Finally, when income surveys are used such that only wage income is used as a source of welfare, the lower reported income will produce an overestimation of poverty if the definition of the poverty line *z* remains fixed; another effect of inequality calculated from income surveys is such that the effect on inequality measurement changes if the lack of income is more accentuated at the lower end of the scale, producing a more unequal distribution and therefore, showing a higher level of inequality in the community.

b) **Household vs. Individual Inequality.**

There are several reasons why inequality has been calculated mostly on a household basis. We might think that, historically, it was easier to deal with household inequality, because of the fewer observations on households than on individuals. In the past, the computational capacity used to be a big constraint. However, today the availability of computing resources makes it easy to calculate inequality at both the individual and the household level in a variety of ways. The decision between using income or household data is important; the results of inequality measures that use one or the other approaches are different. Medina (2001) says that "[t]here exists in empirical

[99] Property that was discussed in chapter **2**.

work a debate about which should be the appropriate variable to evaluate concentration of income. In fact, the principal controversy arises at the moment to choose *household income* or *per capita income*." (p. 22, emphasis in the original). According to him, both recipient units can be used, depending on the objective of the research. It can be argued that taking the individual as the recipient unit makes assigning the individual 'weights' in the family with the use of equivalence scales unnecessary, because all individuals would be considered the same in society. At the end, it will be a decision of the policy maker if h/she attaches more importance to one of the recipient units, either the individual or the household.

i) Equivalence scales and survey data.

The problem of adjusting income for family size is known in economics jargon as 'equivalizing' incomes (Cowell, 1995, p. 98). These equivalence considerations take into account not only the family size, but also the number of children and their representative 'cost' within the household. Economies of scale in households with more than one adult and the proportion of income devoted to food are also issues for consideration with equivalence scales. The use of equivalence scales might be directly linked with a household vs. individual discussion, but it is also indirectly related to the approach of expenditure vs. income surveys.[100] The issue is that the information needed in order to calculate equivalence scales are only available in consumption-expenditure surveys. For some equivalizing methods (e.g. Engel method) it is necessary to know the relationship between the proportion of the budget that is devoted mainly to the consumption of food with the proportion that is spent in other kinds of goods. This comparison can only be

[100] A brief survey of equivalence scales are mentioned in section **7.3 II**.

checked in consumption-expenditure surveys. If the family composition is to be taken rigorously, a consumption-expenditure survey becomes necessary in order to know the proper weights of each kind of individual within the household; income surveys can not tackle this issue directly. But once the relative weights of individuals are computed using consumption-expenditure surveys, it is possible to take those values and impute them into the calculations of welfare where the data source is an income survey.

There are assumptions that affect the modeling which involve equivalizing income and the variety of methods to calculate the scales are numerous.[101] Understandably, the econometric analyses methodology is different from one approach to the other. Some of the methods that are used to compute equivalence scales might claim superiority over other methods, but there is no consensus about the use of one of these methods as a general rule. This academic debate affects also governmental institutions, such that some governments remain skeptical about the use of equivalences in their calculations of income poverty or inequality, using only per capita income.

III Income with zero values (Non-response and Misreported Data).

There are concerns in the literature about the treatment of non-positive income in survey data. The concerns come from methodological and computational problems. (Cowell, 1995, p. 155). I will concentrate on the case of zero income, which is usually seen as a non-response bias. A 'zero' value in the data does not mean that the person represented in that observation shall not be considered. The problem arises if those zero observations are ignored, as it usually happens in practical computations when those

[101] The issue of equivalence scales and a discussion of a variety of methods are mentioned in chapter **7**.

values are dropped. When the functional form that considers the income distribution is assumed in some kind of logarithmic representation (e.g. Theil Index), this transformation becomes a problem in the case of zero as well as negative values. The non positive observation might imply that the individual is totally deprived or in debt, so a logarithmic transformation, which is convenient because of the emphasis on the poor, it fails to consider these perhaps poor people.[102] Zero values might not come from underreported income, but from the most destitute people. But it would be desirable that these destitute people could be taken into account on inequality measures (Anand 1983, p. 308). More than a technical problem, the most important issue here is from ethical considerations. The ethical judgment is considered very important by some authors, for instance, Dutta (2002) say that Gini coefficient has been considered better in a general sense: "This [Gini coefficient] gives it a decided advantage [accommodate non positive incomes] over the Atkinson and Generalized Entropy family since these are only defined for positive income." (Dutta, 2002, p. 615, [comments added]). In the available literature there are attempts to solve this problem. A simple solution can be to run the calculations in a normal way, but to impute directly some small income (ε) to the zero observations (Anand, 1983). Another solution can be to identify those individuals, taking estimates from income of similar people according to their characteristics, and then to impute them with a simulated income. This estimation can be made not only with people with zero income, but also with people with missing observations (Székely et al., 2000).

[102] Logarithms have convenient properties, they consider in a similar way high and very high values, but they have the power to explain with more detail what happen at the lower end of the distribution: "The fact that a logarithmic transformation staggers the income levels tends to soften the blow in reflecting inequality since it reduces the deviation, but on the other hand it has the property –as noted before—of highlighting differences at the lower end of the scale." (Sen, 1973, p. 29).

In the normative vs. pragmatic measurement discussion, we have some sort of trade off between the convenient decomposability properties of some methods (e.g. Theil) versus those which are able to attach greater importance to those who are the most deprived in society, people with zero income (e.g. Gini). The ethical judgment, about which property is more desirable, might be based on the 'practical' value of the theory for policy planners. On the one hand, decomposability by the population sub-group property allows policy makers to focus on the region or group that is considered to be contributing more to inequality. It is not always the case that 'the most unequal' groups should be considered first. It might be the case that groups with lower inequality, but larger population, have a larger impact on overall inequality. In this case, those groups might be considered first. On the other hand, if the population size of groups with zero income is large enough and these values are dropped from the computations, inequality measures might be biased downwards, making the assessment of welfare not only difficult, but incomplete.

There are other solutions to this problem if we assume that zero incomes refer to informally paid family members at the lower end of the distribution, as it happen when we deal with entrepreneurial activities. In this case, the measurement error in the analysis of welfare can be diminished. It can be assumed that the observation with missing and/or zero incomes should be treated equally as a 'non-response' bias, as is done by Székely et al. (2000, p. 17).[103] With a two steps technique, they simulate income data for those observations. The first step of their procedure is a regression of personal and household characteristics on income, so that the resultant coefficients can be used to predict each individual's income. The second step consists, after producing and ranking the estimated

[103] See also Székely and Hilgert (1999b).

incomes followed by calculation of confidence intervals, in doing calculations using the average of the income slightly above and slightly below of the missing and zero observations (Székely et al., 2000, p. 18).[104] The predicted value of the estimates is regrouped for each household, and the estimated values are used as if those come from the original data. In Latin American countries, the bias that is due to missing or zero income might not be apparently very significant, because the solution proposed does not lead to a very large change to the original results on inequality or poverty measurement. In the case of Latin American countries, this exercise in regards of headcount poverty measures can lead to a change between nothing and less than 5 percentage points change. The changes can be more important in economies with lower level of development, such as Nicaragua, where the change appears to be more than 10 points of difference using this technique of simulation. It should be borne in mind that a change of 3 or 5 percentage points on inequality or poverty measurement in a particular period of time, even though is a small change, it may mean an important change on the distribution of the very poor. In that sense, this 'small' change can have 'big' economic implications for the most destitute.

The technique mentioned in the last paragraph can help us to have an idea about the size of the bias that is caused by the presence of zero values in the survey data, which might come from misrepresented or undervalued income reported in survey data. It is also known that certain groups of the population are misrepresented in every survey, for instance, young people that already have a job, which are difficult to be interviewed or considered in any survey. These kind of biases might produce undesirable results, then

[104] The application of this technique has been discussed by Brick and Kalton (1996), Kalton and Kasprzyk (1986), and Rubin (1987), among others.

the measurement error in income surveys might lead to an underestimation of poverty in countries of Latin America, and also might lead to an ambiguous biased estimation of inequality (see section **3.3 II a) ix).**). The bias might come from the missing poor people in the survey, or from the misreported incomes in higher deciles of the population, among other things, so this simulation of the incomes and the imputation of those values in the calculations might help us to evaluate if the effect of the non-response values are affecting importantly the measurement of well-being.[105]

IV Survey coverage.

The principle of population replication of inequality measures (or independence of population) provides an extension of the basic theorem of *Lorenz dominance*, because it allows the comparability of inequality measures when the size of the population is not the same, a phenomenon that is very common in reality (Dutta, 2002, p. 610). This principle also allows the comparability of our inequality measures from different regions or from different time periods. We just need to assume some sort of equivalence of certain population group over different periods of time. Formally, the principle of population replication says, I being a suitable inequality measure, the following: $I(y, y,..., y; r \cdot n) = I(y; r \cdot n) = I(y, n) \forall r > 0 \mid r \in \{Integers\}$,[106] where r is the number of groups, each one containing *n* individuals having identical income distribution

[105] Another way to correct for these biases might be using adjustments for national accounts, which is a method to simulate a 'proper' income, the Mexican case discussed this issue (CTMP, 2002, p. 44-47), but the results are inconclusive. A general discussion is found in Ravallion (2000).

[106] Generally $I(R_r y) \equiv I(y, y,..., y) = I(y) \forall y \in Y_1, \forall r > 0 \mid r \in \{Integers\}$ where R_r is a replicator matrix of dimension $n(y) \times rn(y)$ with the form $R_r = [E, E,..., E]$ for some identity matrix E**.** (Shorrocks 1984, p. 1369).

y, so those can be aggregated into a single population of $r \cdot n$ individuals (Shorrocks, 1980, p. 619). The replicator r works as an arbitrary multiplier of the size of the population, and this convenient assumption makes it possible to compare inequality measures across regions, or to do the comparison between population groups across time. The above axiomatic generalization is one relevant issue, but another issue, perhaps equally relevant, is the confidence that the policy makers can have on the results, considering that the information might come from different populations with different size and different sample distribution. Not all the time the survey coverage is the same across different periods of time or across different regions within a country. These practical limitations are faced by the institutions that collect the survey data. The survey institutions have to make a variety of decisions in regards to the use of the statistical methods that define samples that are representing the population, and that also affects the homogeneity of the survey coverage. There are more practical issues to decide, for instance, a budget limitation that affect the sample size, a natural disaster, or a negative social conditions that might block the free flow of information during the time of data collection. It shall be convenient to explain in the research the assumptions made when we calculate inequality, so that our results can be taken with the caveats made clear, and our research might be considered reliable.[107]

Going further into the consideration of population size, the way to operationalise this condition has been discussed elsewhere (Foster and Sen, 1997, p. 122), and it is claimed that in order to get accurate estimates of human welfare it is necessary to take note of size variations on population. Sometimes the use of graphical tools has been proven useful, making clearer to the researchers and the policy makers how the survey

[107] An example of a sampling procedure might be find in INEGI (2000, part 3) for the case of Mexico.

coverage keeps changing. In this framework, the survey limitations can be clearly presented, and issues like budget constraints or changing sample sizes can be presented along with the supporting documentation, because it is known that these limitations affect the quality of the survey and the results that comes from this information as well. Again, this approach will make the results of the calculations more reliable.

V Consideration of Regional Prices.

It is difficult to see often an application of regional price adjustment in development inequality literature, even though the problem has been highlighted by some authors. The usual reason behind this apparent lack of consideration is the unavailability of regional price data. There are some operational problems that are better explained in a formal framework. Letting *I* being an inequality measure, it will be scale invariant (or income homogenous, or mean independent) if *I* remains the same for proportional changes of income. Intuitively, this condition might be violated if the changes on income are not the same for the whole population, as happens when diverse regions are affected differently due to those changes. Formally, $I(y,n)$ is homogenous of degree zero in the income vector y if and only if $I(ky;n) = I(y,n) \forall k > 0$ (Shorrocks, 1980, p. 621**;** 1984, p. 1372; Foster and Sen 1997, p. 139). The change in income is denoted by the letter *k*, which is supposed to be constant for the entire population. If the term *k* is not constant for the whole population, then the change in distribution *y* will not be the same for all $y_i \in y$, so the scale invariance property will not hold. The change of prices might be due to a factor like inflation. These differences on prices are also common in developing

economies because of the heterogeneity of the communities within the country. In this sense, De Ferranti et al. (2004) commented that “If prices faced by all households were the same, the distinction would be irrelevant. However, prices usually differ by location.” (p. 52). So, prices do not change automatically in every region of the country, and that should be considered on the calculations.

Going further in the price adjustment, Anand (1983) mentioned a violation of this property (p. 317), where even a homogenous change that is not proportional, but additive, I will not satisfy the property of homogeneity of income, such that $I(y+k;n) \neq I(y,n) \forall k > 0$, and it is clear that this change will neither satisfy the homogenous condition if the change of k is not the same for the whole population. In this case, the same as mentioned in the previous paragraph, there is no consistency in the calculations if the k is not the same for the entire population. What is true is that the possibility of making this adjustment lies in the availability of regional prices. That is the reason why price adjustment is seldom performed; Latin American economies are no exception in this respect. Even if regional price data were available, that does not completely solve the problem, since price dispersion may vary widely from one region to the other. Moreover, the price difference within a single region might be not the same for the whole sample, for instance, between urban and rural areas (De Ferranti et al. 2004, p. 52). In the available inequality literature, the results are a little bit different when income is adjusted considering a regional price, so the changes in the indicators of welfare with price change are relatively small (Idem, pp. 52-3).

VI Population Sub-groups.

When we need to make the decision about how inequality statistics are presented, there are many possibilities in regards to population sub-groups. The many combinations might be, for instance, inequality among specific social groups (i.e. traditional caste systems in some countries, or groups divided by income level such as deciles), inequality that considers gender or sexual orientation groups, inequality among different geographical areas (e.g. urban and rural), or indices by state or some pre-classified regional distribution within the country. Some people can have strong opinions in favor of one of the regional classification, but practically, it is not possible to show all combinations of regional disparities. There can be several reasons to believe that one classification is better than the other, and it might also be believed in the convenience to show those results in a particular way. The fact is that people, affected by their beliefs or the audience concerns, they can argue in favor of a certain way in order to express the results. This is why the decision about showing the results will depend on the audience, or the interest of the policy makers.

Nowadays it is very common to compare inequality between sub-groups of communities, such that we measure inequality in regards to geographical location, gender, or considering ethnicity. When we do these exercises, that there might be a limit in the groups considered should be borne in mind. Not all sub-groups are communities (Sen, 2000, p. 80), hence, this procedure should not be abused by the use of decomposition by population sub-group of deprivation measures, which is easy to calculate in practice, but difficult to explain if the group is artificially chosen. For

instance, the inequality of income among the group of households with more than 3 children might be compared with the income of the rest of the population, but the meaning of this comparison will be difficult to explain. Thus, this type of exercise shall be taken with care, because the definition of a 'sub-group' might not be very clear. The point is that the assessment of inequality among groups should have a solid foundation that should come from a documented position. Otherwise, there is the risk of implying that some classifications of groups of people are more important than others (e.g. gender inequality vs. urban-rural inequality), so the results might be considered incomplete.

3.4 Conclusions.

The considerations of operational procedures support the use of income surveys as a reliable data source, though imperfect, in the measurement of inequality. On the basis of the literature documented in this chapter, we can see that the variety of operational procedures and the decisions taken on those regards do indeed affect the reporting of inequality and poverty measurement. One of the important issues is that the researcher needs to provide a documented account of the inequality measurement and not only being focused on the estimates provided by the statistical measures. The research should provide an account of the operational decisions, so that policy makers and other researchers can make comparison of the results presented such as any bias might be discounted, or at least considered.

The quality of survey data and the institutions that undertake these surveys have been improving over the last decades. The different sources of information that are used

to calculate human welfare provide an opportunity to measure deprivation on intertemporal and interregional contexts. There is a strong tradition in the Latin American countries that prefers the use of income surveys. Consumption surveys, which are approximated with expenditure, are being progressively used as well. One issue related to consumption surveys is the focus on the household as the recipient unit; in this case, individual welfare is approached with the use of equivalence scales that are subject to a variety of theoretical assumptions on different methodologies. There are other operational decisions that might be important. There are issues that might pose ethical questions, for instance, the consideration of observations with zero value in the data sets, which are usually discarded on the computations, but those observations can be a representation of the poorest people. Another issue is the variability of the population size that has been solved with a theoretical assumption of a perennial homogenous population, which might be different from the reality. The existence of heterogeneous prices for different population groups makes inequality measures to be separated from the true picture, because of the violation of the property of scale independence. Summing up, the size of the biases and the measurement error can not be known with certainty by theoretical means, because even though the direction of the bias might be clear for a particular measurement error, the total effect on the measurement of inequality or poverty can only be computed using empirical data sets with a variety of sensitive analysis. Taking the case of Mexico as an example, a sensitive analysis will be performed in the next chapter.

Finally, the higher sample size of income surveys has been useful for the interregional comparison of human welfare. The higher sample size provides meaningful data for the measures that are sub-group decomposable, which can then be used to

estimate the contribution of deprivation by region, an approach that is highly appreciated in policy discussion. The spatial aggregation of income surveys also provides the researcher with the opportunity to show results using with geospatial maps; because of their intuitive graphical nature and richness in information, geospatial maps are better means for communication for such audiences that are not specialized in human welfare measurement.

4 Measurement of Inequality in Mexico: Operational Decisions and Empirical Issues.

4.1 Abstract.

Measuring inequality in Mexico, as an indicator of relative deprivation, has been calculated with technical alternatives that usually are not fully specified in development literature. Following the trend in Mexico that tries to formalize different measures of the standard of living, it is explored, for instance, the household or the individual as the recipient unit in the computations of inequality. Besides this, the use of the (wage) income information is compared with the inequality obtained from consumption-expenditure surveys. The technical issue of the people with zero or negative income is touched, and also the consideration of the different regional coverage of the survey instruments across time. In regards of the regional heterogeneity of Mexico, it is included in the calculations of inequality, the consideration of a regional Consumer Price Index (CPI). Not only the traditional Gini coefficient, but also other types of measures are also considered, as are those that belong to the Entropy family of indices, in order to present results in regards of different groups of the population. Finally, Geographical Information Systems' tools (GIS) in order to construct some inequality maps are used. After all of this, when the technical issues are explained, 'what' among 'whom' is calculated can be clearer.

4.2 Introduction.

A number of scholars have studied the issue of income inequality in Mexico. While their contributions have shed much light on many aspects of the Mexican income distribution, they share certain limitations. Insofar as they might ignore some important issues (to some extent, that might be due to the fact that most of the earlier contributions focused on the relationship between inequality and other variables, such as growth, education or poverty, rather than the study of different aspects of income inequality as such), [109] some of them have considered a number of those issues for the case of Latin America,[110] but in general, the research agenda is still open (CTMP, 2002; Székely, 2005, Székely, Lopez-Calva and Székely, 2006).

The aspects of inequality that are usually considered in the literature are based in the traditions that said that in order to estimate the amount of social inequality, the measurement must be done almost exclusively by the calculation of the Gini coefficient, using data from expenditure surveys and having the household as a recipient unit. Despite the fact of these assumptions, there are more technical issues that are sometimes unclear or neglected in the literature (Medina, 2001). Therefore, the focus of this paper is to tackle some of those operational issues. The methodological discussion was presented in the previous chapter, so is necessary to do some empirical applications. In that way we will have a better understanding of income inequality. The following aspects are some of these issues that have not received much attention in the literature about Mexican inequality so far:

[109] Székely, 1998; Székely, 2005; Lopez-Acevedo, 2006; among others.
[110] As in De Ferranti et al. (2004).

1. The recipient unit, either if it is considered the household or the individual as a basis. The consideration of family structure is mostly narrowed to the inclusion of per-capita (non-equivalized) income in Mexican literature (CTMP, 2002, p. 43, Székely, 1998, p. 255), but this has been changing (De Ferranti et al., 2004, p. 39-40). In this paper is covered both individual and household inequality. In the case of the calculation of household inequality, it is also considered the equivalized income, which assigns weights to individuals in regards of their gender and age.

2. The use of either expenditure surveys or (labor) income data in order to calculate income inequality. This issue is closely linked with the previous one, and in the case of Mexico, has had recently some debate. On the one hand, the discussion pointed out the important bias of savings in the information provided by expenditure surveys, but on the other hand, the debate was centered in whether the degree of underestimation on income surveys was more important than the inaccuracy of the recorded expenditure, which tries to approach real consumption (Cortés, 2005, p. 856). It has also been discussed the only use of expenditure surveys for calculation of inequality (CTMP, 2002), and because of that, it might be good to explore other sources of data rather than only consumption. Using those other sources, we might provide alternative and interesting results, as it is the more regional detail because of the level of aggregation of the data.

3. The inclusion of people with zero income in the computations (Székely et. al. 2000). It can be both a technical difficulty and an ethical problem for the measures that are unable to handle these observations (e.g. Theil index). On the other hand and because of this problem, the exclusion of the measures that use some form of logarithmic

transformation take off the opportunity to value more the people at the lower end of the distribution (Sen, 1973, p. 29). In any case, it is explored the size of the change in the measurement of inequality when this group of people is considered.

4. Survey coverage. The principle of population replication allows the comparison of different population groups in different time (Dutta, 2002). This is the assumption that permits the comparability of the results in regards of the different regional survey coverage. This coverage fluctuates across time in Mexico due to changes in budget and variations in methodological procedures. Our calculations show that this principle might be very strong for the case of Mexico.

5. Regional considerations. In order to acknowledge Mexico and its regional heterogeneity in regards of inequality measurement, the following topics are considered:

a) Different prices per region. In general, in the existent literature is used income data that comes from expenditure surveys, with some sort of general per-year price consideration through a Consumer's Price Index (CPI). But this is done only with an urban/rural regional assessment of prices.[111] In this paper is explored this property more in detail with an available regional price index that comes from the Bank of Mexico (2006).

b) Population sub-groups. In regards of the type of measures, the restriction of the computations only to the Gini coefficient, it might mean a limitation. The recent literature has been including other types of measures, as are those included in the Entropy family of indices, but this effort has not been consistently explored, but for Székely in some of his publications.[112] The diverse properties of the different types of measures help us to

[111] CTMP (2002, pp. 40, 46, 58, 61), Székely (1998).
[112] Restricted to the period before 1992 (1995; 1998, Ch. 2).

explain the various expressions of income inequality, and for instance, it is useful in this paper to explore the property of decomposability by population sub-group.[113] Therefore, I will consider in the estimations some natural divisions among geographical regions, and some divisions between urban and rural areas using the Theil index.

c) Inequality maps. The geospatial tools are being used in development economics, mostly on the construction of poverty maps. Using that technique, it is convenient to show inequality maps in a more understandable graphical way, because of the difficulty that means to present voluminous information to policy developers. This is more suitable using Geographical Information Systems tools (GIS), which have become more available due to the modern computational software and faster equipment.

The previous issues can be appreciated better if we look upon the economic scenario in Mexico. To understand better the results, the Mexican economic scenario will be explained in the following chapter, but it can be briefly mentioned that recent conditions are important in explaining the prevalent increases and decreases of inequality, and this is indeed related with the standard of living of Mexicans. It will be clear that the shocks experienced during the two major crises, the one in 1982 and the other during 1994-5, affected seriously the very poor (see also Lustig, 2001 & Lustig and Székely, 1998).

[113] The decomposition by income source has been explored recently; see Lopez-Acevedo (2006), among others.

- Overview.

The organization of the chapter is as follows: after this short introduction, the data sets and the tools used are briefly introduced in section **4.3**. The bulk of the chapter is section **4.4**, which includes operational decisions such as several possibilities are calculated using available data, such as 'household' vs. 'individual' inequality, survey limitations, pragmatic and normative measurement, and similar things. This section finished with some results of individual inequality, using GIS tools. Finally, section **4.5** has some concluding remarks.

4.3 Measures and other tools.

In this section, I will introduce technical details of the data sets and software used. The used measures, Gini coefficient and some of the measures of the Entropy family of indices, are briefly mentioned in this section but those were explained in detail in a previous chapter.

I Data and software.

The data comes from an extended version of the *National Survey of Employment* (*ENE –Encuesta Nacional de Empleo*), which is provided by the Mexican Institute of Information '*INEGI*' (*Instituto Mexicano de Estadistica, Geografia e Informatica).* It records data per household at individual level from the years 1991-2003, and includes

data not only on urban, but also on rural communities (details about the data in Appendix **4.6 I**; for some discussion about this type of survey see section **4.4 II**).

Regarding computations and software, it is used STATA version 9.1 and routines based on the code developed by Stephen P. Jenkins (1999**)**, and the graphic version of the Lorenz curves by Jenkins and Van Kerm (1999**;** 2001). For the graphic tools of Geographic Information Systems (GIS), it is used ARCGIS (ArcMap and ArcCatalog), Version 9.1. The geospatial map of Mexico was kindly provided by Glenn Graham Hyman (CIAT) from data developed in research of the Institute CIMMYT (Bellon et al., 2004).

II Measures.

As it was explored in chapter **2**, among the pragmatic measures there is a variety of this kind, such as the variance, the coefficient of variation, or the relative mean deviation, but those are not used very much for practical reasons or due to methodological constraints. Instead of those measures, the Gini coefficient is traditionally used and is broadly mentioned in development literature. On the other hand, the Entropy measures, such as the Theil index or the Logarithmic deviation measure, are being used more. Entropy measures are useful, mainly because of their decomposability by population sub-group property, but they have some limitations. Besides these two kinds, in the chapter is also used some traditional measures, such as shares and deciles with their related ratios. Those do not need too much explanation, just some intuition (see section **2.3 VII d)**).

4.4 Survey considerations.

Now that we have the tools and the prevalent scenario in Mexico, it can be started the analysis of the issues that have not receiving much attention in regards of inequality assessment, using the available data. Mexico belongs to the group of countries that have been improving the quality of survey data, and it has been more clear the procedures to operationalise the computations. In Mexico there has being an effort in order to standardize the most common measure of the standard of living, which is poverty. The Technical Committee of Poverty Measurement, (CTMP) produced a document called 'Medición de la pobreza: variantes metodológicas y estimación preliminar' ('Measurement of poverty: methodological variants and preliminary estimation'). It was published in 2002 (CTMP, 2002). This committee, as a result of a year of work, institutionalized the Foster-Greer-Thorbecke (1984) poverty measure, using non-equivalized income, having the household as the recipient unit, and the expenditure survey (ENIGH) as the main data source. This is the starting point for the consideration of human deprivation in Mexico, but only of poverty. Inequality measurement was left out from the agenda, and then my contribution will be the formal consideration of some of the different operational and technical issues in regards of the calculation of income inequality in Mexico, using an income data set that, among other things, it will allow a more detailed regional assessment. Therefore, the following topics are intended to shed some light into the limitations of previous literature.

I Household vs. Individual Inequality.

As it was discussed in the previous chapter, there might be reasons to do the computations of deprivation based on household. In the particular case of Mexican literature, it is acknowledged the problem about the recipient unit in the estimation of well being. For instance, it is said that is known that "per capita income over represent to the bigger households among the poor" (Teruel, et al. 2005, p.1). In this case, the consideration of individuals within the household leads to another problem, which is the proper weight (using equivalence scales) that would be assigned to each individual in regards of his/her gender and age. In this sense it was said that "unfortunately, there are not equivalence scales among the household members that are specific to the Mexican case, that is the reason why it was considered that the introduction of scales, made for other countries, it could introduced an unknown bias in the adjustment of the information for the Mexican case" (CTMP, 2002, p. 60, translated from the original). Later on, more research was done in regards of equivalence scales, and it was applied mostly for poverty measurement (Teruel et al. 2005; Teruel & Rubalcava, 2005). I will take some of the equivalence scales results in those papers, and apply them for inequality measurement.

In order to make a comparison between household and individuals, it is necessary to do both calculations. So my chapter shows those calculations in **Figure 4-1** (Gini), **Figure 4-2** (Theil) and **Figure 4-3** (Log. deviation). It can be noted that when we calculate Gini coefficient for households (yellow)[114], it has a higher level of inequality

[114] Due to some limitations of the data, household identification is not available for all years.

than inequality for individuals (blue).[115] With the exception of the immediate period after the 94-5 crisis, Theil index also show a higher household inequality, and again higher household inequality levels when is considered the measure of logarithmic deviation. It can be generally inferred that, *ceteris paribus*, household inequality is higher than individual inequality in Mexico, and to make clear the understanding of why inequality is like that, or if that is so, it will be necessary to assess it with weights that come from equivalence scales, which is discussed in the next paragraph. It can also be shown, that using bootstrap techniques, the statistical properties of the household or the individual inequality measures remain more or less the same, as it can be seen by the dotted lines, which represent the 95% confidence interval of the inequality measures (some details in Appendix **4.6 III**, **Table 4-9**).

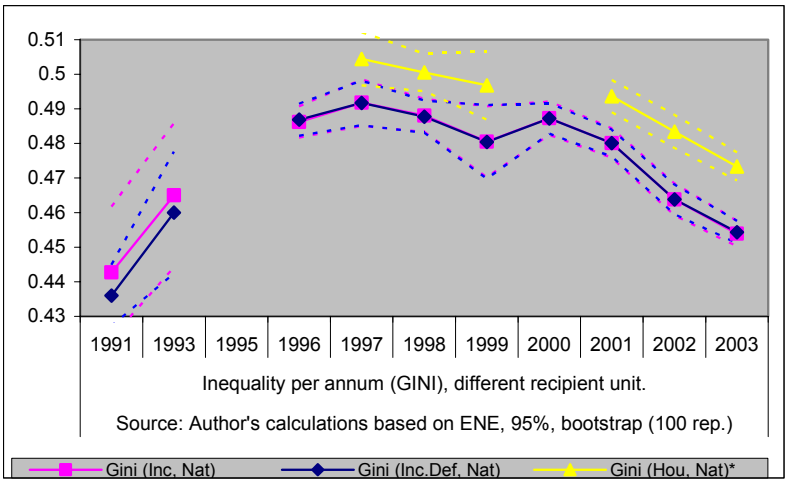


Figure 4-1. Income Inequality in Mexico (Gini)

[115] The pink line is the individual income without the price transformation, but the perceived change is minimal in the graph, so the blue and the pink lines are very close.

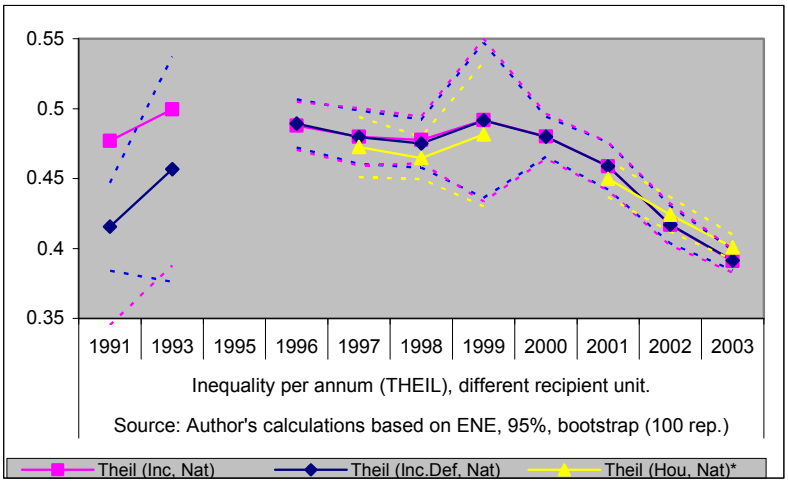


Figure 4-2. Income Inequality in Mexico (Theil Index)

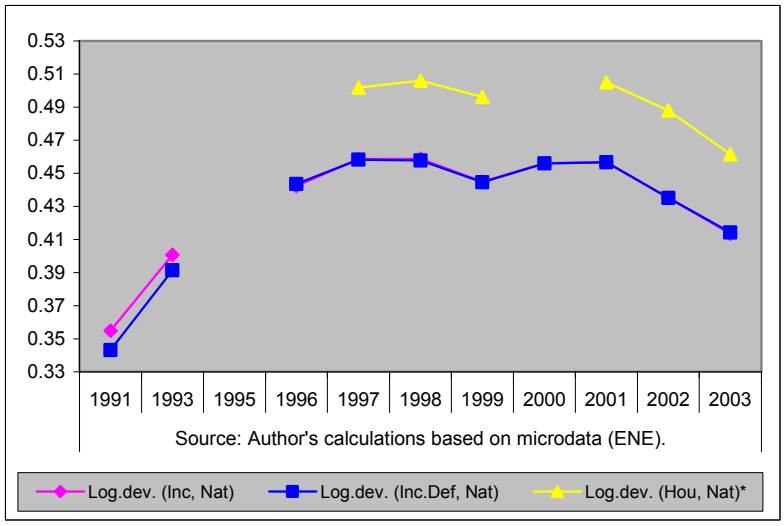


Figure 4-3. Income Inequality in Mexico (Log. Deviation)

Now considering the important issue of equivalence scales, I am doing another set of calculations that are presented in **Table 4-1**. Taking as a sample the year 2003, the results about household and individual inequality are such that in general, household inequality remains higher than individual inequality. How much higher depends on the assumptions made about the family composition. In the case of the Amsterdam Scales,

they consider children and females with a different weight (male and female children 0-13=.52, young male 14-17=.98, young female=.90, male adult=1, female adult=.9). In the parametric case, children are counted with a value of 0.7 (α), and economies of scale with a value of 0.75 (θ). Considering the Mexican literature, it was used the estimates in Teruel et al. (2005) according to the Engel and Rothbarth method, with and without economies of scales (without making a difference between males and females, because in their case the difference was not statistically significant).[116] It is also true that while the lower bound is shown by individual inequality, the upper bound is the per capita not equivalized household inequality, and the results are sensitive. From individual to individualized per capita household inequality, Gini coefficient shows a difference of 8%, and the difference gets lower up to 1.5%, considering the Engel method of equivalence scales with economies of scale. In this case, the equivalization almost corrects from the aggregation problem on the household per capita income. This is not the case for Theil Index, which present a higher difference, 25% higher in individualized household inequality than on pure individual data, getting significantly lower, but still 8% higher than individualized per capita household inequality when we look at the same Engel method. In all cases, equivalized household inequality remained higher than individual inequality, and a little bit lower when are introduced economy of scales within the household. So, the results are sensitive from 1.5% on the best case, to 25% on the extreme case, and this show that the operational procedures might mean a big difference, therefore those procedures should be explained in detail.

[116] Teruel et al. (2005, p. 22). Engel method with economy of scales, children 0-12=.65, young 13-18=.61, and adults 19 and up =.82. Engel method without economy of scales, children 0-12=.78, young 13-18=.74, and adults 19 and up =1. Rothbarth method with economy of scales, children 0-12=.54, young 13-18=.54, and adults 19 and up =.71

Inequality Measurement and Equivalence scales (2003)	Gini	Theil
Individual Inequality	**0.4733**	**0.4007**
From Household aggregates		
Per capita inequality (No equivalence scales)	0.5132	0.5033
Equivalized income (Amsterdam Scales)	0.4953	0.4642
Equivalized income (Parametric method NRC (1995)).	0.4812	0.4300
Equivalized income (Mexico, Engel, no economies of scales)	0.4782	0.5021
Equivalized income (Mexico, Engel, with econ/scales)	0.4793	0.5026
Equivalized income (Mexico, Rothbarth, with econ/scales)	0.4806	0.5032
Source: Author's calculations based on microdata (ENE).		

Table 4-1. Household and individual inequality (with equivalence scales). 2003.

II Income vs. Expenditure Surveys.

The discussion on chapter **3** about the use of income surveys and consumption-expenditure surveys it highlighted some properties, advantages and disadvantages of both approaches. In the Mexican literature was said that in order to make indicators of welfare, such as poverty or inequality measures, the use of income or consumption data might imply a decision, which can be both a practical issue and a conceptual challenge (CTMP, 2002, p. 34), so it is recognized the difficulty of choosing one source or another. In Mexico there are roughly three kinds of data sets available for the measurement of inequality, a) census data, b) expenditure data *(ENIGH)* and c) income coming from employment surveys *(ENE/ENEU)*. All instruments have their own properties, advantages and disadvantages (CTMP, 2002, p. 27). For poverty assessment, in general, there are not many decisions to take: if the researcher accounts with an expenditure survey, this is usually preferred to others, because this is supposedly better to approach

consumption. With expenditure data is possible to draw a poverty line according with a particular basket of basic goods.

But a survey with expenditure data is not mandatory in regards of inequality measurement. In order to make the policy maker aware of this discussion, it will be good to compare our results (income survey) with other published results (expenditure data), as we can see in **Table 4-2**. For instance, looking at the results around the year 2000 we can see first a comparison of our estimates with other source, which uses a similar income survey (ENEU-ENET). The results for the year 1990 or 1995 are quite similar. Checking the estimates of the inequality indices (Lopez-Acevedo, 2006), it is shown for the year 2000 that both Gini (0.4400) and Theil index (0.3990) are consistently lower than our estimates of household inequality (0.4968, Gini; 0.4816, Theil), but this is because of the different operational assumptions made on her calculations.[117] In the second place, if we compare the results that use consumption-expenditure data with ours, the indicators of household inequality (.5460, Gini; .6160, Theil) are consistently higher than our estimates. This is an example of how diverse are indicators of inequality in different papers, but that is mostly related with the different (sometimes unknown) operational and technical assumptions that were taken.

[117] She dropped not only observations with zero income but very high incomes because those were considered unreliable in her criteria.

Inequality Indices for the Distribution of Earnings, comparison of different sources and years.

	Recip. Unit	Inc. Source	Equivalized	Deciles				Ratio	Traditional Measures	
	(Ind/Hou)	(Wg/Exp)	(Eqv/No Eq)	Bot. 20%	Mid. 40%	M.Hg. 30%.	Top 10%	R 10/20	Gini	Theil
1991 (Own calculations)	I	W	-	4.3%	22.2%	35.7%	37.8%	8.79	0.4360	0.4155
1991 (Own calculations)	H	W	NE	na	na	na	na	na	na	na
1992 (L-A 2006)	H	W	NE	6.5%	23.4%	33.5%	36.6%	6.74	0.4340	0.3960
1992 (DeF 2004)	H	Ex	NE	3.1%	18.3%	33.9%	44.8%	14.45	0.5590	0.6670
1992 (DeF 2004)	H	Ex	Eq	3.4%	19.3%	34.1%	43.2%	12.71	0.5390	0.6120
1997 (Own calculations)	I	W	-	2.2%	19.7%	34.5%	43.6%	19.72	0.4917	0.4795
1997 (Own calculations)	H	W	NE	1.7%	16.2%	38.8%	43.3%	25.82	0.5044	0.4726
1996 (L-A 2006)	H	W	NE	5.7%	22.1%	33.6%	38.6%	6.74	0.4640	0.4740
1996 (DeF 2004)	H	Ex	NE	3.2%	18.9%	34.6%	43.3%	13.53	0.5440	0.6160
1996 (DeF 2004)	H	Ex	Eq	3.6%	19.8%	34.7%	41.8%	11.61	0.5250	0.5710
1999 (Own calculations)	I	W	-	3.7%	22.5%	36.0%	37.8%	10.14	0.4804	0.4916
1999 (Own calculations)	H	W	NE	2.9%	21.2%	39.9%	36.0%	12.28	0.4968	0.4816
2000 (L-A 2006)	H	W	NE	5.9%	23.3%	34.5%	36.2%	6.11	0.4400	0.3990
2000 (DeF 2004)	H	Ex	NE	3.1%	18.9%	34.9%	43.1%	13.90	0.5460	0.6160
2000 (DeF 2004)	H	Ex	Eq	3.4%	19.7%	35.3%	41.5%	12.21	0.5270	0.5580
2002 (Own calculations)	I	W	-	2.8%	21.3%	38.1%	37.8%	13.56	0.4638	0.4169
2002 (Own calculations)	H	W	NE	3.7%	21.3%	38.3%	36.7%	9.89	0.4834	0.4242
2002 (L-A 2006)	H	W	NE	6.7%	25.5%	35.5%	32.3%	4.81	0.3960	0.3020

Notes: Ind= Individual, Hou = Household, Wg= Wage Income survey, Ex= Expenditure surveys.
Sources: L-A 2006 (Lopez-Acevedo, 2006), DeF 2004 (De Ferranti et al., 2004), and Own calculations (ENE survey)

Table 4-2. Comparisons between surveys, inequality indices and deciles.

Some indicators of inequality that use expenditure survey data take into account weights to individuals within a family. The inequality indicators (Gini and Theil) that use equivalence scales here (marked with 'Eq' on the third column of the table) show to be lower compared with the values that use just per capita income ('NE'). This is also consistent with our findings, albeit the functional form and the values assigned to the parameters are slightly different than those in our calculations (recall **Table 4-1**).[118] We shall bear in mind that the indicators that come from (expenditure) equivalized income might be more comparable with our estimates of (income) individual inequality. To finish this section, it is also shown other kind of measures, such as deciles and shares in the same table. The finding is that shares, which come from expenditure data calculations, are lower than the household income shares, particularly at the lower end of the distribution.

[118] The equivalized income is calculated by the formula $(A+\alpha_1 \cdot K_1 + \alpha_2 \cdot K_2)^{\theta}$ where A is the number of adults, K_1 the number of children under 5 years, and K_2 the number of children between 6 and 14 (De Ferranti et al. 2004, p. 40). Following Deaton and Zaidi (2002), they assigned values to the parameters in the following way: $\alpha_1 = 0.5$, $\alpha_2 = 0.75$ and $\theta = 0.9$.

III Income with zero values.

There were discussed in chapter **3** a variety of methods in order to solve the issue of zero income. For our purpose, I will focus in the simple solution that is mentioned by Anand (1983), assigning some small positive value (ε) to those individuals who are willing to work, assuming that they have no income because they are unemployed (Anand 1983, p. 308). If we consider individuals who are willing to work, but have no job (and because of that, no income), the Gini coefficient, as expected, increased between 0 to 2%. This can be shown in the column of 'differences', located at the right hand side of **Table 4-3**. In the other columns we can see the different effect of the change on indices with logarithmic transformations (Theil and Log. deviation). If the values of zero income are set up equal to 1, the Theil index increases by 1% up to 5%. We can argue that the higher increase of inequality expressed by the Theil index is not surprising, because of the number of observations with zero income also increased, and that might be related with the higher proportion of the unemployed after the 94-5 crisis.

Sensitive analysis. People with zero income.

Simulation (ε=1) Year	Calculations			Differences with original		
	Log Dev	**Theil**	**Gini**	**Log Dev**	**Theil**	**Gini**
1991	0.32884	0.41812	0.43652	**0.00%**	**0.00%**	**0.00%**
1993	0.32371	0.37999	0.43386	**0.00%**	**0.00%**	**0.00%**
1995	0.63829	0.70583	0.51917	**29.12%**	**3.22%**	**2.11%**
1996	0.57133	0.50924	0.49696	**28.84%**	**4.06%**	**2.08%**
1997	0.55198	0.49413	0.49907	**20.45%**	**3.04%**	**1.50%**
1998	0.52156	0.48688	0.49293	**13.82%**	**2.05%**	**1.02%**
1999	0.49072	0.49866	0.48409	**10.38%**	**1.44%**	**0.77%**
2000	0.5033	0.48697	0.49087	**10.40%**	**1.49%**	**0.75%**
2001	0.49983	0.46536	0.48347	**9.46%**	**1.41%**	**0.70%**
2002	0.47883	0.42346	0.46729	**10.06%**	**1.57%**	**0.75%**
2003	0.46844	0.39946	0.45869	**13.11%**	**2.06%**	**0.97%**

Simulation (ε=1 E-10) Year	Calculations			Differences with original		
	Log Dev	**Theil**	**Gini**	**Log Dev**	**Theil**	**Gini**
1991	0.32884	0.41812	0.43652	**0.00%**	**0.00%**	**0.00%**
1993	0.32371	0.37999	0.43386	**0.00%**	**0.00%**	**0.00%**
1995	1.1419	0.7059	0.51918	**130.99%**	**3.23%**	**2.12%**
1996	1.0264	0.50931	0.49697	**131.46%**	**4.08%**	**2.08%**
1997	0.88658	0.49418	0.49908	**93.46%**	**3.05%**	**1.50%**
1998	0.74605	0.48691	0.49294	**62.81%**	**2.05%**	**1.02%**
1999	0.65396	0.49868	0.48409	**47.09%**	**1.45%**	**0.77%**
2000	0.66816	0.487	0.49087	**46.56%**	**1.50%**	**0.75%**
2001	0.64921	0.46537	0.48347	**42.17%**	**1.42%**	**0.70%**
2002	0.62934	0.42348	0.46729	**44.66%**	**1.57%**	**0.75%**
2003	0.65423	0.39948	0.45869	**57.97%**	**2.07%**	**0.97%**

Source: Own calcuations (ENE), Various years

Table 4-3. Effect of zero income in levels of inequality.

At the difference of Theil index and Gini coefficient, the Logarithmic deviation shows a higher impact when $\varepsilon = 1$, and much more when income is equalized to an smaller value $(\varepsilon = 1.0.E-10)$. This last finding is difficult to interpret. It was also found that after taking this into consideration, the standard ranking tools (e.g. deciles) suffered some changes, but those results are not shown because of space constraints. The ad-hoc assignation of a small positive value (ε) proved to be useful to shed some light on inequality measurement in the sense that any given measure will be sensitive with the inclusion of people with zero income. Therefore, it can be said that the extent of this gap, which can go from 1 to 5 percent, means that the normal lack of consideration of this

very poor people, dropping those observations from the sample, certainly would show that in reality the levels of inequality are higher in that proportion.

IV Survey coverage.

In the case of Mexico, it is stated in the government institution's procedures that all survey projects should consider, among many things, sample size and geographical coverage according to the budget (INEGI 2005, p. 16). Usually, in almost all surveys, we can find a detailed specification of the sample, its size, and the methodology used, in order to ensure that the sample is representative of the population.[119] But one of the issues that is not very common, is to find in those explanations the detail of the budget constraints, or some technical issues that limited either the size of the sample, or the data collection in certain areas. When our inequality measures take into account the principle of population replication, it is making a convenient, but a strong assumption. In the first two boxes of **Figure 4-4**, we can see that survey coverage was very limited. That is shown by the empty spaces that correspond to the non-surveyed municipalities. Later on, we can see that little by little, most of the country was more represented by the sample.

[119] Some technical details are found similar in INEGI (2000 and 2003).

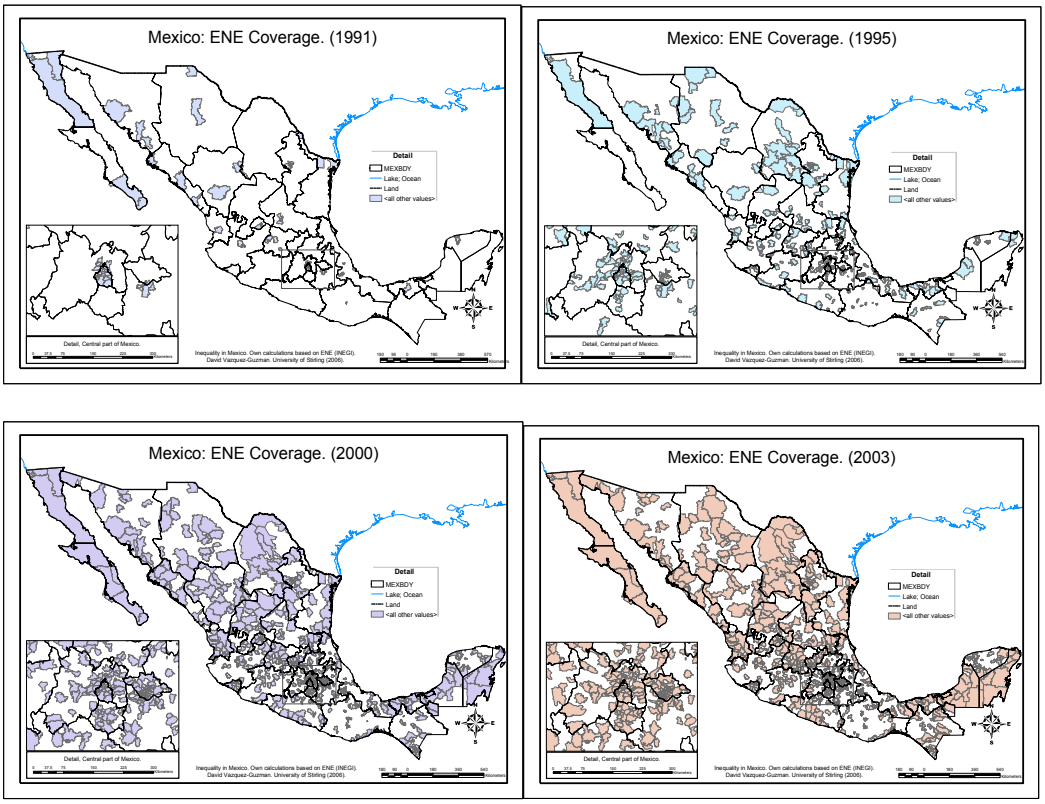


Figure 4-4. Geographical coverage of *ENE* survey, selected years.

In order to know how these possible new samples have been changing across time, and if that has been affecting the size or the dynamics of real inequality, I calculated individual inequality measures for all the years, but considering only the 215 municipalities included in the first survey (1991).[120] The **Figure 4-5** shows the similar, but lower inequality of the new computations when it is used only the small sample. In that sense, it can be clear that the larger regional coverage of the survey, allows a different (and supposedly better) understanding of the dynamics of inequality.[121] The small sample of 215 municipalities has also a higher variance (using the bootstrap

[120] The results for the household inequality are similar, and are omitted for obvious reasons.
[121] It might be inferred that there is a (small) positive relationship between the size of the area covered, and the levels of inequality, but this finding might be explored. A similar exercise that shows also regional differences in a similar survey can be found in Freije et al. (2006, p. 282).

technique) across time, presented with the dotted line. By the previous reasons, it can be seen that the axiom of independence of population does not hold perfectly for the case of Mexico, because inequality levels are not equal in the different samples, neither their statistical properties.

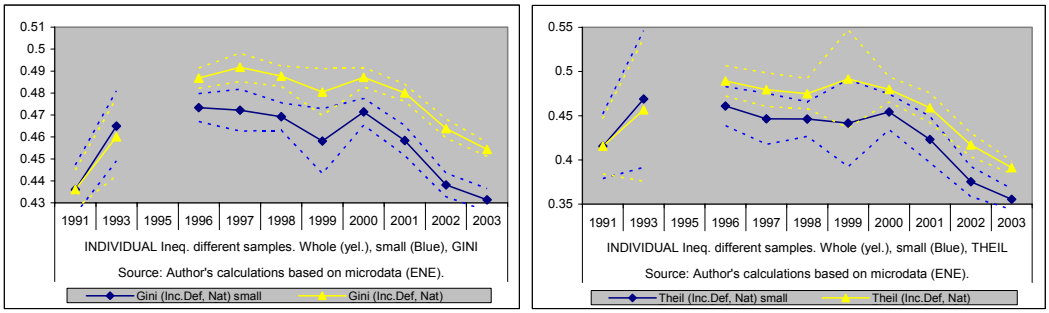


Figure 4-5. Comparison of different samples, Gini and Theil.

V Regions.

Mexico is a country that because of its geographical size and because of its different ecosystems within, it presents a particular heterogeneity in regards of its climate, culture, and economy. In the case of the assessment of social inequality, which can be seen as economic phenomena, those regional differences must be considered as much as possible. The topics in this section try to capture some of this regional heterogeneity, so income inequality might be explored better.

a) **Regional Prices**

It is the contribution of my paper to consider inequality with these regional prices in a detailed way. Recent literature made an effort to include some sort of this regionalization in Latin American countries (De Ferranti et al., 2004), but for the case of Mexico, the literature is practically inexistent. Considering the particular characteristics of Mexico, if we consider the country as a whole without regional differences, our results can be misinterpreted, because the poor and the rich are not 'homogenously' distributed within the country. "We must recognize that changes in consumer goods' prices will affect the purchasing power of the poor and of the rich in different ways". (Cowell, 1995, p. 100). For Mexico, we can solve this issue, because it is the case that the Bank of Mexico publishes periodically a regional index (2006**)**, using as a base the year 2002. The Bank uses its own regional distribution, which is based on such factors as the proximity of a municipality with respect to the U.S. border, state geographical closeness, and density of population (2002, p. 6), as we can see in **Figure 4-6**.[122]

[122] This distribution is useful for consideration of prices, but it might not be very much for other purposes. It has the inconvenience of mixing municipalities within states that belong to different regions, as is clearly noted in bordered states colored in gray in the map.

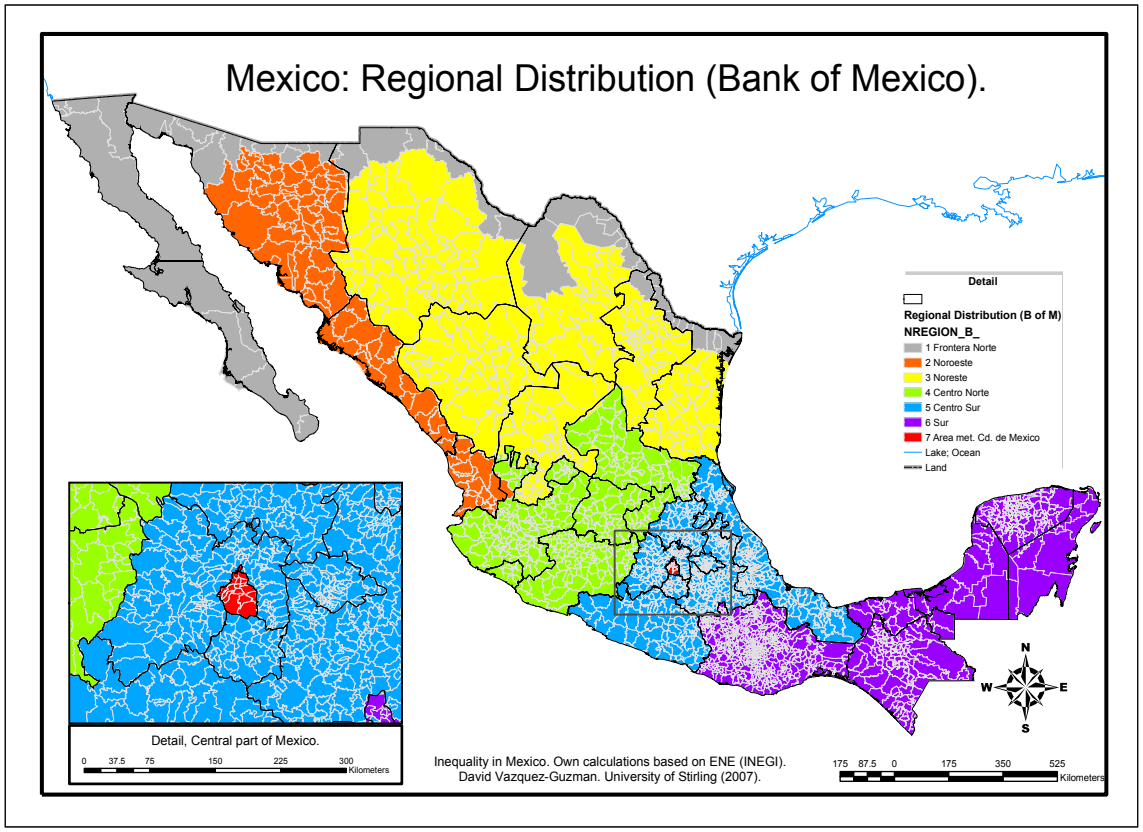


Figure 4-6. Regions (Bank of Mexico)

The Bank of Mexico publishes the Consumer Price Index (CPI), not only at a national level, but also at a regional level as well. The CPI is composed by 8 categories of goods, according to the consumers' expenditure (food, clothing, housing, furniture, health, transportation, education and others). The CPI considers more than 170,000 price inputs that are gathered in a monthly basis from different sources, and are stratified in 313 generic concepts (Bank of Mexico, 2002, p. 3). In order to calculate the CPI, it is imposed a particular weight to each category of goods. These weights are constructed from data gathered in an expenditure survey (ENIGH), so the weight of each category is assigned in relation to the population average consumption of the good, as a proportion of

the total expenditure (Idem, p. 4). Moreover, in order to consider in a proper way the regional distribution, it is assured that at least in every state of the country one important city is chosen. That makes each region to be represented through the overall collection of price inputs. It is also the case that the cities are classified according to their population size, and finally, the price index considers 4 household strata according to their income level.[123]

In **Figure 4-7** we present a set of selected years of the Generalized Lorenz curves for the whole country, without price index consideration. It is convenient to note that without transforming income into 2002 prices, it is not possible to compare 'real' income distribution, neither to compare how economic conditions, during the crisis of 1994-5, really affected the people's purchasing power. It can also be seen that differences across years are very dissimilar, so we can be tempted to believe that using the *Generalized Lorenz Dominance* criteria, the Lorenz curves do not intersect each other and can be accordingly ranked. It might be thought that later years were better than previous in regards of income distribution, but the mentioned 94-5 crisis makes us think more about this first graph.

[123] There is a recent critique about the calculation of the CPI in some Latin American countries, including Mexico, and how happen that "with heterogeneous consumption baskets the overall CPI tends to mimic the individual price index of [just] the better off" (Goñi et al., 2006, p. 4 [comment added]), having as a result that "the changes in nominal inequality provide and upward-biased measure of the underlying changes in real inequality" (Idem, p. 10). But this just enforces our theory that it is necessary some regional assessment when we consider prices of goods.

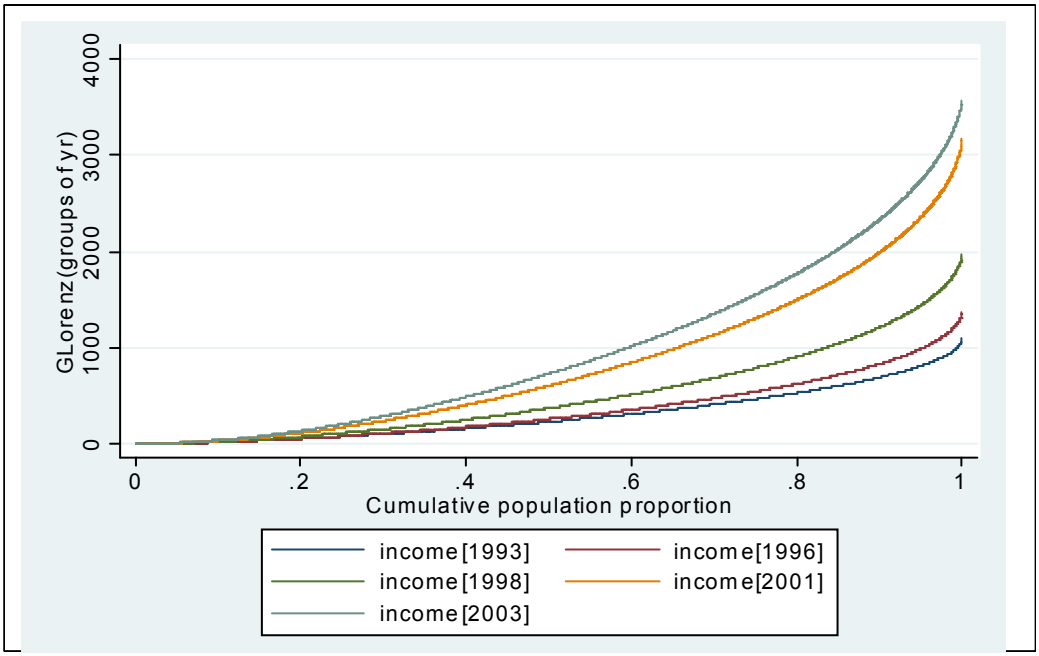


Figure 4-7. Distribution of Income without price index consideration

After the price deflation, which is a contribution of this chapter, the picture changes quite a bit. I can be shown in **Figure 4-8** that, after applying to every income the regional CPI published by the Bank of Mexico, the order of the curves changed, and it is clear that the Mexican economy enjoyed higher real incomes before the 94-5 crisis, where the income distribution of 1993 was better than later years. We can also note that, just recently, the distribution has becoming similar to those years before the cited crisis, as it can be seen in the graph. It got closer the recent distributional curves (2001 and 2003) to the distribution before 1996. It still seems to be that curves do not intersect each other, so it can be applied a direct Lorenz ranking. By now, using the graphical Lorenz curves is clear that it will be better to consider levels of inequality with regional prices, because that allow us to compare the status of income distribution through time, much better than without regional price assessment.

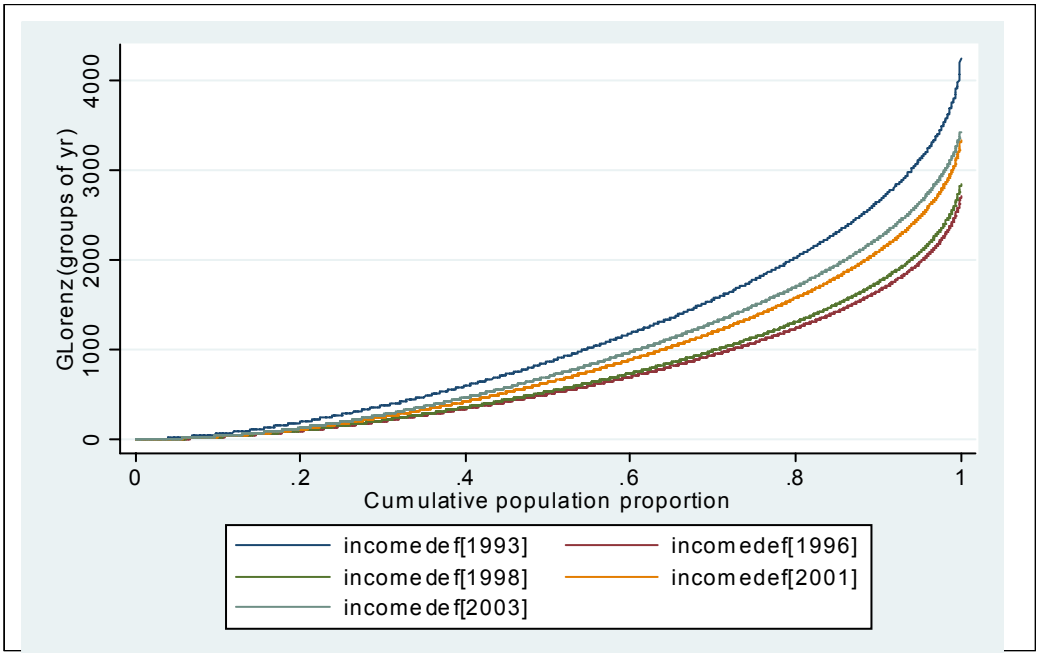


Figure 4-8. Distribution of Income in regards of regional price index.

Still considering prices, we can carry out some regional computations. We know that most of the inequality measures are invariant to a change in prices, because they focus in relative variations of income (Sen 1973, p. 69; Foster and Sen, 1997, p. 139; Annand, 1983, p. 339), but in this case, the assumption of 'mean-independence' can be violated, because of the prices that affect income in a different way in each state or region. Taking into account regional prices on inequality computations, it was carried out an interregional comparison, shown in **Table 4-4**.[124] It is observed that in the columns with 'differences', some values are different than zero. The regions that show values different from zero, is because of the small, but perceived change between the column of the deflated vs. the non deflated inequality index, due to the presence of price changing.

[124] Regional classification of states is briefly presented in Appendix **II**

This fact can almost be ignored in state comparisons (except in states in the border with the U.S.; detail in Appendix **4.6 III**, **Table 4-8**)

Region	Gini			Theil			Log Dev.		
	Deflated	Non-def.	Difference	Deflated	Non-def.	Difference	Deflated	Non-def.	Difference
1	0.4818	0.4817	0.013%	0.4931	0.4929	0.027%	0.4451	0.4449	0.025%
2	0.4625	0.4626	-0.006%	0.4215	0.4216	-0.017%	0.4338	0.4341	-0.026%
3	0.4338	0.4338	0.000%	0.3521	0.3521	0.000%	0.3651	0.3651	0.000%
4	0.5426	0.5425	0.014%	0.5412	0.5411	0.010%	0.6044	0.6040	0.044%
5	0.5111	0.5112	-0.006%	0.5044	0.5046	-0.019%	0.5165	0.5166	-0.018%
6	0.4214	0.4215	-0.017%	0.3542	0.3544	-0.021%	0.3403	0.3407	-0.040%
7	0.4254	0.4253	0.009%	0.3620	0.3618	0.022%	0.3140	0.3139	0.008%
8	0.4524	0.4524	-0.001%	0.3875	0.3875	-0.002%	0.3772	0.3772	-0.002%

Source: Own calculations for the year 2001 (ENE)

Table 4-4. Effect of regional prices in different inequality calculations. 2001.

My results are consistent with the available literature, where small, but perceived changes are presented in experiments in Argentina and Chile (De Ferranti et al., 2004, p. 53). Therefore, it might be seen that results became comparable, and a little bit more accurate, so it might be more useful to employ income that takes into account some price index. This will have the advantage of making it easier the comparisons across time with a uniform base year, but the levels of inequality seems to be not very different.

b) **Population Sub-groups.**

For Mexico, the tradition of the classification lies in the regional groups, either location or urban and rural areas (World Bank, 2004). I acknowledge that in other parts of the world, the interest can lie sometimes either in the gender classification (because of

possible female discrimination),[125] or sometimes in social groups classified by income level (i.e. deciles). The gap between urban and rural areas is recognized in Latin-American literature (World Bank, 2004, De Ferranti et al., 2004, among others). In **Figure 4-9** (Gini), we can see that inequality is consistently higher in rural areas compared with the national indicator. So inequality at a national level remains in the middle of both urban and rural inequality. We can also observe higher dispersion (using the bootstrap technique) in years where happened economic or social shocks (during the 94-5 crisis, or the year 1999, previous to a presidential election).

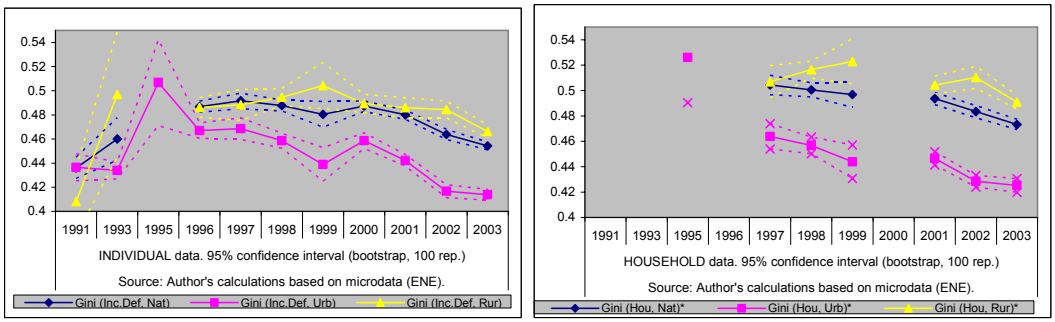


Figure 4-9. Household and Individual Inequality (Gini). Total, Urban & Rural areas.

If we compare the graph of the Individual data (left), with the one with the household data (right), the numbers are similar, just the dispersions appears to be smaller

[125] In spite of this, in Mexico, for instance, when is controlled for observable characteristics, the size of gender inequality is narrower than in the rest of the Latin-American region (De Ferranti et al., 2004, p. 62) and sometimes, with surprising reverse results in favor of females (Idem, p. 75, n. 60). Other development literature, in regards of poverty measurement, tests for gender differences, finding no statistical significance in favor of males or females (Teruel et al., 2005, p. 22), and finally, it is also known the case where Mexican females have different understanding of what is 'development', such that they challenge the traditional theory that supposedly make them always better of when, for instance, they get a paid job outside of their house, or they enroll in contraceptive method programs promoted by the state (Nazar-Beutelspacher et al. 2005, p. 236)

in the household data. The **Figure 4-10**, which uses the Theil index, shows a similar outcome than the calculations that uses Gini coefficient, and both are consistent with the present literature (World Bank, 2004, p. xxii & xxiii).

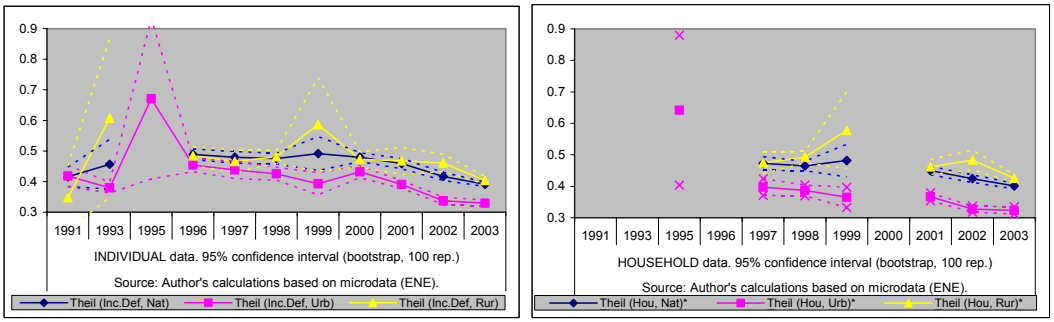


Figure 4-10. Household and Individual Inequality (Theil). Total, Urban & Rural areas.

c) Individual inequality: some results.

There is also a methodological challenge to display results in an appropriate manner. Now is more possible to show visually accessible and friendly results with the availability of modern equipment and software. There is a recent growing trend in 'poverty mapping', because "The plotting of such information on maps – poverty mapping – is useful to display information on the spatial distribution of welfare and its determinants. It is also useful to display simultaneously different dimensions of poverty and/or its determinants." (World Bank, 2007). The so called 'spatial analysis' allow us to process in a short period of time a lot of information. Now it is important to consider some of the certain limitations of expenditure surveys, as is their level of aggregation and

the sample size. Expenditure surveys have a lot of detail in consumption, but the number of observations is very limited, because they have other focuses, such as the assessment of poverty at a country level. On the other hand, an income survey looks more suitable in order to do a proper spatial analysis. It will be desirable to account with data in the level of aggregation of census data, but usually census data do not focus in income data or expenditure details, and the time period between one survey and the other is very long. The graphics of Gini coefficient (**Figure 4-11**) and Theil Index (**Figure 4-12**) at municipality level are consistent with some stylized facts, as is the high inequality in country side regions, or some regions with higher inequality in states with big industrial corporations, or in tourist areas with high investment. The analysis and the interpretation of the inequality maps are left to the policy maker. For the case of Mexico, it will be very difficult to show all the 2500 municipalities in a table, but in an inequality map is possible to give an idea about them.

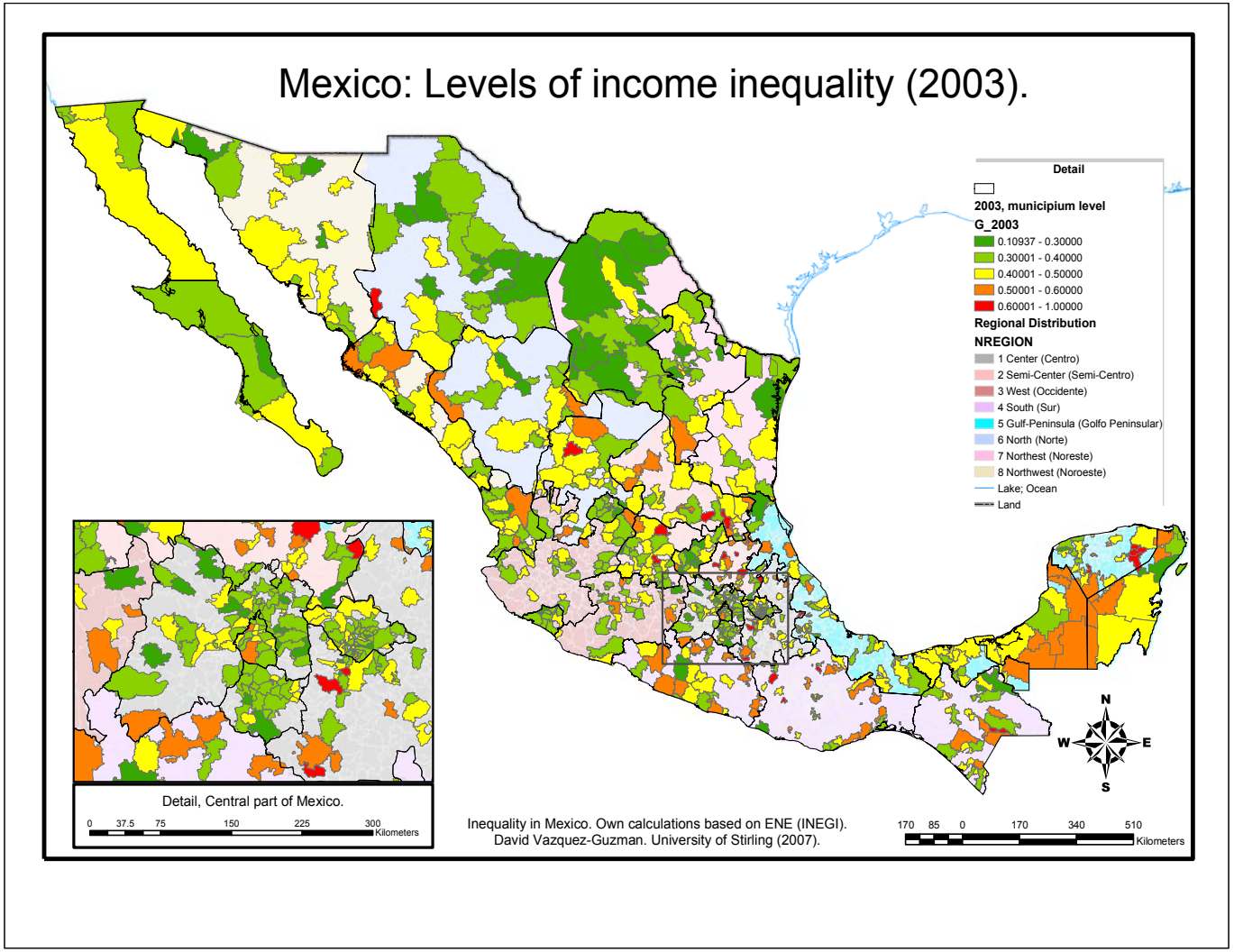


Figure 4-11. Gini per municipality (2003).

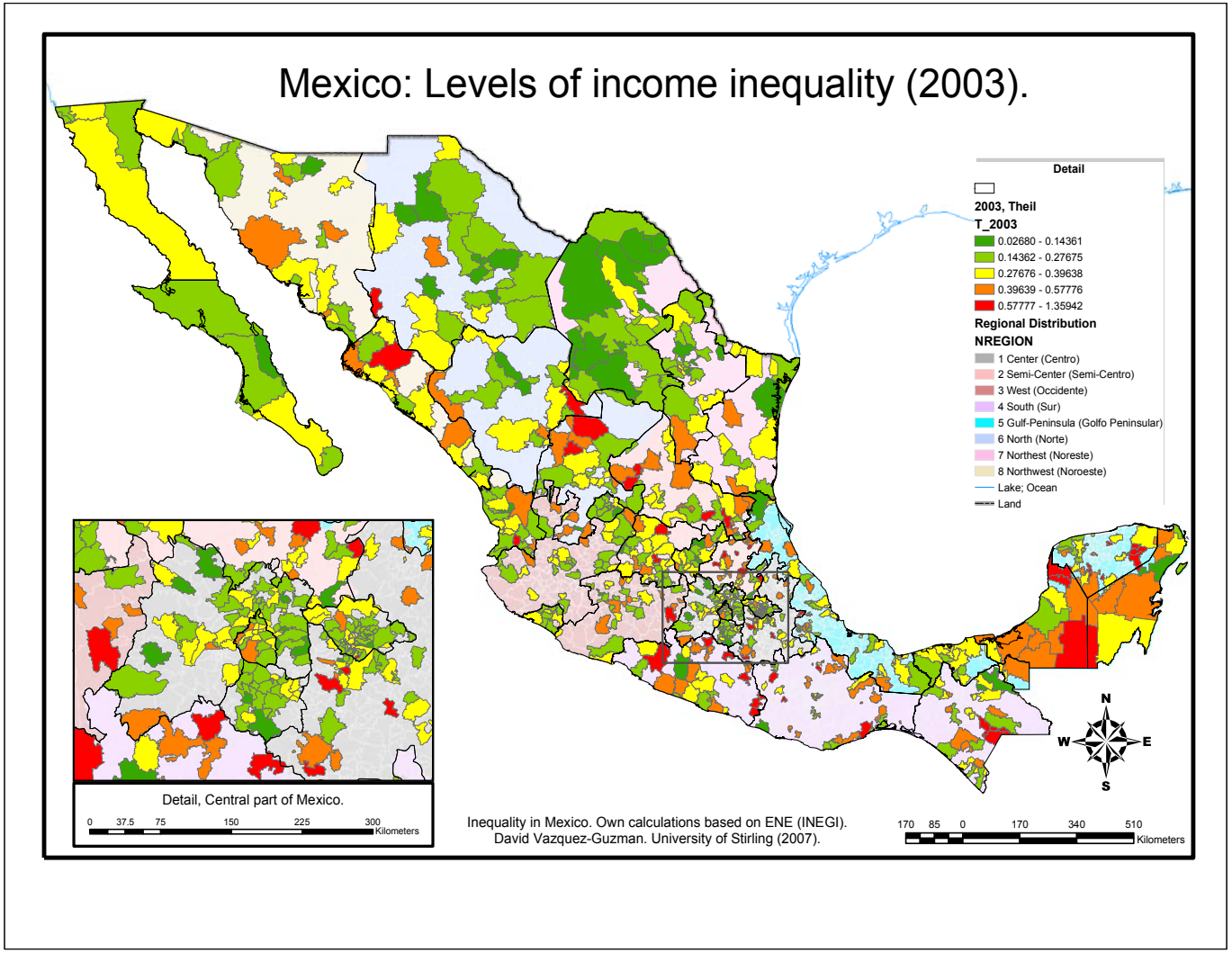


Figure 4-12. Theil index per municipality (2003).

4.5 Concluding Remarks.

It might be clear that, in general, the levels of inequality have decreased in Mexico in the last decade, so those have reached similar levels to the period before the 94-5 crisis. But there are still things to consider on the assessment and the measurement of inequality. The different aspects of inequality in Mexico can be explored better if it is used more than the Gini coefficient, household inequality and expenditure surveys. In the course of this paper it can also be understood why the available literature presents sometimes dissimilar indicators of inequality. Those differences come from the different technical and methodological assumptions, which have not received much attention. There have been recent advances in Mexico about the definition of poverty measurement (CTMP, 2002; Székely, 2005), but the definition of inequality as such is still a matter of debate (De Ferranti et al., 2004).

This paper covers some of the issues that have been a matter of debate, and it finds some interesting relationships, as is the close connection between the decisions of the recipient unit used, and the choice of using either expenditure or income surveys. It was found that inequality measurement is sensitive to these decisions, such that household income inequality is usually higher than individual income inequality, even considering equivalence scales. Comparing our results with others in the available literature, it was exposed that inequality measures are sensitive to the use of different data sources, either expenditure or income surveys. In Mexico, the inequality measured with expenditure surveys are usually higher than inequality measured with income survey data. In regards of other technical considerations, it was shown that the inclusion of

people with zero income in the computations makes a significant difference in inequality measurement. The same happens when regional coverage is considered, the principle of population replication does not hold perfectly for the case of Mexico.

Acknowledging the country heterogeneity in Mexico, there are various issues to think about. The first one is the consideration of a price index in the computations, which prove to be useful for regional assessment. It was shown that the computations regarding inequality seem to be clearer when prices, if those are available, are considered. The second issue was the convenient use of indices that come from the Entropy family measures, because of their decomposability sub-group property. In this case, the rural area showed a higher inequality, compared with the national level. Being the last, but not the least topic in regional estimation, the presentation of inequality results in a visually accessible way, prove to be useful as well. The use of inequality maps, with GIS techniques, is helpful to communicate more efficiently with the policy makers.

4.6 Appendix.

I Data

The data comes from the Mexican Institute of Information '*INEGI*' (*Instituto Mexicano de Estadistica, Geografia e Informatica)* which provides information to the public. We focus in the *National Survey of Employment* (*ENE –Encuesta Nacional de Empleo*), a recent survey that had its foundation in previous attempts traced to 1971.[126]

[126] In 1971 was agreed by the President and the Secretary of Commerce to start a new employment survey. It was between 1973 and 1984 that the *Continuous Survey of Occupation (ECSO –Encuesta Contínua sobre Ocupación*) was developed with some changes. A second major change started in 1979, when the *Direction of General Statistics* (*DGE*) started and inquiry regarding the assertiveness of *ECSO*. The new product that

The *ENE*, which started in 1991 as a biannual survey, changed its periodicity per annum later on, and recently added up quarterly data, as shown in **Table 4-5**. The methodology is found in INEGI (2000, 2003) or Székely (2006, p. 298).

National Survey of Employment (*ENE*)

Year	Records*	Surveys per year	Population represented	% of country population
1991	143,957	1	-	-
1992	-	-	-	-
1993	139,902	1	-	-
1994	-	-	-	-
1995	111,949	1	59,083,793	-
1996	365,525	1	62,302,968	-
1997	119,404	1	63,425,327	-
1998	375,134	1	69,537,053	72.60%
1999	164,550	1	70,818,567	72.86%
2000	436,344	3	72,137,537	73.12%
2001	450,577	4	73,577,159	73.54%
2002	443,035	4	75,352,912	74.31%
2003	414,785	4	76,863,320	74.84%
Total Records	3,165,162			

**** People of more than 12 years age. Source: INEGI.***

Table 4-5. Main data set.

We have quarterly data between the year 2000 and 2003 in a more detailed fashion, having even the household characteristics correspondent to the year 2003, not only the personal survey. That is shown in **Table 4-6**.

includes some changes regarding international standards was *ENEU* (*National Survey of Urban Employment*), and covered the period between 1981 through 1998. The present survey (*ENE*) again was an effort to upgrade past surveys (*ENEU*), and between the years of 1991 and 1998, both instruments were surveyed.

National Survey of Employment (*ENE*)

Year	Quarter	Records*	Population represented	% of country population
2000	2	443,354	72,137,537	73.12%
	3	454,232	72,528,671	73.25%
	4	454,971	72,929,882	73.40%
2001	1	461,928	73,264,167	73.48%
	2	460,271	73,577,159	73.54%
	3	454,708	74,141,311	73.85%
	4	455,390	74,496,476	73.96%
2002	1	456,645	75,026,801	74.24%
	2	451,687	75,352,912	74.31%
	3	442,114	75,836,489	74.55%
	4	441,256	76,224,891	74.69%
2003	1	448,590	76,746,666	74.96%
	2**	422,523	76,863,320	74.84%
	3	366,715	77,076,798	74.81%
	4	354,484	77,448,509	74.93%
Total Records		6,568,868		

**** People of more than 12 years age. Source: INEGI.***
***** Available household characteristics***

Table 4-6. Quarterly data (2000-2003)

The survey is divided in 'batteries' of questions, and it obtains information about employment, self-employment and unemployment conditions, status of residence (i.e. migrant from other region), income, traditional questions about related working sector, and all general characteristics of people like gender and age.

II Regional distribution.

Mexico, in the same way as many other countries in the world, presents a natural heterogeneity within it. It is easier to show results by regions than for every state in the country, but there are many ways to divide the country in regions. Even the federal government does not have a unique way to consider regions. It happens that several departments within the government make their own distribution of states in regards of their own objectives. The distribution considers not only geographical closeness of states,

but also different ‘tastes’ according to related cultural values, historical inheritance and native composition.

This distribution (**Figure 4-13**) considers major geographical characteristics, not only state proximity, which guarantees that states that appear close in the map are really economically closer to each other. This also considers two sets of mountains that naturally divided the country, where it is difficult to get from states in the center to states in the Pacific or in the Gulf of Mexico. It also has the convenience of not mixing municipalities within states, so each region contains complete states (details in this Appendix, **Table 4-7**). So unless stated in the paper, the classification of regional distribution of Mexico will be the following:

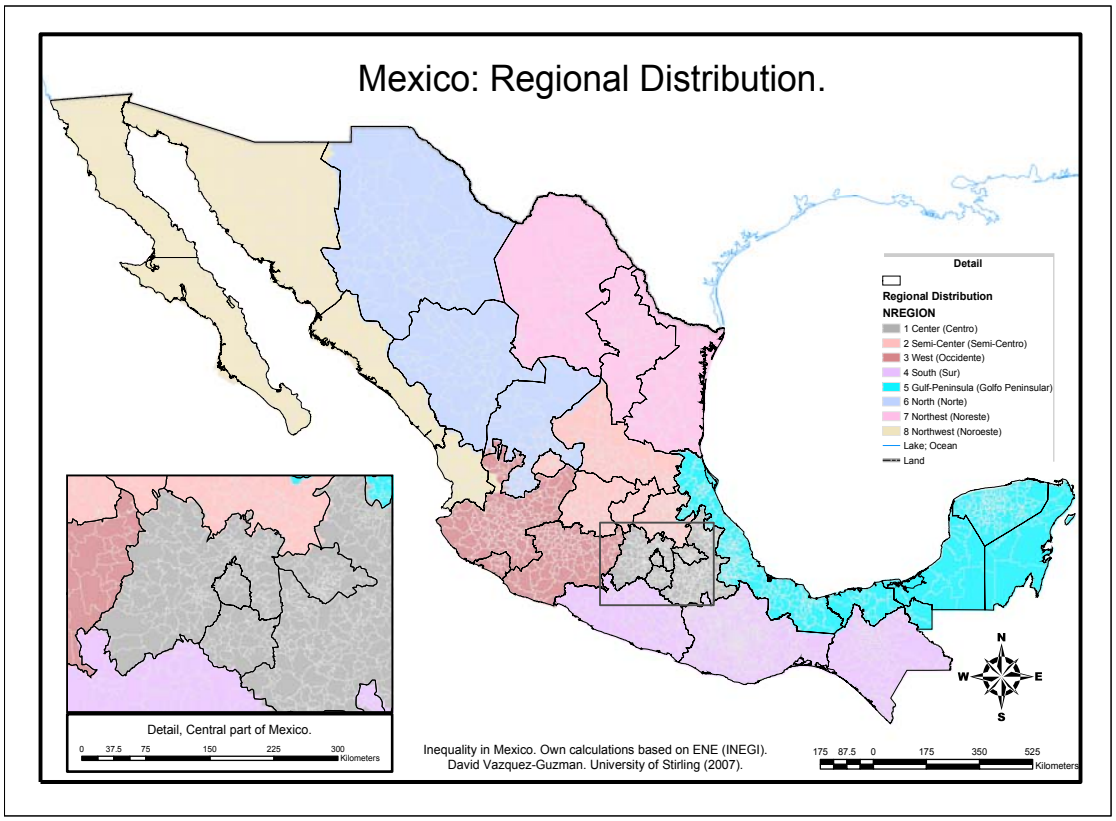


Figure 4-13. Regional Distribution.

III Supporting tables and graphs.

Zone	Distribution by regions	Population	% Pop.
1	Centro -Center- (Distrito Federal, México, Puebla, Tlaxcala, Morelos	29,296,553	30.05%
2	Semi Centro –Semi center- (San Luis Potosí, Querétaro, Guanajuato, Hidalgo, Aguascalientes)	11,546,574	11.84%
3	Occidente –West-(Jalisco, Michoacan, Colima)	10,850,296	11.13%
4	Sur –South- (Guerrero, Oaxaca, Chiapas)	10,439,306	10.71%
5	Golfo-Peninsular –Gulf Peninsula-(Campeche, Yucatan, Quintana Roo, Veracruz, Tabasco)	12,024,666	12.34%
6	Norte –North-(Chihuahua, Durango, Zacatecas)	5,855,178	6.01%
7	Noreste –North east- (Nuevo Leon, Tamaulipas, Coahuila)	8,885,433	9.11%
8	Noroeste North west- (Baja California, Baja California Sur, Sonora, Sinaloa, Nayarit)	8,585,406	8.81%
	Source: INEGI, Census data, 2000.	97,483,412	100.00%

Table 4-7. Distribution of regions.

State	Gini			Theil			Log Dev.		
	Deflated	Non-def.	Difference	Deflated	Non-def.	Difference	Deflated	Non-def.	Difference
1. AGS	0.4015	0.4015	0.000%	0.3568	0.3568	0.000%	0.2942	0.2942	0.000%
2. BCN	0.3931	0.3931	0.000%	0.2882	0.2882	0.000%	0.2559	0.2559	0.000%
3. BCS	0.3793	0.3793	0.000%	0.2796	0.2796	0.000%	0.2538	0.2538	0.000%
4. CAMP	0.5113	0.5113	0.000%	0.4922	0.4922	0.000%	0.5061	0.5061	0.000%
5. COAH	0.3895	0.3894	0.012%	0.2919	0.2917	0.021%	0.2637	0.2636	0.009%
6. COL	0.4369	0.4369	0.000%	0.3621	0.3621	0.000%	0.3541	0.3541	0.000%
7. CHIS	0.5632	0.5632	0.000%	0.6163	0.6163	0.000%	0.6136	0.6136	0.000%
8. CHIH	0.3820	0.3820	-0.006%	0.2875	0.2876	-0.012%	0.2698	0.2700	-0.023%
9. DF	0.4859	0.4859	0.000%	0.4749	0.4749	0.000%	0.4069	0.4069	0.000%
10. DGO	0.4587	0.4587	0.000%	0.4570	0.4570	0.000%	0.4055	0.4055	0.000%
11. GTO	0.4154	0.4154	0.000%	0.3377	0.3377	0.000%	0.3066	0.3066	0.000%
12. GRO	0.4560	0.4560	0.000%	0.3695	0.3695	0.000%	0.4202	0.4202	0.000%
13. HGO	0.5160	0.5160	0.000%	0.4918	0.4918	0.000%	0.6063	0.6063	0.000%
14. JAL	0.4296	0.4296	0.000%	0.3484	0.3484	0.000%	0.3541	0.3541	0.000%
15. MEX	0.4326	0.4326	0.000%	0.3703	0.3703	0.000%	0.3602	0.3602	0.000%
16. MICH	0.4322	0.4322	0.000%	0.3422	0.3422	0.000%	0.3698	0.3698	0.000%
17. MOR	0.3895	0.3895	0.000%	0.2942	0.2942	0.000%	0.2711	0.2711	0.000%
18. NAY	0.4630	0.4630	0.000%	0.4153	0.4153	0.000%	0.4351	0.4351	0.000%
19. NL	0.4396	0.4396	0.001%	0.3917	0.3916	0.002%	0.3355	0.3354	0.003%
20. OAX	0.5703	0.5703	0.000%	0.5965	0.5965	0.000%	0.7099	0.7099	0.000%
21. PUE	0.5598	0.5598	0.000%	0.8423	0.8423	0.000%	0.6626	0.6626	0.000%
22. QRO	0.4751	0.4751	0.000%	0.4741	0.4741	0.000%	0.4382	0.4382	0.000%
23. QROO	0.4171	0.4171	0.000%	0.3333	0.3333	0.000%	0.3054	0.3054	0.000%
24. SLP	0.5017	0.5017	0.000%	0.4811	0.4811	0.000%	0.5197	0.5197	0.000%
25. SIN	0.4678	0.4678	0.000%	0.4523	0.4523	0.000%	0.4041	0.4041	0.000%
26. SON	0.4181	0.4181	0.000%	0.3215	0.3215	0.000%	0.3100	0.3100	0.000%
27. TAB	0.5185	0.5185	0.000%	0.5060	0.5060	0.000%	0.5053	0.5053	0.000%
28. TAMPS	0.4245	0.4247	-0.011%	0.3549	0.3549	0.000%	0.3117	0.3120	-0.030%
29. TLAX	0.4185	0.4185	0.000%	0.3825	0.3825	0.000%	0.3349	0.3349	0.000%
30. VER	0.5101	0.5101	0.000%	0.5027	0.5027	0.000%	0.5172	0.5172	0.000%
31. YUC	0.5319	0.5319	0.000%	0.5901	0.5901	0.000%	0.5816	0.5816	0.000%
32. ZAC	0.4527	0.4527	0.000%	0.3877	0.3877	0.000%	0.3874	0.3874	0.000%

Source: Own calculations for the year 2001 (ENE)

Table 4-8. Effect of regional prices in income distribution. 2001 (per state).

Inequality per annum, different recipient unit. WHOLE country.

	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
Gini (Inc, Nat)	0.442693	0.465018		0.486176	0.491778	0.488093	0.480507	0.487287	0.480063	0.463776	0.453938
Gini (Inc.Def, Nat)	0.436007	0.459991		0.486826	0.491696	0.487698	0.480406	0.487199	0.480096	0.463787	0.45429
Gini (Hou, Nat)*					0.504427	0.500517	0.496782		0.49367	0.483416	0.473308
Theil (Inc, Nat)	0.476957	0.499433		0.487693	0.47975	0.477592	0.491654	0.480077	0.458666	0.416903	0.390874
Theil (Inc.Def, Nat)	0.415489	0.456662		0.489352	0.479546	0.47501	0.491566	0.47981	0.458865	0.416923	0.391379
Theil (Hou, Nat)*					0.472588	0.464589	0.48161		0.449879	0.424195	0.400735
Log.dev. (Inc, Nat)	0.354963	0.400678		0.44233	0.458658	0.458778	0.444963	0.456164	0.45663	0.435032	0.413464
Log.dev. (Inc.Def, Nat)	0.34312	0.391458		0.443453	0.458279	0.457753	0.44459	0.455884	0.456655	0.43505	0.414139
Log.dev. (Hou, Nat)*					0.50178	0.505933	0.496227		0.504894	0.48794	0.461482

* Household Id. Not Available For 1991, 1993, 1996, 2000. Measure for 1995 is only urban

Source: Author's calculations based on microdata (ENE).

Table 4-9. Country inequality comparisons per annum.

Individual income deflated, measures of inequality per region.

	Gini										
Region	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0.439617	0.435509	0.467648	0.467571	0.488545	0.47769	0.46208	0.480753	0.481803	0.444502	0.434173
2	0.42804	0.522121	0.584785	0.462527	0.460291	0.467879	0.468866	0.467574	0.462491	0.46228	0.460583
3	0.408488	0.415077	0.455065	0.460974	0.483887	0.461149	0.426298	0.443452	0.433795	0.436289	0.4213
4	0.403369	0.424637	0.510561	0.510396	0.521288	0.536977	0.529999	0.535632	0.542615	0.526384	0.517007
5	0.437768	0.47454	0.479639	0.489837	0.541751	0.519711	0.546876	0.52476	0.511124	0.505281	0.487916
6	0.445702	0.449564	0.625307	0.44637	0.443514	0.436477	0.434425	0.433938	0.421374	0.406226	0.41579
7	0.43752	0.485998	0.473694	0.521139	0.492121	0.465698	0.443755	0.457867	0.425366	0.41697	0.404631
8	0.414565	0.474907	0.460924	0.468648	0.442712	0.464241	0.454535	0.460325	0.452407	0.452316	0.442532
	Theil										
	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0.433944	0.3799	0.471703	0.45444	0.49314	0.470777	0.456194	0.487045	0.493136	0.397874	0.365696
2	0.409658	0.667359	1.092412	0.4292	0.414411	0.436059	0.45935	0.426965	0.421452	0.406883	0.402587
3	0.344384	0.326861	0.403962	0.411655	0.4468	0.431774	0.351047	0.37473	0.352074	0.363146	0.33743
4	0.289918	0.358022	0.479398	0.473699	0.504165	0.535986	0.504688	0.549879	0.541242	0.504048	0.489496
5	0.380736	0.431096	0.433148	0.472304	0.583465	0.525591	0.821876	0.546232	0.504443	0.482192	0.436246
6	0.544447	0.376702	1.740419	0.408988	0.415789	0.384587	0.357026	0.36984	0.354172	0.315173	0.331411
7	0.414189	0.51677	0.480038	0.611593	0.478872	0.43378	0.409373	0.440441	0.362003	0.348272	0.328357
8	0.361214	0.645141	0.428552	0.447254	0.37147	0.428993	0.411641	0.424777	0.387484	0.395	0.358378
	Log. Dev.										
	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0.339994	0.334541	0.402844	0.401892	0.443978	0.427974	0.396193	0.426513	0.445138	0.383293	0.357478
2	0.335417	0.499062	0.662578	0.402711	0.388694	0.410153	0.423254	0.420097	0.433796	0.460038	0.445903
3	0.297873	0.34117	0.388241	0.401946	0.451255	0.414231	0.344728	0.37494	0.365053	0.374316	0.348914
4	0.328131	0.372168	0.545881	0.525781	0.538092	0.592799	0.572839	0.592668	0.604399	0.569977	0.559571
5	0.352133	0.419255	0.439371	0.44057	0.556935	0.521296	0.581577	0.532805	0.516456	0.532785	0.487196
6	0.363172	0.374469	0.733998	0.353881	0.35644	0.349948	0.345121	0.349173	0.340274	0.311999	0.330309
7	0.335002	0.412535	0.40549	0.493817	0.46401	0.395707	0.350767	0.369819	0.313964	0.308906	0.295736
8	0.304631	0.440165	0.381679	0.383589	0.358343	0.390061	0.376632	0.377127	0.377183	0.379427	0.361654

Source: Author's calculations based on microdata (*ENE*).

Table 4-10. Inequality comparisons per annum (per region).

Income Inequality decomposed by population sub-group (regions), Entropy measures

	Income Shares, per region										
	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0.35347	0.38547	0.33728	0.31598	0.32197	0.32717	0.31443	0.32183	0.32778	0.32246	0.32465
2	0.08737	0.09233	0.12337	0.09332	0.08857	0.09962	0.09849	0.09721	0.10074	0.10222	0.10505
3	0.10095	0.10263	0.10410	0.08650	0.10353	0.08465	0.08600	0.09315	0.09794	0.09947	0.10092
4	0.04774	0.06063	0.05206	0.06033	0.07374	0.06306	0.05975	0.05902	0.05518	0.06036	0.06209
5	0.08325	0.07747	0.08668	0.10143	0.10740	0.10098	0.11171	0.10089	0.09823	0.09943	0.09686
6	0.06079	0.06293	0.08897	0.06526	0.06135	0.06445	0.06826	0.06219	0.05819	0.05767	0.05814
7	0.11590	0.13029	0.11671	0.13872	0.12711	0.12417	0.12923	0.13565	0.13263	0.13209	0.12483
8	0.15054	0.08824	0.09083	0.13846	0.11632	0.13590	0.13213	0.13006	0.12930	0.12630	0.12746
Sum	1	1	1	1	1	1	1	1	1	1	1
	Regional contribution to overall inequality (Theil)										
	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0.15338	0.14644	0.15910	0.14359	0.15878	0.15403	0.14344	0.15675	0.16164	0.12830	0.11872
2	0.03579	0.06162	0.13478	0.04005	0.03671	0.04344	0.04524	0.04151	0.04246	0.04159	0.04229
3	0.03477	0.03355	0.04205	0.03561	0.04626	0.03655	0.03019	0.03491	0.03448	0.03612	0.03405
4	0.01384	0.02171	0.02496	0.02858	0.03718	0.03380	0.03016	0.03246	0.02986	0.03042	0.03039
5	0.03170	0.03340	0.03755	0.04791	0.06266	0.05307	0.09181	0.05511	0.04955	0.04794	0.04225
6	0.03310	0.02371	0.15484	0.02669	0.02551	0.02479	0.02437	0.02300	0.02061	0.01818	0.01927
7	0.04801	0.06733	0.05602	0.08484	0.06087	0.05386	0.05290	0.05974	0.04801	0.04600	0.04099
8	0.05438	0.05693	0.03892	0.06193	0.04321	0.05830	0.05439	0.05525	0.05010	0.04989	0.04568
GE(b)	0.01053	0.01199		0.02015	0.00838	0.01717	0.01906	0.02110	0.02214	0.01847	0.01773
GE(w)+GE(b)	0.41549	0.45666		0.48935	0.47955	0.47501	0.49157	0.47981	0.45887	0.41692	0.39138
GE(t)	0.41549	0.45666		0.48935	0.47955	0.47501	0.49157	0.47981	0.45887	0.41692	0.39138
Dif.	0.00000	0.00000		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Regional contribution to overall inequality (Log. Dev)										
	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0.120176	0.128955	0.135872	0.126989	0.14295	0.140022	0.124574	0.137264	0.145908	0.123595	0.116056
2	0.029307	0.04608	0.081745	0.03758	0.034427	0.040861	0.041685	0.040839	0.043702	0.047025	0.046842
3	0.03007	0.035016	0.040416	0.034767	0.046718	0.035064	0.029646	0.034928	0.035754	0.037233	0.035212
4	0.015664	0.022563	0.028417	0.031722	0.039679	0.037382	0.03423	0.034982	0.033349	0.034404	0.034745
5	0.029315	0.03248	0.038087	0.044688	0.059814	0.052638	0.064966	0.053753	0.05073	0.052973	0.04719
6	0.022076	0.023565	0.065301	0.023096	0.021869	0.022553	0.023559	0.021714	0.019802	0.017994	0.019204
7	0.038828	0.05375	0.047324	0.068502	0.058981	0.049135	0.045329	0.050165	0.041641	0.040805	0.036918
8	0.045858	0.038842	0.034667	0.053112	0.041683	0.053009	0.049765	0.049048	0.048771	0.047921	0.046095
GE(b)	0.01134	0.01244		0.02044	0.00859	0.01776	0.02004	0.02202	0.02381	0.01942	0.01883
GE(w)+GE(b)	0.34263	0.39369		0.44090	0.45472	0.44843	0.43379	0.44471	0.44347	0.42137	0.40109
GE(t)	0.34312	0.39146		0.44345	0.45828	0.45775	0.44459	0.45588	0.45665	0.43505	0.41414
Dif.	-0.00049	0.00223		-0.00256	-0.00356	-0.00933	-0.01080	-0.01117	-0.01319	-0.01368	-0.01305

Source: Author's calculations based on microdata (*ENE*). 1995 is not available for national representativeness, only urban.

Table 4-11. Inequality contribution (*T* and *L*) by population subgroup per annum (per region).

Income Inequality decomposed by population sub-group (states), Entropy measures

Income Shares, per state

	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0.00575	0.00888	0.00873	0.00887	0.00771	0.00916	0.00894	0.00951	0.00946	0.01006	0.00971
2	0.04515	0.02611	0.02884	0.04905	0.03923	0.05313	0.05576	0.05619	0.05699	0.05596	0.05419
3	0.01093	0.00000	0.00000	0.00665	0.00715	0.00629	0.00586	0.00615	0.00625	0.00597	0.00629
4	0.00357	0.00588	0.00278	0.00558	0.00852	0.00691	0.00662	0.00635	0.00616	0.00653	0.00642
5	0.01671	0.02299	0.02764	0.03161	0.03374	0.03219	0.03199	0.03085	0.03070	0.02989	0.02857
6	0.02398	0.02347	0.00330	0.00600	0.00702	0.00665	0.00749	0.00651	0.00688	0.00696	0.00693
7	0.00572	0.00814	0.01533	0.01984	0.03027	0.02271	0.02101	0.02120	0.02049	0.02195	0.02245
8	0.04051	0.04032	0.04090	0.03983	0.03804	0.03933	0.04293	0.04052	0.03635	0.03692	0.03763
9	0.20937	0.20157	0.17402	0.14394	0.15464	0.14062	0.12728	0.14487	0.13974	0.13034	0.12794
10	0.00802	0.00961	0.04304	0.01550	0.01396	0.01510	0.01497	0.01335	0.01395	0.01233	0.01249
11	0.05339	0.05188	0.03103	0.04047	0.03726	0.03900	0.04202	0.03955	0.04070	0.04327	0.04285
12	0.00639	0.01971	0.01737	0.01952	0.02011	0.02015	0.02109	0.02188	0.01769	0.01996	0.02095
13	0.00758	0.00677	0.02508	0.01365	0.01433	0.01744	0.01521	0.01485	0.01513	0.01441	0.01719
14	0.06176	0.05358	0.06252	0.05220	0.06367	0.05267	0.04898	0.05804	0.05805	0.06119	0.06175
15	0.08736	0.10936	0.11803	0.12050	0.11343	0.13202	0.13410	0.12075	0.13088	0.13470	0.14002
16	0.01381	0.02438	0.03793	0.02830	0.03284	0.02530	0.02954	0.02860	0.03301	0.03132	0.03224
17	0.01027	0.02958	0.00944	0.01187	0.01111	0.01368	0.01303	0.01286	0.01295	0.01202	0.01011
18	0.01078	0.01045	0.01628	0.01084	0.01141	0.00973	0.00862	0.00823	0.00824	0.00830	0.00861
19	0.06173	0.06953	0.06487	0.07001	0.06513	0.05703	0.05866	0.06587	0.06296	0.06423	0.05795
20	0.03497	0.03207	0.01919	0.02098	0.02337	0.02017	0.01766	0.01595	0.01699	0.01845	0.01870
21	0.03863	0.03746	0.03169	0.03282	0.03673	0.03401	0.03309	0.03602	0.03646	0.03737	0.03866
22	0.01493	0.00158	0.03615	0.01335	0.01328	0.01523	0.01462	0.01525	0.01582	0.01473	0.01441
23	0.00000	0.00000	0.00141	0.00983	0.00903	0.01128	0.01099	0.01136	0.01167	0.01126	0.01195
24	0.01839	0.02214	0.02197	0.01698	0.01600	0.01876	0.01770	0.01805	0.01963	0.01974	0.02089
25	0.04660	0.02165	0.01572	0.03371	0.02894	0.03219	0.02908	0.02784	0.02887	0.02918	0.02891
26	0.03499	0.02901	0.02968	0.03821	0.02959	0.03497	0.03281	0.03166	0.02895	0.02689	0.02946
27	0.02259	0.01588	0.02094	0.01772	0.01902	0.01703	0.01756	0.01617	0.01636	0.01855	0.01829
28	0.03585	0.03625	0.02716	0.03710	0.02824	0.03489	0.03857	0.03893	0.03897	0.03797	0.03831
29	0.00293	0.00300	0.00297	0.00685	0.00607	0.00668	0.00693	0.00732	0.00776	0.00804	0.00792
30	0.04199	0.05167	0.04548	0.05264	0.05832	0.05003	0.06325	0.05339	0.04971	0.04887	0.04762
31	0.01395	0.01481	0.01578	0.01566	0.01251	0.01568	0.01329	0.01362	0.01433	0.01422	0.01258
32	0.01142	0.01227	0.00473	0.00993	0.00935	0.00998	0.01036	0.00831	0.00790	0.00842	0.00802
Sum	1	1	1	1	1	1	1	1	1	1	1

Regional contribution to overall inequality (Theil)

	1991	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003
1. AGS	0.001984	0.002813	0.003287	0.004297	0.002259	0.003568	0.002924	0.003493	0.003376	0.002732	0.002517
2. BCN	0.016639	0.00571	0.009514	0.017721	0.012596	0.020018	0.016148	0.020279	0.016422	0.018391	0.013433
3. BCS	0.002409	0	0	0.002502	0.002518	0.002816	0.001894	0.001907	0.001748	0.001753	0.001751
4. CAMP	0.000671	0.002012	0.001271	0.0026	0.006663	0.004258	0.003475	0.003693	0.00303	0.003029	0.002958
5. COAH	0.006273	0.012223	0.011614	0.017432	0.014372	0.013636	0.011731	0.012369	0.008962	0.008927	0.008262
6. COL	0.004182	0.004517	0.001413	0.002001	0.003663	0.002834	0.00405	0.00263	0.002492	0.002358	0.001968
7. CHIS	0.001743	0.002878	0.008216	0.010502	0.01629	0.01171	0.010366	0.013629	0.01263	0.012054	0.010904
8. CHIH	0.015229	0.015434	0.014941	0.014342	0.015432	0.012667	0.012577	0.013959	0.010449	0.009857	0.010846
9. DF	0.091577	0.081715	0.091042	0.066911	0.07623	0.063727	0.058404	0.080215	0.066362	0.053472	0.049559
10. DGO	0.002556	0.002401	0.128492	0.006944	0.005352	0.006861	0.005728	0.004972	0.006373	0.004301	0.004371
11. GTO	0.023773	0.041702	0.019609	0.015066	0.013738	0.014168	0.020676	0.015676	0.013744	0.014962	0.015359
12. GRO	0.001583	0.00515	0.007065	0.008115	0.007974	0.01032	0.010972	0.009932	0.006538	0.008583	0.009325
13. HGO	0.00309	0.002864	0.012409	0.005849	0.007493	0.008453	0.007784	0.006891	0.007441	0.007032	0.008048
14. JAL	0.023341	0.020271	0.023368	0.02026	0.025625	0.02298	0.014246	0.020773	0.020221	0.02138	0.019423
15. MEX	0.038477	0.037451	0.042116	0.04802	0.048845	0.061328	0.058793	0.04098	0.04846	0.040003	0.039796
16. MICH	0.005737	0.008203	0.017118	0.012997	0.016557	0.009948	0.011313	0.010781	0.011299	0.011371	0.011912
17. MOR	0.002165	0.009979	0.002556	0.003194	0.003477	0.004638	0.003601	0.004182	0.003808	0.003559	0.002472
18. NAY	0.002287	0.003407	0.007463	0.005989	0.003912	0.004605	0.003171	0.003288	0.003424	0.003009	0.002816
19. NL	0.029016	0.03684	0.04486	0.04918	0.031944	0.025624	0.023441	0.030965	0.024659	0.023938	0.019466
20. OAX	0.009985	0.0122	0.009268	0.009718	0.012389	0.011718	0.008565	0.008002	0.010134	0.009285	0.009624
21. PUE	0.015539	0.011227	0.012483	0.011899	0.013519	0.013567	0.01321	0.016665	0.030706	0.021051	0.017245
22. QRO	0.050071	0.00023	0.073259	0.006455	0.006595	0.007611	0.006258	0.006366	0.007501	0.0062	0.005507
23. QROO	0	0	0.000759	0.003993	0.0051	0.004238	0.005065	0.005548	0.003889	0.004185	0.003863
24. SLP	0.006016	0.01166	0.011644	0.007422	0.006178	0.008757	0.006894	0.008342	0.009443	0.009308	0.010153
25. SIN	0.020975	0.00741	0.004978	0.012677	0.00874	0.013096	0.012893	0.011929	0.013057	0.012374	0.012012
26. SON	0.009815	0.036532	0.013602	0.020304	0.012454	0.016199	0.015515	0.012892	0.009308	0.009085	0.011098
27. TAB	0.009029	0.007121	0.009027	0.0098	0.009662	0.007515	0.007914	0.007396	0.008279	0.008478	0.007745
28. TAMPS	0.010775	0.016884	0.013554	0.016931	0.013589	0.014334	0.017559	0.015586	0.013828	0.012073	0.012878
29. TLAX	0.000537	0.000612	0.000771	0.002464	0.002339	0.00239	0.002295	0.003247	0.002969	0.002899	0.002234
30. VER	0.016026	0.067798	0.016797	0.02265	0.034055	0.026235	0.066831	0.031161	0.024988	0.023535	0.021012
31. YUC	0.00514	0.007146	0.008656	0.00753	0.005792	0.008854	0.007752	0.006392	0.008455	0.007825	0.005633
32. ZAC	0.014563	0.004366	0.002197	0.004746	0.00387	0.004511	0.0055	0.003247	0.003063	0.00336	0.003194
GE(b)	0.03648	0.02238		0.03884	0.03032	0.03393	0.03402	0.04242	0.04181	0.03656	0.03400
GE(w)+GE(b)	0.47769	0.50114		0.48935	0.47955	0.47712	0.49157	0.47981	0.45887	0.41692	0.39138
GE(t)	0.41549	0.45666		0.48935	0.47955	0.47501	0.49157	0.47981	0.45887	0.41692	0.39138
Dif.	0.06220	0.04448		0.00000	0.00000	0.00211	0.00000	0.00000	0.00000	0.00000	0.00000

Table 4-12. Inequality contribution (*T*) by population subgroup per annum (per state).

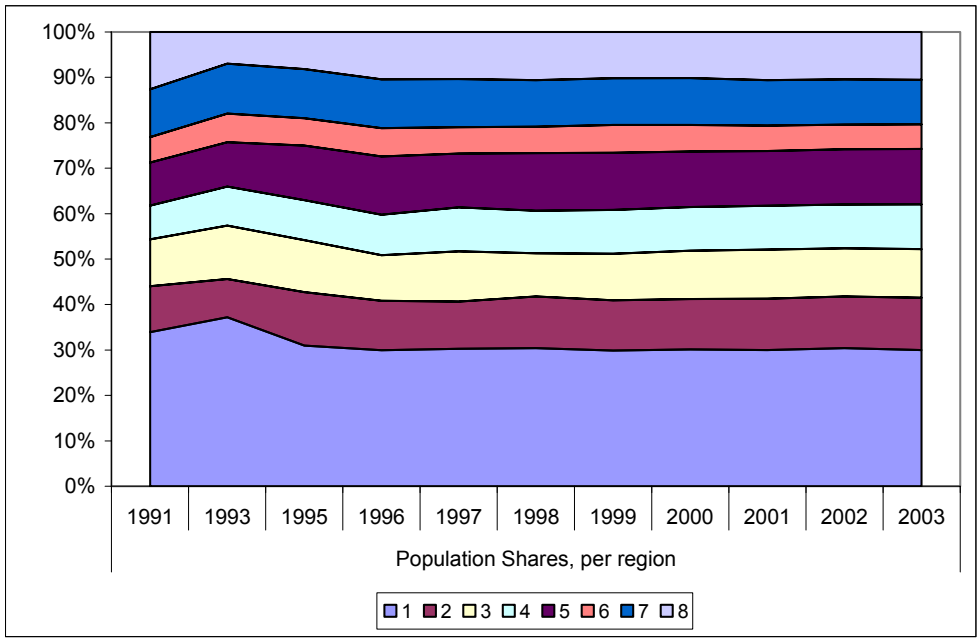


Figure 4-14. Share of population per region.

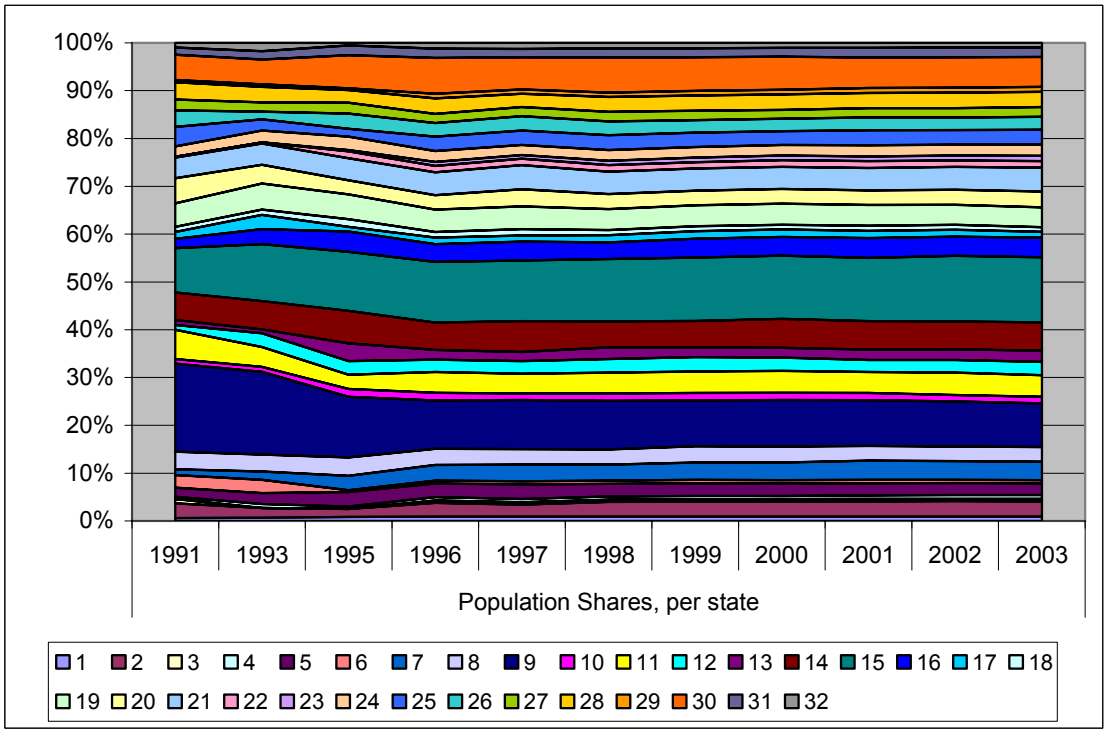


Figure 4-15. Share of population per state.

5 The Institutional View of Poverty: Recent Deprivation Measurement in Mexico.

5.1 Abstract.

Two important crises are the explanation for the increase of poverty and inequality in Mexico in the past which prompted the governmental institutions to measure appropriately how much the well-being of people has been affected by the rise in poverty and inequality. The effort to formalize the measurement of poverty was introduced by the Mexican President and carried out by the Secretariat of Social Development (SEDESOL) at the beginning of this decade. The resultant committee standardized the measurement of poverty using the Foster-Greer-Thorbecke (1984) headcount poverty measure; though some other methods of destitution measurement are also used by different governmental institutions in the present. These last institutions calculate poverty in different ways, mostly using the marginalization concept with the principal component analysis tool. The variety of laws within the legal system in Mexico makes poverty measurement sometimes confusing; the measurement of well-being is assigned to a variety of governmental offices by different regulations. The diverse results of these measures have the risk of using them with discretional criteria for the allocation of public resources for the very poor. At present, different offices carry on parallel measurements of destitution, though these results have been contextualized with the official measurement, there are methodological differences. On the other hand, in Mexico is still the case that the consideration of the unequal distribution of income has not been explored in depth.

5.2 Introduction.

This chapter will give an overview of deprivation measurement used in recent decades in Mexico. Both the institutional scenario and the academic research have influenced the measurement of deprivation over the last years. A formal research agenda was necessary to organize, and this happened at the beginning of the year 2000 (Hernández-Laos, 2005, in Székely, 2005), but the motivation behind the measurement of deprivation in Mexico still have some inertia. So, it is the case that the task of poverty measurement and considerations of human development are spread among a variety of governmental institutions in Mexico (López-Calva and Székely, 2006, Introduction). The understanding of methodological, operational and theoretical discussions in regards to human development is not sufficient. The academic framework should be tied to the institutional background of human development in the country, so in this case, a clearer picture will make it easy to analyze the problem. This clearer understanding will allow us to understand and to construct better measures of inequality, as it is required for the construction of poverty measures, remembering in particular that "[c]onstructing consumption aggregates without knowledge of the country and its institutions will not give useful results." (Deaton and Zaidi, 2002, p. 359). Besides the institutional background, the measurement of human development in Mexico should be understood in the context of its economy. Therefore, a brief description of the Mexican economy in recent years will be given together with the formal attempts to measure human development and the institutional background.

In spite of the recent advances in research about the definition of poverty in Mexico, inequality measurement is a topic that is still on the agenda for discussion. That the measurement of inequality is a topic that human development literature in Mexico does not mention very often will be made clear, so in this chapter, the unequal income distribution will not be mentioned as often as poverty measurement is. The question about why inequality measurement was not tackled in the same way as it was considered poverty or multidimensional human development will be touched upon in detail on the next chapter. In the mean time, this chapter will give an account of the definition of human development measurement in Mexico, but mostly focusing on the definition of poverty and marginalization measurement. Researches on human development in general are connected with inequality measurement, in this sense we can see the questions that have been answered by using poverty measurement, and which of the answers given for poverty measurement can be applied to inequality measurement. In this way, a good number of questions will be answered by the researchers on the status of inequality measurement, which are crucial for our understanding of the institutional view in the context of the framework of the Mexican economy. This section provides an intuitive understanding into the institutional decisions in Mexico with regards to the methodological approaches adopted behind measurement of poverty, inequality and in general human development over the last decade.

- Overview.

The organization of this chapter is as follows: the Mexican economy in the immediate past decades is described in section **5.3**, followed by the institutional views of poverty measurement, which is tackled in section **5.4**, having the picture of the Mexican institutions and the legal system as a starting point (**5.4 I**). The standardized measurement of poverty that started on the year 2000 is mentioned in section **5.4 II**, followed by a discussion of the measurement of marginalization by other institutions in section **5.4 III**. Finally, part **5.5** presents the concluding remarks.

5.3 The Mexican economy.

Not only endogenous and exogenous economic conditions, but also political shocks are responsible for economic growth, and therefore, for the increase and decrease on the levels of income inequality. Being far away from the import-substitution model that used to rule from 1930 until the early 70's, the most important issues in the Mexican economy in the last 30 years are the two major crises (Lustig, 2001). The first one in the year 1982, as a consequence of the debt crisis, and the second one, in the year 1994, due to the inability and bad luck of the Mexican government to make a smooth transition between the administration of President Salinas de Gortari (1986-1994) and the administration of President Zedillo (1994-2000). The first crisis ended with a major devaluation of the Mexican Peso, while the second, known as the 'Tequila' crisis, ended with a major $50-billion rescue package from the IMF and the Clinton administration.

The adverse conditions and the inability of the Mexican Government to alleviate these complex situations exacerbated both crises. The poorest people suffered most of the consequences. Between the years 1994 to 1996, the crisis caused at least 16 million of new people that joined the rank of the poor (Székely, 2005, p. 23). Inequality across the country also increased during the 90's, while for different reasons this tendency appeared to ease up during the next decade. Some people argue that inequality decreased and overall welfare improved due to the boosting effect of international trade (e.g. NAFTA agreement), while others put this down to the huge out-migration of poor nationals to the United States.

The first crisis happened during the middle 80's. Mexico experienced a lack of macroeconomic policy management, due primarily to the poor allocations of foreign direct investment. Those resources were supposed to be invested in the oil industry, because of the discovery of great oil resources in the middle 70's. The Fiscal deficit rose from $23 billion in 1977, to $53 billion in 1981. It is true that at that time, some external shocks, such as some changes in fiscal policy and interest rates in the US that made their banks to stop inflows of money to almost all Latin American countries, were aggravating the situation. This became an important condition, and it negatively affected Mexico in such a way that in 1982 the Mexican peso had to be devalued. In those years several attempts failed to stop this inertia. Finally, in 1988, the Administration of President Salinas was finally successful in controlling this decay. On the one hand, the growth rate was very limited during the period from 1983 to 1988: the GDP increased by a ridiculous average rate of 0.2 percent, millions of Mexicans became poor and inequality increased substantially. On the other hand, some efforts were successful, for instance, in 1991,

foreign and local investment were repatriated, such that near to 10 US billion came back again to the Mexican financial system. An important engine for the economy, the NAFTA agreement (North American Free Trade Agreement), was signed in 1993. Little by little, the GDP grew up by an average of 1.7%, the inflation in 1994 reached its lowest level of the period to 7.0%, and confidence in Mexico was partially recovered. But that positive recovery did not last very long.

The second crisis, which was triggered by political shocks in 1994, started with some negative economic environment. The atmosphere in Mexico was full of uncertainty regarding the inflow of foreign capital at the beginning of the decade. In 1990, the banking system was privatized without an adequate framework of prudential regulations (Lustig, 2001, p. 89). The Mexican peso was effectively pegged to the US dollar through some financial policies. This was supposed to alleviate and maintain the rate of inflation lower. This policy caused international reserves to exhaust very soon, but it was not considered to be a serious issue by the government. On the other hand, the benefits from the NAFTA agreement and all policies that opened the Mexican economy were not yet effective; some of the social sectors were adversely affected. Therefore, a rebellion occurred. The *EZLN* (Zapatista Army for National Freedom -Ejercito Zapatista de Liberación Nacional) declared hostilities to the Mexican Army in January of 1994. Three months later, Luis Donaldo Colosio, the most important presidential candidate from the ruling party –PRI, was assassinated. This disturbing fact was very close to the incoming election in June of the same year. Right after this election, the PRI's General Secretary was also assassinated in September, only three months later after the Presidential election. Having such an adverse scenario for the new president Dr. Ernesto Zedillo, the

new government administration was unable to make the political and economical transition successful. As a consequence of this instability, both national and foreign investment flew from the country in December of 1994, causing again a major devaluation. This problem was partially solved with the help of the Clinton administration, because the Americans feared of a domino-effect affecting their own economy. The US treasury, jointly with the IMF, came with a $50 billion-aid rescue in order to support the very weak Mexican peso. It took some years of the Zedillo Administration to repay this loan, but an enormous $200-billion hole was opened in the Mexican public sector account, which is still in the process of being repaid.

Nowadays, Mexico has been embracing a more open model of economy, but there are still many challenges. The government has contracted more than 8 trade agreements with different countries with the aim of diversifying trade. The macroeconomic indicators have been improving since the last crisis via the opening of the domestic market. For instance, the average rate tariff, which used to be near to 10% before 1994, has been going down rapidly, and almost half of all import tariff categories have been eliminated (Lustig, 2001, p. 97). Mexican exports grew faster than imports after the crisis, so trade in general among Canada, US and Mexico improved. But in spite of this, income distribution is still a problem such that there are millions of poor people: near to 20 million Mexicans live with less than $2 dollars per day (Lustig, 2001, p. 86), in other words, around 20 percent of Mexicans do not have enough money to buy a very basic basket of goods (Székely, 2005, p. 26). The extent of the problem of poverty and inequality has begun to be known in increasing level of detail. The effort of the Mexican

government to estimate in detail about the effect of the crises on the most destitute will be described in the following section.

5.4 The institutional view of poverty in Mexico.

The same as many countries in the world, Mexico did not have a formal definition of poverty. It is known that countries like India and the United States have been careful to define official poverty lines, but Mexico did not define this officially until the beginning of this decade. The indicator provided by the annual per capita GDP was not longer seen as an appropriate measure of well-being (Hernandez and Székely, 2005). The difficulties involved in an effort of the formalization of poverty measurement, due to the highly politicized meaning of measuring of poverty, is not a secret (Székely, 2005, p. 24). Among other things, there are implications for the huge social spending that is attached to this measurement. Other implication is the political cost for the government of accepting publicly the existence of high levels of poverty, which can change people's political preferences. On one side, the government wants to control this task as much as possible, but on the other side, the social institutions and people's representatives want to be sure that the government is not giving false or biased information. Sometimes these demands contradict one another.

The most important effort in the measurement of poverty was done in the following way. The Secretariat of Social Development (or SEDESOL by its acronym in Spanish), which depends directly on the President's office, created in the year 2000 the Technical Committee for Poverty Measurement (Comité Técnico para la Medición de la

Pobreza or CTMP) (Székely, 2005; CTMP, 2002). This committee, after a year of work, institutionalized one of the Foster-Greer-Thorbecke (1984) poverty indices, using an expenditure survey as a basis (ENIGH) and having the household as a recipient unit. They neither formalized any measure of inequality, nor included any sort of dispersion analysis on the poverty measurement. Nowadays, that Committee is virtually dissolved, but CONEVAL (National Evaluation Council for the Social Development Policy), a decentralized institution that mostly depends of SEDESOL, took CTMP's role in poverty measurement. The next paragraphs will give an account of these institutions, and how these institutions, among others, are interrelated with poverty research and its measurement.

I SEDESOL, CONEVAL and Legal Concerns.

The detail of the definition of poverty measurements might be seen as a complicated task in Mexico, because of the laws that stipulate how and who should make deprivation assessment. The present legislation is not always interpreted identically by all parties. Firstly, we need to know who SEDESOL is. In regards to social expenditure, SEDESOL is the main organization in charge of social spending in Mexico, for instance, the federal budget for the year 2006 was around 3 billion USD on social spending programs, the equivalent to 1.7% of the GDP.[128] From this social expenditure, the most important government program for poverty alleviation is OPORTUNIDADES. With 5

[128] Own estimations based on the Statistical Annexe of the First Presidential Report (Presidencia de la República, Felipe Calderón, 2007b, pp. 4, 15, 55-56). One US dollar is equivalent to 10.5 Mexican pesos.

million household recipients,[129] the spending is around 700 USD per family per annum (Presidencia de la República, Felipe Calderón, 2007, p. 251). On the other hand, SEDESOL has been assigned by law, among others responsibilities, with the tasks of making evaluations in order to improve social development, and also to inform the society about the actions that are needed to be taken in these regards (General Law of Social Development –*LGDS*, 2004, Art. 43, Part IX). In regards to the administrative responsibilities, SEDESOL is the head of two departments that are connected with the issue of poverty measurement, such as CONEVAL (National Evaluation Council for the Social Development Policy) and the General Direction of Analysis and Prospective (GDAP). SEDESOL was also in charge of the creation and organization of the CTMP Technical Committee for Poverty Measurement. These two offices that depend on SEDESOL, plus the committee, will be described below briefly.

Mentioning briefly, CTMP (2002) recommended the use of the Foster-Greer-Thorbecke (1984) family of indices for poverty measurement, using an expenditure survey (ENIGH) and having the household as a recipient unit (CTMP, 2002). They defined poverty in relation to 3 poverty lines, but remained silent about the formalization of calculation of inequality (World Bank, 2004, p. 8), mostly because of the 'undefined' effect of inequality when poverty increases (CTMP, 2002, p. 20).[130] The next section contains more detailed information about CTMP and their effort, but here is mentioned to understand the role of CONEVAL.

CONEVAL was created under the law of social development that was published on December of 2003 (*LGDS*, 2004, Arts. 36, 37 and 72), but it started to operate from

[129] A detail of how these households are chosen in Hernández and Székely (2005, p. 92-101).
[130] The 'undefined' part comes from the consideration about the increase of inequality because of impoverishment (Cortes and Rubalcava, 1991). This discussion is tackled in detail in the following chapter.

May of 2006 (CONEVAL, 2007, p. 6). CONEVAL is a decentralized institute created for the purpose to the evaluation of poverty, and in general, the evaluation of any social development policy; CONEVAL has the power even to be able to modify or suspend any program of SEDESOL.[131] CONEVAL took as a basis the research made by CTMP on the issue of poverty measurement; that is the reason CTMP does no longer exist. CONEVAL is the organism that should define poverty guides about deprivation measurement: "The guidelines and criteria that [CONEVAL] established for the definition, identification and *measurement of poverty* are mandatory for entities and public organisms that are participating in the execution of social development programs," (*LGDS*, 2004, Art. 36, emphasis added, translated from the original). The measurement provided by CONEVAL is rather important, such that the Mexican President "will review annually the regions that needed more attention, in regards to the evaluations and the results of the studies of *poverty measurement*, which will be provided by [CONEVAL] …" (*LGDS*, 2004, Art. 30, emphasis added, translated from the original). Nowadays, the methodology of the information provided about the levels of poverty is controlled by CONEVAL. Therefore, the evaluation made by the President, taking into account CONEVAL's measurement, should help to define the allocation of resources to the most deprived; by now CONEVAL's measurement is mainly used as an indicator of well-being, an example of which can be seen in the last presidential report (Presidencia de la Republica, Felipe Calderón, 2007, p. 250).

On the other hand, SEDESOL is in charge of the GDAP through its internal regulation (*RISDS*); this internal regulation comes from the general law of social

[131] There is actually a legal controversy between the President and the Congress about the assessment of the programs and policy of SEDESOL, The problem is CONEVAL depends on SEDESOL, so it is difficult for it to be an 'independent' institution (Boltvinik, 2006).

development (*LGDS*). It is said in the law that this Direction has among other responsibilities, that of "[t]o elaborate indicators and make measurements in order to identify and evaluate the evolution during time of variables related with poverty and marginalization…" (*RISDS,* 2004, Art. 30, translated from the original). In practical terms, this Direction is focused on the assessment of poverty in a disaggregated level, so in this case SEDESOL, through this department, is responsible for the 'focalization'[132] of alleviation programs for the poorest communities.

There is another measure of destitution, which is done by SEDESOL also. This index is called the 'Indice de masas carenciales', and it is stated in the article 34 of the Law of Fiscal Coordination (LCF, 2007). This measurement has the purpose of giving the fair allocation of federal funding resources (Federal Funding for Social Infrastructure, FAIS) to every state in the country. The amount of money shared among the states was near to $328 million for the year 2006 (Presidencia de la República, Felipe Calderón, 2007b, p. 84), which is similar to one tenth of the federal spending for the program of OPORTUNIDADES. Since the year 1996, the amount of money is distributed among the states using an ad-hoc composite index that measures destitution in five different dimensions, such as health, education, dwelling, drainage and energy (Hernandez and Székely, 2005, p. 91). These funds are given directly to the states in order to be used for the building of infrastructure to provide with interregional benefit among the communities within the state (LCF, 2007, Art. 33).

In regards to the institutions linked with SEDESOL (1), we have CONEVAL (2), and GDAP (3). CTMP (4) was also part of SEDESOL, but it does no longer exist. Using the above information, providing a picture of which institutions make poverty

[132] This term refers to a particular focus in certain geographical location.

measurement might be useful. These institutions are shown on the diagram in **Figure 5-1**. Besides the mentioned institutions, there are two additional offices that are not part of SEDESOL, but these two offices contribute with measures of destitution, such as indices of multidimensional well-being. These two offices are the National Population Council (CONAPO) (5), and the National Institute of Statistical and Geographical Information (INEGI) (6), the role of the measurement provided by these institutions will be explained later. The following diagram explains better who is who in the Mexican scenario of poverty measurement.

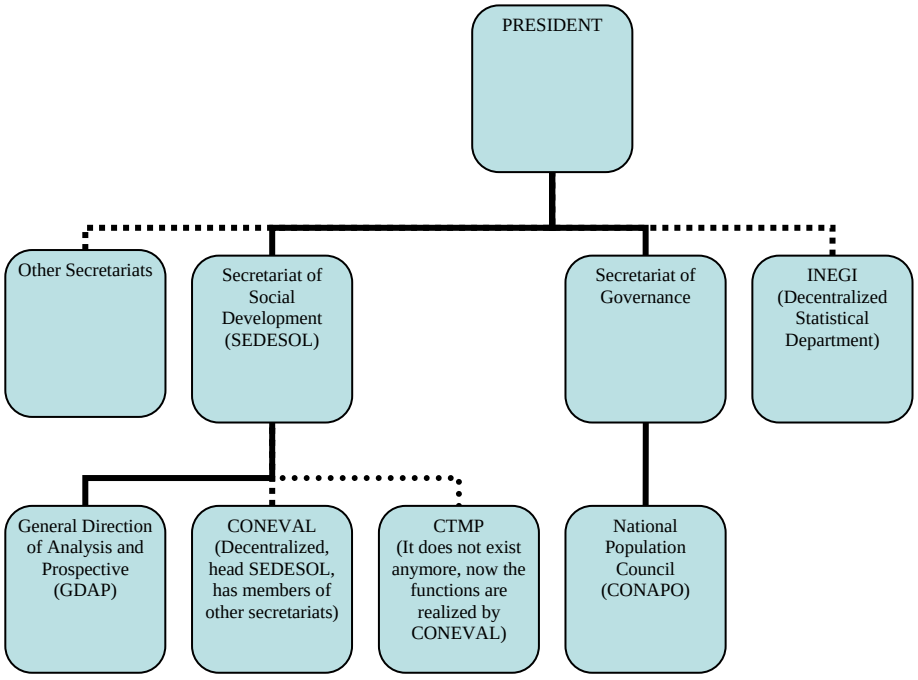


Figure 5-1. Institutions and Poverty measurement in Mexico.

II CTMP and detail of poverty measurement.

Because of the importance of the CTMP in Mexico, it is important to highlight particular details of the measurement proposed by this committee. As we mentioned, there has been an effort in order to standardize the most common measures of the standard of living in Mexico, such measure is poverty. During the administration of President Fox, through SEDESOL, a research agenda about measurement of poverty was established on the year 2000 (Cortés, 2005, p. 846). Josefina Vázquez-Mota, the head of SEDESOL, gathered a team of recognized academics and public sector personalities in order to arrive at a formal definition of poverty measurement (World Bank, 2004, p. 6). The legacy of her administration was a committee (CTMP) that provided a formal definition of poverty, with reference to the broad international literature on the topic. The effort of the committee was finally presented in a document called '*Medición de la pobreza: variantes metodológicas y estimación preliminar'* (*'Measurement of poverty: methodological variants and preliminary estimation'*). It was published in 2002 (CTMP, 2002). In this document that was the result of a year of work, the CTMP institutionalized the headcount Foster-Greer-Thorbecke (1984) poverty measure ($\alpha = 0$), using the household as the recipient unit and the expenditure survey ENIGH as the main source of data. The estimation of per capita deprivation was done using non-equivalized data. They did not formalize any measure or approach to inequality, but highlighted some research agenda about other issues (CTMP, 2002, pp. 20 & 87).

What was the definition of poverty due to CTMP in detail? In regards to some philosophical and ethical considerations, they defined poverty with reference to a

deprivation of necessary elements for the human life, not only because without these elements it is impossible to live in the society, but also because of the perverse effect of deprivation, such that deprivation reinforces itself (CTMP, 2002, p. 17). The role of cultural values and social relationships that are important in the context of poverty assessment is mentioned in the document (Idem., p. 17-19). They defined poverty using the terminology of capabilities, usually equating this term with the one of functionings, having in mind a multidimensional space, similar to the one proposed by Amartya Sen. This means that income is not a space, but income was seen as an image of multidimensional capabilities (CTMP, p. 17-8).[133] The definition of inequality was not considered, mostly because of the [apparent] ambiguous relationship of inequality and poverty (CTMP, 2002, p. 20).

On the operational decisions, the Foster-Greer-Thorbecke (1984) family of indices was chosen for poverty measurement, mostly because of its decomposability by population subgroups (CTMP, 2002, p. 22). They use per capita income, dividing total household income among the total of persons within the household, with the same weight assigned to children and adults (Idem., p. 43), and they choose an expenditure survey, in preference to employment surveys and census data (Idem., p. 49). They decided not to rely on employment surveys because of the problems associated with unreported or misreported income, and they did not use census data because of the inconvenient long period of time between each survey data collection. They did not adjust income with national accounts (CTMP, 2002, p. 61). Finally, they focused on the first of the Foster-Greer-Thorbecke poverty measures ($\alpha = 0$), showing the results at the national level, with separations between urban and rural areas (CTMP, 2002, p. 74), and giving

[133] An account of the Mexican case and the capability approach can be seen in the last part of chapter **7**.

information of the characteristics of the poorest households. They defined the household as the basis for the measurement, and they also define three poverty 'lines'.

Regarding the concept of the definition of poverty lines, three levels of poverty were chosen.[134] With certain minimum income, the household is supposed to be able to acquire a basic basket of goods. This first poverty line is known as the 'food' poverty line. The second one is the 'capability' poverty line, which is the required amount of income that every household needs for food, plus health and educational goods. The third line is the 'asset' poverty line, which is the required amount to afford items as housing and public transportation, besides the required amount of 'food' and 'capabilities' (CTMP, 2002, p. 9). The minimal requirements for subsistence, such as minimum caloric intake and some other goods, these were taken from earlier Mexican literature (Coplamar, 1983; INEGI-CEPAL, 1993). Following the general discussion of the basket of goods in Ravallion (1998), the definition of the basket of goods and its equivalent on income was done using the theory of the Engel coefficient (CTMP, 2002, pp. 36 & 41).[135] The rest of the operational, methodological and technical decisions on the measurement of poverty are described by Székely (2005, chapter 2).

However, immediately after such a big effort of the formalization of poverty measures by the CTMP, some governmental offices were nonetheless kept reporting poverty statistics without considering the CTMP methodology (*La Jornada,* 2003). This incident could be seen as undermining the scientific effort of CTMP, but the most probable explanation for that could be that the CTMP research was 'too recent' to be considered 'definitive', so the fact that those offices published statistics in such a way, it

[134] A reference to the definition of poverty lines in relation to the capability approach is available chapter **7**.
[135] A detail of the Engel coefficient in CTMP (2002, Annexe 1).

could be seen as a normal adjustment while the CTMP methodology was progressively absorbed at all governmental levels.

III Marginalization measurement: CONAPO and INEGI.

The term of marginalization and social exclusion has been traced to the work of Max Weber (1924),[136] but more recently in France during the 1970's, mostly referring to the unprotected ('*les exclus*') by social policy (Burchardt et al., 2002). The term of marginalization later included a set of different kinds of social deprivations; this idea has been used mostly in European countries (Hills, 2004, p. 52). This terminology might be interchangeably used with known concepts such as income poverty or social deprivation, and can be understood as a multidimensional face of poverty that considers not only material deprivation, but particularly, the limited access to public services as well. For instance, the following multidimensional space has been proposed by authors like Atkinson et al. (2002) in order to measure social exclusion: material deprivation, education, employment opportunities, health and housing. Therefore, the term social exclusion is trying to give us a broader definition of deprivation rather than only income poverty, explaining the principles of social deprivation with a 'multi-layered' concept, either of households, individuals, or communities (Hills, 2004, p. 54). The marginalization concept try to focus not just in the poor, but in the subset of the poor that is affected more heavily by several deprivations, such that the government shall be capable (because it is responsible) of alleviating the status of that poor people. This is the

[136] See his essay *Class, Status and Party*.

idea that has been used by the next two following institutions in their measurement of well-being.

a) **CONAPO.**

The next institution that makes 'poverty' measurement is CONAPO. To explain the poverty measure of their choice, it this is necessary to understand the political role of this institution, because of its dependence on the Governance Secretariat, the right hand of the President. According to the second Article of the General Population Law (*LGP*, 1996), it is stipulated that the president will perform, through the Governance Secretariat, coordination and promotion of solutions for demographic problems. Problems such as population distribution, reduction of mortality, contraception programs, women participation, in and out-migration and integration of marginalized groups to society. CONAPO was created in 1974, with the aim to help the Governance Secretariat with demographic projection, in order to "include the population in the economic development and social programs…, and to link the program objectives with the necessities that arise because of demographic phenomena" (*LGP*, 1996, Art. 5, translated from the original). CONAPO in its website explain this in detail: "[CONAPO] has the mission of regulating the phenomena that affects population regarding its volume, structure, dynamics and national territory distribution, *with the purpose of making the population have a fair and egalitarian participation in the social and economic benefits*". (Emphasis added, translated from the original).[137] The sentence in regards to the egalitarian focus is not

[137] In "General Information". (http://www.conapo.gob.mx/00que/01.htm)

directly relevant to the law that created CONAPO. Without entering in this discussion, the fact is that CONAPO makes their own assessment of marginalization based on the philosophy of social exclusion,[138] even though it is stated in the *RISDS* that SEDESOL, through the office of GDAP, should be in charge of that measurement.

CONAPO's measure of marginalization, which is based on census data using the statistical method of the principal component analysis,[139] is virtually a multidimensional measurement of poverty, similar to the concept of functionings and capabilities due to Amartya Sen. CONAPO's marginalization index uses five classifications of deprivation vectors with the technique developed by Dalenius and Hodges (Lopez-Calva and Székely, 2006, p. 30-31). The ranking comes from dimensions with information such as literacy, schooling, water and drainage supply, electricity, stacking household level, size of community and income level (CONAPO, 2005, Annexe C). Using this index as a basis, CONAPO classifies municipalities and states in five levels of marginalization; such index goes from 'very high' to 'very low'. The index is published periodically, and is extensively used by state and municipal governments. It is supposed that the government should focus on the indicators where marginalization is higher, applying more resources when needed.

There are some theoretical problems with marginalization measures. These are not decomposable by population sub-group, so there is no possibility of knowing the contribution of marginalization by each group, because this measurement provides only a ranking of communities. We do not know with certainty which dimension is causing the

[138] About 'marginalization' see footnote 2 in CTMP (2002, p. 20).
[139] Under the assumption of correlation among vectors, this technique captures in fewer dimensions the highest variance present in the data set using the best eigenvector of those dimensions. This technique is applied in computer systems, particularly on data management of graphic files and file encryption.

community marginalization, because of the artificial weight that the method attaches to each dimension of destitution. It is a measure that is relative *per se*, so this measure does not take into account absolute destitution, as other formal poverty measures do. In regards to the representation that this 'virtual' measurement of poverty is, during the year 2000, CONAPO tried to link their findings with standard poverty measures, before the attempt provided by CTMP. After making a comparison between this ranking and the Foster-Greer-Thorbecke measures (CONAPO, 2000, Chapter 4),[140] they conclude that "the general data about the intensity of poverty approximates to the one on marginalization" (CONAPO, 2000, p. 34). For the policy maker it might be confusing to look at measures provided by the CTMP if they look at the ranking provided by CONAPO, because the measurement of CONAPO might be considered as a substitute measure, rather than a complementary way to assess well-being. There might be a legal conflict here between marginalization measurement and poverty measurement that is assigned by law to SEDESOL.

b) **INEGI.**

The last institution which might be making measurement of poverty or marginalization is INEGI, which is the institute that provides data for all the previously mentioned institutions, despite the fact that their role is usually restricted for collection of data. INEGI have a 'product' called 'Socioeconomic Regions of Mexico'.[141] This product

[140] It is not clear in the tables which were exactly the calculations for the FGT indices, because they classified them later in the same ranking as the marginalization index.
[141] Found in http://jweb.inegi.gob.mx/niveles/jsp/index.jsp

used to be published as a list of 15 indicators from the census data, and now, besides those indicators, they construct a composite index of marginalization that is called 'well-being index' (Lopez-Calva and Székely, 2006, p. 31). They have clearly stated in their methodology the following: "[i]t is important *to insist* that this product has not been designed for, or has the purpose of measuring poverty, well being or marginalization. As is known, the Secretariat of Social Development (SEDESOL) is responsible of giving the *official* poverty measures" (INEGI, 2004, part III.6, emphasis added, translated from the original). Even tough they claim not be carrying out any poverty measurement, they seem to produce one such measure. They use a very interesting geographical interactive web tool to show results. The methodology for the data base is similar to the one used by CONAPO, but is focalized on the AGEB, which is a smaller geographical unit than a municipality.[142] The calculation method is based on the optimal stratification for multiparametric samples, as suggested by Jarque (1981), as an improvement of the principal component method, because the method uses more information for the assessment of the ranking, and not only the 'principal component' vector. There are 36 variables included, these are described by Lopez-Calva and Székely (2006, p. 32). The audience of this product is intended to be not only the municipal government, but also the state and the federal governments. This product can be accessed by the private, academic, and the social sectors as well. The purpose of this product is to help "the tasks of projection, design and formulation of policy rules and specific programs in their own action spaces" (2004, part II.2, translated from the original). In the view of the author of this chapter, there is no problem with the presentation of raw indicators of census data,

[142] For an explanation of AGEB and its classification, see note *a* in the same Methodological document (INEGI, 2004, p.1)

those are easily available with the interactive tool, but there can be an overlap with the composite ranking provided by INEGI, which can be considered as a virtual measure of poverty or well-being. They might be ignoring the fact that the President should use only CONEVAL's poverty measures in order to propose programs and allocate spending for the alleviation of poverty (*LGDS*, 2004, Art. 30).

5.5 Concluding remarks.

The consideration of various approaches in regards to poverty can be valuable because of the complex nature of poverty as a social phenomenon. As it was described for the Mexican case, the previous crises affected the poorest people in many ways. An understanding of the multidimensional faces of poverty can be helpful. However, when important public resources are to be distributed, there should be a unique consistent and fairer tool that allocates public spending, otherwise, the provision of resources suffers the risk of being discretionary. If there is no coordination in human development research, the efforts of isolated institutional research might be a waste of time. Arguably, the best exercise in Mexico regarding poverty measurement is the one proposed by the CTMP that was adopted later by CONEVAL. CTMP's poverty measurement recognized the broad spectrum of the task, standardizing poverty measures mostly based on international and recognized development literature (World Bank, 2004, p. 6). They include ethical judgments of fairness and justice and also suggested a research agenda. The literature in destitution measurement was stimulated later by the effort of CTMP and the conclusions they arrived at.

The inertia on poverty measurement should be considered, because even though the effort of the CTMP was very influential, such that now it is the official measurement,[143] there are still traditions in other governmental institutions that assess some sort of well-being measurement. There are also regulations that seems to support ad-hoc ways to measure well-being in order to allocate federal resources. On the side of the institutions, for instance, there are rankings that use the principal component method, such as those proposed by CONAPO or INEGI. The constructed indicators of marginalization are used to generate policies and to allocate resources as well. But these multidimensional indicators are not always consistent with official poverty literature. In the event that marginalization measures become totally consistent with the official measure, carrying out any further research would be a waste of resources and efforts. Considering the current legislation, the 'Indice of masas carenciales', which is stated on the *LCF*, it does provide a measurement that does not take into account the measurement of poverty as defined by CTMP, so the distribution of resources using their measures as a guide might not be the most efficient. With a large list of alternative methods to measure destitution to choose from, the researcher might be confused on the selection among the plethora of 'poverty' measures available.

The measurement of poverty and destitution in Mexico is not perfect. There are still many things to consider. For instance, as a central part of this work, inequality measurement has not been considered in full. On the other hand, it is important to note that in practice, SEDESOL only takes into account the headcount ratio of the Foster-Greer-Thorbecke family of indices ($\alpha = 0$). Neither the meaning of the intensity of

[143] CONEVAL measures are used officially for poverty assessment, for that see the last Presidential Mexican Report (Primer Informe de Gobierno, Felipe Calderon, 2007, p. 250).

poverty ($\alpha = 1$) has been exploited, nor the measurement of poverty that is transfer sensitive ($\alpha = 2$) has been considered, even though these alternative measures has been suggested and calculated in some Mexican studies (CTMP, 2002, p. 111). Recently, multidimensional indices of human development (HDI) that have their root in the capability approach of Sen are being considered more seriously (Lopez-Calva and Székely, 2006). HDI measurement could be a more complete way to measure well-being, being fully consistent with CTMP and CONEVAL measurement of poverty, but that issue, which entitles a methodological discussion of Sen's work, will be tackled in chapter **7**, on the issue of inequality and the capability approach.

6 Poverty and Inequality in Mexico: Some Theory, History, and Empirical Testing.

6.1 Abstract.

Recently, the study of income distribution in Mexico has been revived. The study of income inequality was put aside for years because of the influence of certain literature. During the 90's, it was claimed an ambiguous relationship between inequality and poverty, therefore, the consideration of inequality was not seen as another dimension of human deprivation. Because of this reason, the assessment of welfare was mainly centered on poverty measurement on the following decade, with the inclusion of some of the capability approach concepts. Now in the Mexican literature, there are serious concerns about the inclusion of distributive considerations in the human welfare measurement. This chapter gives some insights on the historical, theoretical, and empirical reasons to support a clear unambiguous connection between the indicators of inequality with other measures of welfare. So the study of inequality as an important aspect of welfare should continue. The empirical part includes a regional assessment with various correlations checks. It is acknowledged household heterogeneity with the use of equivalence scales. The empirical part sheds light in regards to the proposed positive relationship of inequality and other measures of destitution.

6.2 Introduction.

The study of poverty and inequality, as a measurement of welfare, was revived following the publication of to the seminal contribution of Sen (1976) and Atkinson (1970), which stimulated research that proposed certain types of measurements with several properties, some of which are still being investigated. The new perspectives, due to these authors, influenced policy changes in several countries, as the old fashioned poverty measurement used to be focused only using the headcount ratio and the discussion in this regards used to be about the absolute or relative nature of poverty. Inequality measurement also changed. Inequality used to be calculated using common arbitrarily selected deciles, it was measured using statistical tools to measure the dispersion of the income distribution, or it was mostly calculated with such ad-hoc measures as the Gini coefficient. That tradition started to change later on with a variety of new developed measures of poverty and inequality.

During the middle 80's, the theoretical relationship of poverty and inequality was discussed through a tool named 'stochastic dominance' (Foster and Shorrocks, 1988; Atkinson, 1987; among others). The studies of this condition lead to a deeper understanding of the (theoretical) relationship between poverty and inequality. Since because in order to rank two different distributions, it was known that if the stochastic dominance condition holds (approached with certain types of inequality measures and their graphical representation), there is no need to check for poverty measures, therefore, the dominance condition would be enough to rank two different states of any income distribution (Zheng, 2000, p. 443). In the present time, the dominance condition, which is

a virtual consideration of inequality, is not always checked when some income distribution is considered on the grounds of poverty assessment. It is still the case that between measurement of inequality and well-being, usually well-being (poverty and human development indicators) has been chosen as the most important topic in the discourse of standard of living. However, in recent discussions, not only the discussion about definition of the poverty line but the consideration of inequality of income distribution is also included, together with the sub-group consistency property and the multidimensional nature of well-being.

The central point of discussion of this chapter focuses on the unambiguous relationship of poverty and inequality, being those topics two very important indicators of deprivation. For the case of Mexico, that there was an ambiguous relationship between poverty and inequality was said (CTMP 2002), and that will be commented in detail later on the chapter. This finding is theoretically possible, relaxing the fixed mean income condition, but it is against the traditional predictions, something only likely to happen in extreme cases of crisis. In spite of the argument that sustained some ambiguity of this relationship, using empirical tests will be proved that the relationship of measures of inequality and poverty in Mexico holds in strong positive direction, which is consistent with the present theory, a finding that is consistent even with some robustness checks as well. Because of the nature of deprivation that entails the notion of inequality, it is argued that this important side of human well-being should be included in the recent agenda, so inequality should be a matter of study on the assessment of well being (e.g. López-Calva and Székely, 2006).

There is the classic question of why inequality and poverty should be considered together. In the case of the Latin American countries, there are various answers, and all of them are important. In the macro level, the relationship of poverty and inequality is not only positively correlated, but the latter has proven to be countercyclical for the case of Mexico (World Bank, 2004, p. xxii; Esquivel et al., 2006, in Lopez-Calva and Székely, 2006, p. 187). Inequality has also been seen as an obstacle for poverty alleviation: "Even with steady growth, poverty reduction tends to be slow, as a consequence of Mexico's high income inequality" (Idem, p. xvii), and not only that, "high inequality of opportunities and outcomes reduces the rate of growth itself" (De Ferranti et al. 2004, p. 24). On the other hand, it is fair to say that in the micro level, the existence of excessively high inequality hurts the self-esteem of the low-middle class and the very poor, because for them is clearly visible that the problem of their condition is not a lack of resources, but a problem of a possible unfair distribution. Therefore, regardless of the people's poor circumstance, high inequality might be a clear (and sufficient) condition for social problems. In spite of the clear or unfair perception of inequality, whether inequality is perceived as a social deprivation or in some cases as a measurement of 'social envy', [145] in both cases, the uncomfortable feeling attached to any sense of inequality, should be of interest for policy makers, because of the possibility of rebellion (Sen, 1973, p. 1).

[145] The idea of fairness and envy is mentioned in Sen (1987b, p. 1041), where 'equity' happens if no one wishes to have or preferred a bundle of goods that belongs to other person instead of his own, see references therein. See also Simmel (1922) in Coleman (1987, p. 170).

- Overview.

The organization of the chapter is the following: after this short introduction, section **6.3** includes some stylized facts about some of the underlying reasons that exist behind inequality and poverty, mainly in the context of Latin American countries, in particular for the case of Mexico. A very brief theoretical survey of the relationship of poverty and inequality follows in section **6.4**, mentioning the research about poverty orderings. Section **6.5** shows the empirical testing and robustness checks of the main claim of this paper, that the relationship of poverty and inequality across regions remains unambiguously determined. Finally, section **6.6** has the concluding remarks.

6.3 Traditions and Literature of Inequality and Poverty in Mexico.

Inequality in Latin America is difficult to comprehend without the understanding of the historical facts that, five centuries ago, started the tortuous process that allowed the European 'colonizers' the control of the selected territories. The institutions that were sowed instead of the existing organizations were designed in order to exercise control over the mass population, composed of indigenous people (whenever not exterminated), imported slaves, and a growing sector of interracially mixed population. That control was designed to be done by very few in the conquered territory, because of the necessity of guarantee the effective transfer of resources from the recently discovered territories to the European nations. It has been empirically proved by authors like Angeles (2007) that in certain countries, including most of the Latin Americans, inequality was artificially

raised, such that "…colonialism brought into the country an amount of European settlers whose number was considerable but still inferior to that of the local population. This minority was able to concentrate most of the countries' income in their hands, mainly by excluding the rest of the population from owning land or mining resources" (p. 1173). That form of organization was prevalent by near to 300 years, when later on, most of the Latin American societies gained independence. However, two hundred years after the independence, that rooted form of organization is still prevalent in our society, and because of that, it might be perceived as normal, it has been there for a long period of time, and some people had possibly become used to it. For the superficial observer, it might be clear that the present institutions, but not the historical reasons, are usually responsible for the persistent inequality in Latin America (De Ferranti et al. 2004, p. 109). But it is necessary to consider not only the present but also previous facts that enhanced inequality, so the phenomena might be better understood.

There had been a speculation of why it is the case that inequality in Latin America has not been studied in depth in economic science. The lack of people's proper education has been held responsible for the lack of interest in inequality assessment. The acquisition of the model of import-substitution that isolated those countries from the rest of the world has been mentioned as another explanation, but there are not sufficient grounds in order to affirm categorically which issue is responsible for the improper study of inequality (De Ferranti et al. 2004, 121). If we take as the truth that there exist institutions that still follow the colonial mode, that the study of inequality would be uncomfortable for the ruling class might also be said, and a very popular topic in the research agenda might not be. Nowadays, there might be a problem in Latin countries due to the (financial) control

of the most important institutions by groups of very few families. Moreover, a reduced number of these families have been mentioned elsewhere (it can be seen Haggard et al. 1993), such that they exercise control to the most strategic institutions in the country.

I Traditions in Inequality Measurement

In regards to the traditions of measurement of welfare in Mexico, it can be said that one of these traditions has been related with the definition of the poverty line, but not as a matter of relative or absolute value, but as a matter of the definition of the basic basket of goods.[146] This discussion is still prevalent in recent publications (Székely, 2005, ch. 11 & 12).[147] Mexican literature has seldom questioned the absolute character of this definition. It is said that "in this part are taken into account several theoretical and methodological aspects that is convenient to take into account in order to define a poverty line that is measured from a certain basic basket of necessary goods." (CTMP, 2002, p. 35, translated from the original). This issue left out any discussion about the possible relativity of the poverty line, which is common to consider in certain European countries or others like Canada. This chapter does not argue in favor of a relative definition of the poverty line, it just mentions that the inequality consideration embedded in the measurement of relative poverty, is not considered in the Mexican case.

In relation to the above paragraph, we can suspect that this ignored relativity of the poverty measurement might be connected to the inherent relative concept of

[146] See the references in the note 17, CTMP (2002, p. 36).
[147] The discussion is related with the equivalence of scales that are present in the household, the update that is needed in the composition of the goods that are part of the basic basket, and the definition of the non alimentary goods. (Szekely, 2005, pp 29-30).

inequality, and that might be the reason why the concept of inequality has not been studied in depth. For the common policy maker, it might be blurred the definition of 'inequality' with 'relative poverty'. The methodological implications of these two different challenges invite philosophical discussions as well.[148] On the one hand, relative poverty does measure welfare, using as a benchmark a changing poverty line. In this case, the poverty line can be a fraction of the median of the income, or other arbitrarily predefined value that is usually related to some endogenous characteristic of the population. The relative poverty measurement indicates more deprivation if the distribution of the population is more unequal, *ceteris paribus*. On the other hand, income inequality is a comparison of each member of the community in regards to the income of other peoples [within the group], and it might be a comparison of a person's income with every member of the community, regardless of the sufficient or insufficient satisfaction of their needs.[149] Having those two distinct concepts in mind, it can be clear that inequality measurement is not only a comparison of the personal income with the average income of the population, as the relative poverty measure does, but a different type of deprivation that might hurt the feeling of the population, mostly of the very poor.

II The 'ambiguous' relationship of Poverty and Inequality

Some of the papers that studied income inequality in Mexico affirmed that the relationship between inequality and poverty is ambiguous. Almost all the papers that

[148] The relative dimension of poverty, is understood differently by sociologist than economists, see the Sen-Townsend issue in Foster and Sen (1997, p. 184, n. 107), and the references therein.
[149] See the topic of a third degree stochastic dominance in chapter **2**, where inequality assessment might be equivalent to poverty measurement with distributional sensitiveness.

affirmed this issue, took the study published in 1991 by Cortés and Rubalcava. In that publication, it was a finding that during a special period of crisis, during the 80's, a poverty increment was observed while the opposite was happening to the level of inequality (CTMP, 2000, p. 20). Some authors were conservative in order to assert such a thing. For instance, Boltvinik (1989) only showed that poverty increased during the mentioned period. In the case of Hernandez-Laos (1991) and INEGI-SPP (in Tuirán, 1992), they estimated and confirmed that inequality remained virtually unchanged during the period near before and after the crisis of 1984. Cortés and Rubalcava maintained that this result was due to some particular behavior of householders that attempted to offset their losses during the period of crisis (1991, pp. 11 & 21).

This result might not be particularly interesting, but it is remarkable because of the fact that such study was used by the Mexican official committee of poverty measurement (CTMP) in order to support the idea that, as a matter of study, only poverty should be the prevalent concept of study of true well-being. In favor of an 'awkward' relationship between inequality and true well-being was argued. The following was said: "[a]n increase in poverty does not necessarily imply higher inequality when the income of the poor diminishes, neither an increase in inequality implies necessarily a higher level of poverty" (CTMP, 2002, p. 20, *translated from the original*). It was argued in a persuasive way that this relationship could be possible due to a higher dispersion of the income distribution of the non poor. Our research argue that it was overstated the basic claim of Cortés and Rubalcava. They did not claim a general thing (1991, pp. 26 & 34), as the CTMP emphasized. That might be the reason why, virtually all the study of inequality, in regards to the assessment of well-being was taken as a secondary topic in the Mexican

literature. Important theoretical and empirical relationships among inequality, poverty, and overall welfare seems to be ignored.

In detail, the study of Cortés and Rubalcava covered an important period between the years of 1977 through 1984. They tried to explain the adverse scenario of Mexico in a particular time of crisis, which ended with large currency devaluation in 1982. This scenario was responsible for a generalized decrease of well-being. The deep study of Cortés and Rubalcava claimed a consistent, but a very small inequality reduction while headcount poverty was increasing (1991, pp. 26 & 34). This finding was possible, according to them, through the offset of losses of the poor people with alternative labor supply (e.g. female and children labor), rent of assets and through the transfer of resources coming from social networks (Idem., p. 25). The intuition to support this empirical finding came from the sociological literature of that time (Idem., pp. 25 & 60). It is fair to assert that all our remarks about this study need to be placed on the right temporal context. At that time, there were a variety of methodological ways to do the measurement of welfare, and even the most basic poverty measurement was done differently by different authors (CTMP, 2002; Cortés and Rubalcava, 1991, pp. 88, 118). Cortés and Rubalcava explored inequality differences using a very basic statistical measurement of dispersion, which is the variance as a measure of inequality. Even though the narrative arguments there were rather convincing, those were empirically weak. They faced both data limitations because they only account with aggregated data, and also they have limitations because of the use of primitive tools to measure inequality, besides some inconvenient technical decisions in the assessment of the distribution. These three issues will be commented below.

Cortés and Rubalcava decided for some technical issues, as it was the use of the variance as a measure of inequality. They pointed out the difficulty to use the Gini coefficient as a reliable source (Cortés and Rubalcava, 1991, p. 35). Considering their decisions, there are various critiques in order to use the variance as a measure of inequality because of measurement error. It is true that the measure of the variance satisfies the Pigou-Dalton condition, where any transfer from the poorer person to a richer person always shows an increase of the level of inequality, but the variance has the problem of being attached to the mean income level (Sen, 1973, p. 27). In Mexico, the mean income was changing drastically during the period of crisis in 1982 because of the huge devaluation.[150] So, at first glance, it seems to be dangerous to draw conclusions on the basis of a measure of inequality using the variance alone, more so if the weakness of that inequality measure relies in a condition that was changing heavily in that period. In order to alleviate that weakness, Cortés and Rubalcava said they checked for the next measure independent of the mean income, which is the coefficient of variation (1991, Appendix II, p. 168). They claimed a similarity of the results with those achieved by using the variance. But again, they were relying only on aggregate data and only accounting for the rate of inflation using national price deflator, not a regional price deflator (Idem., pp. 24, 120 & 169). The pervasive effect of the devaluation was progressive, and not all the regions were affected in the same way (Bank of Mexico, 2006). Our claim is that a regional price consideration should be performed.[151] On the other hand, even if we consider that the coefficient of variation measurement was done in a proper way, we find a particular flaw of this measure that attaches the same weight to

[150] The exchange rate at the beginning of 1982 was 1 dollar for 26.79 pesos. At the end of the same year, the same dollar cost 150.00 pesos, almost four times its value (Cortés and Rubalcava, 1991, p. 14).
[151] In chapter **4** was shown that inequality measurement is sensitive to the consideration of regional prices.

transfers, irrespective of the different income level where this transfer takes place (Sen, 1973, p. 28). Cortés and Rubalcava were relying on this type of measure in order to assess differences on each distributional level (1991, pp. 58-83); where the issue in dispute is precisely the awkward relationship of high poverty with the supposedly less unequal distribution across the different income levels, such a methodological constraint of weight of transfers should not be ignored.

Considering their methodological decision, they could use other type of measures, particularly those that applied a transformation that highlight the differences at the lower end of the scale. The standard deviation of logarithms measure or the Theil index satisfies that condition (Sen, 1973, p. 29), but they were constrained by the data available to them (Cortés and Rubalcava, 1991, pp. 70, 91 & 114). On the other hand, they took as given other thing, which is the common assumption about the independence of the measure to a changing population, known as the symmetry axiom for population (Sen, 1973, p. 59), which allows the comparability of two income distributions with different number of individuals in two different periods of time. During that period, even though they were suspecting that some out-migration was taking place (Cortés and Rubalcava, 1991, pp. 79, 85 & 86), they did not perform a robustness check for this condition. The real dimension of the problem was not known, where millions of Mexicans were traveling and establishing themselves in the US (Massey and Espinosa, 1997; among others). So in that case, that assumption of independence of population was also in fact violated.

It was mentioned above that Cortés and Rubalcava did not use the Gini coefficient as a measure of inequality, they pointed out that Gini coefficient is not population sub-group consistent (Cortés and Rubalcava, 1991, p. 35). We think that the real reason was

that the data constraint did not allow them to measure inequality using this method. Because of the same data constraint, they could not use a tool that satisfies the condition of population sub-group consistency neither, as it could be any of the indices of the Entropy family. Giving the fact that they reject the Gini coefficient as a reliable source of measure, it is curious to notice that they use the Gini measurement from other authors in order to support their claim that inequality was decreased, or at least not increased (Idem., p. 112). They did not perform robustness checks on those Gini levels, as it is common to do using bootstrap techniques and measuring standard errors; neither have they mentioned any use of stochastic dominance. Because of data constraint, they could not apply equivalence scales neither, so all the measurement was done using only the aggregates that came from household totals (Idem., p. 46); we do not know if they considered either per-capita income or household aggregates.

Finally, they made some assumptions in order to explain the measurement error that comes from underreported and misreported income. They were aware of the highly misreported data (Idem., pp. 47 & 68). On the one hand, they recognize the misreported income from the poorest people, and they acknowledge this error with various researches (Idem., p. 25). They in fact recognize a huge increase on informal activities that could just increase the measurement error (Idem., p. 89). On the other hand, they claimed that high income classes were unable to behave in the same way for their own benefit as a reaction of the crisis. That rich people were insensitive to their own deprivation is particularly problematic to believe. At that time, rich people were investing in financial assets at that time, and corruption was taking place during this chaos. We suspect that those activities will not be reported or captured in a survey in any way. In spite of this,

Cortés and Rubalcava claimed that the underreported income should be proportionally the same in the two different periods of time, before and after the crisis (Idem., p. 26, n. 15). It is our claim that they in fact were analyzing two different objects with the same microscope, assuming that only the poor people changed their behavior from 1977 to 1984.

In spite of Cortés and Rubalcava finding, that of the negative relationship of poverty and inequality, the next section will show why this 'ambiguous' finding, even though is theoretically possible in extreme cases, it might be particularly difficult to prove, as it was explained above. It will be made a theoretical a review and we will see if the ambiguous argument could have a proper support.

6.4 Theoretical relationship of poverty and inequality.

In the following section is mentioned briefly about three known reasons in order to say that, at least theoretically, poverty and inequality should be related with unambiguous direction, holding the mean income constant. Using the standard definitions in this subject, a clear connection between those two indicators of deprivation has been shown, For instance, proposed in 1973, Sen's poverty measure accounts with a connection among a headcount ratio, a poverty gap, and certain inequality measure; in this setting, poverty increases as inequality increases. Later on, one of the indices that belong to the family of the Foster-Greer-Thorbecke (1984) poverty measures includes a (sub-group consistent) relationship of inequality and poverty that is evident. The literature that also enlighten the unambiguous relationship of poverty and inequality is

about the 'poverty orderings', developed by Foster and Shorrocks (1988). These three discussions will be briefly mentioned.

In order to discuss the issue, some notations will be introduced. Let *y* be the vector of personal incomes for the community as a whole, so $y = [y_1, y_{2,} \ldots, y_n]$, where *n* is the number of people in the community. The average overall level of income is μ, such that $\sum_{i=1}^{n} y_i = n\mu$. The average level of income for the poor population μ_p is analogously defined $\sum_{i=1}^{q} y_i = q\mu_p$. Let be *z* the defined poverty line (it is convenient to assume that $z \in R_{++}$). The number of the poor *q* represents people who have fallen below the poverty line *z*, so $q = q(y, z)$. The headcount ratio *H*, as a first measure of poverty, is simply *q/n*. The intensity of the poor person's poverty can be measured by the extent of the gap between the poverty line *z* and the person's income $g_i = (z - y_i)$. The income-gap ratio became $\mathrm{I} = (z - \mu_p) / z$,[152] which is a widely used measure of poverty and reflects the share that the average shortfall of the incomes of the poor departed from the predefined poverty line *z*.

a) Lets us consider first the definition of poverty according to Sen (1973; 1976; also in Foster and Sen, 1997). Going beyond the simple measures of poverty, such as *H* and I, that only capture respectively the number of the poor and some idea of departure from the poverty line, an ideal poverty measure might include not only these properties, but also a sense of inequality of the income distribution of the community. Sen argued

[152] Please note the difference of the Greek letter I, which means the income-gap ratio, with the letter I, which is used later on as a generalization of any inequality measure. Gini coefficient can be described interchangeably as *G* or as I_G.

that a proper poverty measure should be distribution sensitive (Foster and Sen, 1997, p. 170). Starting with an absolute poverty line, and stating basic intuitive axioms, such as ordinal ranking weights, monotonic welfare and a normalized poverty value (Sen, 1982, p. 378), the proposed measure of poverty, named *S*, became (asymptotically) the following:

$$S = H\mathrm{I} + H(1-\mathrm{I})G_p$$

This population invariance measure shows an unambiguous positive contribution of inequality to the overall measure of poverty if the mean income remains constant, given by the Gini coefficient of the poor G_p. It is important to note that the Gini coefficient was not artificially imposed on the *S* measure, but it was a consequential implication of one of the axioms that were intuitively invoked, giving a proportional higher weight to the person's income with larger distance from the poverty line (Sen, 1982, pp. 376-379; Foster and Sen, 1997, p. 171). Thus, the community with more unequal distribution (higher *G*) shall be considered poorer (higher *S*). The critique of this measure by Shorrocks (1995) focused on other aspects of the measure, but not in the sign of this relationship,[153] which remains positive. With some small rearrangement ($S = H \cdot (\mathrm{I}(1-G_p) + G_p)$), it can be made clear that the poverty measure attaches bigger importance to inequality when the income-gap ratio is small, with small emphasis on inequality as the income-gap becomes bigger. That would be the reason why it might be believed that the measurement of inequality might be ambiguous with the measurement

[153] This measure, and also its generalization (by Blackorby and Donaldson, 1980b), might violate the very basic Pigou-Dalton condition, not only the sub-group consistency, as was discussed by Shorrocks (1995) (see also Foster and Sen, 1997, p. 169).

of poverty. The fact that this relationship is not linear, does not hide the fact that the relationship is unambiguously positive, if the mean income remains constant.[154]

b) As a second issue, in other theoretical development in the measurement of poverty, there is other set of poverty measures showing also a positive relationship between inequality and poverty. It is the Foster-Greer-Thorbecke (1984) family of poverty measures P_α , which are defined in the following way:

$$P_\alpha(y,z) = (\frac{1}{n})\sum_{i=1}^{q}\left(\frac{g_i}{z}\right)^\alpha \text{ for } \alpha \geq 0$$

The connection between poverty and inequality is not straightforward for the first two poverty indices of this family, because P_0 is only equivalent to the headcount ratio (*H*), and P_1 that is the same as $H \cdot \mathrm{I}$, it captures only the intensity of poverty but not of inequality. On the other hand, that P_2 can be expressed in relation to a measure of inequality can be shown, and this is consistent with the fact that this measure of poverty is transfer sensitive (Foster et al., 1984, p. 763; Foster and Sen, 1997, p. 179). Being C_p^2 the square of the coefficient of variation, which is a well known measure of inequality,[155] P_2 could be rewritten as follows:

$$P_2 = H[\mathrm{I}^2 + (1-\mathrm{I})^2 C_p^2]$$

This measure shows the same theoretical implications of *S*. In any case, the relationship of inequality and poverty remains always positive, holding the mean income

[154] The only exception for this could be a very strong change of I, either in the definition of the poverty line, or in a change of the mean income, but we assume both are fixed.

[155] The squared coefficient of variation of the poor $C_p^2 = \sum_{i=1}^{q}(y_i - \mu_p)^2 / \left(q\mu_p^2\right)$, is the measure of inequality, when *n* and μ are substituted for *q* and μ_p respectively (Foster et al., 1984, p. 762).

constant. The effect of inequality on poverty becomes stronger when the income-gap ratio is small, loosing its meaning when this gap increases.[156]

c) The third issue that is related with the link between poverty and inequality, it is the relation of the poverty indices just presented above with the distributional judgment embedded in the stochastic dominance. The theoretical connection of P_α measures with distributional judgments has been discussed in the ground of the 'poverty orderings'. It was said that "[o]ne interesting finding of this line of enquiry is that the two conceptually distinct forms of [variable-line and variable-measure] poverty orderings are closely related, and link up with other well-known quasi-orderings such as the stochastic dominance relations…. Consequently, this general approach to measurement is a significant unifying theme across welfare, inequality, and poverty measurement" (Foster and Sen, 1997, p. 188, [comments added]). Using a more general way to rank different distributions, the stochastic dominance criterion relaxes the completeness of the ranking that is usually provided by most of the inequality measures. Stochastic dominance is a weaker way to provide a ranking between a pair of income distributions, assuming less restrictive properties that are usually attached to traditional inequality measures (Sen, 1973, p. 47-48). The stochastic dominance relationship can usually be verified (in the second degree) with the Generalized Lorenz dominance criterion, in order to present consistent results of ranking of distributions. Defining α as the n-degree of the stochastic

[156] C^2 is a measure of inequality that is also sub-group consistent, because it can be derived from the Entropy family of indices, being I_2 a multiple of the coefficient of variation C^2 (Foster and Sen, 1997, p. 140).

dominance relation (D_α),[157] and using the family of poverty measures (P_α) to compare any two income distributions (**x** and **y**), the basic theorem of Foster and Shorrocks (1988, Proposition 1, p. 175) stated the following:

$$\mathbf{x}\, P_\alpha(z)\, \mathbf{y} \text{ if and only if } \mathbf{x}\, D_\alpha\, \mathbf{y}, \text{ for } \alpha \geq 0, \text{ and } z \geq 0.$$[158]

This means that if we have a clear (non-intersecting) inequality relationship provided by the ranking of stochastic dominance (D_α) of two distributions, that will imply that the poverty ranking ($P_\alpha(z)$) that applies to the same distributions should be equivalent to that stochastic dominance ranking, regardless the definition of the poverty line *z*, whether those distributions are two regions in the country, or the same region in two different periods of time (Foster and Sen, 1997, pp. 188-191). In some cases non-intersecting relationships are not always present, that is known, but for the case of Mexico, during the period correspondent to 1991-2003, the stochastic dominance condition holds in general at national level.[159] So in the presence of stochastic dominance, the ranking relationship of the compared distributions in regards of poverty and

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[157] The dominance relation D_0 is the first degree stochastic dominance, and implies unanimity for all symmetric, population-invariant, and monotonically increasing welfare functions, it is also called *quantile* comparison (Dutta 2002, p. 608). The second degree stochastic dominance (D_1) add it up the Pigou-Dalton transfer condition (equivalent to the Generalized Lorenz dominance), and finally D_2, which is the third degree stochastic dominance relation, includes 'transfer sensitivity', which attaches greater importance to the transfers at the lower level of the distribution, in other words, is 'poor sensitive' (Foster and Shorrocks, 1988, p. 176; Foster and Sen, 1997, pp. 137-138; Cowell, 2000, pp. 102-103).

[158] Is defined that x $P_\alpha(z)$ y (distribution **x** is unambiguously less poor than **y**) if and only if x $P_\alpha(x,z) \leq P_\alpha(y,z)$ for all $z \in Z$ and $P_\alpha(x,z) < P_\alpha(y,z)$ for some $z \in Z$. For some implications of this theorem see Zheng (2000, p. 434-6).

[159] The author checked for second degree stochastic dominance with the plot of Lorenz curves for selected years at a country level in chapter **4**. The relationship became more clear when it was applied the generalized dominance criteria, which is the Lorenz curved scaled by the mean income. This relationship holds both at individual and at household level.

inequality remains unambiguous, and we can not deny the theoretical relationship of less-poverty being equal to less-inequality.

The points a) to c) are rather important, so any apparent deviation of the traditional setting must be considered in this regards in advance to assess the ambiguity of inequality and poverty. There might be a violation of some of the axioms embedded in the measurement indices, or an extreme change in the mean income of the population, as is our hypothesis that it happened for the case of Mexico, when in certain periods of crisis, the income of the people was seriously affected.

6.5 Data and Empirical Testing.

A data set with household characteristics for the year 2003, with close to a half million records, is used (ENE-INEGI, details in chapter **4**); includes both urban and rural areas. Some general characteristic of the indicators of the 749 available municipalities are shown in **Table 6-1**, and the regional coverage in **Figure 6-1**.

	Mean	St. Dev.	Min	Max
Mean inc. (μ)	1230.82	593.41	20.97	3499.40
Mean inc. (poor)	232.41	78.15	0.00	617.31
P_0	0.338	0.204	0.021	1.000
P_1	0.202	0.150	0.006	0.955
P_2	0.160	0.125	0.000	0.915
Gini	0.424	0.070	0.083	0.724
Theil	0.344	0.136	0.030	1.296
	(n=749)			

2003. Based on per capita income. Own calculations.

Table 6-1. Main variables for correlation checks, (ENE-INEGI), 2003.

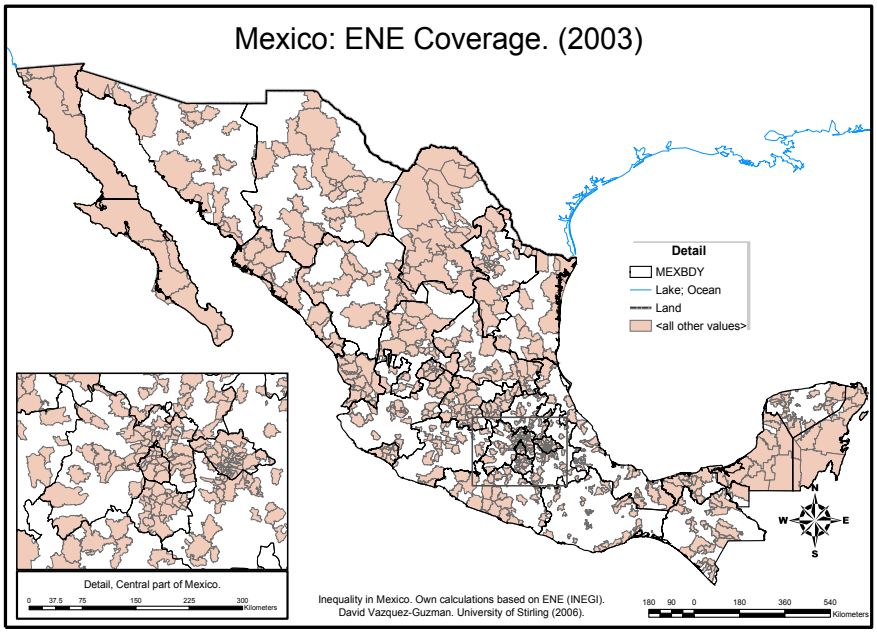


Figure 6-1. Survey Coverage, 2003.

In regards to the data set, it might be noticed that there is clear heterogeneity among the explored communities explored, for that it will be easy to recall that our Gini and Poverty estimates are different across the country. The minimum value of a Gini estimate is about 0.083, while the maximum is about 0.724, the degree of variability is similar for poverty measurements. Our estimates for poverty (**Table 6-2**), at a national level, are consistent with the literature on official poverty measurement (CTMP, 2002 and Teruel et al. 2005). There is an understandable variability in the measures, due to the fact that our estimates come from an income-based survey, and not from a consumption-based survey. Our estimates of national poverty in our segment (H), without any equivalence scales, are around 33%, which is sensibly bigger than the official one for 2002, which is 24.1% (Teruel et al. 2005, p. 34). But that can be explained by the normal

underreported income in higher deciles in income-surveys, and also the fact that we are including families with zero income. The similarity of our data when is considered equivalence scales is also shown, because the consideration of equivalence scales reduce the poverty measure by 10% on the official results, and our estimates reduce the ratio by 8.6%. Equivalized income will be used in order to make robustness checks.

P_0	Non equivalized income	W/equivalizing methods (Engel method)	W/equivalizing methods (Parametric Method)
(H), Official, 2002	0.241	0.140	N.A.
(H) Our results, 2003	0.338	0.252	0.217

Sources: CTMP (2003), Teruel et al (2005) and Own calculations

Table 6-2. Comparison of Poverty measurement, different sources.

Before going to some of the results, it should be explained the choice of the poverty and inequality variables. It was chosen for poverty measure P_0 , which is the headcount ratio calculated in an absolute way. For inequality measure was chosen primarily the Gini coefficient (I_G). Even though our theoretical insights show a relationship between the Coefficient of Variation (C^2), and the poverty measure (P_2), it might be argued that it is a clear mechanical account and therefore a resultant endogeneity if those indicators are used for empirical testing. We want to make sure that our findings are not based on mechanical accounts of those measures of inequality and poverty, so our measures are not endogenous estimates. The results will explain if the measures that are not related in theory show some relationship. The measures that are not related in theory are the poverty headcount ratio and the Gini coefficient. The poverty measure P_2 and the Theil Index (I_1) were used as a comparison (results not shown but

available upon request), but the general results are mostly based on the previous measures.

The hypothesis that our estimates per community will show a positive relationship between poverty and inequality is tested, so if this is not true, we should expect a correlation coefficient between the associated indicators close to zero. A covariance relationship is not used because of the possible problem with the interpretation of the units of measure. Instead, a correlation coefficient that accounts with weights in regards of the population size is used. In the same way, in order to clear any doubt in our results about the cardinality of our tests, we drop any assumption about linearity in the correlation test, using the Spearman rank correlation coefficient. The null hypothesis is that the ranks of one of the variables do not covary with the ranks of the other; in other words, as the ranks of one variable tend to increase, the ranks of the other variable are not more likely to increase or decrease. The same as the traditional correlation coefficient, the possible values of this test go from -1 to 1.

I Main results.

There are various findings in our **Table 6-3**, which is a set of different correlation checks; the upper part is traditional correlation coefficients while the lower part is the correlation coefficients using the Spearman method. We can follow our result of interest, which is the relationship of P_0 with our measure of Gini coefficients. Our estimated results of inequality and poverty are working as it is theoretically predicted (.518), having a clear positive relationship not only when it is considered for the national sample, but

also when the urban (.155) and rural (.613) municipalities are treated separately. This relationship is stronger for the rural areas, which suggests that in rural communities there is a stronger correlation between deprivation and inequality.[160] The relationship runs in the same direction when the other measure of poverty (P_2) is considered (.577). The Spearman test made our results robust, because in all cases it shows similar findings, with only some changes in the size of the coefficients of the positive relationship. In almost all cases, the results are statistically significant at 99% percent level. Therefore, we reject the null hypothesis that the rankings of the inequality measures do not covary with the ranks of the poverty measures.[161]

Having also the mean income variable, which is also presented in the same table, we checked correlation estimates against the other variables, first, with the measures of poverty (P_0 and P_2). A strong negative relationship between the mean income (μ) and both poverty measures is clear at a national level. This is consistent with our findings, because if the relationship of poverty and inequality is positive, we would expect that both inequality and poverty behaves more or less the same with the mean income. Consistent with the findings for other Latin American countries, it is noticed that the mean income is negatively related with Inequality in the rural areas, and positively related in the urban areas, but the overall relation of the mean income with inequality is negative. The explanation for this different behavior of the mean income with inequality measures between urban and rural areas might be interesting to explore in future research.

[160] Knowing that in other regions of the world the facts prove to be totally the opposite, for the intuition of this strange behavior see the particular case of Mexico in section 8.3 II, This behavior might be generalized to rural communities in Latin American countries.
[161] Our analysis is strong even using other type of inequality measures. It was tested the Theil index, and in all cases, both the significance and the positive estimated results remained with the same sign.

Different Correlation Coefficients of Poverty,Inequality levels and mean income (2003)

		National			Urban			Rural		
		μ	P_0	P_2	μ	P_0	P_2	μ	P_0	P_2
Correlation	P_0	-0.789			-0.655			-0.872		
Coefficient	P_2	-0.626	0.897		-0.335	0.770		-0.732	0.902	
	Gini	-0.109	0.518	0.577	0.464	0.155	0.294	-0.334	0.613	0.651
Spearman	P_0	-0.8745*			-0.8075*			-0.9162*		
Correlation	P_2	-0.7230*	0.8347*		-0.4191*	0.6722*		-0.7821*	0.8721*	
(ranks)	Gini	-0.2476*	0.4965*	0.5514*	0.4422*	0.004	0.2885*	-0.3724*	0.6027*	0.5982*
		n= 749			n=203			n=595		

* Significant at 99% level. Own calculations

Table 6-3. Traditional correlation coefficients with the Spearman Test (2003).

II Robustness checks.

As a second check to our estimates, we suspect that there might be some measurement errors, due to the calculation of the measures just in terms of the per capita income of the households, without any consideration for weights when the family composition is diverse or without assuming any economy of scales within them. On the one hand, per capita income provides identical value for the adults, females and children; in this simple approach, the usual way to compensate for family composition is to divide the total household expenditure among the number of people within the household, and then, this per capita compensated expenditure is carried on for poverty and inequality computations. The weakness of the per capita income approach is such that it does not recognize individual heterogeneity within the households. This approach implicitly assumes that the male family members consume the same as the female members, and also that the adults have quite similar tastes to that of the children. Considering just the per capita expenditure, “it also fails to recognize the fact that not everyone in the household is the same and has the same needs … it is true that children consume special goods, they surely require less of most things than do adults.” (Deaton, 1997, p. 241). On

the other hand, not only the weight to family members is important, but also the presence of economies of scales in bigger households.[162] And if those economies of scales are not included, we might be ignoring the fact that it is usually cheaper, in per capita terms, to maintain a household with many individuals rather than a household with fewer of them, all things remaining the same. This can be explained by the presence of 'public' goods within the households.

In order to get rid of the possible error due to the use of the per capita income method, and also trying to acknowledge any variability in the family composition of the regions in Mexico, we use two ways to perform this scale equivalence. The parametric formula proposed by the National Research Council is used first (in Deaton and Zaidi, 2002, Chapter 5; NRC, 1995). In order to compensate for the economies of scale and family composition, children are assigned a weight of 0.7 (α), and economies of scale with a value of 0.75 (θ). In second instance, and for the particular composition of Mexican households, the estimates of Teruel et al. (2005) according to the Engel method are considered, including economy of scale and without making a difference between the males and the females, because in their case the difference was not statistically significant.[163]

The newer results provided after the consideration of equivalence scales, available in **Table 6-4**, they show the same direction of the coefficients (.600 and .563 using equivalized income methods). The economic significance, given by the size of the coefficients, does emphasize the relationships between poverty and inequality at all national, rural and urban level. The Spearman correlation test (in the Appendix **6.7 I**) was

[162] In chapter **7** is discussed the different methods and some of the implications of using equivalence scales.
[163] Teruel et al. (2005, p. 22). Engel method with economy of scales, children 0-12=.65, young 13-18=.61, and adults 19 and up =.82.

also checked and it shows similar stronger results, even the correlation between Gini coefficient and P_0 on the urban area, which in the previous Spearman table was not significant, it gets significance in the same direction.

Correlation coefficients, different equivalizing methods. Poverty and Inequality levels with mean income (2003)

		National			Urban			Rural		
		μ	P_0	P_2	μ	P_0	P_2	μ	P_0	P_2
Per capita	P_0	-0.789			-0.655			-0.872		
income	P_2	-0.626	0.897		-0.335	0.770		-0.732	0.902	
(Not Equivalized)	Gini	-0.109	0.518	0.577	0.464	0.155	0.294	-0.334	0.613	0.651
Equivalized Inc.	P_0	-0.694			-0.438			-0.787		
Param. Method.	P_2	-0.529	0.904		-0.265	0.932		-0.656	0.914	
(α=.7, θ=.75)	Gini	-0.159	0.600	0.558	0.413	0.311	0.296	-0.363	0.666	0.621
Equivalized Inc.	P_0	-0.739			-0.532			-0.825		
Engel Method	P_2	-0.569	0.902		-0.288	0.887		-0.684	0.907	
(Teruel et. al)	Gini	-0.124	0.563	0.571	0.443	0.263	0.308	-0.340	0.643	0.637
		n= 749			n=206			n=599		

Own calculations

Table 6-4. Robust checks, correlation coefficients with equivalized income.

6.6 Concluding Remarks.

In regards to the theory and the empirical tests presented, it is argued that the recent agenda should include a careful study of the relationship of poverty and income distribution in Mexico. Findings that gave contradictory results must be revisited. On the one hand, the possible causes behind these ambiguous relationships between poverty and inequality might not hold anymore. The argument of this paper is that it is not convenient to generalize very strongly the apparently ambiguous relationships, because of the possible contamination of the data set used. This data set could have been contaminated by the prevalent scenario of crisis at that time. The fact that the people's income was changing drastically during that period of crisis was not totally understood, neither was understood that the composition of the country's population was changing importantly.

This last concern was mainly due to the huge out-migration of nationals to the US. On the other hand, the tools available for the researcher nowadays are better, and the simple comparison of inequality only in regards to certain types of indices without disaggregated data might be misleading. The results of this paper show that inequality is related unambiguously with other type of deprivations, as it was the case with the various calculations of poverty. Now the scenario is different, and conditions at present time are more stable. That would enable the researchers to look into this relationship more carefully. For next research, it might be tested this relationship using time series data; because the available data set allowed us to do our regional level estimations only using cross sectional data.

6.7 Appendix.

I Tables.

Spearman Correlation Ranking, different equivalizing methods. Poverty and Inequality levels with mean income (2003)

		National			Urban			Rural		
		μ	P_0	P_2	μ	P_0	P_2	μ	P_0	P_2
Per capita	P_0	-0.8745*			-0.8075*			-0.9162*		
income	P_2	-0.7230*	0.8347*		-0.4191*	0.6722*		-0.7821*	0.8721*	
(Not Equivalized)	Gini	-0.2476*	0.4965*	0.5514*	0.4422*	0.004	0.2885*	-0.3724*	0.6027*	0.5982*
Equivalized Inc.	P_0	-0.7865*			-0.5477*			-0.8362*		
Param. Method.	P_2	-0.6253*	0.8909*		-0.2631*	0.8296*		-0.6933*	0.9051*	
(α=.7, θ=.75)	Gini	-0.2723*	0.5783*	0.5050*	0.3930*	0.2929*	0.2776*	-0.3870*	0.6311*	0.5393*
Equivalized Inc.	P_0	-0.8338*			-0.6508*			-0.8746*		
Engel Method	P_2	-0.6559*	0.8577*		-0.2977*	0.7532*		-0.7231*	0.8808*	
(Teruel et. al)	Gini	-0.2513*	0.5453*	0.5328*	0.4279*	0.1994*	0.3117*	-0.3739*	0.6158*	0.5685*
		n= 749			n=206			n=599		

Own calculations. *=Significant at 99% level.

Table 6-5. Robust checks, Spearman correlation coefficients with equivalized income.

Inequality and the Capability Approach: Functionings, Equivalence Scales and the Mexican Literature.

7.1 Abstract.

This chapter explains the Mexican literature in regards to inequality measurement in connection with the capability approach. Inequality measurement is methodologically related with other types of deprivation measures, just like poverty measurement and human development assessment are. Because of the importance of the capability approach in recent development literature, the identification of functionings is discussed. The inequality concept as a separate form of destitution fits the capability framework, both in the original 'incomplete' method of Sen that is enlarged by Robeyns, and also in the 'universal' approach that uses a fixed list of capabilities in the fashion of Nussbaum. So inequality indices should be considered as a proper way to assess a capability deprivation. In another way, the indirect way to deal with inequality measurement is considered with the use of equivalence scales. In the multidimensional setting, the Mexican literature has merged a Human Development Index (HDI) with inequality considerations, issue that is done through some sort of transfer sensitivity. Rejecting the assumption of individual homogeneity, equivalence scales have a variety of methods that have been applied in the Mexican literature. That real poverty levels have been overestimated applying those scales has been found. Summing up, this is a descriptive

analysis that recognizes what has been done, and how the present research compares now with the theoretical framework, so what has been possibly misunderstood is highlighted, pointing out what can be done about it.

7.2 Introduction.

The different conceptual foundations for the consideration of income distribution have affected differently the application to development economics and empirical research. For instance, the capability approach of Sen has been very influential in the development literature. One important example is the multidimensional measurement of deprivation in the first *Human Development Report*, which is published by the United Nations Development Programme (UNDP) since 1990. UNDP credited Sen with providing the conceptual foundations of this new measurement when he rejected income as the sole space for the calculations.[165] There are also numerous contributions emerging from the capability approach, not only in the development literature, but in the theoretical side of this measurement as well, as was surveyed by Robeyns (2005). Another conceptual foundation for the assessment of income distribution is the acknowledgment of household heterogeneity by the use of equivalence scales, rejecting the measurement of homogenous per capita valuations. The inconvenient assumption of individual homogeneity, which can be traced to the welfaristic tradition, makes difficult the measurement of real deprivation. At least, the equivalence scales research accounts for

[165] "The work of Amartya Sen and others provided the conceptual foundation for an alternative and broader human development approach defined as a process of enlarging people's choices and enhancing human capabilities (the range of things people can be and do) and freedoms, enabling them to: live a long and healthy life, have access to knowledge and a decent standard of living, and participate in the life of their community and decisions affecting their lives." (UNDP, http://hdr.undp.org/en/humandev/origins/).

the differences of needs in regards to gender an age, following the applied microeconomic setting. To some degree, both the capability approach and the consideration of equivalence of scales do tackle the issue of unequal distribution.

The Mexican case has not been the exception to the influence of this research. In most cases, the literature about poverty measurement, like the research on human development, have both included several references to Sen's work.[166] On the other hand and to a lesser extent, the literature has also included inequality considerations with the estimation of equivalence scales for the particular population of Mexico (Teruel and Rubalcava, 2005; Teruel et al., 2005). Taking account of those advances in research, this paper will argue that the consideration of income distribution in Mexico has skipped or mishandled some of the basic concepts, particularly referring to measurement of inequality, and also concerning to some basic concepts of functionings and capabilities. However, this might have happened because of the progressive introduction of the new methodological concepts in the development literature, as is the case of the capability approach. Therefore, it is the aim of this paper to offer an alternative clarification of some of the points in the discussion.

In recent Mexican Literature, the distributional judgment has been introduced in the measurement of human development (Foster et al., 2005; Lopez-Calva and Székely, 2006). The proposed human development measurement has tried to include the consideration of inequality, but this issue is presented together with transfer sensitiveness in HDI assessments. We need to recall that for the particular case of Mexico, the topic of the measurement of inequality was left out for some time, because of the belief during the 90's of an 'ambiguous' relationship of inequality with other indicators of welfare (Cortés

[166] For instance CTMP (2002), Székely (2005), Lopez-Calva and Székely (2006).

and Rubalcava, 1991).[167] This important consideration of distribution was missing from the Mexican literature, and maybe from other Latin American countries as well. On the other hand, the capability approach and its theory has been providing the intuition to consider other aspects of deprivation, broadening the scope for the study of well-being in Latin America, rather than focusing only on the lack of income. This broadened range of the space to measure human well-being might be helpful to see to what extent the consideration of inequality as a social deprivation is important.

- Overview.

This paper will develop 3 insights. The first topic is a theoretical background of the capability approach and the use of equivalence scales in regards to income distribution, so the definition of (social) inequality is discussed in section **7.3**. This section includes, on the one hand, the consideration of inequality as a dimension of the capability approach in the measurement of well-being (**7.3 I**). On the other hand, defining also social inequality, the natural heterogeneity of the population is considered with the use of equivalence scales. The assessment of the distribution in regards to gender and age is effectively an indirect way to consider inequality in the empirical literature (**7.3 II**). In section **7.4** is presented the second topic of this paper, which is a brief survey of the Mexican literature in the particular topic of income distribution, discussed along with the theoretical findings of the previous section, both in the sense of the capability approach (**7.4 I**) and also to the estimation of equivalence scales (**7.4 II**). The last part, in section

[167] This finding is discussed in detail in chapter **6**, but the basic claim was that it was possible a less unequal distribution with higher poverty levels at the same time.

7.5, presents the concluding remarks and some clarifications of different measures of inequality and human development for the Mexican case.

7.3 Inequality and Methodological Foundations.

There are various ways to consider deprivation and social inequality in economics. The most traditional methods are discussed in chapter **2**, such as estimation of Gini coefficients, measurement of coefficients of variation, and similar measures. But there are other indirect ways to consider inequality as well. For instance, when the econometrician 'controls' for characteristics, putting those variables in the right hand side of the equation, he is assuming that extracting the influence of the covariates will help to determine the true meaning of the main independent variable. In that sense, the 'unequal' characteristics of the covariates, after include these in the equation, they might be helping to show the 'true degree of inequality' (Shorrocks, 1987, p. 824). Another way to consider inequality is to adjust income in such a way that household circumstances, such as gender, age, or the number of members of the family are included in the computations; this is possible with the use of household equivalence scales (Idem). Another indirect way to focus on the unequal distribution is to make transformations to the income variable. That is the case when logarithmic transformations are used; the result is a softened shape of the distribution with the penalization of higher incomes, as happens in the measurement of Human Development Indices (Anand and Sen, 2000). With logarithmic transformations, the impact of a 'high' income is almost the same as the one of a 'very high' income, and the logarithmic tool produces the effect of focusing on the

dispersion at the lower end of the distribution, which represents the very poor (Sen, 1973, p. 29). Therefore in economics, there is always the interest to consider some distributional judgment, even though this is not always done with the same tool or with the same traditional measure (Foster and Sen, 1997, p. 145). With a degree of methodological rigor, the next part will explain how the consideration of inequality in two frameworks can be done: first the deprivation in the framework of the capability approach, and later with the consideration of inequality in the family composition.

I Looking for other deprivations: The Capability Approach.

The capability approach has been seen lately as a complete normative framework for the evaluation of overall well-being. It has also been used as a reference point in order to make policy recommendations for welfare improvement (Robeyns, 2005, p. 93). This approach was started by Sen and his rejection of utilitarianism.[168] He considered as highly deficient other approaches in regards to justice, such as the approaches of Rawls, Nozick and Dworkin (Sen, 1984b). In one of his main critiques, he questioned about the problems of having just utility or income as the sole space for the measurement of poverty (Sen, 1999, p. 20). Sen was puzzled by a paradox: the existence of very high deprivation in certain communities in India, and the acceptance of this fact by some of the most deprived members of the same community. In this case, the utilitarian framework consents that as long as the members of the community agree with their own condition, there is no real deprivation that needs to be alleviated. As a reaction, Sen opposed the utilitarian framework that 'gave sanctity' to the distortion of the acceptance

[168] Methodologically discussed (Sen, 1985b, Ch. 3), and previously rejected in Sen (1973, p. 15-9; 1984).

of people's deprivation (Sen, 1984b, p. 309), same thing that is still common in very poor communities, either because of religious beliefs or because of biased governmental propaganda. The capability approach tries to enlarge the understanding of human well-being, focusing not only on income deprivation but also trying to go beyond traditional perceptions of destitution.

Once the comfortable and measurable income space is rejected, we enter into a possible blurred characterization. The idea that Sen uses in order to enlarge human welfare is taken from the concept of 'functioning' contained in Aristotle's *Nicomachean Ethics* (Sen, 1999, p. 73, Basu and Lopez-Calva, 2002, p. 6). In this case, neither the level of satisfaction perceived by the individual, nor only the ability and freedom to consume a particular good was the most important, but the achieved welfare contained in this process altogether. The word capability is sometimes used interchangeably in this setting by the word 'freedom', for instance, Alkire (2002) explains about the concept of 'capability' that "[it] refers to a person's or group's *freedom to* promote or achieve valuable functionings" (Idem, p. 6; emphasis on the original). In other words, it can be said that the achieved functioning bundle is important, but it is not the only thing that matters; the process that promotes the access to those valuable functionings also counts. This process might be understood as a capability, which includes the idea of opportunities as well.

Assuming that additional spaces are found, the methodological characterization under the capability approach is more or less clear: the different functionings (doing and beings that people value), once those are achieved, they define the individual's well-

being.[169] Further, capabilities represent the freedom to choose among the vector of functionings, not only this process of choosing having an instrumental value, but this choice process has also a value itself (Sen, 1992, pp. 39-42). In this framework, the achieved functioning bundle should be chosen from a set of different options (named the 'capability set'). The link between a capability (e.g. the right to be adequately nourished) and its representative achieved functioning (e.g. individual's caloric intake) is the individual's rationality. So the individual, using her rational ability to decide, should be able to enjoy a more legitimate welfare that comes also from her own decision, if the society has provided her with the freedom to choose. Going further, the society will enjoy a better outcome if it is possible to expand this capability set for each individual, bringing more valuable choices to her. This includes not only freedom, but also 'agency', that is the power of change (Alkire, 2002, p. 6, note 18; Sen, 1999, p. 19; Sen, 1992, pp. 39-40). The next paragraphs will sketch briefly some of the main points that are needed in order to define a dimension, in the framework provided by the capability approach.

a) **Identifying a dimension.**

When income or utility are rejected as the appropriate space to measure welfare, the question immediately comes about which aspects of welfare have been left out by the traditional economic theory, or which are the alternatives that offer the capability approach (Basu and Lopez-Calva, 2002, p. 1). The identification of the missing

[169] See a formal definition in Basu and Lopez-Calva (2002), or Kuklys and Robeyns (in Kuklys, 2005, ch.2). The linguistic use of the words 'capability' and 'functioning' is found in Robeyns (2005, pp. 100-101), and Sen (1992, pp. 49-50).

dimensions on the consideration of well-being is a subject of useful debate (Sen, 1992, p. 44). The procedure to get a complete list of functionings and capabilities has been largely discussed in welfare analysis. On the one hand, the original proposition about which capabilities shall be incorporated was discussed by Sen (1992) in his *Inequality Reexamined*: the identification of the evaluative space in terms of functionings and capabilities (Idem, p. 43). It is essential in Sen's approach that the search for evaluative spaces is fundamentally incomplete, either because of the dimension's fuzziness or because of the practical difficulty to find the suitable spaces with full certainty (Idem, p. 49). Following the incomplete approach, it should be a task of every community or culture to find their own possible deprivation spaces, depending on their own context and their own values. It will also depend on the same communities that they attach more importance to either one space or the other in the assessment of well being (Sen, 1992, p. 46; Alkire, 2002, p. 10; Robeyns, 2005b, p.70). On the other hand, some authors argue in regards to a predefined definition of well-being dimensions with the aim to 'universalize' human rights.[170] One of the most quoted lists of capabilities has been produced by Nussbaum (2000), but this list has various criticisms, as does the validity of its sources (Alkire, 2002, p. 33, n. 41-42). Nussbaum's approach seems to ignore the very basic ideology of Aristotle in regards to the construction of a just city, the construction of the *polis* through people's participation (Aristotle, 335 BC [1999], Book I, Part XIII), but she might be emphasizing the right that the 'philosopher' has to dictate what is good for the society, as Plato argued (Slote, 2006) (here we can raise a question, which 'philosopher'?). An argument of Robeyns enlightens a practical issue. Robeyns said that even if the list of values produced by the Sen's approach is the same as any of those

[170] A survey of lists of capabilities by different authors is in Alkire (2002, chapter 2)

produced by the universal approaches (e.g. Nussbaum's), the process of generating the list of functionings and capabilities would imply a favorable agreement in the community (Robeyns, 2005b, p. 71), and this exercise will indeed legitimate the process of getting the list. It is the claim of this paper that in either the incomplete definition of the capability approach of Sen (preferred by the author of this paper because of some issues coming later), or in the list provided by the authors that support a universal view of capabilities, inequality deprivation is always a measurable dimension of human welfare.

In Sen's 'incomplete' approach, the way to do the search for evaluative spaces seems to be not very much elaborated, but he argues firmly about every community's right to decide their own spaces of well-being: "The functioning vectors can be ranked and partially ordered in line with some common valuations," (Sen, 1985e, p. 198, emphasis added). The notion of what is valuable starts with individual tastes and preferences, followed by the consideration of the criteria of all the members in the community.[171] In order to have a proper functioning vector, what is negligible should be discarded, according to such predefined criteria (Sen, 1992, p. 44). In his original setting, in order to define which functionings are more important, Sen endorsed the 'urgency' criteria of Scanlon (1975) based on consensus, [172] only adding that the description of what is 'urgent' does not need to be based only on a moral setting, but also needs to take into account the natural heterogeneity of diverse people's tastes and preferences (Sen, 1985e,

[171] Sen takes from Scanlon that the starting point for moral facts is the consideration of individual well-being, which is the philosophical basis of overall human welfare, described in his acronym WAIF: 'well-being as informational foundation' (1985e, p. 185).

[172] It is fair to say that Scanlon's urgency approach, more precisely the 'relative urgency' approach, has a basis, not surprisingly, in the social equality concept: "… relative urgency seem to be appeals to a consensus about how much people care about certain benefits, protections, etc." (Scanlon, 1975, p. 667), he also said "The second approach would be to preserve the idea of consensus and to defend the notion of urgency as a construct put together for the purposes of moral argument" (Idem, p. 668). In his writing, the way to assess what is important in regards to well-being, seems to be that it is more important to be protected, rather than enjoy a future benefit (Idem, p. 668).

p. 196). Following the same incompleteness of Sen, a more elaborated way to define a particular list of capabilities has been proposed by other authors, like the set of five criteria spelled out by Robeyns (2005b).[173] She proposes that a) any list should be clearly stated in order to be discussed, b) that the methodological foundations of that list should be justified, c) that the list should be spelled out in the appropriate language considering the audience that discusses it, d) that the normative definition and the pragmatic measurement limitations of those functionings should be distinguished in that list, and finally, e) that the list should only include topics that are mostly self contained, in order to avoid repetition. This way to spell out a list of functionings is not against Sen's initial proposal; it might be only a way to clarify the issue and to make the discussion more tractable.

b) **Inequality as a dimension of the capability approach.**

According to the previous section, both the incomplete definition of capabilities and functionings and the universal view will consider inequality as a dimension in any of the mentioned criteria. For instance, if we consider the moral validity of the criteria in order to define a functioning, as Sen interprets on Scanlon's consensus, we know that inequality has been defined as a deprivation by almost all philosophers (e.g. Marx, Rawls or Nozick). Even in regards to religious thought, the moral consideration of inequality has been targeted both as a deprivation, and also as an opportunity to help fellows, but in both cases, inequality is a characteristic of the society that should be diminished by their own

[173] Alkire elaborates an 'intuitive' way to define functionings in a Kantian-Aquinas fashion, following Finnis and other Catholic authors, like Grisez (Alkire 2002, p. 43-59).

members and institutions, with the aim to maintain it as low as possible.[174] Thus by consensus, equality is always a desired state. Departing from the moral background, if we consider the pragmatic view of Sen and his addendum insofar as to consider human heterogeneity, there is always an admonishment for giving more to the most deprived, the persons with disabilities or the chronically deprived (e.g. females in India or the African American community). There is no place for considering social inequality as a social benefit. If we follow the elaborated version of Robeyns with her procedure of five points in order to define what should be a desired functioning, we find that a) inequality is a concept that has been clearly stated, we find also that b) inequality measurement has a solid foundation in regards to social justice unless we talk about natural inequalities, we find that c) inequality discussion can be understood by any reasonable person in any language, d) we also know about the discussion of the measurement of inequality, and e) that inequality discussion is almost self contained, so it can be disentangled this deprivation from other type of deprivations (e.g. food deprivation). The last concern in the methodology of Robeyns can be enlarged for the dimension of inequality; there are countless the philosophical foundations that mention the right to be able to live in a more equal society, issue that has been largely discussed. Moreover, equality as been described sometimes as the final desired human state, which is the extremist egalitarian claim.

Coming back to the identification of functionings and capabilities, we mentioned that some authors propose 'universal' lists of those vectors, as opposed to those that argue in regards to incomplete lists. This author will claim that, selecting any of these lists, it can also be found that inequality is a dimension of human deprivation, the same result

[174] See the Greek and the Jewish traditions in relation to distributional judgments, in chapter **1**.

that is found using the incomplete criteria.[175] For instance, in one of the most mentioned lists we can find clear inequality implications, which is the Nussbaum's list of central human functional capabilities (2000). In this many-times-revised version of her list, she defined that we should have the social basis for self respect, such that we should be able "to be treated as a dignified being whose worth is equal to that of others". In the emotional side, she claims that humans should have the freedom to feel 'justified anger' (Nussbaum, 2000, p. 78-80). In this regards, equality of treatment among humans is a direct declaration about the need to consider inequality as a social deprivation, and 'justified anger' might be solely understood by the lack of opportunities, feeling that is exacerbated in the presence of unfairness. Another example from the World Bank's Poverty Reduction Group can be taken: Narayan et al. (2000, in Alkire, 2002, p. 64) describe well-being according to the 'voices of the poor'. In this setting, inequality might be related with "self-respect and dignity" at the level of social well-being. The same authors discussed in that list that humans should be able to enjoy a "physically safe and secure environment". So, it can be argued that low levels of inequality are required for a stable community, a stable community that is free from rebellion. From a psychological perspective, Shalom Schwartz (1994, in Alkire, 2002, p. 63-66) declares a list of universal human values: under the point of 'conformity', it is a universal value to restrain violations of social expectations, and under the point of 'security', it is mandatory to have harmony and a stable society. The previous two issues of Schwartz do indeed need low inequality in order to be achieved. As a final example, in the list of prudential values of Qizilbash (1996 in Alkire, 2002, p. 71-72), it is central that the 'significant relations with

[175] Alkire (2002) made a survey of 39 of these lists (pp. 32-43, 75-84).

others and some participation in social life' do also imply low levels of inequality, which are needed in order to achieve the desired relations and the beneficial participation.

Regardless of the incomplete or the fixed approach to the definition of functionings and capabilities, at this point can be asserted with no doubt that the capability related with inequality is the right that every individual has in order to appear in his community with no embarrassment. Using Smithian terminology, it is the right to appear in public without being ashamed (1776, *WN*, 5.II). Has been proved above that using any of the two methodological bases, the existence of lower levels of inequality is necessary, both for social stability and also for the individual sense of fairness in the community. The related achieved functioning is the real access that individuals have in their community to a certain standard of living with low inequality, same thing that can be captured by suitable inequality measures in one or more spaces. The achieved functioning is both a 'being' and a 'doing'. It is obvious that it should be a desired state to 'be' in a fairer and unequal society, but it should also be a task of everyone to 'do' actions in order to use inequality as a matter of opportunity, the opportunity to help the poorest people. It is acknowledged that most of the people focus on the 'being' nature of this functioning (e.g. the Marxist tradition). In this sense, people usually expect that the governmental institutions provide a more equal environment. However, people ignore their responsibility for the 'doing' part, which is to be an active member in the community in order to alleviate natural and artificial inequalities (e.g. helping people with disabilities or avoiding labor discrimination).

Because of the need to define other things related with inequality measurement, the author of this chapter will show strong reasons to use the 'incomplete' approach of

Sen about the definition of capabilities and functionings. There are three things that belong to the society in regards to the measurement of inequality. First, the society needs to define the space where inequality is to be calculated. For instance, income inequality can serve as a proxy for real social inequality, but if the community decide that it is not enough, additional or alternative spaces can be chosen. Second, the assessment of this measurement and more than that, the interpretation of this inequality measurement, do belong to every community (who else can do that?). It is necessary to remember that inequality measurement, even calculated with mathematical precision, is always subjectively perceived. So, as long as the members of the community have voice, the judgment about how the community read those indicators belongs to their members. In other words, every community has the right to decide which level of inequality is acceptable for them. The only philosophical constraint would be that, *ceteris paribus*, a more and more equal distribution across time will always be preferred. The third issue that belongs to the society, is the importance that this society attaches to the consideration of inequality in regards to the other achieved functionings. The 'relative weight' connected with this functioning can not be decided by any other people than by the same members of the community, the only advice of the researcher is to say that, as long as the community put more weight to this functioning, this community will be enrolling in the virtuous circle of social cohesion (Sen, 1999, p. 93). These three definitions can not be understood without people's participation.

c) **To operationalise a dimension.**

Basu and Lopez-Calva (2002) claim that "… the idea of capability is not fully formalized and perhaps not even fully formalizable" (p. 5). It is clear that inequality is a dimension of human welfare, but, what then is the appropriate way to measure it? After defining a suitable dimension, the challenge comes to operationalise in an easy way the measurement in the empirical analysis (Kuklys, 2005). Inequality does share the same incomplete formalization of the measurement as almost any functioning and capability. There is a necessary set of assumptions, methodological and theoretical, in order to assess inequality in a proper way, thus the procedures are not always the same. For our case, the formal way to do income inequality measurement is already covered by the multiple options in the kinds of measures available.[176] There are handbooks that spell out how and why this measurement might be done, for instance Foster and Sen (1997), Cowell (1995) or Atkinson and Bourguignon (2000), among many others. Even though there is a lot of research in this regard, the issue of considering inequality is still open, and it will be like that because of the different possible methodological assumptions that can be made.

In the particular case of income inequality measurement, there are interesting distributional considerations in regards to the multidimensional setting. It is true that social inequality can be approximated with the measurement of income inequality, but it is also true that there are measures that consider not only deprivation in a particular dimension, but also a distributional judgment on the same calculation. One has been applied precisely to the case of Mexico (Foster et al., 2005), where it is shown, with a

[176] See the chapter **2** about standard measures of inequality.

new class of parametric indices, that there are indeed differences when human development is measured with and without distributional judgments. An extension of this family of indices, which allows distributional judgments and expands the understanding of the method of identification, has been developed by Foster and Alkire (2007). It needs to be clarified that most of the problems are not related with mathematical issues, but mostly with the methodological decisions that the researcher makes in order to pursue a particular measure of inequality. Given the constraint of the mathematical language and the empirical setting, there will be important issues that would be left out on the measurement of inequality as long as those issues are not presented in the aforementioned language, or as long as the data sets available constrain the researcher to explore inequality in other dimensions. On the opposite case, the next topic will deal with an issue that has been studied more in the theoretical framework, so we will expect sometime in the future to see the capability approach studied in depth in such a way.

II Equivalizing methods.

There are issues of concern in regards to family that are related with inequality assessment. An issue that was largely ignored in the traditional economic framework was the family, even though its importance was highlighted many years before (Becker, 1987, p. 281). The most remarkable contribution of family issues in the applied economic setting is due to Becker (1981) with the use of mathematical language. Considering this, there are many relationships within the household that can be discussed in regards to inequality (e.g. power relationships), but traditional economic science usually deals with

those issues that are observable, then the rigorous language can be applied here as well. So, issues like intrahousehold allocation of resources, gender bias and individual weights within the family are important issues that are intrinsically related with inequality measurement, and those have been tackled somehow by economic theory.[177] The empirical application of equivalence scales deals with some of the referred concerns within the framework of economic theory.

There is the concern in applied welfare economics about making comparable the different levels of utility or satisfaction of the individuals who belong to different households (Blackorby and Donaldson, 1991, p. 164). The usual way to compensate for family composition is to divide the total household expenditure among the number of people within the household. This per capita 'compensated' expenditure, which is considered as a proxy for individual welfare, is carried on in poverty or inequality computations. On the contrary, it does make sense to consider, in regards to consumption, that children have different needs than adults, that female body composition is different from than of males, and also that bigger households have the opportunity to use more efficiently their 'public' goods. In this case, intrahousehold distribution might be seen as another way to consider a capability dimension of well-being, which is inequality among the individuals that acknowledge their natural heterogeneity. It might be the case that the rejection of the utilitarian approach, which questioned the assumption of homogeneity of population, made possible the study of interpersonal comparisons.[178] The progressive use of equivalizing methods has been possible in real applications because of the availability

[177] Intrahousehold allocation and gender bias is discussed in Deaton (1997, p. 223-241) and the references therein.

[178] Sen claimed to account with natural heterogeneity of diverse people's tastes and preferences, but he indeed rejected the utilitarian framework (Sen, 1985e, p. 196), which is the most used in the equivalence scales research.

of household data. Then it is possible to know more in detail the patterns of consumption. But this data availability has some limits, such as the level of detail available. The information do not show individual consumption, but household aggregated consumption, because of the implicit familiar nature of the household consumption. This discrepancy gives space for multiple theoretical settings that try to produce reasonable explanations for individual behavior, taking household aggregates in consideration.

The result of these theoretical considerations in the empirical framework gives the researcher an 'equivalized' space, which most of the times it makes more sense to consider, particularly when the aim is to understand the different levels of deprivation in the community.[179] The problem of adjusting income for family size is known in economics jargon as 'equivalizing' incomes (Cowell, 1995, p. 98). When household inequality is calculated, some kind of weight by family size is often included. As it is said, per capita considerations assume that each individual has a weight of one, so it is implied that everyone in the household receives an equal allocation of resources. Considering only per capita expenditure, Deaton says that "[per capita income] also fails to recognize the fact that not everyone in the household is the same and has the same needs. While it is true that children consume special goods, they surely require less of most things than do adults" (1997, p. 241). But other equivalence considerations should be considered, not only family size. For instance, the distribution of members within the house can be considered, as can be the number of children and the consumption goods devoted to them. The economies of scale in bigger households can also be mentioned,

[179] This paper will focus on the empirical application of this theory, but for the reader interested in the theoretical background, there are questions in regards to the validity of this approach and its representation in the neoclassical framework, so it is recommended Blackorby and Donaldson (1991), Deaton (1997, pp. 243-251), and the theoretical background on Deaton and Muellbauer (1980, chapter 7) together with Deaton and Zaidi (2002, chapter 5), and all the references therein.

because it should be cheaper to run a house with many individuals in the presence of 'public' goods within the household. The proportion of income devoted to food compared with the proportion of income spent in other goods is another important issue in regards to the equivalence considerations.

With the different use of a variety of theoretical assumptions, equivalence scales methods consider indirectly the measurement of inequality, making clearer for the researcher the true component of deprivation, which is either approximated with poverty measures, with human development indices, or even with standard inequality measures (e.g. Gini coefficient).[180] There are different ways to assign the proper weights to each individual in regards to their personal characteristics, so the literature is broad in this sense. Some of the empirical approaches are a) the Engel (1857) method, b) the Rothbarth (1943) procedure, c) the Prais and Houthakker (1955; in Houthakker, 1987) method, d) the Barten (1964) method, d) Subjective approaches or d) the 'parametric' setting, like the formula proposed by the National Research Council (Deaton and Zaidi, 2002; NRC, 1995). Some of these methods, discussed briefly in the following paragraphs, do claim superiority over the others, but there is no consensus about the use of one of them as a general rule: "How these adult equivalents should be calculated, and whether it even makes sense to try, have been (occasional) topics of discussion in the economics literature for more than a century… as a result, there is no consensus on the matter" (Deaton, 1997, p. 242). All these methods require deep computational skills. The empirical results show that even no consensus, the use of any of those methods is

[180] Shorrocks (1987) made a difference between inequality that considers opportunities, and inequality arising from natural abilities and characteristics. Equivalence scales focus on the unequal natural attributes of the individuals, such as their age, gender and the number of them in the household. Any endogenous determination of these attributes on the household composition is excluded from this research.

preferred, than the use of none of them; per capita income is a very rough estimate that does not account for individual heterogeneity.

a) **Engel's method.**

Using household data from Belgian surveys, Engel (1857) was the first person that showed that, *ceteris paribus*, when the income of the household increased, the budget share spent on food decreased. So the household preferred to increase their consumption in non-food goods as their absolute income increased. In the neoclassical framework, Engel curves have been conveniently characterized by the income elasticity, which is the change in household expenditure with respect to the household overall resources (Houthakker, 1987, p. 142).

Being w_i the share of some particular kind of goods, where w^F is the correspondent share of the expenditure devoted to food, and being x the letter that describes the total expenditure, we have two cases of Engel curves that describe household preferences and their behavior. In this case, the implication of Engel's Law is satisfied, because it represents the negative relationship between the food share and the total expenditure. In **Figure 7-1**, the curve A describes the small reference household, while A' does the same for the larger one. The hypothetical maximum amount of income that the smaller reference household spends on food is shown by the letter x_0, similarly, x_1 for the bigger one. For a given share of food of the reference household w_0^F, which is achieved with the expenditure x_0, the equivalent to compensate the larger household with

the inclusion of a new family member (e.g. children) will be the distance between the budgets $(x_1 - x_0)$. This difference is known as the 'cost of children'.[181]

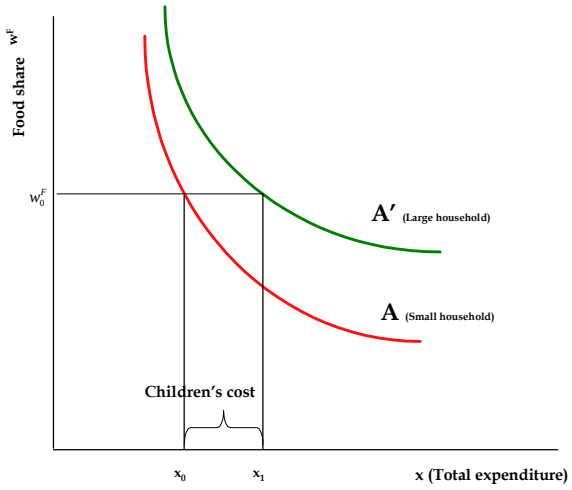


Figure 7-1. Engel method.

Using suitable approximations, the Engel curve can be computed if consumption data is available for many households. This law was first explained in a linear fashion by Allen and Bowley (1935), but later on, this representation was dropped off because of the lack of resemblance with reality (Houthakker, 1987, p. 143). Nowadays there are many variations of the Engel curve, but the traditional logarithmic form proposed by Working (1943) still remains, such that the income food share can be defined in the following way:

(9) $$w_i^F = a_i + b_i \log x$$

[181] The assumption is that children enter into the utility function of parents via the expenses made on them. This paper is just borrowing from this terminology, see Becker (1987, p. 282).

where $i = \{1...n\}$, n is the number of households in the community, x is the amount of expenditure devoted to food, and a and b are estimated parameters. This formula provides a traditional framework for econometric calculations.

b) **Rothbarth Procedure.**

The procedure to estimate the Rothbarth (1943) approach is very similar to the one of Engel, even though the variable used is rather different. Both approaches need to estimate an equation where a dependent variable is explained by a proportion of some expenditure, and some personal characteristics might be included. In the case of the Rothbarth method, different from the Engel procedure, the dependent variable is the expenditure on consumption of goods for adults rather than the food share. The independent variable is assumed to be the overall expenditure, which is explained by the total value of the basket of goods consumed. In this case, some characteristics of children are included (Teruel et al., 2005, p. 28). Deaton explains that "Rothbarth chose a very broad group of adult goods (including saving), calculated how much the total was reduced by the presence of an additional child, and calculated the cost of the children to the adults by the amount that income would have to rise to restore the original expenditures." (1997, p. 230-1).

The indicator of welfare used in this method, which is expenditure on goods consumed by adults rather than food share, is represented in the **Figure 7-2** by x_0^A. This is the valued quantity of expenditure consumed in adult goods. The positive relationship of adult goods with the total expenditure (assuming that adult goods are normal) is indicated

below by the curve A, which is the small household, then A' that is the bigger one with additional children. *Ceteris paribus*, we assume that both households consume the same amount of adult goods if their preferences are the same, but the larger household has a higher expenditure in other goods (x_1) compared with the household reference (x_0), and again, the cost of children is determined by the distance determined by the subtraction $(x_1 - x_0)$.

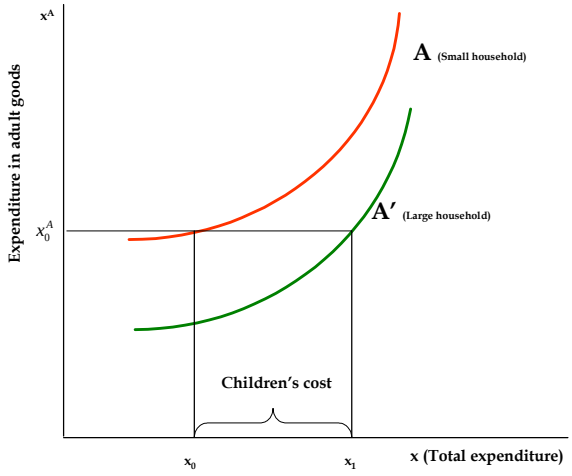


Figure 7-2. Rothbarth procedure.

In order to represent this relationship empirically, we just change equation **(9)** with the value of the expenditure of adult goods instead of the share of food in the Engel method, and the rest of the calculations are quite similar. The version of this method using economies of scale was suggested first by Jean Dreze (in Deaton, 1997, p. 264).

c) **Others.**

Some of the other methods available for equivalence scales estimates might be theoretically more precise, or can take into account more variables than the previous two examples, but then we face empirical problems. For instance, the method proposed by Prais and Houthakker (1955, in Houthakker, 1987) is more precise in terms of commodity specifics, but it requires detailed data about consumption goods and some idea about the functional forms of the demand functions: "The calculation of the Prais-Houthakker scales requires estimation of a potentially large system of nonlinear equations, a task that is a good deal easier than it once was, but the effort requires a justification that is not apparent" (Deaton, 1997, p. 261). Another method was proposed by Barten (1964),[182] which is less suitable for applied applications, but contains important insights in regards to economies of scale within the household (Deaton, 1997, p. 261). This model needs a proper set of price data variations, which is usually not available. Thus the simplified application by the Rothbarth procedure or the Engel method is superior either to the Barten or the Prais-Houthakker method, having empirical grounds as a basis.

There are other approaches for equivalence scales that are based on alternative methodological roots. One is the subjective method pioneered by van Praag and his colleagues (van Praag and Warnaar, 1997 in Deaton and Zaidi, 2002, p. 50). This methodology uses household surveys where the respondents give an assessment about how certain goods satisfy their needs, using a suitable scale. The subjective nature of this approach is questionable in regards to the utilitarian paradox described by Sen, which is

[182] This method was extended by Gorman (1976), and generalized by Blackorby and Donaldson (1991, p. 187). See references in Blackorby and Donaldson (1991, p. 173, n. 7)

discussed at the beginning of section I, and it is difficult to generalize about these estimates, much more when the perception of satisfaction could vary from household to household.

The last method, which is also based on alternative grounds, is the parametric approach of Deaton and Zaidi (2002, pp. 51-52).[183] It uses the formula proposed by the National Research Council (NRC, 1995). The number of adult equivalents (*AE*) is defined by the following formula:

(10) $AE = (A + \alpha K)^{\theta}$

Where *A* is the number of adults in the household, K is the number of children, α and θ are parameters of the model. The parameter α, which goes from 0 to 1, defines the cost of a child relative to an adult, and the parameter θ is a suitable parameter, also between 0 and 1, which controls for economies of scale. In the extreme per capita case, both parameters are equal to the unit: no discount for children neither a bigger household has more efficient allocation of resources. The usefulness of this approach lies in the simplicity of the mathematical formula, which also provides room to apply various empirical tests. There are similar formulas to **(10)**, for instance, if it is desired to account for the addition of subsequent adults, in this case *A* is replaced by the more complex expression: $1 + \beta(A-1) \left| 0 < \beta < 1$, but in any case, it might be pointed out the arbitrary way that the relationship is defined. There might be reasons to use this formula, rather than only point out the reality of the expression, such as the pragmatic use of the

[183] This is named by them the 'arbitrary approach', but other literature named it 'parametric', for instance, Teruel et al. (2005).

estimates on the calculations, or the usefulness of this kind of expression in the mathematical language. In empirical tests, this formula has proven to make sense, and just the calibration is a subject of discussion.

7.4 Mexican Literature

The relevant functionings and capabilities for the Mexican population have been established historically in their written laws. The general public and the governmental institutions take for granted that any source of deprivation mentioned in those laws should be tackled. The most important document for Mexico, its Political Constitution (CPEUM), establishes a particular set of rights for all inhabitants. Besides the traditional freedoms, it states that every head of household should have access to a decent job, which should be remunerated with a sufficient minimum wage (CPEUM, Art. 123.VI). The right to a minimum wage is explained in detail in the Federal Labor Law (LFT) in its 90th Article. Considering the different economic activities, this wage should be sufficient to cover all the family needs in regards to their material, social and cultural spending. It should also provide enough resources for the children's education. Access to health services and housing credit is also granted (CPEUM, Art. 4). On the other hand, the General Law for Social Development (LGDS) establishes special considerations for marginalized groups (LGDS, Article 8), so it is the aim of this law to take care of the more destitute through responsible social spending, promoting programs that diminish unequal opportunities. It is the objective of these programs that are run by the Secretariat of Social Development, to promote economic progress with social justice, to foster the

creation of stable jobs, and to improve the household income level, at the same time that it should be improved the income distribution across the communities (LGDS, Art. 11).

There has been the concern in the Mexican literature to assess human development properly once the desired functionings to be achieved are known, as these are expressed explicitly in the different laws (e.g. material, social and cultural needs). In the Mexican literature, the first organized attempt of poverty measurement, in 2002, included the capability approach of Sen in its considerations (CTMP, 2002, p. 18). However, the main concern at that time was the formalization of the assessment of well-being, and that was approached with traditional income poverty measurement. The product of this research was twofold, the first objective was to put in order the disarray caused because of the non-standardized measurement of welfare, because Mexico did not have a regular definition of poverty, even at the government level. The second aim was to establish a research agenda, because the many opportunity areas were acknowledged that needed the collaboration of scientists, government officials and representatives of society. Due to this research agenda, later on the issue of heterogeneity of the population embedded into the considerations of equivalence of scales was also covered, but it is fair to assert that this issue was covered more like a technical decision in the computations and not like a methodological flaw of this assessment. The next sections will explain, in the light of the framework explained in the entire section **7.3**, how the Mexican literature had superficially tackled the issue of inequality deprivation in different ways and how the research agenda has covered subjects in regards to the capability approach.

I The capability approach and Mexico.

One of the first issues that the capability approach requires is public agreement on the measurement of well-being. In Mexico, this public exercise started with a symposium organized by President Fox in the year 2001. The event had the purpose to discuss how poverty was evaluated. Recognized scholars, both Mexican and international, were reunited to discuss poverty measurement. This group also included representatives of different institutions together with members of the society (Foster, in Székely, 2005, p. 6). The result of this exercise was the immediate creation of the Technical Committee for Poverty Measurement (CTMP). We can not say that the aim of this exercise was to explicitly create a complete list of functionings, or to apply the capability approach to the Mexican case. It was trying to understand and to formalize the definition of well-being using standardized indices of poverty. The measurement considered a very basic basket of goods that was valued with suitable prices expressed in monetary terms.

a) A formal attempt: The Technical Committee for Poverty Measurement and the Capability Approach.

In this exercise poverty was defined with reference to a certain level of deprivation, to a certain amount of necessary elements for human life. The negative effect of deprivation in humans was acknowledged, so this deprivation more likely would reinforce itself (CTMP, 2002, p. 17). Their definition of poverty used some of the terminology embedded in the capability approach, thinking of ‘capabilities’ as some

unaccounted dimension of welfare. It was considered a multidimensional space, similar to the one proposed by Amartya Sen. In this document was institutionalized the Foster-Greer-Thorbecke headcount poverty measure. Measuring poverty in absolute terms,[184] CTMP focused on non-equivalized household income, using an expenditure survey as the main source for data (CTMP, 2002, pp. 20 & 87). The highlighted agenda included issues on capabilities and functionings bundles, definition of basket of goods, equivalence scales, and non-monetary indices of welfare, among other issues.

The document from the CTMP attempted to include a multidimensional measurement of poverty, mentioning several types of deprivation such as participation, human capital, income, subjective welfare and human rights (CTMP, 2002, p. 17). The document considered in theory that social inequality was closely linked with individual destitution of social participation, so inequality was another type of deprivation (Idem, p. 18), but finally, the committee followed the Unsatisfied Basic Needs approach tradition. The document used income as the unique reflection of the welfare space, albeit the committee tried to enlarge the income scope. It was a mixture of poverty measurement with a possibly misunderstood capability approach. This means that income was not the focal space, but income was seen as a reflection of multidimensional capabilities (CTMP, 2002, p. 17-18). In this case, income would be only an instrument to measure welfare.

In the discussion of the suitable identification space, the discussion was about deciding whether income was measuring basic consumption goods or other 'capabilities' (CTMP, 2002, p. 23). The definition of income as suitable space took into account five minimal desired characteristics on the desired poverty measure. One of these characteristics, the 'possibility' characteristic, definitely influenced the methodological

[184] As defined in Sen (1983).

decision. The decision was that the chosen index should be practically measured, so it was stated that the poverty measure should be made with the available statistical information. In that scenario, even though it was desirable to measure other dimensions or spaces, such as the 'non-monetary' dimensions, it happens that income, approximated with expenditure data, was the only dimension available for the measurement of well-being (CTMP, 2002, pp. 24 & 56; Székely, 2005, p. 19). Multidimensionality was considered as a mixture of the monetary and non-monetary spaces available, and those were mentioned as a complimentary way to measure welfare (CTMP, 2002, p. 26), but the definitions of those alternative spaces were not explicitly stated at that time.

In spite of the decision made for the income space only, the committee was reluctant to dismiss the capability approach so easily. The way they deal with this issue was through a 'capability consideration' within the 'income' space. They propose three 'poverty lines' (CTMP, 2002, p. 66-68). The first one is the 'food poverty line' (PL_1), that means deprivation of the sufficient amount of money to buy a particular basket of basic goods. The second was the 'capability' poverty line (PL_2). The 'capability' term here might produce some confusion, because of the use of the 'capability' word in a poverty line definition. This 'capability' level of deprivation incorporated the sufficient amount of money to buy other kind of goods, such as clothing, shelter, transportation, health and educational (human capital) goods. Those were the 'capability' goods, so the average of those goods was calculated and their equivalent were expressed in income-money.[185] The third poverty line was called 'asset poverty line' (PL_3), this line was

[185] The Engel coefficient method, which measures the proportion of the spending on food with the spending on other kind of goods, was used. This relationship was explained in the Appendix 1 of the document (CTMP, 2002, p. 97-101), see also Cortés (2005, p. 863).

supposed to measure the ability of the household to have some savings in the form of assets. The poverty lines were nested, so the second poverty line includes not only 'capability' goods, but also 'food' goods ($PL_1 \subset PL_2$). By the same token, the third poverty line includes 'food' and 'capability' goods as well ($PL_1 \subset PL_2 \subset PL_3$).

i) Discussion.

There might be issues that could result in confusion with the present development literature. 'Capabilities' were used to describe mostly non-basic goods (e.g. shelter, clothing), and also the access to public goods (e.g. transportation or education), but this is not a definition of 'capability' in the sense of Sen (see section **I**); they were defining some desired functionings together with some of the capabilities. It could be expressed that, in order to achieved a better outcome, individuals should have the right to be well nourished, but that idea was used interchangeably with the achieved functioning of nutrition. Free access of all individuals to the good markets was assumed. Also assumed, but not mentioned, was the capability to have access to buy the all goods needed, something that is still a problem in rural communities. Also ignored was the issue that having the opportunity to make savings, which is measured in the third poverty line, is the 'capability' to have access to market goods in future time. So the initial Mexican literature confused some of the concepts of freedoms embedded in the term of capabilities with the terminology of achieved functionings.

The Mexican trial for poverty measurement was an attempt to include the capability approach in the income space. This trial posed a methodological challenge from the very beginning. In the theoretical welfare literature, income has been rejected many times as the appropriate space for calculations. In spite of this, the approach of the

Mexican committee tried to entangle the capability approach using the income space, alleging data restrictions. The extra information included in the surveys was used to approximate a more general welfare measurement, even thought it was necessary to go against the original proposal of Sen, which rejects income as the suitable space for calculations. The information available in the surveys was not just income or consumption of basic goods, but also included information about other kind of goods, which would be shameful to waste. Interestingly, in order to show the different levels of destitution in the country, the dimensions that could be approached with some monetary value were the only ones included using the three poverty lines.

Multidimensional measures and mixed indices, like the Human Development Index (HDI) or indices of Unsatisfied Basic Needs (UBN), were highlighted as a clear part of the research agenda. On the one hand, for instance, the UBN approach pointed out the use of a variety of mathematical tools in order to deal with the data, either using correspondence analysis, or multinomial log-regressions, among other tools. Using these complex indices, some weight was given to the different functionings. About the HDI, that this approach proposed new information about destitution was believed, but that the extra information provided was not sufficient was said, even more when the extra effort in the data collection was considered. It was said that HDI might be 'conceptually attractive', but "the cost in terms of resources and time is not enough justification in regards to the poor population or their ranking" (CTMP, 2002, p. 31, translated from the original).

b) **Numbers that move the world.**

The second attempt to consider some topics of the capability approach was included in the volume edited by Miguel Székely, '*Números que mueven al mundo: La medición de la pobreza en México'* (*Numbers that move the world: Poverty measurement in Mexico*) in 2005. This book was an addendum to the effort made by the CTMP in 2002. The publication explained in more detail how the literature was before in regards to welfare measurement, and it also mentioned the influence made of the CTMP document right after it was published. Multiple issues were discussed here, but in regards to the capability approach, that the poverty measurement has intrinsically embedded multidimensional features was recognized again, but the calculation was done in a traditional way because of the data limitations. That the inclusion of non-monetary dimensions in the measurement of welfare was also desirable was also said (Cortés, 2005, pp. 887 & 889).

i) Alternative functionings.

Cortés (2005) made an empirical test: deprivation expressed in non-monetary dimensions was compared with headcount income poverty. A probit regression was constructed, which considered the headcount poverty measurement on the left hand side, and multiple variables of deprivation of other dimensions in the right hand side. The eleven dimensions considered were the following:

a) Two dimensions on education, approximated with the level of instruction of the head of the household, and the school attendance of children.

b) One dimension on health, access to medical services by at least one person.

c) Three dimensions on quality of living, using possible indicators of child labor (working children between the ages 12-15), agglomeration indices (four or more people in one room) and a variable that indicates the presence of a refrigerator in the house.

d) Three dimensions on the quality of shelter, such as roof, walls and floor housing material.

e) Two dimensions on access to public services measured with the access to clean water and bathrooms with water supply (Cortes, 2005, p. 888).

Using as a benchmark the first poverty line (PL_1), it was found that the explanatory power of the 11 dimensions did not disagree 'very much' with the simple headcount income poverty measure. The measurement of income poverty was described as sufficient: "Given the available information, the income poverty measure is an acceptable way, though imperfect, in order to express the multiple dimensions that are embedded on it" (Cortes, 2005, p. 889, translated from the original). On the other hand, the problem that represented the definition of the second and third poverty lines was addressed (PL_2 and PL_3). Focusing on the 'capability' poverty line (PL_2) that was approximated with the Engel method, the issue of including a better alternative of non-basic basket of good was discussed, but this topic was left for future research (Cortés, 2005, p. 890).

ii) Non-monetary dimensions.

The intention in the book published by Székely in 2005 was to enlarge the understanding of human development in other spheres of people's life. One of the points in the research agenda stated a recommendation: "To measure monetary income poverty but complement this measurement with non-monetary indicators, so issues can be added like access to public services, socio-economical indicators, indices of political participation, self-esteem, personal safety and labor conditions" (Cortés, 2005, p. 892, translated from the original). The data constraint prevented the CTMP from doing something about this recommendation; for instance, it is difficult to express public services in a monetary way. That is the reason the CTMP decided to put aside the valuation of governmental transfers in kind. Using the same criteria, the impact of the functioning to be sheltered was not included, so the tacit rent of the house was not considered either, among other problems with functioning's valuations.

iii) Multidimensional measurement.

A literature survey of multidimensional literature was done by Lopez-Calva and Rodriguez-Chamussy (2005). They discussed several approaches. The first approach was the methodological discussion by Bourguignon and Chakravarty (2003), generalizing the one-dimensional setting to the multidimensional one, using the case of Brazil as an example. They mentioned the methodological recommendations of Ravallion (1996) and his research towards better multidimensional poverty measures (Lopez-Calva and Rodriguez-Chamussy, 2005, p. 654). The literature review also included some of the

fuzzy logic research,[186] theory of information, subjective measurement of welfare and the method of the unsatisfied needs (UBN) developed by CEPAL.

In the empirical section of their paper, Lopez-Calva and Rodriguez-Chamussy used multi-factor indices through the application of discriminant analysis, in order to compare the relationship between income and the other dimensions that evaluate welfare (2005, p. 666). In the fuzzy part, they used probits (Idem, p. 687). After some elaborated tables and graphs (Idem, pp. 671-691), they conclude that those measures could explain other shapes of destitution, but the measure of poverty proposed by the CTMP in 2002 was sufficient. They commented that "[a] simple econometrical analysis shows us that income is indeed, a very reasonable predictor of our multidimensional aggregate measure, which is confirmed by our previous analysis… " (Idem., p. 689, translated from the original). Therefore, they concluded that the income poverty measure, though imperfect, was an acceptable way to measure poverty (Idem., p. 692), regardless of the differences shown by the multidimensional analysis.

c) A Closer View to the Capability Approach, Inequality and HDI.

The consideration of unequal distribution remained absent from the previous attempts of the CTMP, as can be noticed in the previous section. The committee determined a higher priority for the definition of poverty measurement, so inequality measurement was not considered in practice as an important topic. Then later, in the

[186] Fuzzy set theory implies the introduction of uncertainty and inaccuracy in certain situations, without loosing the opportunity of analyzing the relationships with formal rigor (Chiappero-Martinetti, 1994, p. 372). For a list of references see Sen (1999, p. 310, n. 43).

contribution of Lopez-Calva and Székely (2006), three different lines of research were opened, the first one was the continuation of the multidimensional approach of Sen, such that the Human Development Index was explored and compared with a variety of new multidimensional measures. The second line was the significance of the HDI in the regional analysis of Mexico and the relationship with economic growth. The third one was the consideration of income distribution through a series of sensitive analysis of the original poverty measurement, but now accounting with inequality assessments.

i) Formal view of the capability approach and state ranking.

In the introduction to the book *Measurement of Human Development in Mexico* (López-Calva and Székely, 2006), the authors discussed formally the capability approach of Sen (López-Calva and Székely, 2006, pp. 21-25 & chapter I), so they recognized the attractiveness of this framework in regards to the proposed multidimensional setting, and they accepted the usefulness of the Human Development Index (HDI) as a good proposal of Sen's approach: "The public sector and academia accept that the HDI provides relevant information on the development situation, using a more open point of view" (Idem. p. 60, translated from the original). Alternatively to the HDI, the variety of aggregated measures was discussed, such as those including the technique of the principal component. Those aggregated indices were for instance, the marginalization index of CONAPO, or the well-being index of INEGI.[187] It was mentioned also the headcount poverty measure provided by the CTMP on 2002, and how this poverty measure tried to encompass such a variety of needs such as food, 'capabilities' and assets (López-Calva and Székely, 2006, pp. 28-37).

[187] The relevance of those indices is explained in chapter **5**.

Important differences were noted in a simple comparison of the HDI state ranking with the GDP per capita positions (Lopez-Calva and Vélez, in Lopez-Calva and Székely, 2006, chapter I). Considering the other two additional dimensions of the HDI (health and education), rather than only income, not surprisingly, the difference was that the image of human development changed dramatically. Some states should be positioned up to 6 places below their original ranking. In this part, they recognized the difficulty to come across with a standard HDI measure, because other authors had shown different rankings, using other methodological decisions with the same HDI (Idem, p. 66; discussed in chapter II of the same publication as well). They also tried to include inequality judgment, including a 'correction' with a logarithmically-transformed Gini index per state. The practical meaning of this transformation is not know to this author, but at least for them, higher inequality meant higher underdevelopment (Idem, p. 62).

ii) Inequality measurement and the HDI.

The most important chapter of Lopez-Calva and Székely's book is chapter 5, which is a translation of the paper of Foster et al. (2005) and an application for the Mexican case. Both authors, together with Foster, explored a multidimensional measurement of poverty with inequality sensitiveness. The initial Foster-Greer-Thorbecke one-dimensional poverty measure included here not only an enlargement in its single space, but also an inequality consideration within each of their vectors. This new measure tried to encompass both the multidimensional setting of the capability approach and a distribution consideration using the method of the 'general means'. The novelty of this family of indices was their sub-group consistency (Foster et al., 2005, p. 7). In the empirical part, not surprisingly for this author, they found that this new measurement of

human development was indeed ‘inequality sensitive’, such that the ranking of the states would change considering a higher ‘inequality aversion’ (Idem, p. 22, Table 1).

The problem with this measurement is that the measure tries to apply arbitrary values to the inequality sensitiveness, a problem that they already recognized (Idem. p. 26). The problem comes from the subjective nature of the perception of inequality measurement. Inequality judgments are values that are subjectively perceived, and more than that, these should be subjectively decided by the community (see Sen’s participation method on the last paragraph of section **7.3 I b)**, and our previous methodological chapter **1** on distributional justice). This author sees a problem in applying an *a priori* social welfare transformation to a human development index. Foster et al. (2005) applied a method for inequality measurement consistent with Atkinson’s (1970) family of inequality indices, where an arbitrary value is applied to the social welfare function. The imposition of this form of inequality measurement on the grounds of sub-group consistency is hardly generalized. We might suggest another way to assess distributive judgment in a multidimensional approach. For instance, inequality should be measured separately, or with a not so restrictive inequality consideration as the Atkinson measurement is (e.g. Entropy indices). An HDI might be a better measure if it includes distributional judgments, but the way to do it can not be fully discussed on mathematical grounds; it is a methodological issue.

Other issues in regards to inequality consideration are discussed in this volume. For instance, the capability to have the right to live in a more equal society, free of gender discrimination, is discussed by Ibarrarán and Robles in chapter VI (in López-Calva and Székely, 2006). The capability is approached with the achieved functioning of political

participation, measured by the number of places in the congress. They include also the traditional income gap between male and females, and also a measurement of proportion of females in higher decision-making positions in different job sectors. This aggregated mixed measurement has found that progressively, but at a low pace, females have been 'empowered' since the 90's. On another topic, in order to trace the origins of the unequal distribution, Freije et al. (2006; in López-Calva and Székely, 2006, chapter VII) focused on the decomposition of income inequality, using an *ad-hoc* technical approach proposed by Juhn et al. (1993, in López-Calva and Székely, 2006, p. 291). They found an increase in inequality in the urban sector from the year 1989 to the year 2000, with some variations within this period of time (Idem, p. 302). They also found some variations of inequality considering the regional distribution (Idem. p. 311), inequality being exacerbated in the area around Mexico City and the southern states (Idem. p. 315). The rest of the book discussed issues in regards to policy valuations and government transfer effectiveness (in López-Calva and Székely, 2006, chapter VIII and IX).

II Equivalizing methods In Mexico.

The Mexican literature has been cautious about the introduction of equivalence scales in the calculations, and there is an important reason: the reported number of poor people diminishes dramatically with this inclusion (Teruel et al. 2005, p. 34). Officially, it is still the case that income poverty is measured using per capita valuations, but there is some history about it. The first time this topic was mentioned was by the CTMP on 2002: they conclude that the use of equivalence scales "… would introduce unknown errors in

the calculations" (CTMP, 2002, p. 60, translated from the original). Thus, the per capita income was the only one considered. The CTMP document surveyed a variety of equivalence scales methods, using as a reference a variety of authors (CTMP, 2002, pp. 41-43),[188] but the committee was reluctant to accept the use of any of those methods described. The reason put forward was that the use of equivalence scales was a theme without consensus, and the related topic of economies of scale within the household was not thoroughly studied in empirical terms (CTMP, 2002, p. 43, and p.43, n. 28). We can feel a strong skepticism about the use of these methods in the CTMP document, but there might be another reason why the committee took that decision in those regards: the political cost of showing a lesser amount of poor people will be something that might not be very pleasant to the public opinion. We need to remember that at the time of the CTMP, the number of the poor used to be believed to be between 40 to 60 million, depending on the source quoted. The CTMP showed that the number of people in extreme poverty was about 25 million. But taking in consideration the equivalence of scales, this figure would diminish the number of the reported poor by up to 15 million, which means 10 million less. We think that such a report would be affecting seriously the credibility of the poverty measurement by the CTMP, so we believe that that was the reason why it was decided not to be followed any of the equivalence scales methods by the committee.

Teruel et al. (2005) took seriously the definition of equivalence scales for the case of Mexico. With empirical methods, they found no statistical bias between males and females (Idem, p. 22), and taking a single adult as the unit, they found a weight for children under 5 years to be 0.64~0.77, children from 5 to 12 years to be 0.69~0.81, and

[188] See section **7.3 II**.

young people from 13 to 18 to be 0.62~0.76, depending of the method used (Idem, p. 35). After these findings, Teruel et al. (2005) introduced adjustments by adult equivalent to the official measures of poverty following the same procedure of the CTMP in 2002. They found that there is a change in welfare measures when family equivalences are included, and this difference is not small at all. Using either the Engel or the Rothbarth method, with and without economies of scale, they showed that the results of poverty measurement are always overestimated. The results are categorical: "This figure confirms that poverty estimations are always bigger if the number of individuals in the household is taken into account only rather than considering that individuals have different needs" (Teruel et al., 2005, p. 30, translated from the original). The gap of overestimation does indeed vary from 3 to almost 13 points, and all those results are statistically significant. The importance of this issue relies on the fact that those points represent sometimes almost half of the reported poor. They conclude that in general, poverty measures were not insensible to considerations of equivalent scales, but their calculations have not yet been taken in account in the official estimates.

Teruel and Rubalcava (2005), following the research of Teruel et al. (2005), went a step further in the consideration of equivalence scales, taking care of the economies of scale in more detail. They rejected the use of any subjective method, as the one proposed by van Praag (Teruel and Rubalcava, 2005, p. 634). They considered the parametric formula of the Deaton and Zaidi (2002), focusing on the literature review of different countries in order to get an appropriate estimate of the economies of scales parameter θ (discussed in section **II**). After an extensive analysis and a careful empirical test, they found problems with the estimation using the Engel method, so they find more suitable

for Mexico the Rothbarth procedure with economies of scale instead (Teruel and Rubalcava, 2005, pp. 634 & 648). With the new set of calculations, they showed that poverty measurement was sensitive to the use of equivalence scales, much more when economies of scale within the household were considered (Idem, p. 646). The new proposed poverty measurement was similar to the one proposed in Teruel et. al (2005).

7.5 Concluding remarks.

Traditional economic theory tackles in a variety of forms the issue of inequality, because it is clearly perceived that a lot of it is harmful for the society. The study of the capability approach of Sen has opened the research for alternative views of human deprivation. In this framework, it is argued in this paper that inequality measurement serves as an additional space to measure destitution, rather than to consider only poverty measurement, that is the space of income deprivation. In both space specifications, either in the 'incomplete' definition or in the 'universalist' approach, the functioning of inequality does indeed capture the social shape of human deprivation. The incomplete definition of functionings and capabilities is preferred to this author, because inequality measurement needs predefined criteria, not only in its measurement but also in its perception. Thus, many of the problems of inequality measurement rely on this methodological struggle. If income is the only data available, it was discussed that social inequality can be captured by any standard measurement of income inequality. Another way to consider inequality assessment is the consideration of equivalence scales. Using the utilitarian framework, which is many times rejected by the capability approach, the

equivalence scales uses the traditional microeconomic setting in order to consider human heterogeneity. In the household framework, the assignment of different weights to females, children and young people is a more realistic assumption in regards to human needs. The use of equivalence scales does change the perceived level of human deprivation, and the use of any of these methods is preferred, rather than considering only the rough value of per capita income.

For the case of Mexico, the capability approach of Sen has been progressively introduced, and it also has been better understood in methodological and empirical literature. In the beginning, the attempt of the CTMP of 2002 that formalized the poverty measurement was constrained by the data sources, so this issue implied the non-inclusion of the multidimensional setting. It was desirable, but not practically calculated with the data available. The important topic of income distribution in regards to inequality as such was left out because of an alleged ambiguous relationship with poverty measurement. The capability approach was introduced in the definition of the second and the third poverty line. Later on in 2005, the people close to the CTMP identified a multidimensional 'hole', so some research was done to support the predefined one-dimensional income poverty measure, and the multidimensional approach was considered redundant. Equivalence scales were introduced in this attempt, but there were political and practical implications that made this new lower poverty ratio to be postponed in the official measurement. Finally, a formal consideration of a HDI was developed in 2006, with a new joint effort of a multidimensional measure with distributional judgments. Not surprisingly, the new measurement showed that inequality measurement should be a

component of a valid human development index. This last point supports our main argument that inequality is a separate face of human deprivation.

8 Inequality and the Capability Approach in Mexico: Empirical Relationship between Income Inequality and other Functionings.

8.1 Abstract.

It is expected that, without artificial intervention, different aspects of human deprivation would be positively correlated. If inequality is considered to be a separate functioning of human well-being, we expect it to be related with other functionings in such a way. For the case of Mexico, we made an empirical test that support the claim that inequality measures are positively and significantly related with destitution measures using other vectors, finding that is also supported by dispersion analysis charts. The implication of this finding might be such that whenever other types of measures of destitution are not available, such as poverty or human development indices, then inequality measurement might be used as a proxy for destitution. The results of the model show that whenever higher income inequality is present in a community, it is more likely to find other sorts of destitutions, such as poorer availability of public services, lower quality of dwelling and overall higher marginalization and underdevelopment as well. These results are found to be consistent over the different geographical regions and after controlling for municipal characteristics. The results are strong when urban and rural communities are considered separately, the results are also consistent after taking into account intrahousehold distribution with the use of equivalence scales, and finally, the results seem to be free of the type of inequality measure chosen.

8.2 Introduction.

If the consideration of social inequality, approximated by the measurement of income inequality, is another shape of human deprivation, the measurement of this deprivation would be expected to be related consistently with the lack of achievement in other dimensions as well. In a country where there is no intended mechanism of the government (e.g. unemployment benefits) in order to compensate the part of the population who are suffering higher levels of inequality, the negative effect of higher levels of social inequality would be expected to be related in the same direction as the other sorts of destitutions (Sen, 1999. p. 94). The link of inequality deprivation with other sources of destitution compel us to understand the central concern of the vicious circle that represents social inequality with the increase of other sorts of destitution: there is a problem of getting access to services when there is high inequality, so "[t]he latter tends to intensify the inequality problem already reflected in income inequality" (Sen, 1999, p. 119). Because the pervasive negative effect of higher levels of inequality in the society is linked with non-efficient outcomes for the society (Sen, 1999, p. 93), the interest for a researcher would be to highlight the issue. The impact of higher inequality is also problematic for the society in terms that this issue 'inhibit overall poverty reduction' (Ravallion, 2004, p. 68).

Inequality is a measure of deprivation that can be measured within any dimension of human well-being as an approximation of social inequality, but is traditionally assessed in the dimension of income.[190] Once the effect of social inequality is determined, or at least approximated, we can explore empirically the extent of the relationship with

[190] See the discussion of income and the capability approach in the chapters **1** and **7**.

other dimensions of well-being. An unambiguous positive relationship of inequality measures with income poverty has been already highlighted in chapter **6**; therefore, a natural expansion of this exercise would be to explore the extent to which the measurement of inequality is related with deprivation on other dimensions of well-being, or, in other words, to see the link of inequality with other functionings. The advantage of this exercise would be that, if we find an unambiguous relationship of inequality levels with other kinds of functionings, we can find alternative ways to assess human development with a simpler tool that is inequality measurement.

The correct way to interpret those results would not be to use inequality as 'the' measure of destitution,[191] but as a parallel device in order to measure welfare, such that whenever other kind of measures are not available, inequality measurement can serve as a proxy for well-being. The intuition is that for a person who suffers from high inequality in her/his community, it would be more difficult to achieve other functionings in order to live well (Sen, 1999, p. 119). For instance, a better provision of public services will allow the community to improve their quality of life through the utilization of these services, so the distribution of resources in the community might be more egalitarian due to the positive effect of the achieved functionings. In the same way, a community that have electricity supply will be more likely to have established firms that provide jobs to the community, and then the community will be able to have households with better wages. A community with better water supply would be more likely to have healthier members, then their jobs would be more stable and so their wages, and so on. On the other hand, if we know the relationship of income inequality and other capability vectors, we might

[191] See the section **2.5** where the approach of Miller and Roby (1971) of inequality as the measurement of poverty is rejected by Sen (1983).

have an idea of what is driving such social inequality. We might use the results of the research for policy recommendations, because if the government wants to alleviate feelings of social injustice, they might focus first on certain deprivations that are more related with the issue of inequality.

Not all the time human development indices or absolute poverty measures are available in a detailed spatial level of aggregation: some times these indicators are available only for the country overall or with a long period of time between one survey and the other. These constraints are not usually applied to inequality measurement. These estimates of inequality can be made with more regularity, considering Mexico as an example, employment surveys are quarterly available, compared with the biannual period of the consumption surveys, or even compared with the five or ten year periodicity of census data. The more detailed level of aggregation of employment surveys is also an advantage. So, inequality assessment can guide policy makers, if they wish so, in order to concentrate primarily in places where the communities are not so equal. The government intervention would allow the community to be benefited from better sorts of public programs. In that sense, it will not be dangerous to think that the government can use estimates of inequality measurement in order to predict underachievement in other functionings, in other words, the relationship of inequality might measure the impact of other achieved functionings that are levels of individual well-being. Once the estimates of achieved functionings or other selected indicators of capabilities are available, the results can be compared with inequality estimates in order to have a clear picture of how the relationship is working through time.

- Overview.

We will highlight a model that includes the relationship of several achieved functionings in the community and see how those indicators are related, after several control tests, with the measure of inequality in the community; this is presented in section **8.3** together with the description of the variables used in the model. The hypothesis would be that the levels of inequality will covariate in the same direction as the other functioning levels. The results that confirm this hypothesis are shown in section **8.4**, followed by some robustness checks in section **8.5**. Finally, section **8.6** has some concluding remarks.

8.3 Data and Empirical Model.

Using the terminology of Sen (1985b) in regards to the capability approach, which is discussed in the previous chapter, we know that (achieved) functionings (doings and beings that people value) can be empirically assessed by the researcher if the definitions are made clear, but the definition of capabilities are not so easy to operationalise, neither it is straightforward to make their measurement (Alkire, 2002; Kuklys, 2005). Considering functionings, we can compare how the expressed social inequality embedded in the standard measurement of income inequality is related with achieved functionings, such as the provision of public services (e.g. water supply, electricity, etc.). On the other hand, it would be difficult to know how the capability of living in a more equal society would be related with other types of freedoms, such as the right to live in a more participatory society, or the right to live in a society with access to functional markets in

order to buy necessary goods. We maintain our focus in measurable functionings and achieved functionings because of the pragmatic empirical approach of this chapter.

Even though our interest relies more in the sign and the significance of the empirical relationship between measures of inequality with other indicators of destitution, we can take suggestions not only from the econometrical experience, but also from the intuitive factors that are present for the case of Mexico, so this underlying theory would specify the dependent and the independent variables in this model as is suggested by Greene (2003), such that this decision would be outside of the consideration of the basic econometric model (p. 7).

I Description of the Data.

The data come from a variety of sources as is shown in **Table 8-1**. The indices of poverty and inequality are our own calculations using the ENE data set, using the methodology explained in chapter **4**. The year 2003 was chosen because of the availability of detailed household information. The information is available for 749 from a total of 2456 municipalities. The achieved functionings are estimates from the same ENE survey; the people reported the availability of services in their home in a section of the questionnaire, services such as electricity connection, water supply, drainage supply and phone service. The services are 'achieved' because people reported to have not only the opportunity of having the access to the service, but the service is reported to be indeed provided at their home.

Marginalization indices are provided by CONAPO for the years 2000 and 2005, constructed on the basis of census data. Both indices use the technique of the principal

component method, but there are differences between them. The HDI constructed in 2000 is a measure of human development, in the contrary, the index of 2005 is an agglomerated measure of deprivation, so the direction of the measure of HDI tends to be more positive as long as the community is better off, while the other indicator is bigger if there is more deprivation. The dimensions that compose the HDI of 2000 are child mortality, literacy and per capita GDP in the municipality. The dimensions of the marginalization index of 2005 does not include dimensions of health, but includes vectors of education, quality of dwelling, access to public services such as electricity and water supply, level of urbanization, overcrowding levels and indicators of low wage employment.

The next six functioning vectors in the municipalities are taken from the CONAPO (2005) data base. These values were indeed used to construct the composite index for 2005, but it will be helpful to look at them as individual functionings separately.[192] There is no problem to include these functionings on the equations considering that they are from different year than 2003. The reason to compare inequality levels of 2003 with levels of achievement of other functionings for 2005 is such that no economic crisis or an important economic event took place between 2003 and 2005. So, the possibility of a bias due to this change of year is minimal on the reported levels of inequality or on the reported levels of functioning achievement. These vectors are used because of the better detail provided by census data. From these 6 vectors, three are public services, and the other three are averages of quality of living, such as indicators of overcrowding in the household, poor quality of dwelling and percentage of households in

[192] These six indicators are considered as functionings, but not as 'achieved' functionings, because these indicators show the availability of services within the community, and it is not for sure that these services were effectively achieved by household members at that time.

the community that earn less than twice the minimum wage. Finally, some characteristics of the municipalities, such as a the proportion of females in the community and the percentage of people living in the rural areas, are included, together with the mean income level of the community and the mean income level of the poor as well. In this paper we use a logarithmic transformation on the mean income variable, as it is the legacy of the Paretian (1897) log-normal distribution. In doing so, we could see clearly the estimated coefficients in economic sense.[193]

Main variables

	Mean	Std. Dev.	Min	Max
Common Deprivation Indices				
P_0	0.339	0.204	0.047	1.000
P_1	0.202	0.151	0.006	0.955
P_2	0.161	0.125	0.000	0.915
Gini	0.424	0.070	0.083	0.724
Theil	0.344	0.136	0.030	1.296
Achieved Functionings (Services)				
% Lack of Electricity Supply	0.020	0.047	0.000	0.935
% Lack of Water Supply	0.084	0.164	0.000	0.992
% Lack of Drainage Supply	0.151	0.219	0.000	0.988
% No Phones (land lines)	0.530	0.258	0.000	0.995
Composite Indices				
Human Dev. Index (2000)	0.778	0.072	0.469	0.930
Margin. Index (2005)	-1.024	0.945	-2.366	3.251
Functionings in the municipalities (2005)				
% Lack of Drainage Supply	0.054	0.091	0.000	0.734
% Lack of Electricity	0.023	0.044	0.001	0.704
% Lack of Water Supply	0.105	0.161	0.000	0.947
% Overcrowding households	0.411	0.122	0.107	0.838
% Poor quality dwelling.	0.110	0.144	0.002	0.915
% Employed < 2 min.wages	0.465	0.187	0.117	0.937
Control Variables				
Log-Mean inc. (μ)	6.961	0.624	3.043	8.160
Log-Mean inc. (poor)	5.387	0.398	1.567	6.425
% rural	0.516	0.481	0.000	1.000
% female	0.522	0.029	0.377	0.667

(n=749)

Own calculations (2003 from ENE), and CONAPO indices (2000, 2005).

Table 8-1. Main variables.

[193] However, the transformation of a variable in a logarithmic fashion does consider implicitly a different treatment to the income of the people in the lower part of the distribution (Sen, 1973, p. 28). This consideration is a property of some of the inequality measures.

II Inequality and Destitution in the Historical Context.

The methodological relationship of measures of inequality with other indices of destitution of other functionings has been addressed in classical and development literature. It is clear that inequality is an indicator of 'social destitution' (Smith, 1776, WN, 5, II; Sen, 1976 in Sen 1982, p. 377), and has been argued consistently that higher levels of inequality induce higher levels of destitution in other functionings. In this sense, inequality is a kind of deprivation. Social inequality is associated also with social rebellion, which produces a lack of cohesion among the individuals in the community (Sen, 1973, p. 1). In this regards, rebellion and social problems enforce cycles of underdevelopment, with the consequent deprivation not only on the family income, but also on the underachievement of other functionings and the lesser possibility to have access to a bigger set of opportunities.

The relationship of measures of inequality with other measures of destitutions might be difficult to explain in an empirical model, we do not know for sure which phenomenon causes the other: it is possible that social levels of inequality might be driving destitution in other functionings, but it also makes sense to think that destitution in other functionings, such as lack of basic services, might be accentuating the increase of inequality in the communities. In the econometric setting, it is necessary to support a causal relationship in order to use a regression model. There is no question that high inequality in the society is related with other destitutions, because of the vicious circle that is the outcome of the lack of cohesion in the community, which is the main argument of this chapter, but it can also make sense to consider that the lack of achievement in other functionings might explain the more unequal distribution in the society. So, once

that the model is specified as a causal relationship, the definition of the dependent and the independent variable makes sense to consider with a variety of possibilities. For instance, Maddala (1992) suggests doing a 'reverse' regression whenever the direction of causation is not clear (p. 75). For our case, that reverse relationship would be that inequality is caused by destitution in other functionings. Econometric theory also suggests that in the case of a not very clear designation of the dependent and the independent variable, the variable that is easier to predict might be more wisely chosen as an independent variable (Amemiya, 1994, p. 229). Considering this criteria, inequality measures seem to be ideal candidates to be chosen as independent variables.

The phenomenon of inequality in Mexico has its roots in the artificial change of the social conditions during the period of the European conquest, almost five hundreds years ago. The European settlers fought for the prevalence of their sowed European-style institutions against the will of the native inhabitants of the conquered territories (Acemoglu et al., 2001, p. 1374). The majority of the indigenous groups that survived the bloodiest battles were surrendered by the European colonizers, and the rest of them fled to the mountains. These last ones, separated from the growing civilization, could not get easily caught by the established army. While the colonizers where organizing the social structures in order to get the most from the American territories (Angeles, 2007), the indigenous groups tried to preserve their own traditions, living a life the most separated as possible from the European and the growing 'mestizo' (mixed) population. This process endured for about 300 years, when most of the colonies around the world started to gain independence from the European settlers. So, the established social organization in Latin American countries that scattered inhabitants in remote rural areas, made the

economic distribution very unequal through this very long process of European colonization.

After the independence, the resultant mixed population tried to gain access to more distant territories controlled by indigenous people and their leaders (‘caciques’), because of the vast natural resources available in that land. With legalistic arguments and the help of national armies, these indigenous groups were again expelled from their own land to more inaccessible rural areas. In order to stay alive, they develop a survival device: they scattered themselves along the territory. They did this because living in well defined communities would imply for them a higher risk to be surrendered. The advantage of being distributed along the territory in small groups would gave them the confidence that, whenever any small group was attacked by their enemies, the rest of the community living in scattered regions would easily move through the mountains, without the risk of being captured. This device has been present for hundreds of years, and that is the reason indigenous people are very much dispersed across the territory. This unnatural dispersion increased again the unequal distribution of resources among the rural communities, because of the unavailability of cheaper public services. This is the main reason why recently the provision of public services by the governmental programs has been so expensive to provide. The very low density of population of these communities makes very difficult to give them public services and health access, but we need to consider that this method of self-isolation gave them the opportunity to survive during five hundred years of persecution.

Coming back to the issue of the causal relationship, it has been pointed out by governmental offices, that the services provided to the population are much related with

the density of population. The more unequal communities have the less probability to have a better provision of public services. In the case of Mexico, for instance, the Federal Commission of Electricity (CFE), a national public monopoly since the year 1960, follows a 'rule of thumb' to provide electricity to remote communities wherever "a community is located less than 10 km from the grid and has a road to facilitate movement of equipment" (ITC, 2005, p. 5). The social inequality captured by our measures of inequality can be used as independent variables that can explain the lack of provision of public services. Since 1996, a program of decentralization by the federal government tried to put the decision-making process of electricity allocation on the municipal and the state governments, therefore, CFE has been working only as a contractor with federal funding 12 years ago. In spite of this decentralization, unluckily for the most destitute communities, it happens that both municipal and state governments are 'vote-maximizers'. The main concern for them is to be reelected, so the decision to allocate public services seems to be again related with the density of population, where the most benefited would be the communities with higher number of people, and because of that, the less unequal. So, it seems to be that the unequal distribution of resources has been enforcing a vicious cycle of underdevelopment.

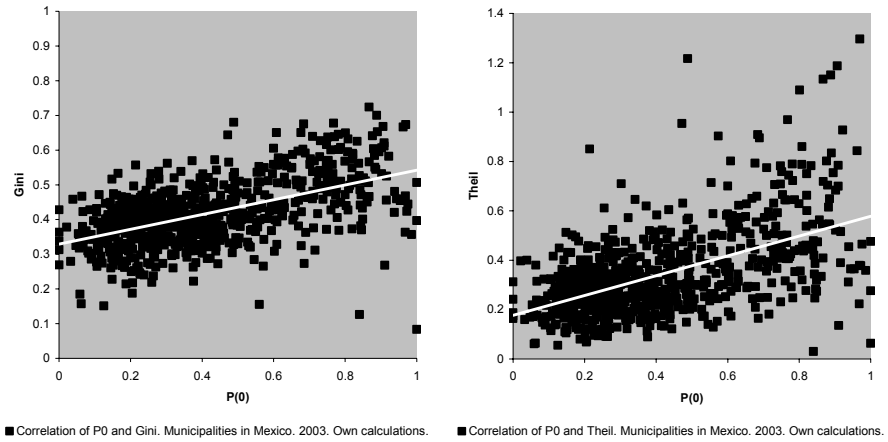
A similar problem is faced by the institutions that provide water supply and drainage, but it is accentuated this problem with the scarcity of water stock in certain areas. Not surprisingly, the most deprived communities in terms of clean water supply and drainage are the states of Guerrero, Oaxaca and Chiapas (CONAGUA, 2007, p. 89), even though these states accounts with important natural water resources. It is of notice that these states have the highest indigenous population density across the Mexican

territory. For the above mentioned reasons, we think that to construct an empirical model is sensible, and that the causal relationship works as we hypothesize seems to be clear, such that the measures of functionings are dependent variables and inequality measures, which approximate the phenomenon of social inequality, can be used as independent variables because of the historic process that caused the unequal distribution.

III Empirical Model.

The first glance of the relationship of inequality with other functionings indicates a positive relationship of inequality with measures of income poverty. The first achieved functioning that is sensible to consider is the sufficient availability of money in order to buy a basket of basic goods. This functioning is well captured by traditional poverty measures. The dispersion analysis of income inequality with income poverty (in **Figure 8-1**) gives a hint of a positive relationship between them. But that was already discussed more formally in chapter **6**, where the positive correlation between poverty and inequality was shown, even after some robustness checks. In our diagram, both indicators of inequality such as Gini coefficient and Theil index present a higher level of inequality that is correspondent to a higher number of poor people in the community.[194]

[194] The relationship holds with other measures of poverty as well, in the Appendix (**Figure 8-4**) is shown the Gini coefficient and the Theil Index with other measure of poverty in the same direction.



■Correlation of P0 and Gini. Municipalities in Mexico. 2003. Own calculations. ■Correlation of P0 and Theil. Municipalities in Mexico. 2003. Own calculations.

Figure 8-1. Dispersion Analysis, Inequality (Gini and Theil) with Headcount Poverty, 2003.

The dispersion analysis is helpful. However, it is obvious that other factors might be affecting the relationship between poverty and inequality; moreover, there might be factors that would be affecting also the relationship between the levels of inequality with the measures of functionings in general. In this case, it is necessary to control the influence of other variables in order to see more clearly the basic relationship of inequality with other functionings. In order to do so, a regression analysis will be performed.

We start with our empirical model that shows a relationship between any of the available functionings with indices of inequality. The empirical model tool allows us to control for municipal characteristics that might potentially bias some part of the relationship. So, we want to be sure that the relationship is only related with the variables of functionings and with those of inequality measures. The basic model is the following:

(11) $$F_{\lambda i} = \beta_0 + \beta_1 \cdot I_{\gamma i} + \beta_2 \cdot X_i + \varepsilon_i$$

Where $F_{\lambda i}$ is the general measurement of the functioning λ in the municipality *i*. We perform a separate regression for each functioning, which are usually expressed in percentage terms, for instance, F_1 is the achieved functioning of electricity supply, F_2 is the availability of clean water in the household, and so on. On the right hand side, $I_{\gamma i}$ is the measurement of inequality γ in the municipality *i*, and γ denotes different inequality measures: Gini coefficient (I_G) or Theil index (I_1) are the most used examples. Finally, X_i is a vector of control variables.

An expanded model includes the consideration of regions, in order to control for the possible regional effect of inequality on the chosen functionings. This effect might differ among the several geographical locations; then the model becomes the following:

(12) $$F_{\lambda i} = \beta_0 + \beta_1 \cdot I_{\gamma i} + \beta_2 \cdot X_i + \sum_{k=1}^{r} \delta_{1k} \cdot region\_k_i + \varepsilon_i$$

Where the additional variable 'region' might be states within the country or predefined geographical regions. As is expected, *r* goes from 1 up to the number of possible regions minus one, in order to avoid the problem of multicollinearity. In this paper we use the 8 regions for the case of Mexico that are defined in chapter **4**.

8.4 General Results.

I Causality.

We conduct not only the regression model of inequality on the achieved functionings, but the other way around as well, which is the 'reverse' regression suggested by Maddala (1992). The results show that the estimated coefficients of the functionings on the variables of inequality are positive and significant. That fact would allow to introduce the main results of our regressions. This basic equation mainly studies how the achieved functionings might be explained at some extent by the inequality measures, including a set of additional explanatory variables on the right hand of the equation. Given the data limitation, the regressions of our models do not test empirically for a causal relationship, as it could be done with the use of the Grainger test (in Green, 2003, p. 592), but we already clarify the causal relationship of inequality on the functionings with the intuitive explanation for the case of Mexico, and also with the support of the present arguments in development economics literature. So, we continue with our main results in the following part.

II Inequality and Achieved Functionings.

The first round of results uses equations**(11)** and **(12)**. The estimates of our model (**Table 8-2**) show a positive relationship of our main variable of inequality on each of the mentioned functionings. Lack of water supply and lack of drain service seems to be functionings that receive a bigger impact by the higher levels of inequality (.259 and .301 respectively). The relationship of inequality with electricity supply is also positive, but

not statistically significant. The other covariates show intuitive results, which increase confidence in our results. So, higher levels of destitution in the functionings are inversely related to the mean income and the mean income of the poor. In general, the probability to be in rural areas is consistent with higher levels of destitution on the achieved functionings, such as the access to drainage supply and phone service. There seems to be a probability to have a better achieved functionings as long as the community shows a higher proportion of females; we will remain cautious about this last finding and we will see if that significance remains the same with the use of equivalence scales in one of the robustness checks at the end of this section. On the other hand, the inclusion of regions in the calculations (columns 2 and 4) strengthen our results and our main findings stay, so our results are free from any regional bias.

Achieved Functionings

Electricity Deprivation	1	t	2	t	Lack of water supply 3	t	4	t
Gini	0.013	0.4	0.020	0.6	0.259	3.6	0.253	3.4
Mean income	-0.043	-9.2	-0.049	-9.8	-0.123	-11.2	-0.130	-11.0
Mean inc. (poor	-0.006	-0.9	-0.003	-0.5	0.003	0.2	0.000	0.0
% rural	-0.002	-0.3	-0.012	-1.6	-0.017	-1.0	-0.027	-1.5
% female	-0.293	-4.4	-0.280	-4.1	-1.041	-6.7	-0.965	-5.9
Regions			Yes	-			Yes	-
	R2=0.1664	F= 28.9	R2=0.1904	F= 14.0	R2=0.2518	F= 48.8	R2=0.2597	F= 21.0

Lack of drain service	1	t	2	t	Lack of a telephone landline 3	t	4	t
Gini	0.301	3.0	0.393	4.0	0.001	0.0	-0.067	-0.5
Mean income	-0.153	-10.1	-0.179	-11.4	0.011	0.6	0.020	1.0
Mean inc. (poor	0.043	2.2	0.048	2.4	0.152	6.2	0.144	5.6
% rural	0.126	5.5	0.116	4.9	0.245	8.6	0.238	7.8
% female	-1.107	-5.2	-0.900	-4.2	0.138	0.5	0.099	0.4
Regions			Yes	-			Yes	-
	R2=0.2753	F= 55.1	R2=0.3335	F= 29.9	R2=0.1086	F= 17.7	R2=0.1183	F= 8.0

2003. Own calculations.

Table 8-2. Relationship of Inequality and Achieved Functionings, 2003.

It is necessary to comment upon the functioning of phone service, which shows almost no impact from the variable of inequality (.001). For this functioning it is necessary to comment that the company that provides this service is not a governmental

institution but an authorized monopoly since 1990. Their decisions are driven mostly by the population density, as it can be clear when we see the higher impact of the variable of percentage of rural areas on the functioning. Even though in order to be privatized, the telecommunications company (TELMEX) acquired certain responsibilities agreed with the government, and one of these responsibilities stated to offer services to all, including the most remote communities, there are still things to be turned into a reality. For our purposes, it is clear that the company's policy related to selection of communities where the service is provided, seems to be unrelated to the sentiment of inequality in the community, but only to the commercial decisions of the corporation; they seems to conduct business taking into account only the efficient use of their resources that will generate the highest payoff for their investment. The lack of significance of inequality in this functioning might also be related with the use of alternative ways of communication, as it could be the use of cellular phones, but that information is not captured by our data on the functioning of phone service, which only includes land lines. For our case, it is not surprising to have a very small effect of inequality related with telephone service functioning, because the decision of phone service allocation seems to be totally independent of what is happening in the community, and our hypothesis that inequality is related in the same direction with other measures of destitutions holds only when there is no artificial intervention by other parties. In this case, a private interest might be biasing the relationship.

The results of the model are consistent with our dispersion analysis. We can see in **Figure 8-2** that the relationship of inequality with any of the achieved functionings mentioned is consistently positive, but with the exception of the phone service

functioning because of the reasons explained above. This implies that higher levels of inequality are consistently related with higher levels of destitution for any of the basic services provided, such as electricity, water supply and drainage supply.

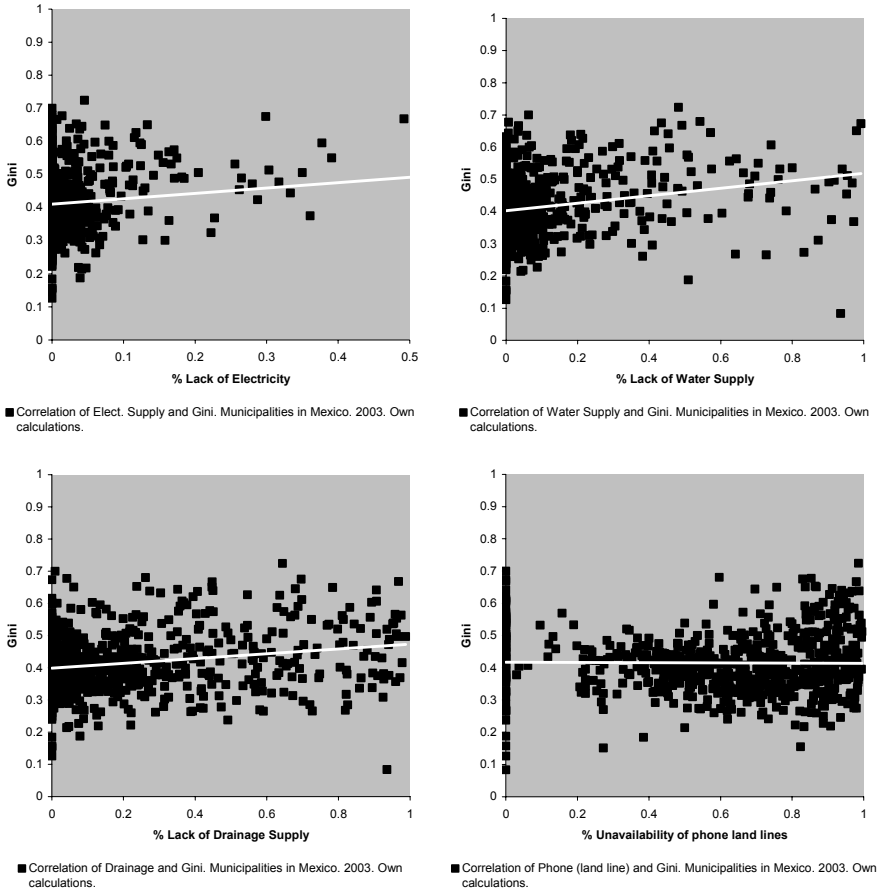


Figure 8-2. Dispersion Analysis, Inequality (Gini) with Achieved Functionings.

III Inequality and Functionings (2005).

It would be interesting to know what the relationships of inequality with other types of functionings are. In **Table 8-3** we show the results of the regressions for a selection of functionings for the year 2005. The first three cases are similar to the functionings just mentioned earlier, such as the provision of electricity, water supply and

drainage supply. The impact of inequality for these three functioning levels is consistently positive and statistically significant as it was the previous case. The other three functionings, which are measures of quality of living, show also a positive relation, which means higher levels of inequality correspondent to lower quality of well-being. This relationship is clear with the impact of inequality on measures of overcrowding (more than four people living in the same room), with the quality of dwelling (approximated with the quality of floor in the house), and with people with lower wages (persons in the household earning less than twice the minimum wage). In all six cases, the mean income is inversely related to the measure of destitution, and rural areas are also the most deprived. The results are consistent not only with those of the original model **(11)**, but also with the consideration of regions, as it is explained in equation **(12)**. The dispersion analysis is provided in the Appendix (**Figure 8-5**), with also a positive relationship of these functionings with the measure of income inequality.

Capabilities available in the community measured at 2005.

Drainage Supply 2005	1	t	2	t	Electricity Supply 2005 3	t	4	t
Gini	0.168	4.0	0.135	3.2	0.045	1.9	0.034	1.4
Mean income	-0.065	-10.3	-0.058	-8.7	-0.039	-10.7	-0.042	-10.7
Mean inc. (poor	0.010	1.3	0.008	0.9	-0.007	-1.5	-0.005	-1.0
% rural	0.046	4.8	0.045	4.4	0.006	1.1	-0.003	-0.5
% female	-0.022	-0.2	-0.070	-0.8	-0.155	-3.0	-0.157	-2.9
Regions			Yes	-			Yes	-
	R2=0.2659	F= 52.5	R2=0.2857	F= 23.9	R2=0.2316	F= 43.7	R2=0.2636	F= 21.4

Water Supply (2005)	1	t	2	t	Overcrowding level (2005) 3	t	4	t
Gini	0.287	4.3	0.200	3.0	0.100	2.4	0.005	0.2
Mean income	-0.110	-10.7	-0.096	-9.0	-0.107	-17.0	-0.090	-15.4
Mean inc. (poor	-0.001	-0.1	-0.013	-1.0	0.072	8.7	0.044	5.9
% rural	-0.004	-0.3	-0.003	-0.2	0.060	6.2	0.078	8.9
% female	-0.285	-2.0	-0.351	-2.4	-0.174	-2.0	-0.164	-2.0
Regions			Yes	-			Yes	-
	R2=0.2243	F= 41.9	R2=0.2799	F= 23.2	m R2=0.40	23 F= 97	m R2=0.56	18 F= 76

Dwelling Quality (2005)	1	t	2	t	People employed with < 2 minimum wages (2005) 3	t	4	t
Gini	0.313	5.7	0.211	4.1	0.291	5.7	0.183	3.9
Mean income	-0.137	-16.4	-0.126	-15.4	-0.182	-23.4	-0.155	-20.7
Mean inc. (poor	0.016	1.4	0.005	0.4	0.109	10.7	0.085	9.0
% rural	0.031	2.5	0.019	1.5	0.109	9.3	0.124	11.0
% female	0.027	0.2	-0.098	-0.9	0.425	3.9	0.300	2.9
Regions			Yes	-			Yes	-
	oor R2=0.	4068 F=	oor R2=0.	5093 F=	R2=0.582	6 F= 202.	R2=0.664	8 F= 118.

2003. Own calculations.

Table 8-3. Relationship of Inequality and Functionings (2005).

IV Inequality and Composite Indices.

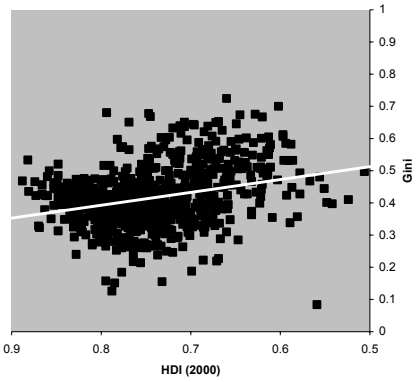
Another way for checking our inequality measurement, perhaps stronger, ,it would be to relate our measures of inequality with composite indices of overall well being, as are the Human Development Index (CONAPO, 2000) and the Index of Marginalization (CONAPO, 2005) provided by a governmental office. We can see in **Table 8-4** that, after controlling for municipal characteristics, the positive relationship with composite indices is maintained. Our inequality measure shows a positive and statistically significant relationship with the marginalization index of 2005; such a thing implies that higher inequality is related with higher indicators of destitution. The relationship with the Human Development Index for 2000 seems to be negative, but we should remember that the nature of this index is different, because HDI shows improvement in well-being, and not a higher level of destitution. The 'negative' relationship just means that higher inequality is inversely related with higher levels of development, which is the same to say that inequality is positively related with lower development. The other covariates remain statistically significant, the mean income, percentage of rural communities in the municipality and percentage of females as explained above. The consideration of regions (column 2 and 4) made our results consistent, because the results remain the same.

Composite Indexes								
HDI 2000 (Mortality, literacy and GDP)					Marginalization index (2005)			
	1	t	2	t	3	t	4	t
Gini	-0.065	-3.6	-0.039	-2.2	1.565	6.6	1.010	4.6
Mean income	0.071	26.0	0.066	23.5	-0.949	-26.2	-0.855	-24.4
Mean inc. (poor	-0.017	-4.6	-0.012	-3.5	0.271	5.7	0.182	4.1
% rural	-0.048	-11.5	-0.048	-11.3	0.576	10.5	0.570	10.8
% female	-0.102	-2.6	-0.061	-1.6	0.326	0.6	-0.216	-0.4
Regions			Yes	-			Yes	-
	R2=0.6523	F= 272.36	R2=0.6809	F= 127.87	R2=0.656	1 F= 277.	R2=0.720	6 F= 154.

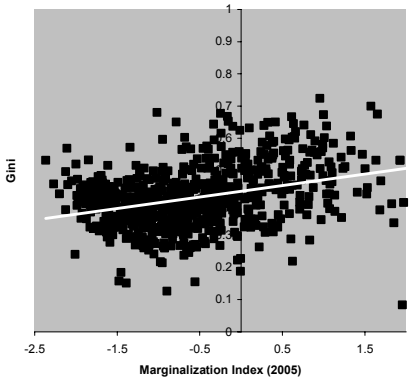
2003. Own calculations.

Table 8-4. Relationship of Inequality and Composite Indices.

The dispersion analysis presented in **Figure 8-3** shows a positive relationship as well. It is noticed that the units of measurement for the composite indices are unique to every index, such thing is due to the endogenous nature of the method of construction of the indices; these indices are calculated according to the matrices of vectors using the principal component analysis. In order to show levels of destitutions, the units of the HDI of 2000 were reversed, so in both cases, the clear positive relationship of higher inequality with higher level of destitutions is also clear.



■Correlation of HDI (2000) Gini. Municipalities in Mexico. 2003. Own calculations.



■Correlation of Marginalization Index (2005) and Gini. Municipalities in Mexico. 2003. Own calculations.

Figure 8-3. Dispersion Analysis, Inequality (Gini) with Composite Indices of Development.

8.5 Robustness checks.

I Assessment with Different Inequality Measures.

The first question that might arise about the robustness of our results might be related to the measure of inequality chosen. Gini coefficient has been widely used in empirical analysis, but it could be interesting to know if other types of measures tell the same story. We chose a member of the family of entropy indices, which is the Theil index. The Theil index's main characteristics are, on the one hand, its decomposability by population sub-group, on the other hand is that it attaches more importance to transfers done at the lower end of the scale, so it has 'transfer sensitiveness'.[195] The results of the regressions of model 1 and model 2 are consistent with the results; just showing slightly different levels of statistical significance, but the same positive direction. Of all the results that we previously obtained, the first 4 achieved functionings, the next 6 functionings, and the two composite indices show exact similarity. In **Table 8-5** we are showing only the check for the functioning of drainage supply as an example, because the rest of the functionings show the same positive relation with the measurement of inequality. In column 1 and column 2 the Gini coefficient is presented, and column 3 and 4 show the Theil Index; from these is clear that the impact of inequality on the functioning is very similar. Now, we can assess that positive relationship of inequality with other functionings is positive regardless the type of inequality measure chosen.

[195] Inequality measurement properties were discussed in chapter **2**.

Lack of Drain Supply, 2003. compared with different Inequality Measures.

	Both Urban and Rural Inequality is the Gini Coefficient.				Inequality is Theil Index			
	1	t	2	t	3	t	4	t
INEQUALITY	0.301	3.0	0.393	4.0	0.164	3.2	0.205	4.0
Mean income	-0.153	-10.1	-0.179	-11.4	-0.151	-9.9	-0.176	-11.2
Mean inc. (poor)	0.043	2.2	0.048	2.4	0.044	2.2	0.049	2.5
% rural	0.126	5.5	0.116	4.9	0.128	5.6	0.118	5.0
% female	-1.107	-5.2	-0.900	-4.2	-1.101	-5.1	-0.890	-4.1
Regions			Yes	-			Yes	-
	R2=0.2753	F= 55.1	R2=0.3335	F= 29.9	R2=0.2760	F= 55.36	R2=0.3335	F= 29.98

2003. Own calculations.

Table 8-5. Relationship of Inequality and Composite Indices.

II Urban-Rural considerations.

Even though we include regional analysis in our regressions, the relationship of inequality with other functionings could be different when we divide the sample between urban and rural municipalities.[196] The results show that in the urban sample, the effect of inequality on other functionings decreases significantly. The effect of inequality is still positive and significant, but with a lower value than in the national sample. The effect of inequality in the rural sample, as expected, remains around the same value as in the national sample, even with higher level of statistical significance. In this case, our result of the relationship of inequality with other measures of destitution is consistently positive, but it is clear that the effect is more accentuated in rural communities, which are the most destitute.

[196] We need to clarify that some municipalities have both urban and rural communities, and these mixed municipalities are included in each urban and rural regression. The variable of percentage of rural areas (% rural) captures this degree of urbanization.

Comparisons of Urban Rural areas.

	National sample.				Urban				Rural			
Marginalization index (2005)		t	2	t	3	t	4	t	5	t	6	t
Gini	1.565	6.6	1.010	4.6	0.799	2.0	0.544	1.4	1.828	6.6	1.243	4.8
Mean income	-0.949	-26.2	-0.855	-24.4	-0.938	-13.0	-0.934	-12.7	-0.894	-20.9	-0.797	-19.4
Mean inc. (poor)	0.271	5.7	0.182	4.1	0.394	5.7	0.316	4.9	0.233	4.2	0.149	2.8
% rural	0.576	10.5	0.570	10.8	0.375	3.5	0.348	3.5	1.005	8.1	0.952	8.5
% female	0.326	0.6	-0.216	-0.4	0.451	0.5	-0.139	-0.2	0.159	0.3	-0.441	-0.8
Regions			Yes	-			Yes	-			Yes	-
	R2=0.656	1 F= 277.	R2=0.720	6 F= 154.	n R2=0.597	9 F= 57.	n R2=0.681	7 F= 33.	n R2=0.58	05 F= 159.	n R2=0.66	34 F= 93.2
Lack of drain service		t	2	t	3	t	4	t	5	t	6	t
Gini	0.301	3.0	0.393	4.0	-0.014	-0.1	0.088	0.7	0.294	2.5	0.404	3.4
Mean income	-0.153	-10.1	-0.179	-11.4	-0.076	-3.6	-0.111	-4.9	-0.160	-8.7	-0.185	-9.9
Mean inc. (poor)	0.043	2.2	0.048	2.4	-0.006	-0.3	0.007	0.3	0.054	2.3	0.052	2.2
% rural	0.126	5.5	0.116	4.9	0.163	5.1	0.163	5.3	0.133	2.5	0.151	3.0
% female	-1.107	-5.2	-0.900	-4.2	-0.495	-1.9	-0.340	-1.3	-1.152	-4.6	-0.955	-3.7
Regions			Yes	-			Yes	-			Yes	-
	R2=0.2753	F= 55.1	R2=0.3335	F= 29.9	R2=0.2100	F= 10.3	R2=0.3164	F= 7.2	R2=0.205	5 F= 29.74	R2=0.276	1 F= 18.05

2003. Own calculations.

Table 8-6. Inequality and Functionings, urban-rural comparison.

III Calculations with Equivalized Income.

In chapter **4** we were careful to assess our results with the use of per capita income in the calculation of inequality. We suspected that some measurement errors might be taking place if the indicators of destitution did not reflect the consideration of intrahousehold distribution. However, the consideration of intrahousehold distributions can be incorporated in our inequality measures with the use of equivalence scales, as it is explained in chapter **7**. In **Table 8-7** we are showing two examples of functionings. The results are consistent with all the functionings presented earlier. The first group of rows shows a composite index, that is the measure of marginalization for 2005, and the second set of rows is the achieved functioning indicator for the lack of drain service. The first two columns are the results obtained using per capita income, available in previous tables. The next two columns are the results (1.454 and .264) that use weights provided by the Engel method in Teruel et al. (2005). The results of the last two columns use equivalized income (1.373 and .255) with the parametric method described in Deaton and Zaidi (2002). The results are consistent for our measures of inequality on the described

functionings, because the relationships are always positive and statistically significant, only the size of the coefficients changes a bit.

Comparisons with Equivalence scales

	Percapita Income				Equivalized Income (Teruel et al. 2005, Engel w/scales)				Equivalized Income (Parametric NRC method 1995).			
Marginalization index (2005)		t	2	t	3	t	4	t	5	t	6	t
Gini	1.565	6.6	1.010	4.6	1.454	6.2	0.924	4.2	1.373	5.7	0.902	4.0
Mean income	-0.949	-26.2	-0.855	-24.4	-0.891	-24.2	-0.823	-23.0	-0.865	-22.2	-0.804	-21.3
Mean inc. (poor)	0.271	5.7	0.182	4.1	0.248	7.1	0.182	5.5	0.255	8.0	0.193	6.3
% rural	0.576	10.5	0.570	10.8	0.581	10.7	0.566	10.8	0.581	10.6	0.578	10.8
% female	0.326	0.6	-0.216	-0.4	0.548	1.1	-0.059	-0.1	0.353	0.7	-0.277	-0.6
Regions			Yes	-			Yes	-			Yes	-
	R2=0.656	1 F= 277.	R2=0.720	6 F= 154.	n R2=0.667	1 F= 282.2	n R2=0.727	0 F= 154.6	R2=0.676	1 F= 283.0	R2=0.731	5 F= 152.3
Lack of drain service		t	2	t	3	t	4	t	5	t	6	t
Gini	0.301	3.0	0.393	4.0	0.264	2.6	0.366	3.7	0.255	2.5	0.353	3.5
Mean income	-0.153	-10.1	-0.179	-11.4	-0.142	-9.2	-0.170	-10.6	-0.141	-8.5	-0.169	-10.0
Mean inc. (poor)	0.043	2.2	0.048	2.4	0.036	2.4	0.042	2.8	0.038	2.8	0.044	3.2
% rural	0.126	5.5	0.116	4.9	0.127	5.5	0.114	4.9	0.126	5.4	0.113	4.7
% female	-1.107	-5.2	-0.900	-4.2	-1.034	-4.7	-0.804	-3.6	-1.015	-4.5	-0.764	-3.4
Regions			Yes	-			Yes	-			Yes	-
	R2=0.2753	F= 55.1	R2=0.3335	F= 29.9	R2=0.2736	F= 53.02	R2=0.3356	F= 29.34	R2=0.2784	F= 52.32	R2=0.3452	F= 29.48

2003. Own calculations.

Table 8-7. Inequality and Functionings, with equivalized income.

The other covariates also remain consistent: rural areas are more likely to have higher deprivation, the possibility of deprivation in a particular functioning is lower as long as the general mean income is higher, and finally, against the traditional prediction in human development literature, there seems to be a higher probability of being better off (or not worse off) as long as the community have a higher proportion of females, even with the consideration of equivalence scales. However, the aim of this paper is not to explain the puzzling probability of higher development for females. We will only notice that this finding is consistent with those reported in the current literature on Mexican development. [197] The purpose of the inclusion of this variable was to show that the effect of inequality was free of any possible gender bias on the impact on the selected

[197] The discussion of gender inequality in Mexico has been investigated in several literatures, however the results are inconclusive. See Nazar-Beutelspacher et al. (2005, p. 236), De Ferranti et al. (2004, p. 62, n. 60) or Teruel et al. (2005, p. 22) among others.

functionings. For our case, we show that inequality measures, as an approximation of a social destitution, are consistently related in the same direction with other destitutions, even after controlling for municipal characteristics, regions, gender, different type of measures and the use of equivalence scales.

8.6 Conclusions.

The empirical exercise was helpful to support our main claim that inequality, as an indicator of social destitution, can be effectively related with deprivation on other functionings. The lack of services can be linked to the higher dispersion of the income distribution, which is captured by traditional measures of inequality. The measurement of inequality can be used as a measure of destitution when other types of measures, such as human development indices or poverty measures, are not available. It can be definitely suspected that in regions with higher income inequality, it is very likely that other sorts of destitution might be taking place.

For the case of Mexico, the availability of services is related with social inequality. The public services that are more linked with inequality are water supply and drainage availability in the community. Electricity seems to play a role, but with a smaller impact than from the previous two functionings. On the quality of life within the household, the chosen functionings proved to be related with income inequality, such as the quality of dwelling and the levels of overcrowding. The relationship of inequality with the functioning that includes people with low earnings was not surprising; the relationship was positive and statistically significant as expected. The comparison of inequality with general levels of destitution, such as those measuring human development

or marginalization, made our results robust and strengthen our claim that inequality might appear to be intrinsically related with destitution overall. For the case of Mexico, the inequality relationship with other functionings is stronger for the rural areas, the effect of inequality remains consistent regardless of the type of measure chosen, and the inequality link is prevalent even with the consideration of equivalence scales within the household. All the previous issues made our results consistent, and help to support our assertion that inequality measurement should be studied and measured as an important side of human deprivation.

8.7 Appendix.

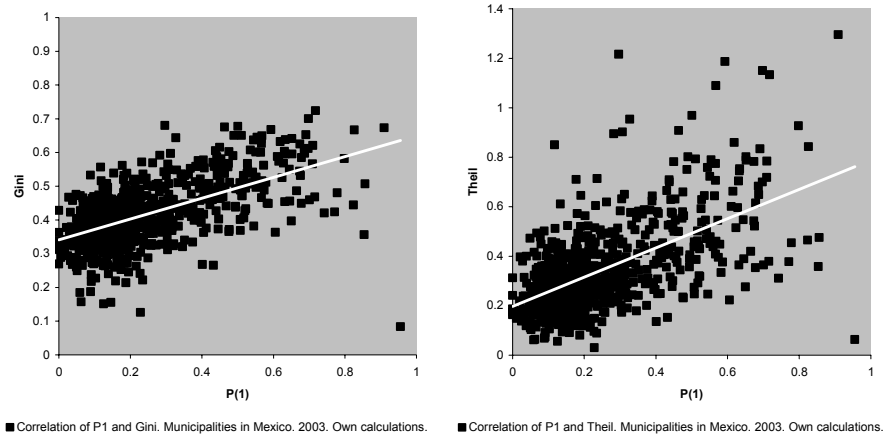
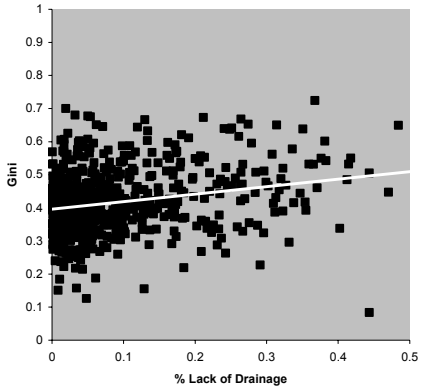
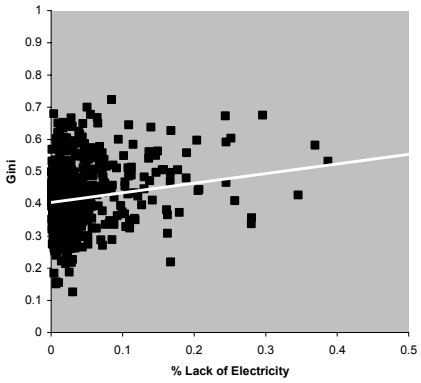


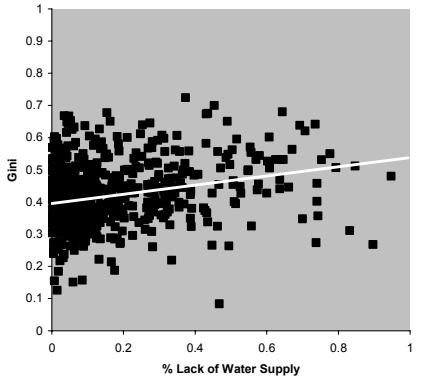
Figure 8-4. Dispersion Analysis, Inequality (Gini and Theil) with Poverty (P_1), 2003.



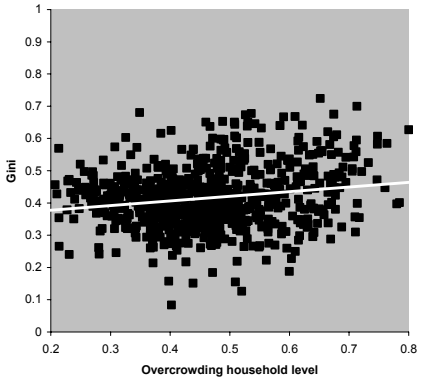
■ Correlation of Drainage (2005) and Gini. Municipalities in Mexico. 2003. Own calculations.



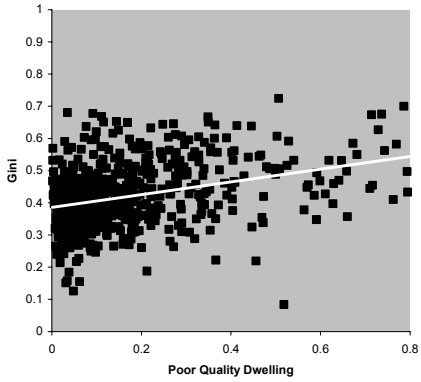
■ Correlation of Elect. Supply (2005) and Gini. Municipalities in Mexico. 2003. Own calculations.



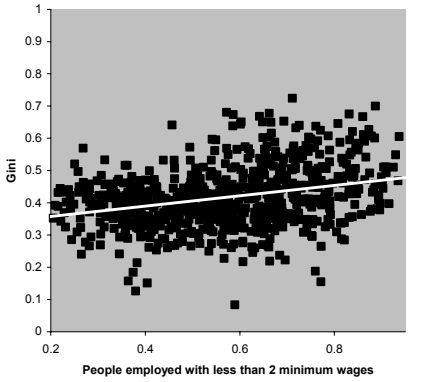
■ Correlation of Water Supply (2005) and Gini. Municipalities in Mexico. 2003. Own calculations.



■ Correlation of Hacinamiento (2005) and Gini. Municipalities in Mexico. 2003. Own calculations.



■ Correlation of Dwelling Quality (2005) and Gini. Municipalities in Mexico. 2003. Own calculations.



■ Correlation of Employment (2005) and Gini. Municipalities in Mexico. 2003. Own calculations.

Figure 8-5. Dispersion Analysis, Inequality with different Functionings (2005)

Part III. General Concluding Remarks.

Given the importance of the renewed interest in inequality measurement in developing countries, particularly in Latin America, the main goal of this work was to highlight several aspects in regards to the assessment of inequality in Mexico, using income inequality as an approximation for real social inequality in the country. The purpose of this research was to offer an additional view for the consideration of income distribution in Mexico with the inclusion of inequality assessments. The methods used in order to tackle this issue were twofold, methodological and empirical; from the general consideration to the particular point of view.

One of the first remarks of this work, analyzing the philosophical context of the value judgments embedded in the consideration of inequality, is such that it is not necessary to endorse the particular view that inequality is an indubitable outcome of an unfair society, as the way might be understood from the Marxist tradition. For instance, a terrible natural disaster might produce an increase in inequality levels between regions, so that would only imply that the better-off people would have an opportunity to serve the people in a worse-off condition. The alternative schools of thought in regards to justice say that there exists other ways of explaining the phenomenon of inequality in terms of alternative grounds rather than exploitation only; so economic science should not be forced to take this particular view as if it were an axiomatic religious belief. It was shown that some branches of economic science follow the Marxist view of inequality as unfairness, but this view seems to be too simplistic and narrow in the light of the Greek and the Jewish tradition. In this sense, the study of social inequality should no longer be

anymore a taboo for the government because of the fear of rebellion. After an accurate estimate of social inequality by region, the government should invite people to be part of the improvement of this situation, putting special emphasis on the measurement of trends of distributional changes through different periods of time. Some other aspects of the subjective perception of inequality have also been discussed in this dissertation. Despite the fact that income inequality can be calculated with mathematical precision, the value judgment that society assigns to certain levels of inequality is a subject that shall be discussed by every community, following the Aristotelian participation method. This issue is not a problem for interregional comparisons, but it might induce problems for the comparability of inequality measures among countries, because the values shared by every culture might be different.

The discussion of the appropriate space for the calculation of social inequality should not be a confusing issue anymore. The capability approach of Sen (1985) rejected the utilitarian space of Bentham, and enlarged the Basic Needs Approach's understanding of the appropriate space for the calculation of several types of destitution (Sen, 1984), but the measure of social inequality is not a subject matter for this discussion. The foundation of inequality measurement is different; inequality is a shape of destitution that might be approximated in almost any valid space, following the Smithian (1776) concept of being ashamed to be the only person to appear in society without a proper set of indispensable commodities. In this sense, income might be used as a space for measurement on the pragmatic approximation of social inequality. The relative ease of the availability of this information in survey data is an important advantage in order to measure inequality. On the one hand, this work do not discourage the pursuit of better ways to measure

destitution, not only on the contemporary traditional setting of human development indices (e.g. income, education and health), but also on the functionings that are important for the development of the community, such as the provision of better public services, and the exercise of more personal freedoms (Alkire, 2002, Kuklys, 2005). But on the other hand, this work emphasizes the need to have a better understanding of social inequality, as an additional form of social deprivation. The approximation of social inequality with pragmatic, normative or statistical methods that use income as the space for the calculations, would serve as a starting point in order to provide suitable indicators with the purpose of enlarging the communal strength produced by the practice of social cohesion.

The review of the traditional indices to measure inequality has shown the vast variety of ways to approximate this phenomenon, but a limitation that has been recognized is that this traditional measurement mostly focuses on the relational and monadic attributes of inequality, leaving out for a variety of reasons the study of the processes and the value judgments included in the consideration of inequality altogether. We imagine there are two reasons why researchers step aside from the consideration of the processes of inequality and its value judgments, one is the complexity of the issue on methodological grounds and the other is the particular constraint imposed by the data availability. The review of this topic reminded us that distributional rankings might differ on the basis of the properties attached to the different inequality measures. On the one hand, normative measures pose difficulties on the grounds of the type of social utility function chosen, which might make it difficult to interpret the results for the policy maker. So the use of this kind of measures seems to be arbitrary at large extent. On the

other hand, there are pragmatic tools that have been widely used. One of these measures is the Gini coefficient, which has been a widely used tool that communicates in a simple manner the idea of inequality, but other tools, such as the Theil Index, might also be used when it is needed to identify which region contributes more to this phenomenon, because of the property of decomposability by population sub-group. The generalized Lorenz ranking, with useful properties of population invariance and mean independence, might also serve to rank distributions when the measurement is not very different among regions or not markedly different over time.

On the basis of traditional consideration of distributional judgments it was made clear that it is better to keep inequality concerns separated from destitution measurement (e.g. poverty measurement). The measure of relative poverty is an example where the two concepts are mixed, so this type of measurement should be rejected for the sake of clarity. An implication of this discussion is such that deprivation measures that are distributional sensitive might be mixing again the consideration of inequality and destitution, so these measures, such as some newly proposed human development indices with distributional sensitiveness, might not be saying which part of destitution comes from inequality assessments, and which part of deprivation comes from absolute destitution concerns. Looking the other way around, such as inequality measures that show 'poor sensitiveness', there might also be a problem. When an inequality measure considers the transfers done at the lower end of the scale to be more important (e.g. third degree stochastic dominance or measures that use logarithmic transformations), this kind of inequality measure is mixing again the deprivation that comes from social inequality with

the destitution coming from the unachieved functioning, so it might not be clear which deprivation is more important in every particular case.

There is a variety of operational decisions that should be considered on the calculations once that the empirical measurement is chosen to approximate social inequality. The reported levels of inequality are sensitive to these decisions. More than being supportive of a particular way to measure inequality, in this work it was argued that it is better to be clear from the beginning about 'what' among 'whom' is calculated (Atkinson and Bourguignon, 2000), and how these calculations are done (Medina, 2001). Most of the problems of comparison between inequality measures come from the, perhaps hidden, underlying assumptions taken on the technical and operational issues. Additional to those decisions, for our purposes we will consider that the spatial aggregation offered by income surveys proved to be an important asset for calculation of regional inequalities. The pragmatic aspect of inequality measurement has to offer clearer calculations of inequality for the policy makers, making them aware of the variety of methodological and technical decisions considered, such that the levels of inequality can be comparable.

Applying some of the different operational decisions just discussed, for the case of Mexico it can be clear that the sensitivity analysis is also important for the calculations of inequality. The Gini coefficient, the Theil index and stochastic dominance were used, because of literature convention, decomposition by population sub-group, and the difficulty to rank distributions with different population size and different mean income respectively. Our calculations in general are consistent with present literature. As expected, the measurement was found to be sensitive to the recipient unit chosen and also

to the source of welfare chosen (e.g. income vs. expenditure data). The measures of inequality were sensitive with the correction made on intrahousehold distribution through the use of equivalence scales, and also with the imputation of values to the non-response observations. The measurement changed when respective regional price index was used, and finally, the different sample size also affected the measurement through the years; this last thing because of budget limitations on the data collection. These issues mentioned only reinforce our belief that a proper measurement of inequality, with clearer assumptions, should be presented along with any report of inequality. The limitation of the empirical calculation in this research might be alleviated in the future with a richer data set when it will be possible to have detailed individual data, in this case, we might be able to measure inequality not only across regions, but also over time with the construction of a non balanced pseudo panel data. An observation that might deserve special attention is the presentation of results. The normal use of tables is a common practice, but nowadays the graphical tools available, such as the presentation of geospatial maps constructed for this research, are practical and useful tools that serves the purpose to inform the policy maker about the status of destitution from an inter-regional perspective.

The alleviation of poverty, unfortunately, might be a very good ‘business’. The assessment of destitution should be taken with care because of the huge governmental spending on these programs. The changes on the law should be an evolutionary process that converges in such a way that the most destitute are covered more by governmental programs, but the researchers should not be ignorant about the additional burden because of the political implications that the definition of destitution measurement entangles, in

addition to the natural frictions coming from academic discussions. There are political assets, important monetary interests and bureaucratic inertias that usually obstruct the advances of this kind of research. The Mexican case is an example of a changing process that is trying to measure more accurately the extent of human deprivation. There might be reasons to assume that the efforts for a better way to measure destitution were only related with the progress of scientific research in social welfare, but definitely for the case of Mexico, the establishment of a standardize poverty measurement was possible because of the *de facto* willingness of the new right-center ruling party, which gathered recognized academia and people from the public sector in order to make the process of theoretical, practical and methodological definitions of poverty measurement transparent, starting on the year 2000. There are still conflicts between the different regulations that measure destitution in Mexico, so the research is still an on-going agenda; in fact, a current topic from that agenda is the definition of the measurement of unequal distributions.

The consideration of inequality measurement was considered an issue of secondary importance for the Mexican case. The measurement of poverty was prioritized (CTMP 2002). This issue gave space for this dissertation. The reasons to leave aside the consideration of distributional judgments were such that it was considered that the measurement of inequality could not properly assess human destitution. The work on this dissertation explained two things on this regards, first is that the literature used in order to found an ambiguous relationship of poverty and inequality were not very strong in such claim, and second, that the research used for such purposes was weak on the selection of inequality measures used, that it was unsure because of data constraints, and might have

judged improperly a set of measurement errors during an important period of crisis in Mexico. A simple empirical exercise showed that the relationship of inequality is such that, when the mean income is controlled, inequality measures covariate positively with poverty measures, in other words, inequality have the same substance of destitution than poverty. When a more detailed data set becomes available, it is expected to show a generalized result of inequality measurement covarying in the same way with poverty, not only in regional analyses, but also when a time trend is considered. In this case, the Mexican literature can again consider distributional judgments on measures of destitution, as has been seen recently with human development indicators that are inequality sensible (Foster et al., 2005).

A final methodological issue was covered in this research because of the strong link with the Mexican literature: inequality considerations are embedded in both the capability approach of Sen and on the consideration of intrahousehold inequality with the use of equivalence of scales. The identification of dimensions in the capability approach served to see the fact that social inequality is indeed a dimension of well-being. This dimension, that is different from other deprivations (e.g. income poverty or health), can be approximated with traditional inequality measures on the income space. The 'incomplete' definition of Sen, based on the Aristotelian participation method, was used in order to show that social inequality is a functioning that needs to be addressed, and this functioning is related with a particular capability for every society: the right to live in a society with more equal opportunities. On the other hand, the consideration of equivalence scales proved to be a pragmatic inequality concern because of the presence of natural inequalities among individuals (e.g. gender or age), so the assignment of

weights to individuals, make the calculations clear in order to know the amount of real inequality in a society.

The Mexican literature has been incorporating progressively the advances made in development literature, such as the use of equivalence scales or the capability approach of Sen. The consideration of equivalence scales on the Mexican literature show that poverty measurement has been overestimated (Teruel et al., 2005). This is a clear example of how important it is to separate inequality considerations from destitution assessments. The calculations of poverty after the consideration of intrahousehold heterogeneity give a clearer account of poverty. Considering Sen's approach, in which the most important factor seems to be the multidimensional nature of well-being, the Mexican literature is not ignorant about this issue; the publication of the Human Development Reports on the 1990's was an important influence. This dissertation covered some of the misunderstandings in the Mexican literature in these regards, for instance, the inclusion of a multidimensional idea of well-being in a one-dimensional space that is income. Like in any other country in the world, Mexico had a data constraint that delayed the full consideration of multidimensional measurement of well-being. The concern about multidimensional deprivation has been present in Mexico reflected in a variety of marginalization measures. These measures are mostly based on the principal component analysis methodology with the philosophy of social exclusion. The research is an on-going agenda that includes Human Development Indices and some sort of inequality judgments (Lopez-Calva and Székely, 2006, Foster et. al, 2005).

The final step of this research show that inequality as a deprivation has an empirical positive correlation with other sorts of deprivation, as it was theoretically

expected. This would serve to explain the fact that in future human development assessments, the consideration of income inequality should be an important aspect of the social well-being that needs to be measured. The relationship of income inequality with other functionings is intuitive: the presence of public services in the community would make the population to enjoy better levels of health and a better quality of life, so those achieved functionings will influence the population with a set of better jobs and consequently better living conditions. This better standard of living would make in consequence a more equal distribution. That is the reason for which the levels of inequality can be also used as an additional measurement of destitution, because inequality indeed is one of the important aspects of deprivation in society.

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