Economics Department Working Paper Series

No. 13-2010

Consumption Poverty and Pro-Poor Growth in Bolivia

(1999-2007)

Marta Moratti[♦]

PhD candidate at Bocconi University, Italy

visiting PhD at Department of Economics

University of Sussex
m.moratti@sussex.ac.uk

Abstract: Using seven Bolivian household surveys conducted between 1999 and 2007, this paper provides a different picture of poverty dynamics in Bolivia. Consistent and accurate estimates of consumption are computed and used to create poverty profiles. Challenging the previous income-based poverty trend, it emerges that Bolivia experiences a very large poverty reduction from 2002 onwards, halving poverty headcount during the period of 2002-2007. Growth incidence curves are also used to investigate the pro-poor component of the large welfare improvement. It shows that the poorest quintiles of the population, mostly represented by indigenous households, did benefit more than the rest of the population. The results suggest that Bolivian pro-poor growth significantly contributed to narrow the welfare inequality between indigenous and non-indigenous groups.

JEL Classification: C81, I32, O15

Key Words: consumption poverty, pro-poor growth, Bolivia

1. Introduction

Bolivia is one of the poorest countries in Latin America and has one of the highest levels of inequality. The United Nations Development Program (UNDP) ranked Bolivia 111th (out of 179 countries) on its Human Development Index.[1] Bolivia exhibits a high level of inequality with a Gini index of 60.1 and by Latin American standards, life expectancy at birth is low - 65 years in Bolivia compared with and 73 years in the Latin American region; infant mortality is high - 55 per 1,000 live births versus a regional average of 22.

Although Bolivia is one of the poorest countries in the world, there has been scant attention paid to Bolivian poverty within the research network. Existing literature indicates that the declining poverty trend in the 1990s reversed during the first years of the present decade although the more recent developments have not been analysed yet. However, the extraordinary political, economic and social changes experienced in Bolivia over the last years (such as Morales' election, his proclaimed commitment to eradicate poverty and redistribute resources, the nationalisation of Bolivia's hydrocarbon reserves and the boom in natural gas price and fiscal revenues, the internal ethnic and regional tensions, etc.) and the availability of recent and good quality household data are a strong incentive to research on poverty and related issues. The only available data on the trends in poverty during the present decade are the official statistical poverty calculations computed by the INE (National Statistics Office) and UDAPE (Economic Policy Analysis Unit). They use income as indicator of wellbeing and they show that there has been a significant negative shock in 1999 with poverty headcount increasing by 5 percentage points. In 2000, an even larger poverty change occurred that led the headcount poverty measure to decrease by more than 6 percentage points. From 2001 onwards, poverty exhibited quite stable patterns with a modest decreasing trend from 2002. Unfortunately, there is no alternative literature on the very recent trends in poverty. However, being able to compare these results with alternative sources and methodologies is extremely important in order to validate them. This is even truer considering that the literature on poverty analysis in developing countries has shown the short-comings using income as an indicator of welfare. In fact, there is a wide agreement on expenditure being a better indicator of welfare than income (Deaton, 1997).

No previous study investigates what happened to households' consumption decisions or what the poverty story would be using consumption rather than income. Previous studies focus on income as a welfare indicator or wellbeing and neglect consumption. The aim of the present work is to fill this gap in the literature and to present a very different story on the recent Bolivian poverty trend. Using seven Bolivian household surveys conducted between 1999 and 2007, consistent and accurate estimates of consumption are computed and used to create poverty profiles. Challenging the previous income-based poverty trend, this study shows that Bolivia experienced a very large poverty reduction from 2002 onwards, halving poverty headcount during the 2002-2007 period. Moreover, the present study investigates whether there have been any specific socio-economic pattern in the large welfare change experienced in Bolivia during the present decade. Many social, political and economic shocks occurred in the present decade that affected welfare changes across regions and social groups and the paper tries to assess which groups have benefited the most, whether the welfare growth has been pro-poor and how the indigenous population, over-represented among the poorest segments of the society, has fared.

---

[1] UNDP, Human Development Report 2008

The paper is organized as follows. Sections 2 and 3 review the literature on poverty in Bolivia and examing theoretical arguments in favour of consumption as a better measure of welfare in developing countries. Sections 4 defines the concept and the computation of consumption data employed for the present study. Section 5 presents summary statistics on the consumption. Section 6 focuses on the trend in durable goods which are not included in the definition of consumption applied in this paper, but provide interesting insights on households' investment behaviours. Section 7 constructs consumption figures and presents consumption-based poverty profiles, while Section 8 compares the consumption-based poverty profile with the income-based one. Section 9 tests the robustness of the results by comparing the survey-based consumption data with National Accounts data. Section 10 tests the sensitivity of the poverty lines using poverty dominance analysis. Section 11 analyses correlations of poverty – containing data description, estimation results and tests of welfare change over time, the differences between indigenous and non-indigenous population and to what extent Bolivia experienced pro-poor growth. Section 12 sums up the main results of the study.

2. Literature Review on Poverty in Bolivia

Although Bolivia is one of the poorest countries in the world, there has been scant attention paid to Bolivian poverty within the research network. Partly, this is due to scarce data availability and comparability. Nationally representative household surveys with income and expenditure information are only available from 1997 onwards.[2] Prior to 1997, there have been income surveys for departmental capitals going back to 1989, and some spotty survey information from urban areas; therefore, rural and Pori-urban areas where almost half of the population live, were excluded from these surveys. In addition, there are three national censuses (1976, 1992, and 2001) and four nationally representative Demographic and Health Surveys (DHS in 1989, 1994, 1998 and 2003), but none of which contains income information. These surveys present serious limitations in terms of comparability - changes over time in the questionnaires make comparison of even basic socio-economic variables like income and education difficult; moreover, surveys before 1999 did not capture household expenditures.

However, since 1999, the World Bank, through the MECOVI program[3], has supported the National Statistics Office (INE) with the development of nationally representative annual household surveys that have significantly improved the comparability of data for poverty monitoring and analysis.[4] Despite that, specific and comprehensive studies on the dynamics of poverty are simply missing; most of the poverty figures available, at least to the author's knowledge, are derived from studies whose focus is on growth

---

[2] The 1997 survey is also not comparable to later surveys so that consistent national time series data is only available from 1999.

[3] MECOVI is a Spanish acronym for: "Mejoramiento de las Encuestas de Hogares y la Medición de Condiciones de Vida" -Improving Household Surveys and Measurement of Living Conditions.

4 The first MECOVI Survey of Living Conditions with national coverage was carried out in November/December 1999. Three more surveys were conducted annually from 2000 to 2002 and three more from 2005 to 2007 for a nationally representative sample of households. They were also carried out in November/December, to ensure comparability. In 2003, INE introduced a new sample design and a new questionnaire for the MECOVI survey program with a view to overcoming the shortcomings of previous MECOVI surveys. The 5th MECOVI survey was dubbed the Continuous Household Survey (CHS) (Encuesta de Hogares, ECH). The CHS differs from the other MECOVI surveys in terms of design, questionnaire and coverage.

analysis[5]. Furthermore, even the few existing works on Bolivia poverty only cover the period up to the late 1990s.

As a result of the lack of available data and different methodological solutions employed to overcome the data limitations, there have been considerable disagreements about the historical trends in poverty in Bolivia[6]. Nevertheless, most of the studies agree on the following three stylized facts: first, in the late 1990s, poverty is much higher in rural than urban areas; second, there was some decline in poverty in capital cities since 1989 with an upturn in poverty again after 1997; third, non-income measures of poverty have declined more sharply than those measured by income throughout the 1990s, particularly in urban areas. Thiele (2001) provides a comprehensive review of the early literature covering studies up to the late 90s.

Another comprehensive study on poverty was carried by World Bank (World Bank, 2005b). The report collects data and studies on poverty, based on different monetary and non-monetary welfare indicators. In general terms, the report shows that monetary poverty measures improved during the growth episode in the 1990s which led to a decline in income-measured poverty from 52% in 1993 to 46% in 1999, while the fraction of the population in extreme poverty decreased from 24% to 21%. The earlier improvement in poverty have reversed since 1999. By 2002 poverty levels in the capital cities went back to the level of the early 1990s. Rural poverty, particularly extreme rural poverty, showed an upward trend between 1999 and 2002. Official poverty rates that rely on household expenditures for rural areas showed a slight increase in total rural poverty, and a two percentage-points decline in extreme rural poverty. The negative impacts on household incomes have been uneven. Figure 1 shows the change experienced by households between 1999 and 2002 disaggregated by income deciles and area. Real income per capita fell by two-percentage points per year for urban households throughout all the income distribution (except for the richest deciles). For rural households, it improved slightly for the poorer half of households and shows a decline of 2-3 percent per year for the upper deciles.

Figure 1: Change in household income per capita by income decile and area, 1999-2002
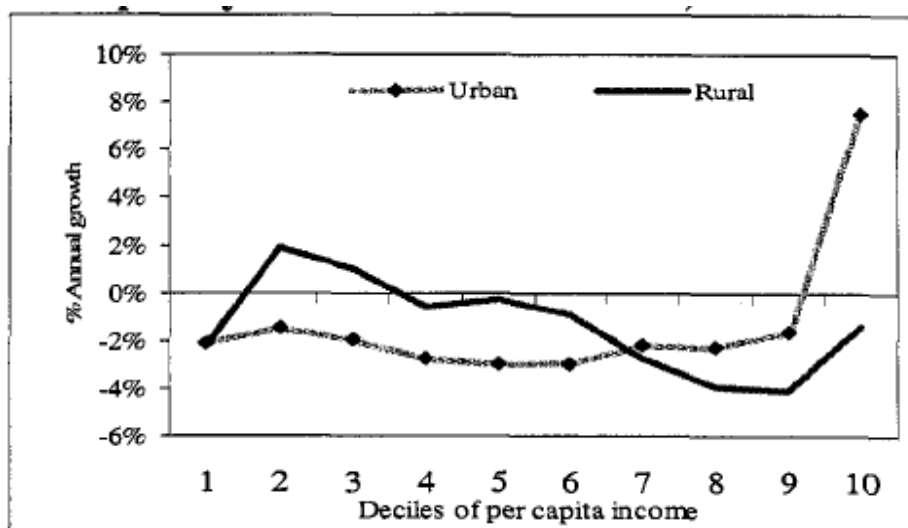
Source: World Bank (2005b)

---

[5] Mainly studies that analyse the impact of macro variables (economic growth, employment, price shocks) on poverty. See later this paragraph for review of the relevant literature.

[6] See Thiele (2001) and Klasen *et al.* (2004).

A complementary approach to income (expenditure) poverty measure is to compute the number or percentage of individuals with unsatisfied basic needs (UBN). The Unsatisfied Basic Needs Index takes into account living conditions, access to basic social services, such as health, education, etc. The national index shows a declining trend of poverty between 1992 and 2001, although huge discrepancies exist between rural and urban areas. In some rural areas in 2001, 91% of the population continued to suffer from unsatisfied basic needs.

The World Bank report (2005b) also describes results of a study on the determinants of Bolivians' subjective perceptions of well-being. The study finds that subjective poverty perceptions in Bolivia are consistent with income metrics and lead to similar conclusions on who the poor are and the main determinants of poverty. Employment, education, access to assets and basic services, ethnicity and location are core determinants of both income poverty and self-rated poverty. Bolivians tend to have a greater likelihood of falling into income poverty or to consider themselves poor if they are young, have low level of education, are unemployed or underemployed, have an indigenous heritage, live in rural areas, lack access to basic services.

Table 1: Poverty according to Unsatisfied Basic Needs (% of individuals)

	1992			**2001**		
	National	**Urban**	**Rural**	**National**	**Urban**	**Rural**
Overall Index	**70.9**	**53.1**	**95.3**	**58.6**	**39**	**90.8**
Housing Materials	48.2	22.5	83.6	39.6	15.6	75.7
Housing Crowding	80	76.3	85.1	70.8	68.9	76.3
Sanitary Services	75.9	60	97.6	58	44.3	78.9
Energy Services	51.8	21.2	93.8	43.7	14.1	91.2
Education	69.1	53.9	90.1	52.5	36.5	70.9
Healthcare	53.6	44.2	66.6	37.9	31	54.5

Source: World Bank 2005b

An interesting contribution to the literature on poverty in Bolivia is Klasen *et al.* (2004). The paper investigates the extent to which Bolivia has been able to achieve pro-poor growth and the results are very much in line with the poverty dynamics described by the World Bank report. The paper uses consumption in rural areas and income in capital cities and towns as the welfare measure as incomes in rural areas are implausibly low (about 25% lower than consumption with many households reported extremely low incomes).[7] It finds that there is a big difference in poverty levels between capital cities, towns, and rural areas, with the latter at a much higher level. It also finds that poverty measured by the headcount or the poverty gap measure declines considerably between 1989 and 1999 and then increases again between 1999 and 2002. The authors also employ an alternative methodology,

---

[7] For the purposes of this study, the authors employ two alternative methodologies to generate national poverty data and poverty profiles for the time prior to 1997. The first uses information from the DHS (Demographic and Health Surveys) to generate an asset index for 1994 and 1998 as a proxy for income following proposals from Sahn and Stiefel (2003) and Pritchett and Filmer (2001). The second combines information from the urban household surveys with the DHS to generate income and poverty information for the entire country from 1989 to 2002. The poverty lines used here are based a regionally differentiated basket of goods that allows sufficient caloric consumption which has been updated using local price data on these goods. The extreme poverty line is derived by just allowing for enough caloric consumption while the moderate poverty line also makes allowance for non-food items.

generating an asset index, as a proxy for income, using DHS (Demographic and Health Surveys) for 1994 and 1998, and that largely confirms the findings above for the time period 1994 to 1998, but with some slightly different nuances.

Barja *et al.* (2004) provides some interesting figures on poverty. Although the paper's main objective is to evaluate the short-term impacts on poverty of pro-poor expenditure and total social expenditure during the 1999-2002, it also provides the only consumption-based poverty profile.[8] The paper uses data on consumption based on 1999 household survey[9] and adopts poverty lines computed by UDAPSO (1995)[10] to compute poverty indicators. The adjusted headcount ratio at the national level indicates that 41.4% of Bolivian households were poor in 1999.This indicator changes dramatically when comparing urban (23.7%) with rural areas (71.5%).

The adjusted poverty gap at the national level indicates that the poor households have a mean shortfall of 39.8% of the poverty line value and require on average an additional per capita consumption of 116.5 bolivianos per month to overcome their poverty condition. This indicator also shows large differences when comparing the depth of poverty between urban (24.6%) with rural areas (48.4%). The adjusted intensity or severity of poverty at the national level indicates an average of 37.8% degree of inequality among poor households. The severity of poverty is greater in rural areas than urban areas, reflecting less inequality between poor people in urban areas and more in rural areas.

Jemio and Choque (2006) analyse pro-poor economic growth in Bolivia and find that despite the fact that Bolivia experienced a relatively long period of economic growth during the 1990s, growth was relatively modest in those sectors where the poor are employed (agriculture, micro and small enterprises). Those sectors where the bulk of employment is concentrated presented the lowest growth rates, labour productivity and real incomes and therefore income-based poverty measures did not improve. Agricultural workers (39.3% of the total employment at the national level) presented 81.7% of poverty incidence in terms of income levels. Urban activities employing most of the urban labour force, (manufacturing, construction, commerce and other services), also were affected by high poverty levels.

From the literature it emerges that the declining poverty trend in the 1990s reverses during the first years of the present decade. There is no study to analyse what happened after that. However, the extraordinary political, economic and social changes have happened in Bolivia in the last years and the availability of recent household data provide strong incentives to conduct research on poverty and related issues. The only information available on the trends in poverty during the present decade is the official statistical poverty calculations computed by the INE (National Statistics Office) and UDAPE (Economic Policy Analysis Unit).

---

[8] To my knowledge, this consumption-based poverty profile is the only one available in the literature on Bolivian poverty.

[9] Definition of consumption used: in the filtering process, all expenditures that are not frequent like legal fees, home repairs and improvements, taxes, expenditures on social ceremonies (e.g. marriages, births, etc.) are dropped. Furthermore, all purchases of financial assets, as well as amortization of debt and interest payments are also excluded from aggregate consumption. Two other items not included are gifts and transfers, given their inclusion in the household that acts as a recipient. Finally, some special items like health expenditures (e.g. hospital and medicines) are also excluded.

[10] As a reference the urban poverty line is 328.1 bolivianos per capita monthly (54.4 US$), the rural poverty line is 233.6 bolivianos per capita monthly (40.1 US$) and the national poverty line is 293.1 bolivianos per capita monthly (50.4 US$).

The data are based on household surveys from 1999 to 2007. However, the definition and measurement of poverty have not been very consistent throughout the years: from 1999 to 2002 poverty is computed using income for urban households and expenditure for rural households. From 2005 onwards, the indicator used for the entire population is income. However, INE and UDAPE also provide estimates of the headcount poverty measures based on the income definition for the whole period considered, see Figure 2.

Figure 2: Official headcount poverty measures (income definition), percentage
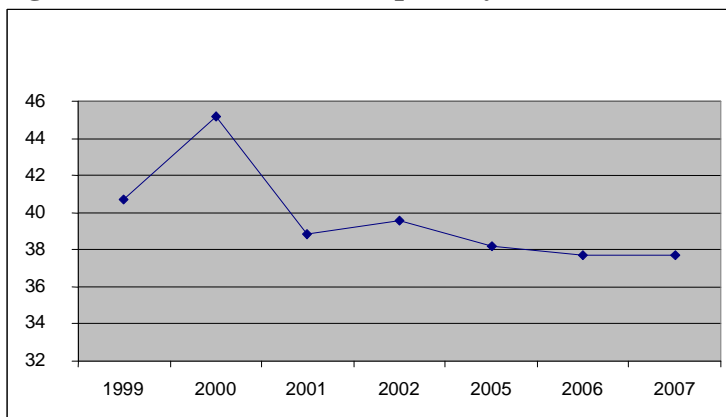
Source: UDAPE, INE

In line with the literature presented above, the results exhibit a significant negative shock in 1999 with an increase in the poverty headcount of five-percentage points. In 2000, an even larger poverty change occurred that led the headcount poverty measure to decrease by more than six-percentage points. From 2001 onwards, poverty exhibits quite stable patterns with a modest decreasing trend from 2002. Unfortunately, there is no alternative literature on the very recent trends in poverty. However, being able to compare these results with alternative sources and methodologies is extremely important in order to validate them. This is even truer given that the literature on poverty analysis in developing countries has widely shown the shortfalls of using income as an indicator of welfare. In fact, there is a wide agreement on expenditure being a better indicator of welfare than income (Deaton, 1997).

3. Income versus Consumption

Researchers have intensively debated on the strengths and weaknesses of different welfare indicators with a quite clear consensus on favouring consumption over income. First of all, families and individuals derive material well-being from the actual consumption of goods and services rather than from the receipt of income *per se* [11]. Deaton and Zaidi (2002) argue that consumption better reflects long-term income as it is not closely tied to short-term fluctuations in income and is smoother and less variable than income.

As a result, if life-cycle models hold a person's consumption at any age is proportional to his or her lifetime resources so that measuring consumption is not only useful in its own right but also provides an indicator of lifetime welfare. However, as Deaton and Grosh[12] claim, "the evidence for this hypothesis is controversial to say the least; for many people, the promise of resources in the future may do little to pay the bills today". If lifetime

---

[11] Johnson (2004:2).
[12] Deaton Grosh (1999**:** 4).

is too long a reference period, "there is evidence that people can smooth their incomes within a particular year and perhaps over a series of years, so that consumption reflect at least living standards throughout the year and perhaps even over a series of years"[13]. While conceptual arguments generally favour consumption over income as a measure of well-being, practical matters related to the nature of the available data are equally relevant. Both income and consumption are usually based on data from national household surveys that collect information on the socio-economic condition of a sample of households. Collecting data on expenditure is usually very time consuming. Households are asked to report the total expenditure on goods and services which results in gathering information on hundreds of items. However, the concept of expenditure is usually clear while income, especially computation of income from self-employment, is not always so. Income is more straightforwardly collected, at least in developed countries or in those situations where there are only few and stable sources of income. Calculating income from self-employment appears to be quite difficult. This is particularly true for agriculture and small businesses where it is difficult to separate business transactions from those of consumption.

Furthermore, income is more likely to be affected by seasonal patterns, especially in agriculture resulting either underestimation or overestimation of real income. Multiple seasonal visits to the respondents would be necessary to account for seasonal variability, a rare praxis given the costs involved. If consumption is smoothed over the seasons, then it appears to better reflect (or approximate) the real living standard. Moreover, income is likely to be a more sensitive issue for respondents than consumption. People may be reluctant to share information about their income and assets. In developing countries' context this is even more pronounced given that, as suggested in Deaton and Grosh (1996), most of the surveys are conducted of necessity in semi-public places, where respondents might be even more reluctant to share information about their wealth in front of relatives or others. There is some evidence that failure to respond is positively correlated to socio-economic status: well-off people are less likely to participate in the survey or to respond.[14] This might bias the results in a way that underestimates income inequality among the population.

4. How to Measure Consumption

Measuring consumption is quite a difficult task[15]. Consumption includes several components: all the individual expenditure on goods and services, a value for consumption that does not go through the market (home production, transfer in kind, etc.) and a value for durable goods possessed. For the latter some sort of consumption flow needs to be imputed.

There is an important distinction to make between consumption and expenditure – the former includes the value of service flows from durable items and assets (such as home, vehicles, washing machine, computers, etc.) whereas the latter includes current expenses on the purchase of these items. Theoretically, consumption is preferable to expenditure as it better reflects material resources, although in practice estimating the value of service flows involves crucial assumptions (such as definition of durable good, depreciation rate of different items, etc.).[16] The methods adopted to construct consumption measures significantly vary among countries and over time. Most of the choices involved with the measurement of consumption are usually driven by data availability or by comparability

---

[13] Deaton and Grosh (1999:4).
[14] See Deaton (2005) and Groves and Couper (1998) as cited in Deaton (2005).
[15] For literature on how to estimate consumption from expenditure surveys see Kay, Keen and Morris (1984) and Johnson (2004).
[16] The definition of consumption used in the present work excluded the durables.

over time within a country. There exist, however, good practice techniques and guidelines which one could look at when trying to construct an accurate measure of consumption.[17]

Total household consumption expenditure should comprise: food consumption, non food consumption, education expenditure and housing expenditure. In revising the method adopted by the Bolivian National Institute of Statistics (INE), it emerged, however, that the computation of the total consumption expenditure was not clear and consistent[18]. However, from 2005 onwards INE includes in the consumption aggregate only the current expenditure thus excluding the value of service flows of durables. Moreover, in computing current expenditure, durable goods and expenditures made in house repair and construction that are above a certain threshold (equal to 2005 US$ 100, or approximately Bs. 800 in local currency) are excluded because they are regarded as investment rather than consumption.

As a result, a lack of consistency in the definition and construction of consumption aggregates provided by the INE is apparent and that simply prevents one from comparing those figures over time. Aware of that, the only feasible option for conducting sound research using consumption data is devoting intense effort to create original, consistent, accurate consumption estimates. This task, although very time consuming, represents a notable and original contribution of the present study to the literature on Bolivia[19].

To estimate consumption figures the following components have been aggregated:
Food consumption inside the household (food purchases, self-produced food, food from other sources-such as gifts, transfers in kind) [20]
- Food consumed outside the household (breakfast, drinks, lunch/dinner, snacks,..)
- Non-food consumption (aggregate of about 40 categories related to current housing costs, domestic fuel and power, tobacco products, clothing and footwear, medical care and health expenses, transport, recreation, personal care, miscellaneous goods and services[21])
- Education expenditure (tuition fees, transport, books and copies, uniform, etc.)
- Housing expenditure (actual rent or rental equivalence value, expenses- gas, water, electricity, telephone- house repair-decoration[22]).

The computation has been done at the (per capita) household level. When the expenditure was reported at the individual level, the household aggregate has been computed and the per capita mean has then been obtained dividing the household figure by the household size. As respondents are allowed for some modules to answer either in US dollars or Bolivianos (LCU), all the values in US dollars have been converted into real

---

[17] See Deaton and Zaidi (1999) and ILO (2003).

[18] In the period of 1999-2002, total expenditure includes a not clearly defined imputation of having some assets inside the house such as beds, TV, microwave oven, etc. Information on the method used to impute such values (which items are included, how the service flows are computed, etc.) are not available.

[19] Appendix 2 describes in detail the steps taken to construct the consumption data employed in the present work.

[20] Data on the consumption of 64 food items were added up to get the household total food expenditure.

[21] With respect to the non-food components in the questionnaire (and to the official consumption estimate) the present work does not include the expenses in financial and capital services - such as mortgages, payment instalments - to avoid double counting of those expenses already reported elsewhere.

[22] Monthly expenditure in house repair-decoration above 100US$ were considered as investment rather than consumption and were not then included in the computation. The benchmark of 100US$ was indicated by the INE and deflated by inflation rate, taken from WDI. As respondents are allowed to answer either in Dollars or Bolivianos, the value has been converted into real Bolivianos. The exchange rates used are from INE and I use the monthly rate reported for the month during which the survey was conducted (usually November-December).

Bolivianos. The exchange rates used are the ones of the month during which the survey was conducted (usually November-December)[23]. The length of the recall period varies throughout the modules and the items considered[24]. All the figures have been converted to get monthly figures. With regard to missing values, the imputation has been done only when the respondent reports to consume a good but doesn't then report the amount actually spent. In those cases, I imputed the amount using the rural/urban mean. (rural and urban means exhibit very large gaps). There still remains some missing data[25].

The definition of consumption used in the present work excluded the durables. However, a separate exercise to compute the stock of durables and the current expenditure in durable goods have been done to provide a insight into the household's investment patterns over the time considered. Further discussion on the computation and analysis of durable goods is provided in section seven.

5. Descriptive Statistics of Consumption

Figure 3 reports the average consumption estimates in real terms, obtained by deflating the nominal averages computed from the surveys by the general CPI. A modest decline in consumption occurs during the first three years considered. Thereafter, an extraordinary increase in consumption clearly emerges. Consumption more than doubled during the period considered, with an average annual growth rate of 10 per cent.

Figure 3: Trend in consumption (constant Bolivianos 1999-2007)
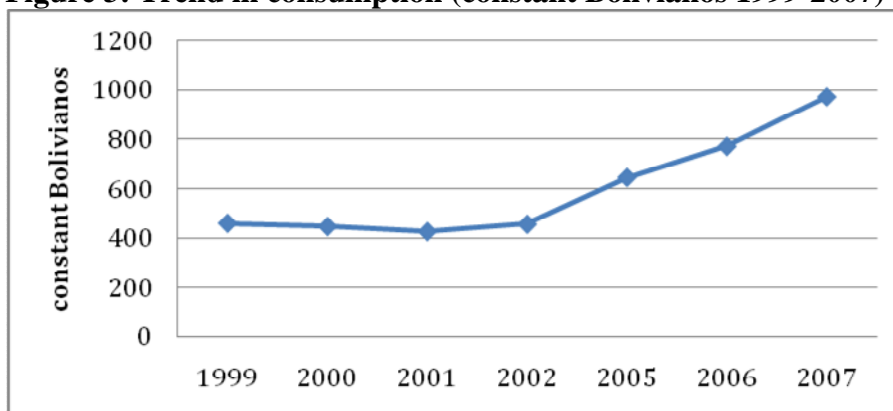
Source: Author's own calculation based on surveys

The decomposition of the aggregates into the consumption components reported in Table 2 provides interesting insights. All the sub-categories exhibit a trend similar to the general estimates: the average figures slightly decline over the first years and they then increase from 2002 onwards. Over the period considered the figures almost double for non-

---

[23] Data on exchange rates are taken from INE.
[24] Monthly recall period for the modules "food inside the home" and "food away from home".
Depending on the variables, the education module includes monthly and annual recall periods; the non food module uses monthly, three months and annual recall periods; the housing module uses monthly and annual recall periods.
[25] Distinguishing between those missing values who are missing by definition and those who should have an imputed value is almost impossible. Mostly, respondents are asked just to report the expenditure of an item. The missing value might then be either a "zero" value (no consumption of it) or a true missing value (cannot answer, doesn't remember how much he spends, etc.) Just in few cases, the respondent is asked to specify both whether he consumes the item and the amount of money. I proceed with imputation only in those cases. See annex for details.

food consumption, education and housing expenditure. For food consumption (both at home and away from home) the increase is even higher.

Table 3 reports the budget shares of each component. It shows a quite stable picture. Non-food expenditure accounts for about 20% of total consumption. Education consumption slightly declines over the period, with a budget share of 5-6% with the lowest share in 2007. Housing consumption accounts for 22-25% and remains quite stable over time. Food consumption is the most important component of households' total consumption and the only sub-category that reveals an increasing share over time passing from about 46% (both food at home and away from home) to 53%.

Table 2: Decomposition of total expenditure estimates (average constant Bolivianos using general CPI) 1999-2007

Variable	1999	2000	2001	2002	2005	2006	2007
NON FOOD	95.39	97.22	90.21	92.55	124.42	155.43	187.38
EDUCATION	32.80	29.52	25.29	29.13	38.96	42.80	52.06
HOUSING	118.33	107.36	96.10	105.33	138.01	191.49	213.94
FOOD outside the HH	39.87	28.46	31.40	41.27	65.31	83.36	103.84
FOOD inside the HH	172.05	183.11	182.91	186.38	278.70	298.34	412.93
TOTAL CONSUMPTION	458.44	445.66	425.03	454.66	645.40	770.76	970.14

Source: Author's own calculation based on surveys

Figure 4: Trend in consumption 1999-2007 (constant Bolivianos)
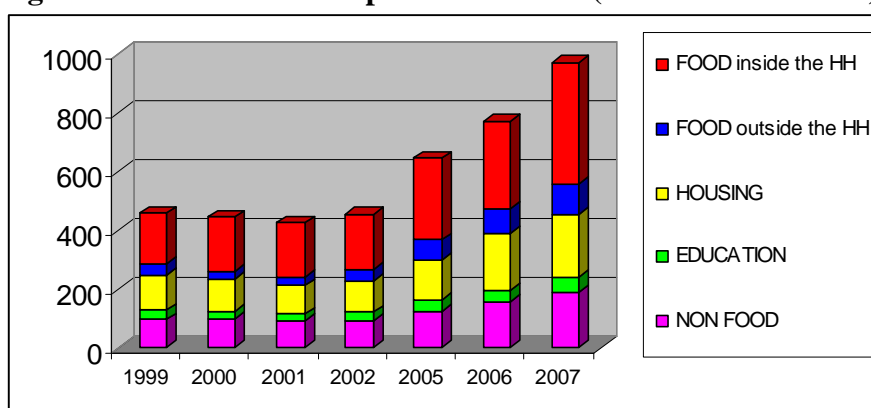
Source: Author's own calculation based on surveys

This exercise might provide us some hints to better understand households expenditure trend: food expenditure accounts for most of the increase in total expenditure. Some of the food expenditure increase, however, could be biased by the "unusual situation" described in Mukherjee and Chatterjee (1974). The sharp increase in food prices experienced in those years might have affected households' perception of prices, resulting in an upward bias in the reporting of prices and expenditure[26].

---

[26] If this theory holds, then non-food consumption should be upward biased as well, due to the high increase in oil prices. Not a significant increase, though, seems to occur there.

Table 3: Decomposition of total expenditure estimates

	1999	2000	2001	2002	2005	2006	2007
NON FOOD	20.81	21.82	21.22	20.36	19.28	20.17	19.31
EDUCATION	7.16	6.62	5.95	6.41	6.04	5.55	5.37
HOUSING	25.81	24.09	22.61	23.17	21.38	24.85	22.05
FOOD away from home	8.70	6.39	7.39	9.08	10.12	10.82	10.70
FOOD at home	37.53	41.09	43.03	40.99	43.18	38.71	42.56
TOTAL CONSUMPTION	100	100	100	100	100	100	100

Source: Author's own calculation based on surveys

6. Descriptive Statistics on Durable Expenditure

The Bolivian household surveys contain a module on durable goods. In this section, households are asked about the amount and value of the durable goods they have. Households report whether they own any durable good (such as TV, radio, PC, bicycle, motorbike, car, kitchen, fridge, washing machine, wardrobe, etc.), how many, how long ago they were bought, how much they spent when they bought them and how much they think they could now sell them for. The latter is a good proxy of the present value of the good and it is therefore used to compute the aggregate value of durables owned by the household.
The total stock of durables is computed, summing up the imputed values per each item and, to find out the household's "investment" decision year by year, the current (last year) expenditure in durables (or the imputed value when the purchase cost was not reported) is also calculated.[27]

Table 4 and Figures 5-6 describe the present values of durables. The first row reports the per capita value of all the durables owned by the household from 1999 to 2007. The total figures are decomposed to highlight the present value of goods purchased during the previous 12 months, which represents the current expenditure in durables. The figures on durables' levels are converted in real terms and growth rates calculated to describe the overall trend.

Table 4: Durables stock and expenditure

DURABLE GOODS real	1999	2000	2001	2002	2005	2006	2007
Durables stock	1967.06	1595.53	1401.61	1576.33	1498.84	1817.71	1759.08
Durables expenditure	262.60	117.81	71.09	82.32	110.96	128.97	147.28
Stock growth rate		-18.89	-12.15	12.47	-4.92	21.27	-3.23
Expenditure growth rate		-55.14	-39.66	15.79	34.79	16.23	14.20

Source: Author's own calculation based on surveys

---

[27] The details on the construction of the variables used in the present paragraph are reported in Appendix 2.

Figure 5: Durables (per capita, constant Bolivianos)
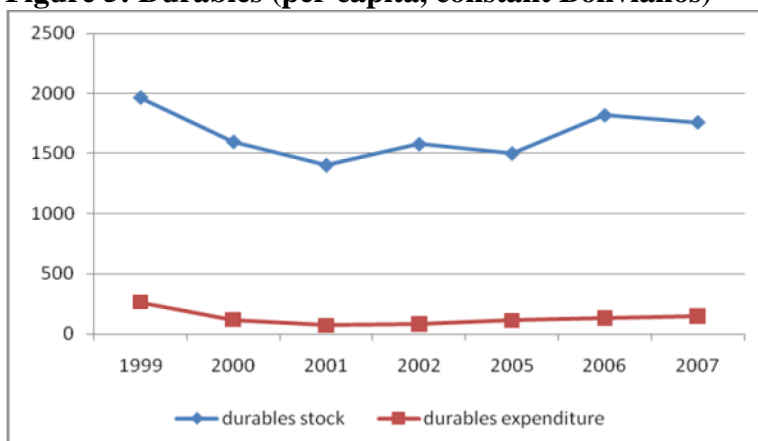
Source: Author's own calculation based on surveys

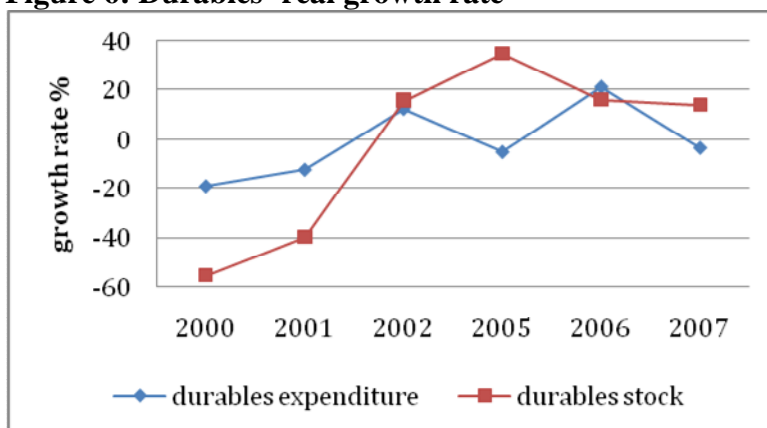**Figure 6: Durables' real growth rate**

Source: Author's own calculation based on surveys

A clear pattern in durables (both stock and expenditure) emerges during the period considered. A substantial reduction in durables occurs from 1999 to 2001 with expenditure dropping respectively by 55% in 2000 and 40% in 2001. From 2002 onwards durables growth rates are positive, with the only exception being a small negative rate for the durable stock in 2005. Particularly, current expenditure in durables grow significantly during the period 2002-2007, with an average 20% annual growth rate. Durable stocks also exhibit, on average, a positive but smaller trend during the period 2002-2007, with an average growth rate of six-percentage points. It is interesting to analyze how durable expenditure shifts over time with respect to consumption expenditure. Does durable expenditure, seen as a proxy of investment, follow the general trend of consumption expenditure? What's the "investment" behaviour of households facing increasing or decreasing consumption levels?

Table 5 and Figures 7-8 show that the trends in durable expenditure is very similar to the consumption one. The initial decline is followed by a constant positive growth from 2002 onwards. The two variables' growth rates exhibit an interesting pattern: the initial reduction in durables is much larger than the consumption one. Thereafter, durables' growth rates closely follow the consumption ones, with durables experiencing relatively smaller growth rates than consumption.

Table 5:Trends in durable expenditure and total consumption (real terms)

	1999	2000	2001	2002	2005	2006	2007
Durable expenditure	262.60	117.81	71.09	82.32	110.96	128.97	147.28
Total consumption	458.44	445.66	425.03	454.66	645.40	770.76	970.14
Durable expend growth rate		-55.14	-39.66	15.79	34.79	16.23	14.20
Total consumption growth rate		-2.79	-4.63	6.97	41.95	19.42	25.87

Source: own calculation based on surveys

Figure 7: Trends in durable and total consumption 1999-2007 (constant Bolivianos)

Source: Author's own calculation based on surveys

Figure 8: Durable expenditure and total consumption growth rate
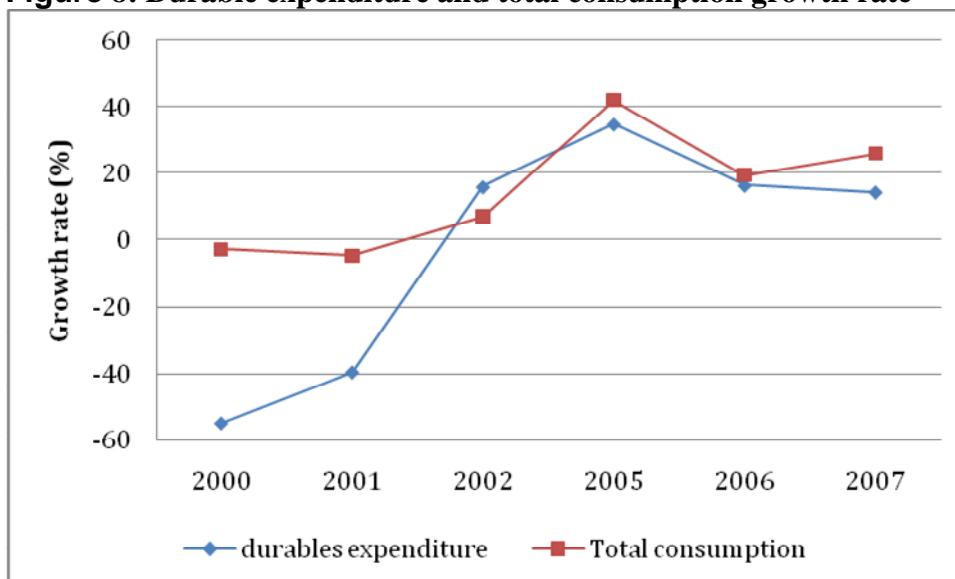
Source: Author's own calculation based on surveys

7. Summary Statistics on Poverty

The concept of poverty is deeply embedded in the poverty literature as well as the conceptual and practical difficulties to measure it. In the context of measuring, consumption-based is more favourable than income-based (Deaton 2002). There much less

agreement, however, on the definition of poverty and poverty lines. The definition and construction of a poverty line is a crucial step in a poverty measurement and many approaches have been adopted by the literature[28]. Poverty lines are used as the poverty thresholds to classify those households and individuals whose disposable consumption expenditures fall short as the poor.

In this work, the extreme poverty lines calculated by the Bolivian Statistical Institute are used as reported in Table 6. These poverty lines are based on the cost of basic needs (CBN) method and are adjusted for differences in the cost of living across regions and between rural and urban areas[29].

Table 6:Poverty lines 1999-2007 (spatial adjusted lines based on CBN methods)

	Oct. 99	Dec. 2000	Oct-Nov. 2001	Nov-Dec. 2002	Nov-Dec 2005	Nov-Dec 2006	Nov-Dec 2007
RURAL	134.74	131.61	131.53	133.03	160.47	167.58	205.23
Sucre	169.39	169.45	168.29	169.48	194.17	211.22	261.00
La Paz	180.16	180.74	182.04	181.84	205.04	214.32	239.50
Cochabamba	177.31	177.37	176.16	177.40	194.17	211.22	261.00
Oruro	163.83	164.35	165.54	165.35	205.04	214.32	239.50
Potosí	150.68	151.16	152.25	152.08	205.04	214.32	239.50
Tarija	180.20	177.37	176.16	177.40	194.17	211.22	261.00
Santa Cruz	180.17	179.79	174.35	174.69	197.53	214.45	276.00
Trinidad	180.17	179.79	174.35	174.69	197.53	214.45	276.00
El Alto	164.12	163.13	164.81	165.20	181.83	190.20	225.20
Pando	180.17	179.79	174.35	174.70	197.53	214.45	276.00

Source: INE

Based on the lines described above, some poverty measures are computed to provide a profile of poverty in Bolivia. The three measures, defined by Foster, Greer and Thorbecke (1984), are the headcount ratio (or incidence of poverty), defined as the fraction of the population below the poverty line; the poverty gap index, to be interpreted as a per capita measure of the total shortfall of individual welfare levels below the poverty line; and, the squared poverty gap (or index of severity of poverty) that takes into account not just the proportion of the poor households and the average income of the poor population, but the variance of income among the poor[30].

---

[28] See World Bank (2005) for methods and guidelines.

[29] Consumption baskets made up of basic food items that reflect the actual consumption patterns of low-income families are used to define poverty lines separately for rural and urban areas. The monetary value of the basic food basket is interchangeably called the food poverty line, extreme poverty line, or the indigent line. Addition of non-food consumption items yields the poverty line. Poverty lines were established separately for rural and urban areas, and for each Department. They were calculated from a priced basket of basic goods and services, obtained from the Household Budget Survey of 1990 (urban) and EVI-FIS survey of 1997 (rural). Auto-consumption and transfers in kind are valued by the price estimates of such products by respondents on the basis of market reference prices, in estimating the total household consumption. The poverty measures obtained using extreme poverty lines by INE are fairly close to the one obtained using the standard "dollar-a-day" expenditure-based measures of poverty. This is an important characteristic as it allows comparisons between the present study and other studies which use the dollar-a-day measure.

[30] The squared poverty gap set is defined by $P_\alpha = (1/N) \sum [(z-x_i)/z]^\alpha$, where N is total population, z is poverty line, x_i is income of poor household i, and the summation is limited to poor households.

Table 7: Poverty measures, Bolivia 1999-2007 (%)

	1999	**2000**	**2001**	**2002**	**2005**	**2006**	**2007**
Headcount ratio	20.30	26.23	25.85	24.09	16.64	16.20	11.99
Poverty gap	7.91	9.95	8.98	8.10	5.11	5.08	3.49
Severity of poverty	4.17	5.20	4.40	3.88	2.31	2.28	1.48

Source: Author's own calculation based on surveys

Figure 9: Consumption-based poverty measures 1999-2007
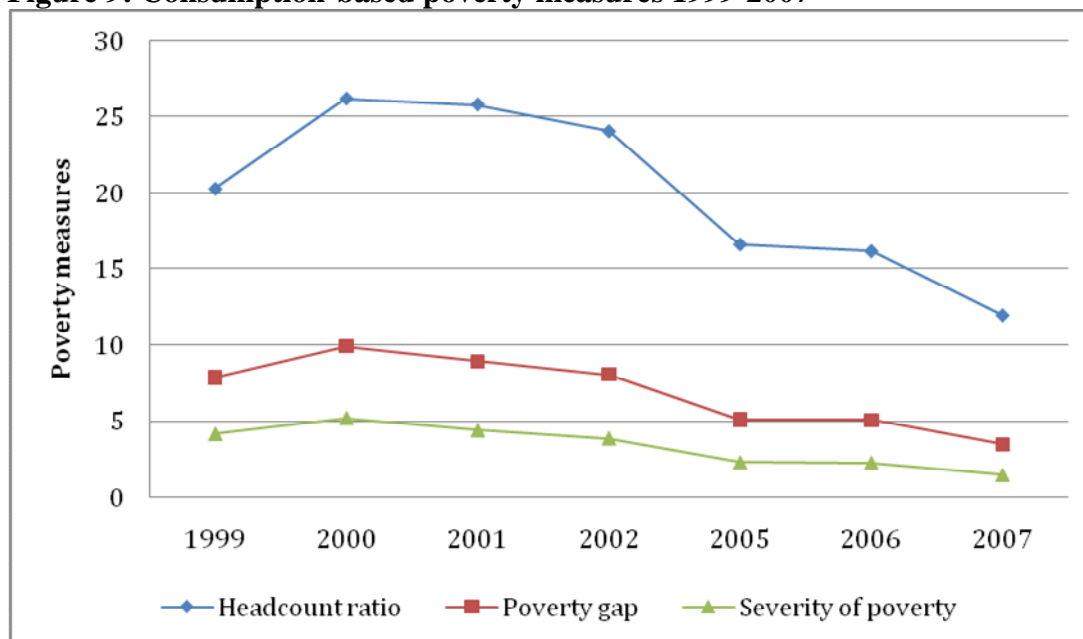
Source: Author's own calculation based on surveys

The poverty measures exhibits interesting results: poverty increases significantly in 1999-2000 and starts decreasing thereafter. The poverty reduction is small during 2000-2002 but it accelerates thereafter. Surprisingly, the poverty reduction showed in the consumption-based measures is so large that poverty headcount halves in 5 years time, passing from 24% in 2002 to 12% in 2007. The measures of depth and severity of poverty follow similar trends. An initial worsening of the measures from 1999 to 2000 is followed by a significant improvement that further intensifies from 2002. In 2007, both depth and severity of poverty exhibit the lowest score ever, thus denoting a clear improvement of those measures over time.

8. Comparison between Income and Consumption Poverty Measures

Within the literature on alternative measures of poverty there is considerable disagreement regarding whether using different welfare indicator affects trends in poverty. Many have argued that while the level of poverty varies significantly with different measures, the trends are generally quite similar.[31] In contrast, others provide evidence that

---

[31] See Hoynes, Page and Stevens (2006), Lang (2007), Triest (1998), Short *et al.* (1999), and Dalaker (2005) for poverty comparison on US data; Zaidi and de Vos (2001) on EU.

some of these alternative measures follow distinct patterns.[32] Earlier work looking specifically at consumption-based measures of poverty suggests that changes in these measures differ from income-based poverty trends, but some recent work concludes otherwise.[33]

The trend of poverty in Bolivia is highly sensitive to the indicator of welfare in use. In fact, consumption and income tell quite a different story about poverty levels and speed of poverty reduction. The overall trend is vaguely similar: a strong increase in poverty between 1999 and 2000 and poverty decrease thereafter. However, the extraordinary large poverty reduction that emerges from the consumption-based measures is striking and there is no similar pattern in the income-based figures. Income-based poverty exhibits a significant decline in 2000 (a reduction of almost 14 percentage points) and remains quite stable thereafter or with modest yearly changes. If the entire period is considered, poverty headcount declines by 7-percentage points; although the decline is noticeable it is not comparable with the 40% reduction obtained using the consumption-based data.

Figure 10 suggests that, for the initial period considered, consumption simply responds smoothly to income shocks. The negative shock experienced by the Bolivian households between 1999 and 2000, that generates a large poverty increase, has been promptly absorbed from an income point of view while the consumption response is more gradual and cautious. However, this interpretation -consumption responding smoothly to income shocks- does not hold when one looks at the second part of the period considered. While income poverty is generally stable and no significant shock occurs from the income point of view, consumption poverty decreases very intensively with peaks of 26-30 percent reduction in 2005 and 2007. Income does not seem to play a role at all in consumption behaviours. Despite no significant improvement in their income, households spend more and the overall number of households below the poverty line decline.

Table 8: Income versus Consumption based poverty headcount

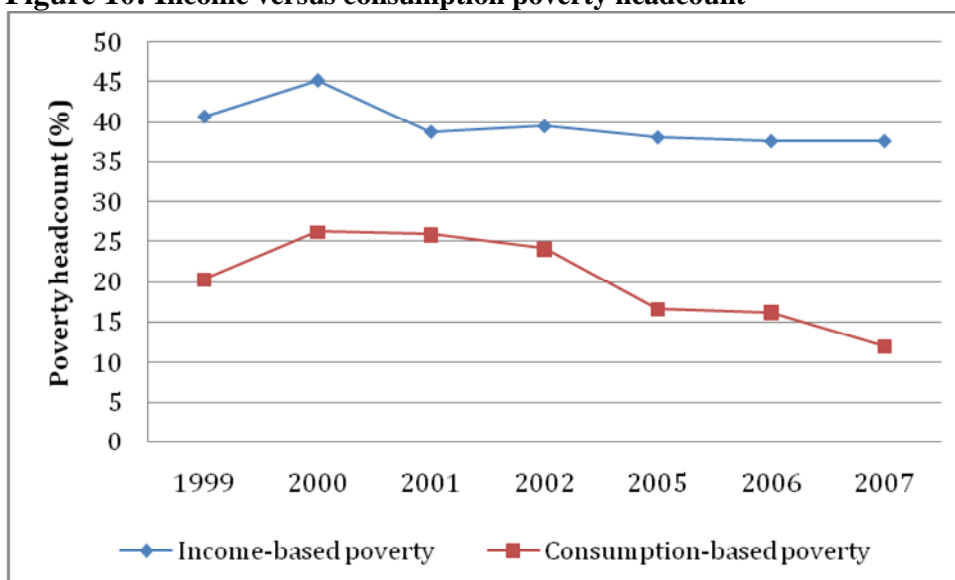| Poverty headcount	1999	2000	2001	2002	2005	2006	2007
Income-based poverty	40.74	45.16	38.84	39.54	38.16	37.68	37.70
Consumption-based poverty	20.30	26.23	25.85	24.09	16.64	16.20	11.99

Source: Author's own calculation based on surveys

The other poverty measures considered poverty depth and severity, exhibit similar trends. While income-based levels are generally higher than the consumption ones, an overall improvement of the poverty measures occurs. Consumption-based reduction rates are also much larger than the income ones. The poverty gap more than halved in the period considered while income-based figures exhibit a reduction of 26%. The severity of poverty declines by more than 60% according to the consumption story and by 36% if income is used.

---

[32]   Meyer and Sullivan (2009).

[33] Cutler and Katz (1991) find that consumption poverty rose more than income poverty during the 1970s. Slesnick (2001) concludes that consumption poverty fell considerably more than income poverty from 1980 through 1995. Johnson (2004) also finds differences between consumption and income based poverty trends, while Bavier (2008) concludes they are similar.

Figure 10: Income versus consumption poverty headcount

Source: Author's own calculation based on surveys

Table 9: Change in income and consumption-based poverty headcount

Change in poverty	1999-2000	2001-2000	2002-2001	2005-2002	2006-2005	2007-2006
Income poverty	10.84	-13.99	1.82	-3.49	-1.27	0.07
Consumption poverty	29.23	-1.45	-6.83	-30.91	-2.64	-26.03

Source: Author's own calculation based on surveys

Table 10: Income versus Consumption-based Poverty Gap and Squared poverty gap

	1999	2000	2001	2002	2005	2006	2007
Poverty gap							
Income	22.22	26.32	20.06	20.57	20.30	18.15	16.26
Consumption	7.91	9.95	8.98	8.10	5.11	5.08	3.49
Squared poverty gap							
Income	15.86	19.53	13.89	14.37	14.08	11.87	10.39
Consumption	4.17	5.20	4.40	3.88	2.31	2.28	1.48

Source: Author's own calculation based on surveys

9. Robustness Check: Survey-Based versus National Accounts Consumption Data

In order to gain confidence on the consumption figures obtained, this section compares the data based on national sample surveys with household consumption expenditure collected from the National Accounts (NAS).

Table 11 reports data from national accounts and compares national accounts' expenditure per capita with nominal expenditure per capita estimated from the national surveys. The figures of the national accounts are from the WDI and, specifically, the aggregate annual household final consumption expenditure in current local currency is used.

In order to compare it to the mean per capita monthly expenditure levels from the surveys (which are in nominal terms), the annual final consumption expenditure is divided by the World Bank population estimates per each year. The surveys and NAS growth rate are also computed. The WDI defines the annual household final consumption expenditure (formerly private consumption) "as the market value of all goods and services, including durable products (such as cars, washing machines, and home computers), purchased by households. It excludes purchases of dwellings but includes imputed rent for owner-occupied dwellings. It also includes payments and fees to governments to obtain permits and licenses. Here, household consumption expenditure includes the expenditures of non-profit institutions serving households, even when reported separately by the country. Data are in current local currency. [34]

On average, the ratio of consumption surveys to NAS estimates is 1.17 with a range that goes from 1.05 in 2001 to 1.27 in 1999. Regarding the growth rates, with the exception of the figures for 2000-2001[35], a similar and positive consumption trend emerges. Consistently, NAS and surveys date reveal large and constant growth rates in consumption from 2002 onwards.

Table 11: Per capita monthly household expenditure consumption from national accounts and surveys (Bolivianos)

| BOLIVIA	1999	2000	2001	2002	2005	2006	2007
Survey-based expenditure	479.53	445.66	418.35	443.43	553.37	633.73	733.79
NAS-based expenditure	378.47	397.35	397.60	402.58	460.71	504.56	616.77
Ratio survey/NAS expenditure	1.27	1.12	1.05	1.10	1.20	1.26	1.19

Source: WDI and author's own calculation from surveys

Table 12: NA and surveys expenditure growth rate (1999-2007)

Growth rate (%)	1999-2000	2000-2001	2001-2002	2002-2005	2005-2006	2006-2007
Survey expend. growth rate	-7.06	-6.13	5.99	24.79	14.52	15.79
NAS expend. growth rate	4.99	0.06	1.25	14.44	9.52	22.24

Source: WDI and author's own calculation from surveys

**Figure 11: Per capita expenditure**

---
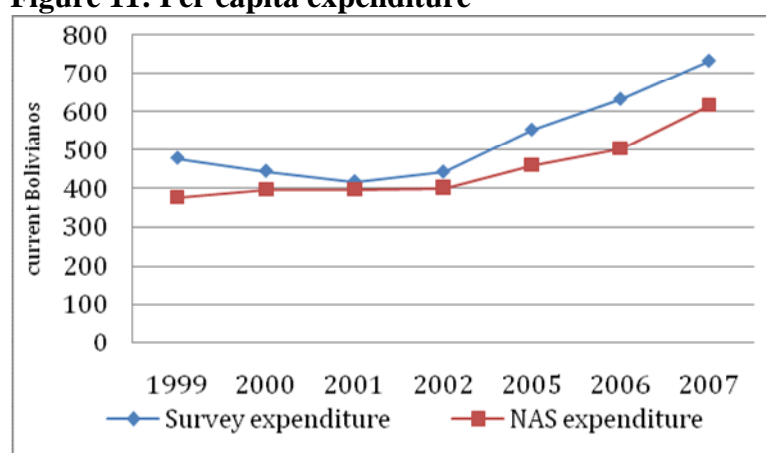
[34] WDI database (16-4-2009) Insert link and then Accessed on 'date'
[35] Survey-based growth rates are negative but the trend is positive whereas in the NAS the figures are positive but the trend is decreasing.

NAS and surveys' consumption levels and growth rates do not perfectly match but some of the discrepancy might be due to the different nature of data and aggregation methods employed. Moreover, the graphs above show an extremely similar trend of consumption. Both sources reveal the extraordinary large increase in households' consumption from 2002 onwards. This exercise boosts confidence on the consumption data obtained from the surveys employed.

Figure 12: Expenditure growth rate
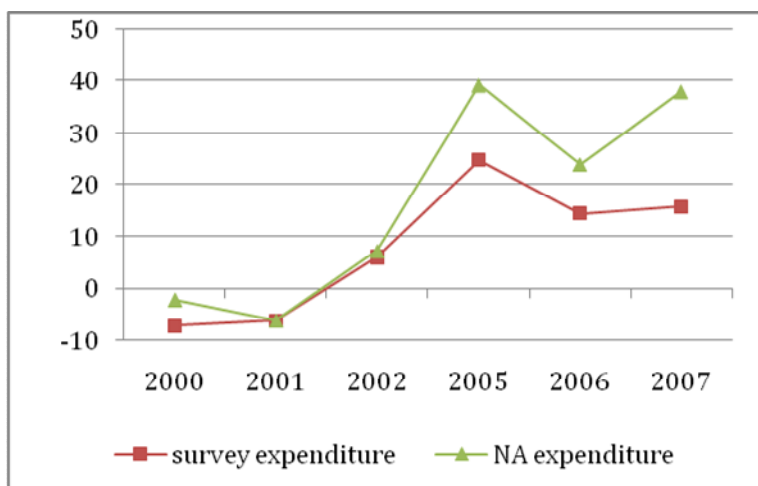
10. Robustness Check: Poverty Dominance Analysis

Having checked the robustness of the surveys data with the alternative source, the next step is to check the sensitivity of the results obtained to the poverty lines adopted. The peculiar poverty estimations obtained could, in fact, be driven by the poverty lines used which are constructed using the cost of basic needs method and are disaggregated at regional level. Poverty dominance analysis is particularly useful at this point as it allows abstracting from any specific poverty line and from any specific poverty measure without having to calculate each possible poverty measure for each possible poverty line. In order to assess the robustness of the poverty trend to the specific poverty lines, cumulative distribution functions (c.d.f.) are created by plotting the log of per capita expenditures on the horizontal axis and the cumulative probabilities on the vertical axis. Hence the c.d.f. can be used to estimate the value of the headcount ratio, and by varying the poverty line, one can examine how the headcount ratio varies. In order to do that, the chosen indicator of welfare, i.e. per capita expenditure, has to be adjusted for spatial and temporal cost-of-living differences. To the extent that the poverty lines adopted are comparable in utility terms (as in our case), then the ratio of the poverty line for region A to that of region B is an appropriate cost of living index. The computed cost of living indexes for the 7 years considered are reported in Table 15.

Figure 13 shows the national distribution of the log of per capita expenditure for the seven survey years. It exhibits a positive shift in the whole distribution between 2000 and 2007, the c.d.f. for each of 2001-2007 is always below the c.d.f. for the previous year, indicating that consumption expenditure increased for all percentiles in 2001-2007. The

c.d.f. for 1999 exhibits a different pattern with respect to the subsequent ones. This is consistent with the poverty analysis presented above: a large expenditure reduction (and poverty increase) between 1999 and 2000 and a significant expenditure increase thereafter. The exercise confirmed that any poverty line employed would provide the same poverty trend obtained before. The same analysis using real per capita income has been conducted and the results are shown in Figure 14 - with the usual exception of 1999's c.d.f., from 2000 onwards income c.d.fs showing a positive shift. The c.d.f. for 2007 exhibits however a small negative shift mainly in the middle/upper part of the distribution.

Table 13: Cost of living index (la Paz=1)

|	**1999**	**2000**	**2001**	**2002**	**2005**	**2006**	**2007**
Rural	0.75	0.73	0.72	0.73	0.78	0.78	0.86
Sucre	0.94	0.94	0.92	0.93	0.95	0.99	1.09
La Paz	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Cochabamba	0.98	0.98	0.97	0.98	0.95	0.99	1.09
Oruro	0.91	0.91	0.91	0.91	1.00	1.00	1.00
Potosí	0.84	0.84	0.84	0.84	1.00	1.00	1.00
Tarija	1.00	0.98	0.97	0.98	0.95	0.99	1.09
Santa Cruz	1.00	0.99	0.96	0.96	0.96	1.00	1.15
Trinidad	1.00	0.99	0.96	0.96	0.96	1.00	1.15
El Alto	0.91	0.90	0.91	0.91	0.89	0.89	0.94
Pando	1.00	0.99	0.96	0.96	0.96	1.00	1.15

Source: INE

Figure 13: Log of real per capita expenditure cumulative distribution
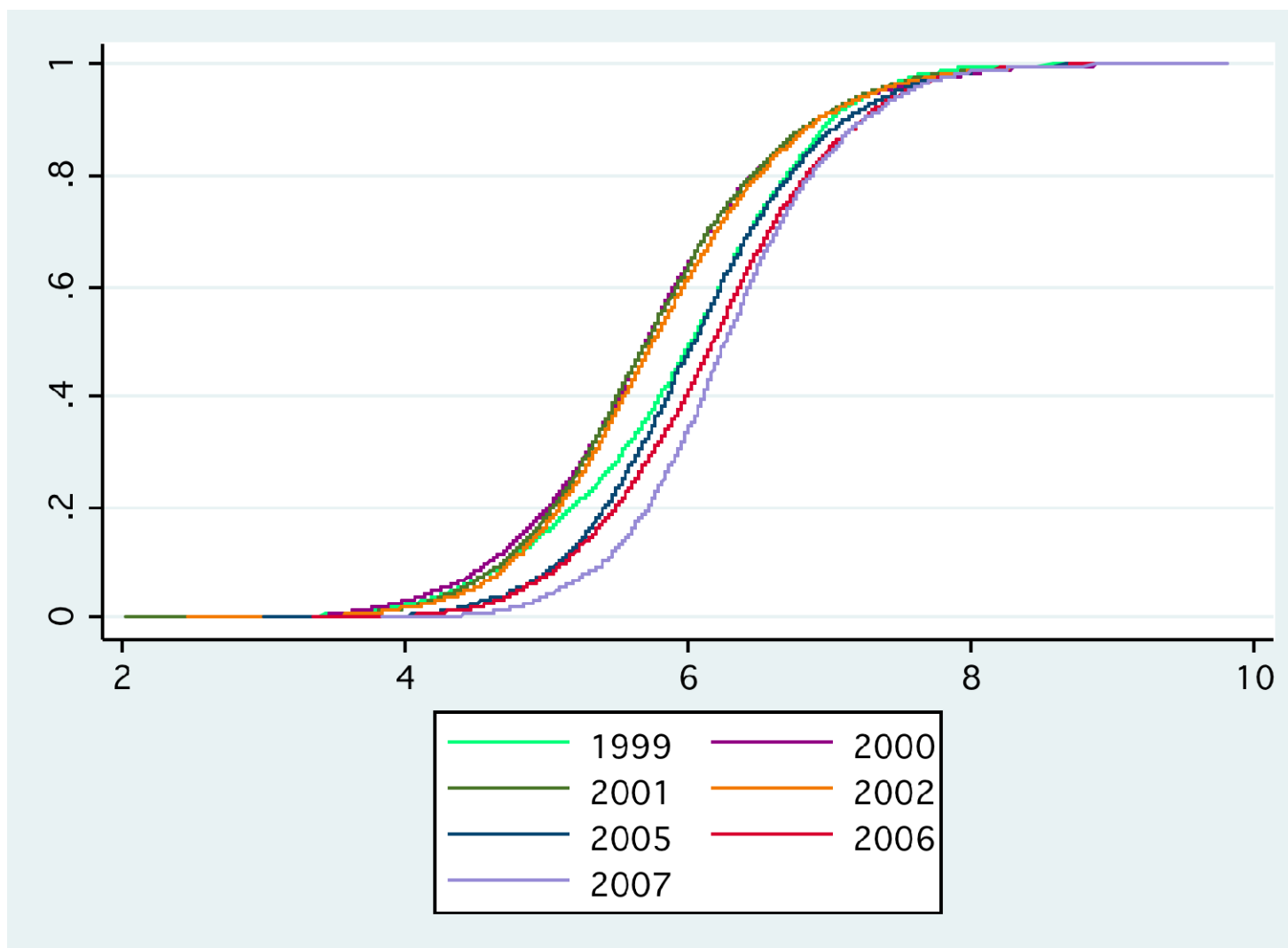
Source: Author's own calculation based on surveys

Figure 14: Real per capita income cumulative distribution
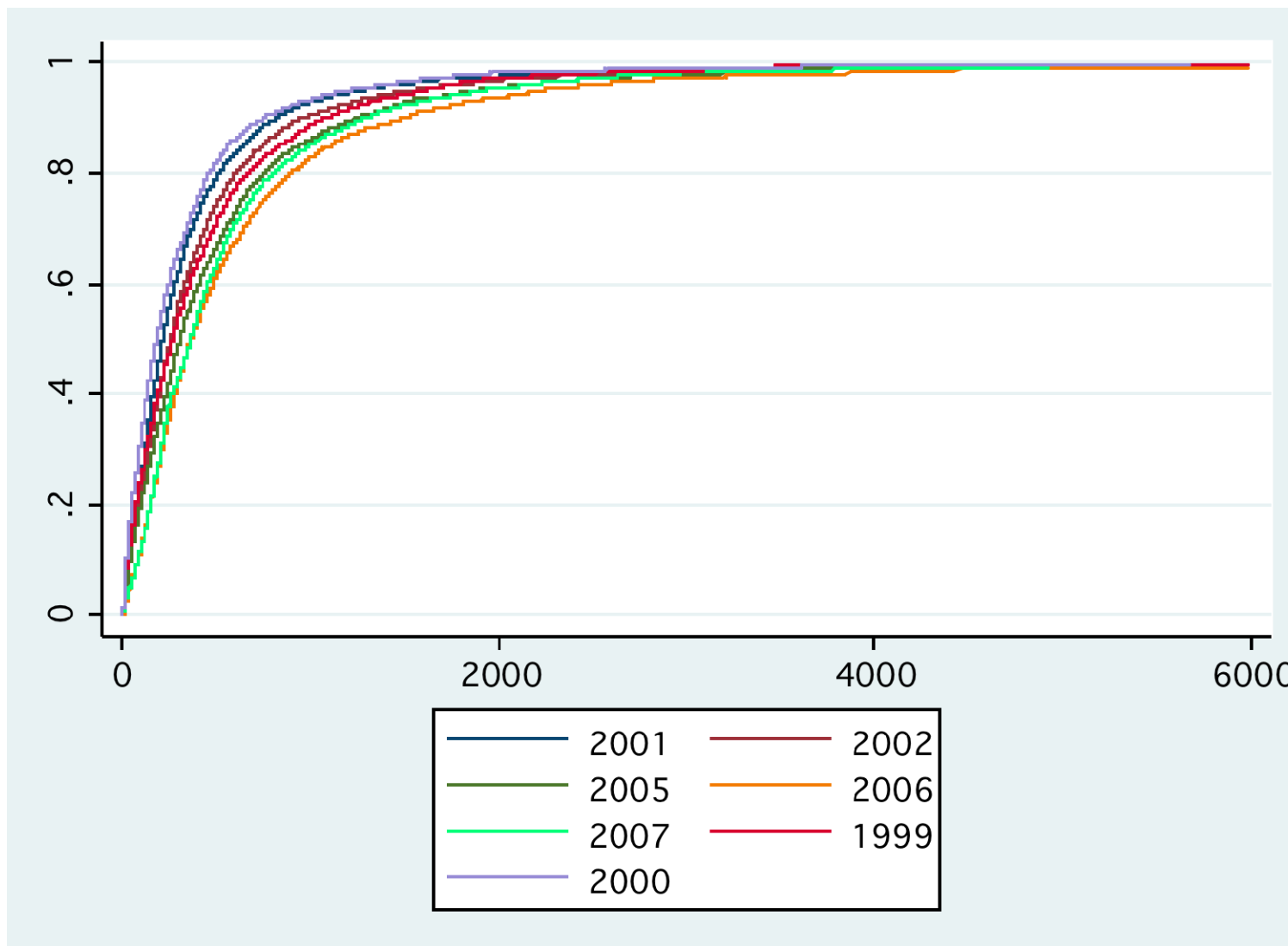
Source: Author's own calculation based on surveys

11. Correlates of Poverty

The consumption aggregates previously obtained and validated by robustness checks are used in the present section to ascertain the demographic and socio-economic characteristics likely to be correlated with households' welfare status. The simple regression equation, typically applied to poverty analysis, is:

$$\ln\left(\frac{y_i}{z_i}\right) = \alpha + \alpha_1 x_1 + \alpha_2 x_2 + \ldots \alpha_n x_n$$

where z_i is the SCOL index, y_i is per capita consumption and x_n are the explanatory variables. Note that $\left(\frac{y}{z}\right)$ is in log form to allow for the log normality of the variable.

The first specification pools data from 1999 to 2007 to provide a general picture on the significant variables associated with welfare and their magnitude. Other specifications will be used to check for welfare change over time and for differences in correlates of welfare between indigenous and non-indigenous population.

11.1 Data Description

The set of explanatory variables hypothesized to be correlated with poverty is selected based on the literature on correlates of poverty, variables consistently defined and constructed across surveys' rounds and variables likely to be exogenous. The analysis is conducted at the household level, mainly looking at variables related to the head of the household and his/her spouse, considered being a good proxy of the entire household.

Only the working population is considered given the difficulties of dealing with many sub-categories of non-working population (retired, unemployed, temporary inactive, permanent inactive). Summary statistics of the selected variables are reported in Annex 2

INDEPENDENT VARIABLES

The first variable included is a dummy that takes the value 1 if the household lives in a rural area (URBRUR) and 0 otherwise. The demographic data is the household size and its quadratic term (MHOGAR and MHOGAR2). The quadratic term is introduced to allow for non-linearities in the relationship between household size and living standards. Based on the literature, a negative relationship between total household size and total consumption per capita is expected. A dummy variable for the gender of the head of the household is also included (F_HEAD). Human capital is assumed to contribute positively to higher living standards. Three variables related to education are adopted: first, a dummy variable for whether the head of the household can read and write (LITER); second, a variable that measures the years of schooling of the head of the household (EDUC) and its quadratic term (EDUC2); third, the years of schooling of the head's spouse (EDUC_SPOUSE). Two variables on the occupation of the head of the household are included. In particular, three broad sectors of employment are distinguished: agriculture, including livestock and fisheries; industry, mining, and construction; and commerce, transport, communication, and other services. Three corresponding dummy variables are constructed to define in which sector the head of the household is engaged. Agricultural sector is selected as a reference group and the coefficients for the industry (EMPLEO2) and service (EMPLEO3) dummies are then to be interpreted with respect to the agricultural base. A dummy variable for whether the spouse of the head of the household works is also included (EMPLEO_SPOUSE).

As a proxy for income diversification a dummy variable is introduced that controls whether the head of the household has or doesn't have a secondary occupation (EMPLEO_SEC). The purpose is to examine the hypothesis that multiple income sources contribute to lower risks and higher welfare for the household. A dummy variable that takes on the value 1 when the head of the household defines himself/herself as belonging to one indigenous group (quechua, aymara, guarani', chiquitano, moieno, other) and 0 otherwise (INDIG) is included. The location effect is captured with the inclusion of regional dummies for the nine Bolivian departments: Chuquisaca (base group), La Paz, Cochabamba, Oruro, Potosì, Tarija, Santa Cruz, Beni and Pando.

DEPENDENT VARIABLE

The chosen indicator of household welfare, i.e., per capita expenditure, has to be adjusted for spatial cost-of-living (SCOL) differences since prices in any given year vary substantially across areas and regions. In theory, the SCOL index is simply the ratio of the cost of attaining a reference level of utility in, say, region k to the cost of attaining the same in the reference region r. To the extent that spatial poverty lines are comparable in utility terms (i.e. they imply the same standard of living), then the ratio of the poverty line for region k to that for the reference region r is an appropriate SCOL index. For this purpose, the official regional poverty lines are used to approximate SCOL differences between rural and urban areas and between regions. (La Paz is chosen as reference region). Comparison of household welfare over time also requires the chosen welfare indicator, consumption expenditure, to be adjusted for nominal price movements during the period considered.

However, as the official poverty lines used are already adjusted for province-specific CPI changes, it is straightforward to achieve real consumption estimates by simply deflating the consumption expenditures using year-specific SCOL indices. As common in the literature, the dependent variable is defined in natural logarithm form.

11.2 The Pooled Model Estimation Results

The results from the pooled model are reported in Table 14. The estimation gives very significant results with a good measure of fit and all the variables have the expected signs.[36] *Ceteris paribus*, households living in a rural area have a 17.3% lower real consumption than those living in urban areas. The size of the household has a significant negative impact on welfare. An additional person in the household is predicted to have a negative, but decreasing, impact on consumption per capita.[37] When the head of the household is a female, *ceteris paribus*, the household has 8% higher welfare than male-headed households. This is quite an interesting result as female-headed households are generally considered to be more likely to be poor than male-headed households. Empirical evidence on this score, however, is mixed. (Kabeer, 2003; Medeiros and Costa, 2008; Fuwa, 2000; Marcoux, 1998 and Quisumbing, Haddad and Peña, 2001). A possible explanation could be related with female-headed households being more likely to receive remittances from partners based elsewhere. In order to test this hypothesis, a separate specification is run controlling for the impact of remittances on household's welfare. The coefficient on households, regardless of the gender of the head, receiving remittances was positive but not

---

[36] Note that as the dependent variable is in natural logarithm form, the estimated regression coefficients measure the percentage change in consumption per capita from a unit change in the continuous independent variables. When the explanatory variable is a dummy, the percentage change in the dependent variable from a unit change in the dummy is approximately $e\beta\hat{} - 1$

[37] The coefficients on household size and its quadratic term suggest that welfare starts increasing when the household has 10 members. However, given that only less than 1% of the sample has size of 10 or more, this effect can be ignored.

Table 14: Pooled cross section model on correlates of welfare

VARIABLES	Log per capita consumption
Urbrur	-0.190***
	(0.0106)
Mhogar	-0.323***
	(0.00568)
mhogar2	0.0164***
	(0.000520)
F_head	0.0794***
	(0.0116)
Liter	0.319***
	(0.0166)
Educ	-0.0269***
	(0.00350)
educ2	0.00395***
	(0.000183)
educ_spouse	0.0156***
	(0.00103)
empleo2	0.217***
	(0.0122)
empleo3	0.300***
	(0.0121)
empleo_spouse	0.0173**
	(0.00848)
empleo_sec	0.0444***
	(0.0104)
Indigo	-0.117***
	(0.00876)
Lapaz	0.0814***
	(0.0154)
Cochabamba	0.227***
	(0.0160)
Oruro	0.0485***
	(0.0184)
Potosi	-0.0177
	(0.0174)
Tarija	0.362***
	(0.0186)
Santacruz	0.378***
	(0.0161)
Beni	0.351***
	(0.0195)
Pando	0.676***
	(0.0263)
Constant	6.406***
	(0.0299)
Observations	27936
R-squared	0.519

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

significant. The interaction term of female-headed households and the remittances dummy was negative, as expected, but not significant. The coefficient on female-headed households (not receiving remittances) remains positive and significant. The hypothesis that controlling for remittances female households would have a lower welfare than male ones failed and different dynamics seems to be at stake.

The coefficient on literacy predicts a large and significant impact: on average, when the head of the household can read and write, household per capita consumption is predicted to be 37% higher than in illiterate headed households. The coefficients on years of schooling of the head of the household and its quadratic term suggest an increasing effect of education on welfare, after the first three years[38]. For instance, *ceteris paribus*, an increase from 7 to 8 years of education increases welfare by 2.84%. When the years of schooling are 10, an additional year results in a 5.21% increase in welfare. An increase from 12 to 13 years of schooling results in an increase in welfare by 6.79%. Looking at the education of the spouse of the household, it emerges that an additional year of schooling of the spouse of the household results in a positive small (1.6%) increase in welfare.

The estimates on the two dummy variables on employment measure the proportionate difference in welfare relative to households whose head is engaged in agriculture. The coefficients reveal that households working in the agriculture sector are the worse off. Households working in the industry sector and services have respectively 24% and 35% higher welfare than those engaged in agriculture. The coefficient on the dummy variable that controls whether or not the head of the household is engaged in a secondary occupation confirms the hypothesis that income diversification is likely to improve welfare. Other things equal, households whose head is engaged in a secondary occupation are predicted to have a 4.5% higher welfare. *Ceteris paribus*, the welfare of a household whose head belongs to an indigenous group is predicted to be 11% lower than that of a non-indigenous households. The regional dummies reveal very large welfare differences across departments. With Chuquisaca as a base group, other things equal, living in La Paz, Cochabamba and Oruro results respectively in an 8, 25 and 5% higher welfare. In Potosì, welfare is on average 1.7% lower than Chuquisaca whereas living in Tarija, Santa Cruz, Beni and Pando results on average in a very large welfare improvement (44%, 46%, 42% and 96%)[39]. The value of the F-test for the joint significance of the regional dummy coefficients indicates that regional dummies are jointly significant.

11.3 Testing for Welfare Change Over Time

It is interesting to look at the variation over time. Table 15 presents the parameter estimates and standard errors for the cross-sectional model with dummy variables for each year considered, 1999 being the reference year.

The fit of the model is good, with an adjusted R-squared of 0.54, and all the coefficients are highly significant. The model allows discerning the change in welfare over time other things being equal. As expected, the coefficients on the dummy variables show that, on average and *ceteris paribus*, welfare decreased from 1999 to 2002 (-19% in 2000, -13% in 2001 and 2002) and it improved significantly from 2002 onwards, respectively by

---

[38] The negative coefficient on education suggests a negative return to education for the first 3 years. However, this result is driven by the presence of the variable dummy on literacy that is likely to capture the positive return of schooling during the first year. As expected, if the dummy on literacy is dropped the coefficient on education becomes positive for any year of schooling.

[39] Caution is called for when interpreting coefficients on small departments such as Beni and Pando as the number of observations is generally much smaller than for the remaining departments.

Table 15: Cross sectional model on correlates of poverty over time

VARIABLES	Log per capita consumption
Urbrur	-0.194***
	(0.0104)
Mhogar	-0.321***
	(0.00558)
mhogar2	0.0164***
	(0.000511)
F_head	0.0648***
	(0.0114)
liter	0.302***
	(0.0163)
educ	-0.0233***
	(0.00344)
educ2	0.00377***
	(0.000180)
educ_spouse	0.0159***
	(0.00101)
empleo2	0.197***
	(0.0120)
empleo3	0.285***
	(0.0119)
Empleo_sec0	0.0511***
	(0.0102)
Empleo_spouse	0.00619
	(0.00830)
Lapaz	0.0642***
	(0.0149)
cochabamba	0.207***
	(0.0155)
oruro	0.0220
	(0.0178)
potosi	-0.0527***
	(0.0169)
tarija	0.402***
	(0.0181)
santacruz	0.406***
	(0.0157)
beni	0.369***
	(0.0191)
Pando	0.710***
	(0.0257)
y2000	-0.179***
	(0.0147)
y2001	-0.125***
	(0.0142)
y2002	-0.126***
	(0.0143)
y2005	0.0891***
	(0.0153)
y2006	0.0639***
	(0.0153)
y2007	0.199***
	(0.0153)
Constant	6.382***
	(0.0311)
Observations	27944
R-squared	0.537

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

9% from 2002 to 2005, 6% in 2006 and 22% in 2007, thus confirming the results emerged in the previous sections. At this point, one might want to investigate whether there have been any specific socio-economic patterns in the large welfare change experienced in Bolivia in the present decade.

Many social, political and economic shocks occurred in the present decade that contributed to welfare changes across regions and social groups. Trying to identify the main causal factor is challenging and might result in a simplistic exercise; it is probably more sensible to look at the overall welfare effect and try to find out which groups or regions benefited the most. Which groups have benefited the most? Has the welfare growth been pro-poor? In order to address these questions, the next two sections investigate whether any differences in the correlates of poverty exist between indigenous and non-indigenous population and test the pro-poor growth hypothesis.

11.4 Testing Differences between Indigenous and Non-indigenous Groups

The poverty measures and regression analysis employed earlier show a very high correlation between poverty and ethnicity. In this section, two separated models of correlates of poverty over time are computed. The first model restricts the observations to the non-indigenous population only whereas the second to the indigenous population. In fact, one might expect that model parameters obtained in the pooled data to differ between the two sub-populations. For example, the effects of education and employment on welfare could be different; welfare trend over time could differ as well between indigenous and non-indigenous population.

The Chow test is employed to test whether there are any differences in effects across groups. Using the pooled dataset, a model is employed where the intercept and all slopes can be different across groups by including the indigenous group dummy and all interaction terms. The test for joint significance of the interaction terms only rejects the null hypothesis that the model parameters are the same for indigenous and non-indigenous groups. The coefficients and standard errors of the two sub-groups' models are reported in the Table 16. The coefficients for the two groups have the same sign but slightly different magnitude. Other things equal, the welfare gap between rural and urban households is much larger for the indigenous population than for non-indigenous households (respectively -23% and -15%). The size of the household has a significant negative impact on welfare. An additional person in the household is predicted to have a negative, but decreasing, impact on consumption per capita[40].

Female-headed households have higher welfare than male-headed households for both groups but the coefficient is larger within indigenous households (respectively 7% and 4% higher). Surprisingly, the welfare improving impact of having a literate head of the household is larger on non-indigenous households. While, *ceteris paribus*, a literate indigenous head of the household has a 30% higher welfare than an illiterate one, for non-indigenous, being literate results in a 38% higher welfare. Interestingly, the coefficients on education reveal that, *ceteris paribus*, the return on schooling is much larger for non-indigenous households. When the years of schooling are 10, an additional year results in 5.6% higher welfare for non- indigenous households but only 4.6% higher for indigenous; when the years are 15, an additional year of schooling results in a 10.4% higher welfare for

---

[40]The coefficient on household size and its quadratic term suggest that welfare starts increasing when the household has 10 members. However, given that only less than 1% of the sample has size of 10 or more, this effect can be ignored.

non-indigenous and only 7.4% for indigenous. The estimates on the two dummy variables on employment reveal that the welfare improving effect of working in the industry sector and services with respect to agriculture is much larger for indigenous than for non-indigenous households. Being employed in the industry sector results in a 13% higher welfare for non-indigenous and 26% higher for indigenous. The effect is even larger for the service sector: working in services results in a 21% higher welfare for non-indigenous and 39% higher for indigenous. The welfare gap between households living in the Media Luna regions (Tarija, Santa Cruz, Beni and Pando) and households living in other parts is significantly large for the indigenous population. *Ceteris paribus* and with Chuquisaca as a reference group, living in Tarija, Santa Cruz, Beni and Pando results respectively in 55%, 56%, 61% and 130% higher welfare when the household belongs to an indigenous group and 39%, 45%, 36% and 88% for non-indigenous households.

By comparing the coefficients on the year dummy variables between the two sub-populations, one can infer whether, other things being equal, indigenous households have experienced a stronger welfare improvement than the non-indigenous ones. In fact, the coefficients on the year dummy variables suggest that the two groups experienced quite different patterns of welfare change. Both groups experienced welfare reduction between 1999 and 2002 but the intensity was milder for the indigenous population with respect to the non-indigenous. On the other hand, the welfare improvement that occurred from 2005 onwards was much larger for the indigenous population. *Ceteris paribus*, in 2007 indigenous households had on average 30 percent higher welfare than they had in 1999; non-indigenous households only 8%.

## Table 16: Correlates of poverty: indigenous versus non indigenous

VARIABLES	(1) non indigenous Log per capita consumption	(2) indigenous Log per capita consumption
Urbrur	-0.140***	-0.206***
	(0.0163)	(0.0135)
Mhogar	-0.313***	-0.326***
	(0.00824)	(0.00745)
mhogar2	0.0156***	0.0170***
	(0.000736)	(0.000693)
F_head	0.0416**	0.0728***
	(0.0173)	(0.0150)
Liter	0.321***	0.260***
	(0.0283)	(0.0201)
Educ	-0.0390***	-0.0100**
	(0.00518)	(0.00459)
educ2	0.00476***	0.00281***
	(0.000258)	(0.000251)
educ_spouse	0.0119***	0.0153***
	(0.00142)	(0.00145)
empleo2	0.122***	0.229***
	(0.0186)	(0.0156)
empleo3	0.195***	0.330***
	(0.0181)	(0.0157)
empleo_sec0	0.0384**	0.0599***
	(0.0159)	(0.0132)
empleo_spouse	0.0694***	-0.00896
	(0.0123)	(0.0112)
Lapaz	0.180***	0.101***
	(0.0236)	(0.0200)
Cochabamba	0.254***	0.266***
	(0.0253)	(0.0206)
Oruro	0.0617**	0.0870***
	(0.0312)	(0.0230)
Potosi	0.00100	0.0144
	(0.0324)	(0.0217)
Tarija	0.335***	0.448***
	(0.0222)	(0.0346)
Santacruz	0.374***	0.445***
	(0.0209)	(0.0238)
Beni	0.308***	0.478***
	(0.0248)	(0.0297)
Pando	0.636***	0.832***
	(0.0289)	(0.0635)
Y2000	-0.177***	-0.219***
	(0.0229)	(0.0190)
Y2001	-0.173***	-0.112***
	(0.0230)	(0.0179)
Y2002	-0.182***	-0.112***
	(0.0227)	(0.0183)
Y2005	0.00117	0.131***
	(0.0240)	(0.0196)
Y2006	0.00981	0.0810***
	(0.0237)	(0.0200)
Y2007	0.0764***	0.267***
	(0.0236)	(0.0199)
Constant	6.491***	6.308***
	(0.0493)	(0.0401)
Observations	11,074	16,862
R-squared	0.528	0.507

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

11.5. Testing for Pro-poor Growth: Growth Incidence Curve

The previous section reveals a pro-indigenous welfare growth in the present decade. Can this pattern be identified also as a genuine pro-poor growth? Or, instead, a political commitment in favour of the indigenous population? To test this hypothesis, growth incidence curves are constructed as a measure of "pro-poor" growth. The growth incidence curve gives the rates of growth by quintiles of the distribution of income/consumption. It is therefore possible to see how the poorest segments of the population have fared with respect to the average or to the better off. [41] The growth incidence curve is downward sloping, indicating that incomes of the richer percentiles of the income distribution grow slower than incomes of poorer percentiles. In fact, the mean growth rate over the entire distribution is 0.83% per year. The growth rate in the mean is 0.76% per year. The first three quintiles experienced two-three times more growth than the average.

Figure 15: Growth incidence curve for Bolivia, 1999-2007
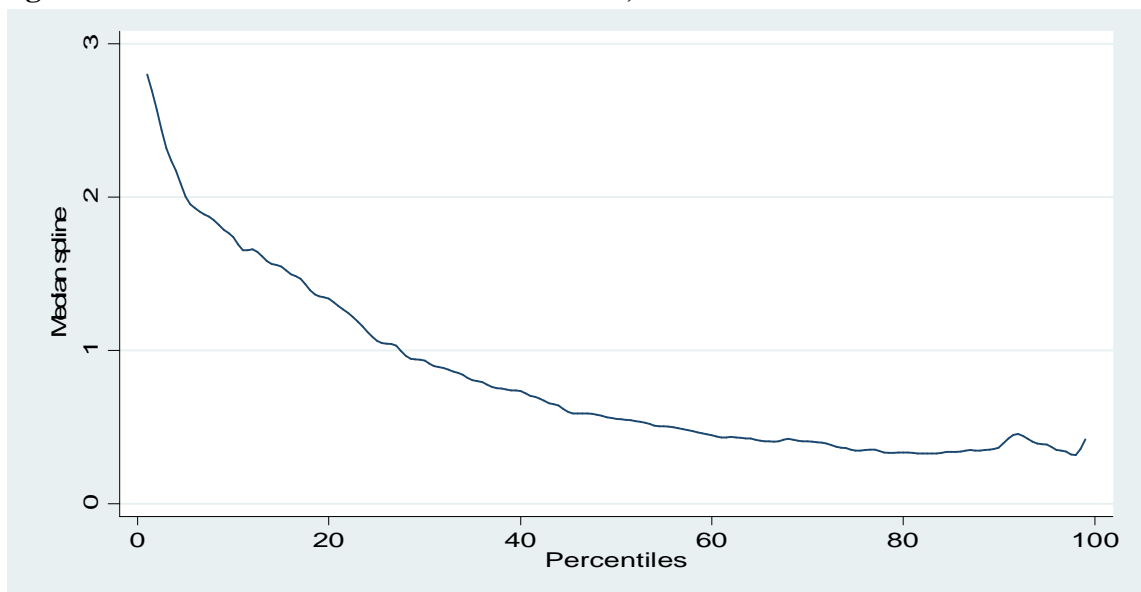
Source: Author's own calculation based on surveys

---

[41] Let F(y) denote the cumulative distribution function (CDF) of income (or expenditure), giving the proportion of the population with income less than y at date t. Inverting the CDF at the pth quintile gives the income of that quintile:

Yt(p)0 Ft-1(p)= Lt'(p)µt   (y't (p) >0)

where L (p) is the Lorenz curve (with slope L't(p)) and µt is the mean; for example, y (0.5) is the median. Comparing two dates, t-1 and t, the growth rate in income of the pth quintile is

g (p)=[y t (p) / y t-1 (p)] - 1.

Letting p vary from zero to one, g t (p) traces out what we will call the 'growth incidence curve' (GIC). It follows that:

$$g_t(p) = \frac{L'_t(p)}{L'_{t-1}(p)}(\gamma_t + 1) - 1$$

where γt =(µt / µt-1)-1 is the growth rate in µt . If the Lorenz curve does not change then g t (p) = γt for all p. Also g t (p) > γt if and only if y t (p) / µt is increasing over time. If g t (p) is a decreasing (increasing) function for all p then inequality falls (rises) over time.

This calculation is repeated for two sub-periods, 1999-2002 and 2005-2007. The CIGs show pro-poor patterns as above-average growth was recorded for the poorest quintiles. However, the 1999-2002 GIC takes a U shape indicating that percentiles at both the tails of the distribution experienced above-average growth. The 2005-2007 GIC instead is clearly downward sloping, indicating that income of the richer percentiles of the income distribution grow much slower than the poorest.

Now the same exercise is repeated for the two ethnic sub-groups. Both curves denote pro-poor growth, with the poorest segments of the population benefiting much more than the richest. However, the growth rates differ significantly between the two groups at any point of the distribution. In fact, for the indigenous population, the mean growth rate over the entire distribution is 1% per year and the growth rate in the mean is 0.96% per year while for the non-indigenous population the mean growth rate over the entire distribution is 0.31% per year and the growth rate in the mean is 0.28% per year. Relative to the sub-groups' respective averages, the poorest percentiles experienced around two times more growth than average, whereas the non-indigenous population relatively benefiting a bit more. In fact the growth rate at the 30th percentile of the indigenous distribution is 1.72% (versus mean growth rate of 1%) and the growth rate at the 30th percentile of the non-indigenous distribution is 0.67% (versus mean growth rate of 0.31%).
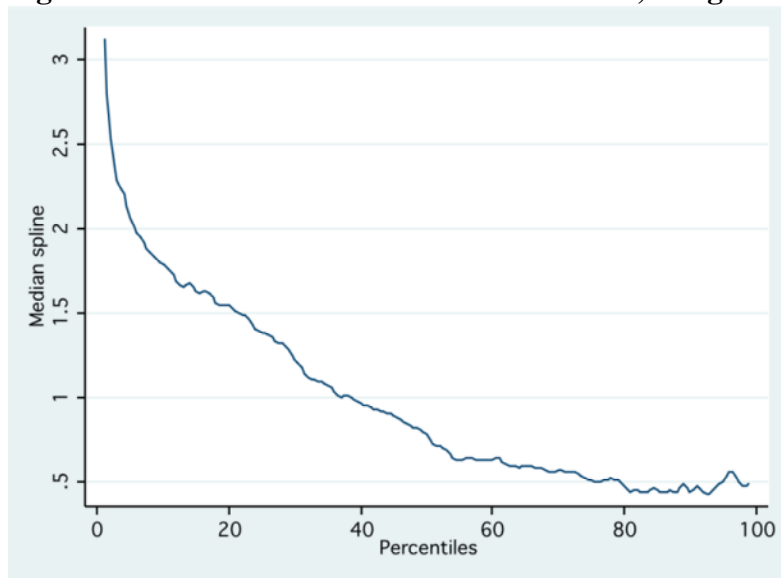
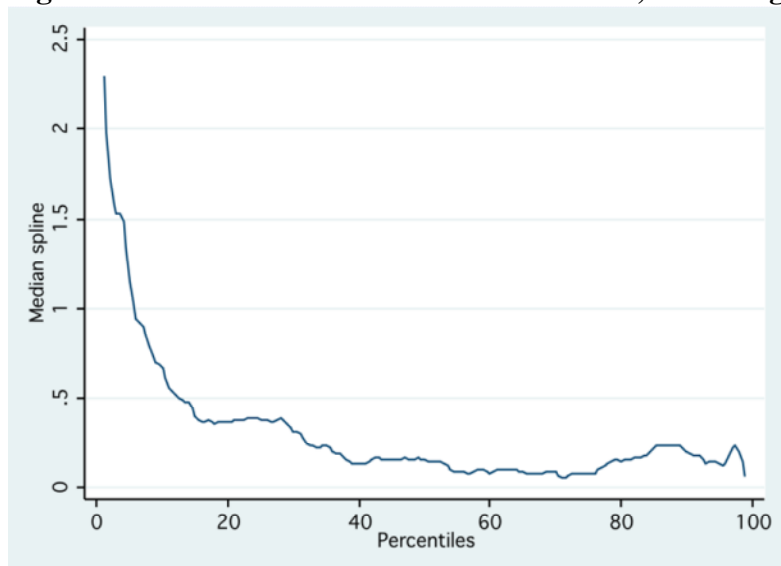**Figure16: GIC 1999-2002 and**   **GIC 2005-2007**
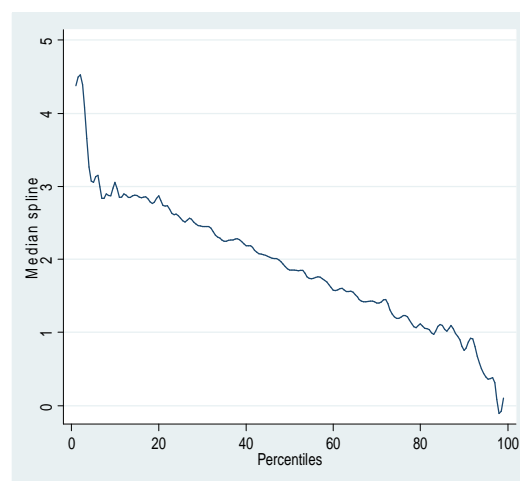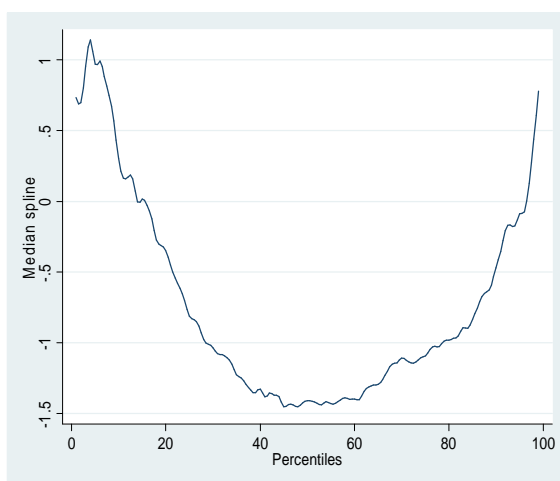
Source: Author's own calculation based on surveys

Figure 17: Growth incidence curve for Bolivia, indigenous population 1999-2007

Source: Author's own calculation based on surveys

Figure 18: Growth incidence curve for Bolivia, non-indigenous population 1999-2007

Source: Author's own calculation based on surveys

12. Conclusion

Filling the gap in the literature on consumption and consumption-based poverty analysis in Bolivia, consistent and accurate estimates of consumption and poverty measures are computed using seven household surveys (1999-2007). This paper provides a recent and previously unexplored story on Bolivian poverty. With respect to the official poverty measures based on income, we find that Bolivia experienced an incredibly large poverty reduction from 2002 onwards, halving poverty headcount during the 2002-2007 period. Robustness checks confirm these results. Furthermore, the welfare improvement has a strong pro-poor component which contributes to reduce the high level of inequality of the country and, particularly, to narrow down the large welfare gap between indigenous and non-indigenous groups.

References:

Arias, O. and Robles, M. (2007) The Geography of Monetary Poverty in Bolivia: The Lessons of Poverty Maps. In: Tara Bedi, Aline Coudouel and Kenneth Simler (eds.), *More Than A Pretty Picture: Using Poverty Maps to Design Better Policies and Interventions*, Washington D.C.: The World Bank.

Barja, D., Monterrey, J. and Villarroel, S. (2004) *Bolivia: Impact of Shocks and Poverty Policy on Household Welfare*. Paper, Global Development Network, World Bank, Washington, DC.

Bavier, R. (2008) Income and Expenditure Data in Poverty Measurement. Journal of Policy Analysis and Management, 27(1): 44-62.

Citro, C. F. and Michael, R. T. (1995) Measuring Poverty: A New Approach. Washington, D. C.: National Academy Press.

Cutler, D. and Katz, L. (1991) Rising Inequality? Changes in the Distribution of Income and Consumption in the 1980s. *American Economic Review*, 82, 546–551.

Dalaker, J. (2005) Alternative Poverty Estimates in the United States: 2003. *U.S. Census Bureau. Current Population Reports* P60-227.

Deaton, A. (1997) *The Analysis of Household Surveys. A Microeconometric Approach to Development Policy*. Baltimore and Washington DC: The World Bank and Johns Hopkins University Press.

Deaton, A. (2005) Measuring Poverty in a Growing World (or Measuring Growth in a Poor World). *The Review of Economics and Statistics,* MIT Press, vol. 87(1), pages 1-19, 04.

Deaton, A. and Grosh, M. (1999) Consumption. In: Grosh, M. & Glewwe, P. eds., *Designing Household Survey Questionnaires for Developing Countries: Lessons from Ten Years of LSMS Experience*, Ch 17. The World Bank, Washington DC.

Deaton, A. and Kozel, V. (2005) *The Great Indian Poverty Debate*. Macmillan India, Delhi.

Deaton, A. and Zaidi, S. (2002) *A Guide to Aggregating Consumption Expenditures. Living Standards Measurement Study, Working Paper* No. 135. The World Bank, Washington, DC.

Foster, J.E., Greer, J. and Thorbecke, E. (1984) A Class of Decomposable Poverty Indices. *Econometrica*, 52(3): 761-766.

Friedman, M. (1957) *A Theory of the Consumption Function*. Princeton Univ Press

Fuwa, N. (2000) The Poverty and Heterogeneity among Female-Headed Households Revisited: The Case of Panama. *World Development*, 28(8), 1515-1542.

Groves, R. M. and Couper, M.P. (1998) *Nonresponse in Household Interview Surveys*. New York: Wiley.

Hoynes, H., Page, M. and Stevens, A. (2006) Poverty in America: Trends and Explanations. *Journal of Economic Perspectives*, American Economic Association, vol. 20(1), pages 47-68, Winter.

ILO (2003) *Household income and expenditure statistics*. Report prepared for the "Seventeenth International Conference of Labour Statisticians", Geneva, 24 November-3 December 2003.

INE (National Institute of Statistics) and UDAPE (Social and Economic Policy Analysis Unit) (2002) *Mapa de Pobreza 2001: Necesidades Básicas Insatisfechas*. National Institute of Statistics and Social and Economic Policy Analysis Unit, La Paz, Bolivia.

INE (National Institute of Statistics), UDAPE (Social and Economic Policy Analysis Unit) and World Bank (2006) *Pobreza y desigualdad en municipios de Bolivia: estimación del gasto de consumo combinando el censo 2001 y las encuestas de hogares*. Report, Second Edicion. National Institute of Statistics and Social and Economic Policy Analysis Unit, La Paz, Bolivia.

Jemio, L. C. and Choque, M. (2006) Towards a More Employment-Intensive and Pro-Poor Economic Growth in Bolivia. *Development Research Working Paper Series 18/2006*, Institute for Advanced Development Studies.

Johnson, D. S., (2004) Measuring consumption and consumption poverty: possibilities and issues. Paper prepared for "Reconsidering the Federal Poverty Measure" American Enterprise Institute November 18, 2004.

Kabeer, Naila (2003) *Gender Mainstreaming in Poverty Eradication and the Millennium Development Goals: A Handbook for Policy-makers and Other Stakeholders*. London: Commonwealth Secretariat.

Kay, J. A., Keen, M. J. and Morris, C. N. (1984) Estimating consumption from expenditure data. *Journal of Public Economics*, Elsevier, vol. 23(1-2), pages 169-181.

Klasen, S., Grosse, M., Thiele, R., Lay, J., Spatz, J., Wiebelt, M. (2004) Operationalizing Pro-Poor Growth - Country Case Study: Bolivia. *Ibero America Institute for Econ. Research* (IAI) Discussion Papers 101, Ibero-America Institute for Economic Research.

Lang, Kevin. 2007. *Poverty and Discrimination*. Princeton: Princeton University Press.

Marcoux, A. (1998) The Feminization of Poverty: Claims, Facts, and Data Needs. *Population and Development Review*, 24(1), 131-139.

Medeiros, M. and Costa, J. (2008) Is There a Feminization of Poverty in Latin America? *World Development*, Volume 36, Issue 1, January 2008, Pages 115-127.

Meyer, B. and Sullivan, J. (2009) Five Decades of Consumption and Income Poverty. *NBER Working Papers* 14827, National Bureau of Economic Research, Inc.

Minhas, B. S. (1988) Validation of Large Scale Sample Survey Data Case of NSS Estimates of Household Consumption Expenditure. *Sankhyā: The Indian Journal of Statistics*, Series B, Vol. 50, No. 3 (Dec., 1988), pp. 279-326.

Mukherjee, M. and Chatterjee, G. S. (1974) On the Validity of NSS Estimates of Consumption Expenditure. In: T. N. Srinivasan and P. K. Bardhan, eds. *Poverty and Income Distribution in India*. Calcutta: Indian Statistical Institute: 139-47.

Pritchett, L. and Filmer, D. (2001) Estimating wealth effect without expenditure data— or tears: An application to educational enrollments in states of India. *Demography* 38, 115–132.

Psacharopoulos G., Morley S., Fiszbein A., Lee H. and Wood B. (1992) Poverty and income distribution in latin America: the story of the 1980s. World Bank, *LAC Technical Department Report 27*. Washington, DC.

Quisumbing, A., Haddad, L. and Peña, C. (2001) Are women overrepresented among the poor? An analysis of poverty in 10 developing countries. *Journal of Development Economics*, Volume 66, Issue 1, October 2001, Pages 225-269.

Ravallion, M. (2003) Measuring Aggregate Welfare in Developing Countries: How Well Do National Accounts and Surveys Agree? *The Review of Economics and Statistics*, MIT Press, vol. 85(3), pages 645-652, 05.

Sahn, D. and Stifel, D. (2003) Exploring Alternative Measures of Welfare in the Absence of Expenditure Data. *Review of Income and Wealth*, vol. 49(4), pages 463-489.

Short, K., Garner, T., Johnson, D. and Doyle, P. (1999) Experimental Poverty Measures: 1990 to 1997. U. S. Census Bureau, Current Population Reports, Series P60-205, U.S. Government Printing Office, Washington, D.C., 1999.

Slesnick, D. (2001) *Consumption and Social Welfare: Living Standards and Their Distribution in the United States*. (Cambridge: Cambridge University Press).

Thiele, R. (2001) The Social Impact of Structural Adjustment in Bolivia. Kiel *Working Papers* 1056, Kiel Institute for the World Economy.

Thomas, J. (1992) *Informal Economic Activity*. New York: Harvester Wheatsheaf.

Triest, R. K, (1998) Has Poverty Gotten Worse? *Journal of Economic Perspectives*, American Economic Association, vol. 12(1), pages 97-114, Winter.

United National Development Program (2008) Human Development Report 2008. New York.

Vos R., Lee H., Mejı́a JA. (1998) Structural adjustment and poverty. In: van Dijck P (ed.). *The Bolivian Experiment: Structural Adjustment and Poverty Alleviation*, Amsterdam.

Wodon Q. (2000) Poverty and policy in Latin America and the Caribbean. *World Bank Technical Paper* 467. Washington, DC.

World Bank (1996) *Bolivia: Poverty, Equity, and Income*. Report No. 15272-BO. Washington, DC: World Bank.

World Bank (2005) *Poverty Manual.*
http://siteresources.worldbank.org/PGLP/Resources/PovertyManual.pdf.

Zaidi S. and De Vos, K. (2001) Trends in consumption-based poverty and inequality in the Member States of the European Community. *Journal of Population Economics*, 14(2), 367-390.

ANNEX 1: Computation of consumption: technicalities

I estimate consumption figures aggregating the following components:

- Food consumption inside the household (food shopping, self-produced food, food from other sources-such as gifts, transfers in kind) [42]
- Food consumed outside the household (breakfast, drinks, lunch/dinner, snacks, etc.)
- Non-food consumption (aggregate of about 40 categories related to current housing costs, domestic fuel and power, tobacco products, clothing and footwear, medical care and health expenses, transport, recreation, personal care, miscellaneous goods and services[43])
- Education expenditure (tuition fees, transport, books and copies, uniform, etc.)
- Housing expenditure (actual rent or rental equivalence value, expenses-gas, water, electricity, telephone, house reparation-decoration[44]).

The computation has been done at the (per capita) household level. When the expenditure was reported at the individual level, the household aggregate had been computed and the per capita mean had then been obtained.

Extreme values (namely, per capita consumption values with standard deviation of the mean above 3) were replaced with mean values: 5 changes in 1999 (housing aggregate), 110 changes in 2000 (non-food and food inside the HH), 75 changes in 2001 (non-food and food inside the HH), 20 changes in 2002 (mainly food inside the HH), 20 changes in 2005 (mainly food inside the HH), 2 changes in 2006 (1 housing 1 non-food) and 4 changes in 2007 (housing).

Data on the specific consumption components comes from different datasets and they have therefore been merged. In some cases the number of the households did not match and therefore no complete information about the total consumption was available. Those households were dropped (150, 30 and 110 observations respectively in 2001, 2006 and 2007).

MISSING VALUES

Distinguishing between those missing values who are missing by definition and those who should have an imputed value is almost impossible. Mostly, respondents are asked just to report the expenditure of an item. The missing value might then be either a "zero" value (no consumption of it) or a true missing value (cannot answer, doesn't remember how much he spends, etc.). Just in few cases, the respondent is asked to specify both whether he consumes the item and the amount of money. I proceeded with imputation only in those

---

[42] Data on the consumption of 64 food items were added up to get the household total food expenditure.

[43] With respect to the non-food components in the questionnaire (and to the official consumption estimate) the expenses in financial and capital services -such mortgages and payment instalments- are not included to avoid double counting of those expenses already reported elsewhere.

[44] Monthly expenditure in house reparation-decoration above 100US$ were considered as investment rather than consumption and were not then included in the computation. The benchmark of 100US$ was indicated by the INE and deflated by inflation rate, taken from WDI. As respondents are allowed to answer either in dollars or Bolivianos, the value has been converted into real Bolivianos. The exchange rates used are from INE and I use the monthly rate reported for the month during which the survey was conducted (usually November-December).

cases: when the respondent reports to consume it but does not then report the amount actually spent. In those cases, I imputed the amount using the rural/urban mean (rural and urban means exhibit very large gaps). Out of these cases, the missing values remain missing[45].

I list below the modules/years for which I could impute values:
- Education: I imputed the values for each variable if the individual reported to be enrolled in a course (not in 2006 because there were too many missing values; 14000 out of 16000).
- Housing: imputed using rural and urban means
- Food outside: imputed using rural and urban means (in 2001 no rural/urban variable so just single mean)

DURABLE GOODS
In the section on durable goods, households are asked about the amount and value of the durable goods they have. Households report whether they own any durable good (such as TV, radio, PC, bicycle, motorbike, car, kitchen, fridge, washing machine, wardrobe, etc.), how many of them they own, how long ago they have bought them, how much they have spent for them and how much they think they could now sell them for. The latter is a good proxy of the present value of the good and it is therefore used to compute the aggregate value of durables owned by the household. I computed both the total stock of durables, summing up the imputed values per each item and, as we are interested in the household's "investment" decision year by year, I also calculated the last year expenditure in durables (or the imputed value when the purchase cost was not reported). Respondents are asked: "How long ago did you buy the item?" and I collected information on items bought one year ago or less.[46]

All the values are converted in Bolivianos (households can report the values either in local currency or in US dollars). In dealing with the missing values of the imputed present value of the good, I identify three cases:
- In case of proper missing values (it is impossible to know whether the household owns the item) I leave them missing;
- If the household reports to possess a good, the amount of money he spent for it and that it has been bought during the last year but cannot impute its present value, the missing imputed value is replaced by purchase's cost (it is reasonable to assume a modest depreciation of the good within a year time). This is a rough approximation but this solution is likely to be more sensible than the one used for the third case.
- Whenever the household declares to own the good but does not report the cost nor the imputed value, the good-specific mean of the imputed value is used to replace the missing value.

To distinguish between very new products and less new ones, two different means are used: one of the imputed value of good bought less than one year ago and a second mean of the imputed values of good bought more than one year ago.

---

[45] However, having to aggregate them with EGEN command, the missing values are finally treated as zero values.
[46] When the purchase occurred during the last 12 months, the interviewers had to report it as bought 1 year ago.

ANNEX 2: Summary statistics of the correlates of welfare

Table A2-1: Summary statistics (mean values for Log consumption, household size and years of education of head of the household and spouse. Proportions for all the other variables. Standard errors below. Source: own calculation based on surveys)

	1999	2000	2001	2002	2005	2006	2007
Log cons	5.89	5.70	5.72	5.76	6.04	6.13	6.26
	0.90	0.92	0.88	0.87	0.80	0.82	0.73
Rural	0.48	0.47	0.53	0.45	0.46	0.35	0.35
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
HH size	4.37	4.35	4.37	4.47	4.24	4.14	4.12
	2.18	2.23	2.29	2.29	2.17	2.14	2.12
Female HH	0.16	0.16	0.17	0.16	0.19	0.20	0.21
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Literate Pop	0.84	0.85	0.86	0.88	0.89	0.91	0.91
	0.01	0.01	0.00	0.00	0.01	0.00	0.00
years educ	6.91	6.83	6.60	6.98	7.32	8.21	8.08
	5.29	5.08	4.98	4.99	5.13	5.37	5.36
years educ spouse	4.18	4.06	3.72	4.06	4.29	4.88	4.79
	5.11	4.91	4.71	4.80	4.97	5.53	5.51
Agriculture	0.41	0.44	0.48	0.40	0.38	0.29	0.29
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Industry	0.21	0.21	0.19	0.22	0.23	0.24	0.25
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Services	0.38	0.35	0.32	0.38	0.39	0.47	0.46
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
working spouse	0.46	0.45	0.48	0.46	0.44	0.43	0.45
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2nd occupation	0.16	0.13	-	0.15	0.13	0.13	0.13
	0.01	0.01		0.01	0.01	0.01	0.01
Indigenous	0.66	0.58	0.65	0.60	0.60	0.57	0.57
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chuquisaca	0.08	0.08	0.07	0.08	0.08	0.08	0.08
	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Lapaz	0.26	0.25	0.26	0.21	0.22	0.22	0.22
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cochabamba	0.18	0.16	0.19	0.16	0.15	0.16	0.16
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Oruro	0.06	0.09	0.07	0.09	0.09	0.09	0.09
	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potosi	0.10	0.10	0.09	0.11	0.11	0.11	0.11
	0.01	0.00	0.00	0.00	0.01	0.01	0.01
Tarija	0.06	0.08	0.07	0.08	0.08	0.09	0.09
	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Santacruz	0.18	0.16	0.17	0.16	0.16	0.16	0.16
	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beni	0.06	0.06	0.06	0.07	0.07	0.07	0.07
	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pando	0.03	0.02	0.02	0.03	0.03	0.03	0.03