POVERTY, INEQUALITY AND SOCIAL WELFARE IN BRAZIL, 1981-1995.

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To Jaime and Ignacio

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ABSTRACT

This thesis investigates the nature and evolution of the Brazilian income distribution during the 1980s and first half of the 1990s. The thesis presents a profile of the Brazilian income distribution, of the level and structure of poverty and inequality, and analyses how these have changed over time, making wider comparisons of social welfare. The empirical results are derived through application of best practice techniques of distributional analysis to micro-data from a large, annual and nationally representative household survey that permits estimation of comparable measures of poverty and inequality over time.

Chapter 1 provides the background to the debate on poverty and inequality in Brazil, reviewing recent macroeconomic policy and performance and key empirical studies from the 1960s onwards. Chapter 2 presents and discusses the household data set, methodological issues in measuring incomes, poverty and inequality and presents the main tools of analysis that are applied in subsequent chapters. Chapter 3 analyses levels and changes in incomes, poverty and inequality, and tests the statistical significance of changes over time and robustness of results to assumptions about the degree of household economies of scale and to variations in the poverty line. Chapter 4 examines the structure of inequality focussing on a number of characteristics of the household and household head, including location and family type of the households, and age, gender, race and education of the household head. Changes in the structure of inequality are also analysed. Chapter 5 investigates the structure of poverty, examining the role of key characteristics of the population and how these have changed between 1981 and 1995. Chapter 6 concludes, discussing the policy implications of the results and possible avenues of further research.

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CHAPTER 1. INTRODUCTION TO POVERTY AND INEQUALITY IN BRAZIL

1.1. INTRODUCTION

Brazil has one of the highest levels of income inequality in the world and this is not a recent phenomenon. A comparison of income inequality across a set of eighteen developing countries listed Brazil, in 1970, as having the eighth highest share of income (62%) accruing to the top twenty percent of the population, and the tenth lowest share (10%) accruing to the poorest forty percent (Chenery et al, 1974). During the 1980s the Brazilian income distribution appeared to worsen. Brazil in 1983 had the highest share of total income (46%) accruing to the top ten percent of the population, and the lowest share (2%) going to the bottom twenty percent of the population (World Bank, 1990). In 1990 Brazil again had the largest share going to the richest 10% (51.3%) and the second lowest share going to the poorest 20% of its population (2.1%) (World Bank, 1994).

Poverty comparisons across countries are more difficult to make because of differences in national poverty lines. Using World Bank $1-a-day international poverty lines, the proportion of the population below the poverty line rose from 16% in 1985 to 20% in 1989 but fell by 1997 to only 5%. $2-a-day poverty lines show a similar pattern rising from 27% to 31% and then falling to 17% (World Bank, 1988, 1992, 2000). These poverty estimates are low compared to many other developing countries, and among the lowest in Latin America, and especially low compared with poverty estimates using Brazilian poverty lines. Even the most conservative estimates of a national poverty line suggest that a quarter of the population was poor in 1990 with very little change over the decade (Fox and Morley, 1991, 1993). This lack of progress on poverty alleviation and the rise in inequality has meant that the period of the 1980s in Brazil is often referred to as the "lost decade".[1]

The aim of this thesis is to investigate the evolution of the income distribution during the lost decade of the 1980s and into the 1990s, applying a wide range of tools of distributional analysis that will provide a comprehensive analysis of inequality, poverty and social welfare together with a detailed examination of changes in the structure of

poverty and inequality. This will be achieved using a large, annual, nationally representative household survey that allows a comprehensive and comparable analysis of income distribution across time.

There are a number of reasons why analysing income inequality and poverty in Brazil between 1981 and 1995 is interesting and important. If Brazil were a small country, geographically, demographically or economically, then the figures on inequality and poverty might be less alarming, but Brazil is a large country in all senses. The population of Brazil is approximately 160 million, ranking it fifth in the world after China, India, the US and Indonesia (World Bank, 1994). On GDP Brazil ranks tenth in the world, after the G7, China and Spain, and it occupies over 8 million km^2, almost half the total area of South America. This particular period of analysis, 1981-1995, was one of political transition and somewhat erratic economic performance. From being one of the fastest growing economies in the 1960s and 1970s with an annual average real growth rate of 9% (1965-1980), Brazil, post oil-shocks and debt crisis, became a stagnant economy, with very low growth and rampant inflation, reaching nearly 3,000% in 1990. Brazil's military government handed over power to a civilian administration in 1985 after 21 years of rule. The main objective of the first civilian government in 1985 was to control inflation and introduce some economic stability, but this was only achieved ten years later with the introduction of the 1994 *Plano Real.*

One of the key social problems in Brazil is the lack of progress on improving the distribution of income. In order for this to be successful it is crucial that policy makers understand the process of income determination, the characteristics of the poor population and the social, demographic and economic processes that affect income inequality and poverty. Poverty and inequality have been, and remain, important arenas of study and debate in Brazil.

Not surprisingly, there is a vast empirical literature on poverty and inequality in Brazil: see for example Amadeo et al (1994), Barros, Mendonça and Rocha (1993), Barros and Mendonça (1995), Barros, Mendonça and Duarte (1995), Camargo and Ramos (1988)

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[1] See for example Bulmer-Thomas (1996).

Fishlow (1972), Fields (1977), Fox (1982, 1990), Fox and Morley (1991, 1993), Hoffman (1989, 1995, 1996), Játoba (1995), Ramos (1993), Rocha (2000), Sedlacek and Barros (1989), Thomas (1987) and Tolosa (1991), to name but a small sample of such studies. These are arguably the key studies that have shaped knowledge and influenced debates on poverty and inequality in Brazil and are reviewed in this chapter and elsewhere in the thesis.

The structure of this chapter is as follows. Section 2 presents a summary of the Brazilian economic background during the 1980s and 1990s. Section 3 reviews some of the evidence on trends in poverty and inequality since the 1960s and some of the empirical studies that attempt to examine more deeply the structure of poverty and inequality, analysing demographic and socio-economic characteristics of households and individuals, employment and earnings and the distributional impact of state transfers. Section 4 concludes the chapter with a discussion of the limitations of the existing empirical studies of Brazilian inequality and poverty, the aims of the thesis and a summary of each chapter.

1.2. The Brazilian Economy in the 1980s and 1990s[2]

The two decades of the 1980s and 1990s represent two very different periods in Brazil's economic and political history. The 1980s are known as the "lost decade", a period when Brazil, and much of Latin America, was buffeted by a series of economic and political storms that not only damaged macroeconomic performance but also are believed to have had serious consequences for poverty and inequality reduction. The 1990s, on the other hand, are known as "the decade of reforms", [3] a period of extensive reforms, including trade and financial liberalisation and privatisation. Table 1.1 shows selected macroeconomic indicators for Brazil during the period 1981-1995.

The 1980s can be split into three sub-periods. The first of these span from 1981 through to 1983 and can be characterised as a period of recession, debt and inflation. The

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[2] For fuller accounts of Brazilian economic policy and performance see for example Williamson (1990), Edwards (1990), Corbo et al (1992), Dornbusch and Edwards (1995), Giambiagi and Mesquita (1999) and Baumann (2000).

[3] See, for example, Baumann (2000).

second is one of recovery, in 1984 and 1985, but the third represents a return to stagflation, between 1986-1990.[4] The oil price shocks of 1973/4 and later in 1979 had profound effects on oil importing countries, but whereas the reaction in most industrialised countries was to contract imports, most Latin American countries, including Brazil, failed to adjust, financing an ever increasing import bill through larger current account deficits. In the space of the ten years from 1973 to 1982 external debt increased almost sevenfold, from US$12.6 billion to US$83.3 billion, and debt servicing requirements were equivalent to 97% of Brazil's export revenue (IMF, 1996). There were some attempts to control imports and increase exports in this early period: a Special Secretariat for State Enterprises was created to review and control excessive public expenditure among the 370 or so state-owned enterprises and in 1980 the Cruzeiro was devalued by 30%. However these attempts were in retrospect not sufficient to offset the effects of rising international prices and domestic interest rates, which, in turn, kept inflation high. In addition, weak demand for Brazilian exports from industrialised countries meant there was little scope to increase export volumes. In 1983 annual GDP growth was –3.4% and GDP per capita had fallen for three consecutive years and.

The earlier adjustment efforts of the Brazilian government began to take effect as the international recovery began and the subsequent recovery of the Brazilian economy is a feature of the second sub-period of the 1980s, 1984-1985. The combination of the devalued currency and growing export demand led to substantial trade surpluses. GDP per capita growth reached a turning point in 1984 and began to grow again in response to growing demand for Brazilian exports abroad and to relaxation of the contractionary policies pursued in 1980-1983. Real earnings of all workers across all sectors increased (Camargo and Ramos, 1988). The return to civilian government in 1985 was accompanied by an increase in the fiscal deficit, more than doubling in 1985 to 11% of GDP (Dornbusch and Edwards, 1995). Increases in demand (from home and abroad) and a move towards increased indexation of wages and prices led to further increases in inflation, already high, to levels in excess of 200 percent per annum.

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[4] Camargo and Barros (1988) also used this division and characteisation for the period 1980-1987.

The extremely high levels of inflation reached in 1985 set the scene for the rest of the 1980s. For a country recently recovering from a serious recession, orthodox attempts to control inflation that were likely to result in increased unemployment or lower real wages were not seen as attractive options. Successive attempts were made to control inflation through a series of "Plans". The first of these was the Cruzado Plan of February 1986 which replaced the cruzeiro with the cruzado (at an exchange of 1000 to 1), temporarily froze wages, prices, rents and mortgages and banned the monetary correction payments[5] that had become pervasive in 1984 and 1985. The temporary stability of prices led to a consumption boom, increasing output and GDP per capita growth, but lack of political will to tackle simultaneously the large fiscal deficit, arguably the root cause of inflationary pressures,[6] in the run up to the November 1986 elections led to the "temporary" freeze being extended and increasingly unsustainable. Inflation in 1986, although lower than the previous year, was still almost 150% p.a., fuelled in part by illegal price increases during the freeze period. The Cruzado Plan was followed by two weaker and unsuccessful plans: the first in June 1987 (the Bresser Plan) and the second in January 1989 (the Summer Plan). Both comprised price and wage freezes, after initial readjustments upwards of public sector prices, and a devaluation of the currency. However, neither plan was credible as each failed to include a strong commitment to tackling public expenditure and by late 1989 inflation was soaring. Camargo and Ramos (1988) and later Kane and Morisett (1993) also cite distributive conflict as being one reason why stabilisation plans have been poorly designed and/or implemented. Since the costs of adjustment in the Cruzado Plan fell disproportionately on richer income groups, future stabilisation plans were politically unattractive. The final plan of the period was introduced in March 1990 by the new government, the Collor Plan, which included not a wage or price freeze but a freeze on financial assets designed to drain liquidity from the economy and to sustain the new currency, the cruzeiro. There were for the first time serious attempts to cut public

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[5] Monetary corrections had become common fetaures of almost every economic transaction in order to protect real values.

[6] There is considerable debate about the causes of inflation in Brazil. Much of the literature focuses on the fiscal deficit, but recently some authors have dismissed this as the explanation, highlighting instead distributive conflicts and rising domestic public debt. See for example Saad Filho and Coelho Saraiva (1999).

expenditure by reducing the wage bill, which was moderately successful, but inflation was not brought under control. Inflation in 1990 reached almost 3000 %, and the liquidity squeeze resulted in declining GDP per capita again.

Hence the period 1981-1990 exhibits a cycle of recession, recovery and recession again, all the while accompanied by high and rising inflation. The subsequent decade contrasts somewhat with this, with the introduction of a wide range of reforms. Trade liberalisation, initiated in 1987, was accelerated in 1990, with average tariffs almost halving between 1990 and 1993 in the run-up to joining MERCOSUR, the Latin American free trade area. In addition financial liberalisation began in 1991 with the aim of reversing the reduction in foreign investment over the 1980s and to compete against investment opportunities elsewhere in the world. An important complementary reform that attracted foreign investment was the privatisation program of petrol, gas, mining, electricity, telecommunications and railways, which not only raised millions of dollars in revenue but also transferred a significant amount of debt to the private sector.[7] There was an initial payoff for the fiscal account which, for the first time in years, recorded a small surplus in 1994, but by 1998 had fallen into deficit again: indexation was still pervasive, the public sector wage bill continued to rise and reforms in pensions and minimum wage legislation in 1995 raised the social security bill (Baumann, 2000). Despite these reforms, by 1994 inflation had again reached 1990 levels, of almost 3000 percent per year, leading to the final plan, the Real Plan. Initially the Real Plan consisted of expenditure cuts and tax increases, but the second stage was designed to re-index wages and prices to a uniform peg through the creation of a unit of real value (URV).[8] By July 1994 the URV became the new currency, the real. As a result, 1995 annual inflation was below 100%, and has continued to maintain a low level.[9] Hence the first half of the 1990s can be seen as representing an evolution from a period of initially

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[7] Baumann (2000: 157) cites estimates of revenues in excess of US$70 billion during the 1990s as a whole, making the Brazilian privatisation program one of the largest in the world.
[8] The URV is an artificial "unit" indexed to the rate of inflation in the 1993 currency.
[9] See Saad Filho and Coelho Saraiva (1999) for a discussion of to what extent the Real Plan is responsible for reducing inflation.

extremely high inflation and sluggish growth to a stronger economy of low and stable inflation, falling unemployment and good growth. [10]

TABLE 1.1 SELECTED MACROECONOMIC INDICATORS, BRAZIL 1981-1995.

Year	Annual GDP Growth	Annual GDP per capita (1995 US$)	Annual Inflation Rate	Open Unemployment (1995=100)
1981	-4.4	2984	106	93.06
1982	0.6	2964	98	84.40
1983	-3.4	2843	142	106.05
1984	5.3	2807	197	93.06
1985	7.9	2962	227	73.58
1986	7.5	3139	145	51.94
1987	3.6	3181	230	77.91
1988	-0.1	3114	682	82.24
1989	3.3	3151	1287	57.69
1990	-4.6	2957	2938	66.52
1991	0.3	2910	441	80.65
1992	-0.8	2850	1009	106.92
1993	4.2	2906	2148	107.73
1994	6.0	3021	2669	105.67
1995	4.3	3123	84	100.00

Sources: IDB (1992, 1997, 1999).

1.3. POVERTY AND INEQUALITY TRENDS IN BRAZIL

The analysis of Brazilian poverty and inequality began in the 1970s, using data from the decadal censuses of 1960 and 1970, and since then a large number of studies have been published using data from census, national household surveys and employment surveys. Several studies covering the period 1960-1990 are summarised graphically in Figures 1.1 and 1.2 and in Table 1.2.

[10] Unemployment has begun to rise in metropolitan regions since 1997.

1.3.1. Poverty and Inequality Levels and Trends, 1960-1995

The two key papers from the early period are those by Albert Fishlow (1972) and Gary Fields (1977), and although they used the same data sources, census data, their studies disagreed on not only the incidence of poverty and level of inequality in 1960 but also on whether poverty had risen or fallen over the decade, and on the size of the increase in inequality.[11] At the time the two papers provoked much controversy, with a split emerging between those who felt the miracle growth rates of the 1960s had not benefited the poorer members of Brazilian society with the result that poverty had and inequality had both increased substantially (Fishlow), and those who believed that the benefits of growth had indeed trickled down, resulting in a reduction in poverty and only a small increase in inequality (Fields). Fishlow estimated that the poverty headcount had increased from 0.31 to 0.36 between 1960 and 1970, while Fields estimated that the headcount has fallen, albeit slightly, from 0.37 to 0.36. Their inequality estimates were also different: Fishlow calculated that the Gini coefficient had risen from 0.50 to 0.63, whereas Fields presented a much smaller rise, from 0.59 to 0.63.

Examining these works now however, it becomes apparent that much of their discrepancies can be explained by methodological differences and inconsistencies. Firstly, Fishlow used a 1% sample from the 1960 census and summary data of frequencies in categories of income reported by the Brazilian Geographical and Statistics Institute (IBGE) for the 1970 census, whereas Fields used summary information from each census. Secondly, the definition of income adopted by each author differed. Fishlow used monetary income, plus imputed rent and imputed rural home consumption (to account for under-reporting of incomes by agricultural households) for the 1960 results but monetary income only in 1970, while Fields considered monetary income only for each year. Hence Fishlow's estimates of household incomes in 1960 will have been somewhat higher than those of Fields, resulting in lower levels of poverty and inequality because much of the adjustments he

made were to incomes more significant for poorer households. Thirdly, the poverty line chosen by each author also varied, with Fishlow using one based on the minimum wage in 1960 and both, by virtue of the fact that they were reliant on published data, the bottom income category in 1970.

In summary, the early debate on poverty and inequality was characterised by disagreement on the behaviour of poverty and inequality measures during the period, and focussed on the beneficiaries of the miracle growth rates of the 1960s. This lack of agreement seems to have been due to differing methodologies.

This diversity of methodologies continued to be a feature of the studies of the period from 1980 onwards, although the broadly consistent stories about changes in poverty and inequality over time provoked less controversy. As data became available for the 1980s, in particular yearly micro-data household surveys, a new wave of studies appeared, again summarised in Figures 1.1 and 1.2 and Table 1.2 below. One of the key methodological issues was the choice of poverty line. The first national expenditure survey (*Estudo Nacional de Despesas Familiares,* ENDEF) was conducted in 1974/75, with a second survey conducted in 1987. Disaggregated prices are only available for the metropolitan regions so contemporary poverty lines, based on consumption levels of baskets of minimum satisfaction of needs, suffer from a bias because changes in consumption patterns over time, due to changing relative prices and changing tastes, are not accounted for, and from a further bias because the estimated metropolitan poverty lines may not be applicable elsewhere. When the poverty line for 1974/75 is inflated to 1980 currencies, poverty estimates exceed 60% (Fox, 1990). Because of the lack of frequent and comprehensive expenditure data the most common practice for analysing poverty in the 1980s is to draw the poverty line at a fraction of the national minimum wage, and deflate this over time using the Brazilian Consumer Price Index (INPC). Fox adopted this last approach, as did Tolosa (1991), by defining the poverty line at 1/4 of the minimum wage in 1980. Hoffman (1989, 1995 and 1996) used two poverty lines, a lower poverty line equal to the 1980 minimum wage, and an upper poverty line equal to

[11] Other studies of Brazilian poverty and inequality that cover the 1960s and 1970s are those by Bacha and Taylor (1978), Denslow and Tyler (1983), Hoffman and Duarte (1972), Langoni (1973, 1974),

twice the minimum wage poverty line. However, Thomas (1996) argued that the falling real value of the minimum wage makes it unsuitable as a poverty line and hence later studies adopted poverty lines based on consumption patterns: Barros, Mendonça and Rocha (1993) examined urban poverty using the 1974/75 ENDEF poverty lines while Ferreira and Litchfield (1996, 2000) used a set of regionally-specific lines based on the 1987 expenditure survey (*Pesquisa de Orçamentos Familiares,* POF).

The lack of an accepted, official or unofficial, poverty line resulted in a wide range of poverty estimates for the 1980s: estimates of poverty in 1980 range from 0.22 to 0.44 and in 1988 a similar range of 0.23-0.45 appears. However, there is much more consistency in the trend in the poverty headcount. Comparing poverty in 1980 with the level at the end of the decade, little change appears to have occurred: Fox (1990) and Fox and Morley (1993) estimated that the poverty headcount rose slightly from 0.26 to 0.27 between 1980 and 1988 while Tolosa (1991) estimated that poverty fell slightly from 0.35 to 0.33 during the same period. Hoffman (1989, 1995, 1996) estimated poverty headcounts using published tabular summaries of a national household survey, the *Pesquisa Nacional por Amostra do Domicilios* (PNAD), and also reported that poverty appeared unchanged between 1980 and 1988, with his upper estimate rising from 0.44 to 0.45, and his lower estimate rising from 0.22 to 0.23. These small changes in the headcount ratio over time are unlikely to be statistically significant but as the authors do not present standard errors of their estimates it is not possible to formally test this hypothesis.

One of the most important and comprehensive overviews of poverty in Brazil is the study conducted by Louise Fox and then later updated with Samuel Morley (Fox, 1990, Fox and Morley, 1991, 1993). Her aim was to summarise the existing evidence on poverty and the characteristics of the poor population, discussing some of the problems associated with measuring poverty and presenting some results on the evolution of poverty over time, with some descriptions of poor households.

Ramos and Almeida Reis (1991) and Macedo (1981).

Using published tabulations of income levels for the economically active population, from the PNAD, Fox estimated a range of poverty estimates, including the headcount and poverty gap, and found that during the 1980s there was a slight increase in poverty, as measured by both the headcount and the poverty gap. The absence of poverty reduction was attributed to a series of shocks: the 3-year drought in the North and Northeast (1979-1982), the debt crisis and recession of the early 1980s and the repeated failed attempts at stabilisation.

Tolosa (1991) focused on the differences between regions and between urban and rural areas in terms of incidence of poverty. He used a 1% sample from the 1970 and 1980 Demographic Census, and the PNAD for 1976 and 1988. Tolosa argued that although the headcount fell slightly during the period 1980-88, poverty actually rose and that much of this increase was due to increasing poverty in, firstly cities, and secondly, the main metropolitan zones. A growing population meant that the size of the poor population actually grew (from 30 to 45 million people).

Barros, Mendonça and Rocha (1993) assessed poverty using average per capita incomes for decile groupings from the PNAD. Income levels fell for each decile between 1980 and 1990, suggesting that, with a poverty line defined as the *ith* decile, poverty increased. The authors also assessed absolute poverty in the metropolitan areas, using the 1974/75 ENDEF poverty lines. They found that the Headcount increased during the recession (from 29.1% in 1981 to 38.2% in 1983) fell for a brief time during the Cruzado Plan (22.8% in 1986) and then rose from 1987 (25.5%) until 1989 when it reached almost the same level (28.9%) as in 1981. Rocha (2000) examined the impact on poverty of the Real Plan of 1994, arguing that whereas poverty during the 1980s and early 1990s followed the short-term fluctuations of the business cycle, after the Real Plan poverty fell and remained stable.

The set of Gini coefficients estimated for the 1980s shows much less variation across studies than the corresponding set of estimates of poverty, probably because there are slightly fewer technical choices to make in the measurement of inequality than of poverty (i.e. there is no poverty line to be set). The estimates for 1980 are within the range 0.58-0.62 and for 1988 between 0.61 and 0.63. The majority of studies report a

rise in inequality between 1980 and 1990. Bonelli and Sedlacek (1991) reported that inequality (as measured by the Gini coefficient) rose slightly between 1983 and 1988. Almeida Reis et al (1991) reported that inequality rose from 0.59 to 0.61 between 1980 and 1988, and Tolosa (1991) recorded a rise from 0.62 to 0.63 for the same period. Barros et al (1993) estimated that the Gini rose from 0.58 to 0.61 between 1980 and 1990. Hoffman (1996) extended the series beyond the 1980s into the 1990s and found that while inequality rose during the 1980s it fell during the first half of the 1990s, leaving the Gini coefficient virtually unchanged between 1981 and 1995.

The possible fall in poverty and the probable rise in inequality is supported by kernel density estimations which show that the shape of the income distribution changed over the decade, with the entire distribution shifting to the right over time and the upper tail stretching (Cowell, Ferreira and Litchfield, 1996).

However, examination of the years in between 1980 and 1990 reveals substantial variation in poverty and inequality levels. All the studies that used data for the period between 1980 and 1990 show that poverty levels appear to be closely correlated with the business cycle, peaking in the recession in 1982/83, reaching a low point with the successful, but temporary, reduction in inflation in 1986, and rising again as inflation again rose. Barros et al (1993) showed that poverty peaked in 1983 at 0.38, fell to a low of 0.23 in 1986 and then rose again to 0.29 in 1990. Fox (1990) and Fox and Morley (1993) estimated a similar peak in 1983 of 0.31 and a low of 0.16 in 1986. Hoffman (1996) also recorded that poverty rose in 1983, fell dramatically in 1986 and then rose as dramatically again at the end of the decade. Inequality estimates show slightly less variation over the period. Ferreira and Litchfield (1996) estimated that the Gini rose as the country moved into a recession in 1983, fell very slightly afterwards and as inflation fell but then rose almost monotonically until 1990, when inflation was at its peak. Hoffman's series of Ginis show a similar volatility during the 1980s and 1990s.

TABLE 1.2. ESTIMATES OF POVERTY AND INCOME INEQUALITY IN BRAZIL, 1960-1995

	1960	1970	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
Poverty Estimates (Headcount)																	
Barros et al (1993)					0.291		0.382			0.228	0.255		0.289				
Ferreira and Litchfield (1996)					0.445		0.553	0.520	0.457	0.296	0.417	0.439	0.403	0.450			
Fields (1977)	0.37	0.36															
Fishlow (1972)	0.31	0.36															
Fox (1990); Fox and Morley (1993)	0.50	0.54		0.26	0.25		0.31		0.254	0.161	0.233	0.269					
Hoffman (1989,95,96) A			0.435	0.444	0.436	0.445	0.494	0.493	0.449	0.336	0.427	0.446	0.414	0.473	0.491	0.492	0.407
Hoffman (1989,95,96) B			0.208	0.219	0.213	0.217	0.263	0.259	0.226	0.152	0.222	0.233	0.214	0.265	0.251	0.243	0.175
Tolosa (1991)		0.54		0.35								0.33					
Inequality Estimates (Gini)																	
Almeida Reis et al (91)	0.50	0.57		0.59								0.61					
Barros et al (93)		0.63		0.58	0.56									0.61			
Ferreira and Litchfield (1996)					0.574		0.584	0.577	0.589	0.581	0.592	0.609	0.618	0.606			
Fields (1977)	0.59	0.63															
Fishlow (1972)	0.50	0.63															
Hoffman (1996)			0.588	0.597	0.584	0.587	0.589	0.588	0.592	0.586	0.597	0.606	0.617	0.603	0.567	0.588	0.589
Tolosa (1991)		0.63		0.62								0.63					

Notes to estimates in Table 1.2.

1. Almeida Reis et al (1991) use a 1% sample of census data for 1960, 1970 and 1980, and household survey data from PNAD (*Pesquisa Nacional de Amostra do Domicilios)* for 1976-1988; income is defined as individual income among the economically active population.
2. Barros et al (1993) use a 1% sample of census data for 1960, 1970 and 1980, and household survey data from PNAD for 1979-1990; income is individual income and the sample is the economically active population. Their poverty line is calculated as the cost of a basic food basket using expenditure data from ENDEF (*Estudo Nacional de Despesas Familiar*) 1974/75.
3. Ferreira and Litchfield (1996) use household survey data from the PNAD 1981-1990; their income definition is gross monthly household income per capita, distributed across individuals, and use a set of regionally-specific poverty lines, calculated by Rocha (1993), also used in this thesis. For details see Chapter 3 of this thesis.
4. Fields (1977) uses a 1% sample of census data for 1960 and secondary analysis of published summary data from the 1970 Census; income is monetary income per family across families. The poverty line is the bottom income category set at NCr2.1.
5. Fishlow (1972) uses a 1% sample of census data for 1960 and secondary analysis of published summary data from the 1970 census; the income definition for 1960 is monetary income plus imputed rent and imputed rural home consumption in 1960, but monetary income only in 1970. The poverty line is set at the 1960 minimum wage for 1960 and the bottom income category in the published tables for 1970.
6. Fox (1990) and Fox and Morley (1993) use secondary analysis of Fishlow (1972) for 1960 and 1970, 1% sample of census data for 1980 and secondary analysis of published household survey data from the PNAD for 1981-1987. The income definition for 1960 is monetary income plus imputed rent and imputed rural home consumption in 1960, monetary income only in 1970, distributed across families (i.e. as Fishlow, 1972) and gross household income per capita per family for 1981-87. The poverty line is set at one-quarter the1980 minimum wage.
7. Hoffman (1989, 1995 and 1996) uses published frequency tables from IBGE of the PNAD 1979-1995; the income definition is gross household income per capita distributed across families. The poverty line in series A is set at twice the 1980 minimum wage, and that in series B is set at the 1980 minimum wage.
8. Tolosa (1991) uses 1% samples of census data for 1970 and 1980 and household survey data from PNAD 1988; the income definition is gross monetary household income per capita for 1970 and 1980 and gross household income per capita for 1988, distributed across families. The poverty line is set as in Fox (1990).

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Figure 1.1. Poverty in Brazil, 1960-1995.

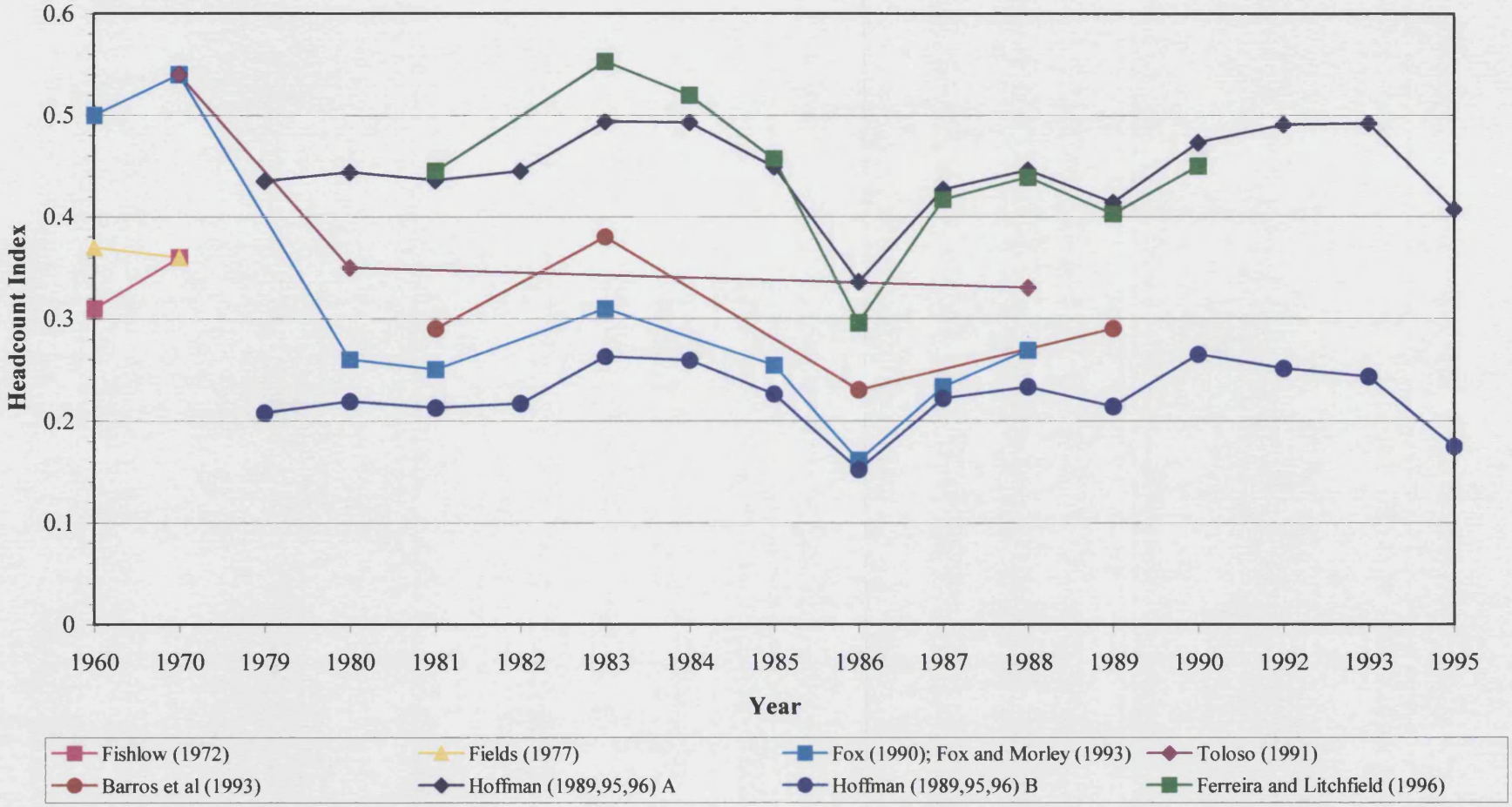
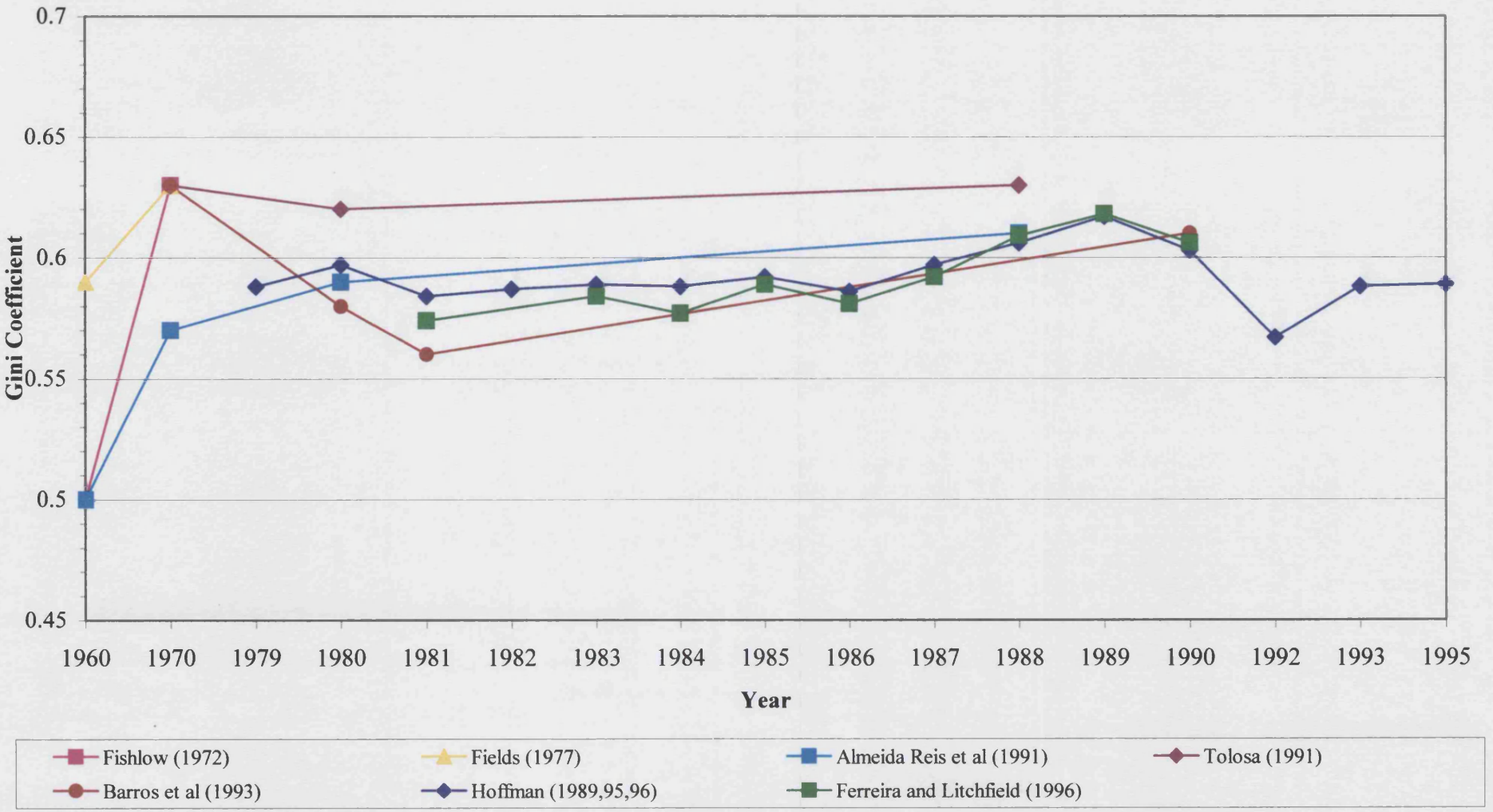


Figure 1.2. Inequality in Brazil, 1960-1995.



1.3.2. THE STRUCTURE OF POVERTY AND INEQUALITY IN BRAZIL

Most of the emphasis of these studies described above was on measuring the extent of poverty and inequality and examining changes over time. Some of the studies moved one step further by disaggregating the analysis by geographical area and/or examining the characteristics of the poor population.

Regional differences are stark in Brazil. An analysis of living standards across the 27 states of Brazil using the human development index demonstrated that living standards (as measured by life expectancy, infant mortality rates, literacy levels and a range of other indicators) varied dramatically. States in the North and Northeast were awarded scores comparable to those achieved by India, states in the Central region were comparable to Bulgaria, while those in the South and Southeast were comparable to Belgium (UNDP, 1996).

Although national level poverty estimates appear to be fairly similar at the beginning and end of the 1980s, there appear to have been much greater changes in poverty at the regional, state and sectoral level.[12] Poverty headcounts in the Northeast of Brazil remained much higher than those of the Southeast (typically two to three times higher depending on the study) but the Southeast experienced the largest percentage increase, from 12% to 18% between 1980 and 1988 (Fox and Morley, 1991, 1993). Within the Southeast urban poverty doubled, whilst rural poverty increased by 30%. Within the metropolitan areas, the highest headcounts were to be found in Recife (Northeast) at 37%, but again the largest increases occurred in the Southeast: the headcount in São Paulo trebled from 2% to 6%, and similarly in Belo Horizonte it almost trebled from 7% to 20% (Fox and Morley, 1993, and Tolosa, 1991). Barros et al's (1993) more detailed results on metropolitan poverty during the 1980s support Tolosa's claim that differences between the metropolitan areas were being reduced as the largest increases in poverty occurred in areas where poverty had traditionally been low. Hence areas that were once considered to have relatively low incidences of poverty experienced an increase in poverty.

In contrast to the trends in regional poverty levels, regional inequality differences increased. Although regional income inequality appears to have decreased in the period 1960-1980, there is some evidence that regional income inequalities (i.e. differences between regions) increased between the census of 1980 and 1991 (Azzoni, 1997). Similarly inequality within regions increased. Income inequality was much higher in 1980 in the Northeast than in the Southeast, and Gini coefficients in both urban and rural areas in the Northeast increased by more than the corresponding Ginis for the Southeast during the 1980s (Tolosa, 1991) Similarly the metropolitan areas of Recife and Fortaleza (both in the Northeast) had the highest Ginis of all the metropolitan areas and also experienced the biggest increases in inequality (Barros et al, 1993).

One implication of this possible urbanisation of poverty is that the characteristics of the poor population may have changed. Poor people in 1960 were characterised by low education and school attendance, employment in agriculture or mining, and belonging to large households with high dependency ratios (Fishlow, 1972). There is evidence of a sectoral change in poverty since then: in 1980 most heads of poor households were employed in agriculture and mining, as in 1960, whereas by 1985 less than 40% of heads of poor households were in these sectors (Fox, 1990). There is also evidence of an increase in female headship among poor households between 1970 and 1980 (Pastore et al, 1983), together with a high level of labour force participation amongst children of poor, female headed households in 1985 (Fox, 1990). Whilst families overall became smaller and younger, poor households in 1985 were still on average larger than non-poor households (Fox, 1990). The dependency ratio (defined as the number of people per working adult) was higher at lower income levels: the bottom quintile had an average dependency ratio of 6.9 compared to an average of 2.5 in the top quintile (Psacharopoulos et al., 1993).[13]

One theory that embodies the relationship between income and age is the life-cycle theory: income rises with age, beginning at a low level at "economic birth" when young adults begin earning, peaking in late-middle age and declining thereafter.

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[12] See the map on page 9 to identify location of states and key cities.

Decompositions of Brazilian individual income inequality show that approximately 10% of inequality can be attributed to differences between incomes of people in different age groups (Bonelli and Ramos, 1995). However, one problem with testing the life-cycle hypothesis is that it is a theory about individual incomes rather than household incomes, yet studies of income distribution, inequality and poverty are usually concerned with analysing the distribution of household incomes, normalised by an appropriate equivalence scale. One possible solution is to analyse the distribution of household incomes using the age of the head of the household on the assumption that the head is the prime earner in the household. Whilst it may be true that on average the head of household is the greatest contributor to household income, the extent may vary across the distribution of income, and also over time. Poorer households may receive a larger proportion of income from secondary earners, i.e. other adults or children (Scott, 1996). Increased female participation in the labour force, as reported by Barros and Mendonça, (1995), and also increased participation by minors (Fox, 1990) may also reduce the explanatory power of the age of household head alone. A similar inequality decomposition exercise conducted by Jenkins (1995) of the UK income distribution revealed that differences in incomes between households with heads of different ages accounted for around 5% of the overall level of inequality. These results suggest that the age of the head of the household is not a significant factor in determining a household's relative income, and that there remains substantial inequality within sub-groups of the population in households with similar aged heads. This is one hypothesis examined in this thesis.

A second demographic feature that is connected with household income is household size and there is some evidence that whilst families overall are becoming smaller, poorer families tend to be larger than richer families (Fox, 1990). One argument is that richer individuals, especially women, have higher opportunity costs as time spent raising children could be spent earning higher incomes, so richer families substitute quantity of children for quality of children (Schultz, 1997). There is an issue of endogeneity to be considered. Larger families may be poorer than smaller families

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[13] The number of individuals aged 15-64 in 1989 was 1.6 times those in the 0-14 age group, roughly half that of

because of the presence of children and elderly relatives whose capacity for generating income is limited. Alternatively larger families could themselves be a response to low incomes in that large numbers of children provide cheap household labour, potentially add to household income when they enter the labour force and provide security for parents in their old age. Furthermore the higher risk of infant mortality amongst poorer families may also result in higher fertility rates (Schultz, 1997).

One attempt to capture simultaneously age and household size and composition, and overcome the problems of focussing exclusively on the age of the household head, is the domestic cycle theory in which families, rather than individuals, are assumed to follow a cycle, with several well-defined stages. Fortes (1970) distinguished five phases: "establishment" of a new household, "expansion" with children, "consolidation" of the household at its maximum size, "fission" as children leave and "decline" as the parents become dependent on their children.[14] Tanner (1987) extended Fortes' classification to incorporate a link with income, using a sample of rural households in Northeast Brazil and dividing households in Fortes' "expansion" stage into 3 groups: "new", (those with one or two young children), "young", (those with several young children), and "expanding", (those with few young children and with working older children). These three stages were followed by "dispersing" households where some children have left the home, but with some infants, either grandchildren or children from a second partnership. Tanner found that the domestic cycle was linked to both malnutrition and the level of per capita expenditure: new and young households had the lowest per capita expenditure as well as the highest proportion of malnourished children. Hence, if expenditure and income are both proxies for welfare, the age-size composition of households may affect the distribution of income, and demographic change may affect the evolution of poverty and inequality. This hypothesis is addressed in chapters 4 and 5.

A third demographic factor that may affect poverty and inequality is gender. Female headship is often thought to be associated with low incomes: households headed by

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the UK (Barros and Camargo, 1993).

women in developing countries are usually assumed to be single adult households with or without children,[15] typically widowed, divorced or separated, with lower income-generating capacity than households headed by men (Boserup, 1981, Chant, 1997). Lower incomes among female headed-households may be due to discrimination against women, either in labour markets or in credit markets or to family responsibilities (child-care, care of elderly) that restrict labour market participation or entrepreneurial activities. During the 1980s in Brazil there appeared to be a growing tendency for women to set up independent households (Fox, 1990). However just as age of household head is expected to have little "explanatory" power, it is hypothesised that the sex of the head of household is also likely to be of little importance. Multivariate analysis of the determinants of poverty, which control for other factors that may also affect poverty status, reveal little support for a significant impact of sex of household head for a range of Latin American countries, including Brazil (Wodon, 1999). This is firstly because the definition of "household head" is somewhat arbitrary and surveys typically identify the individual that household members refer to as head, rather than the person who has primary economic responsibility (either in income earning or spending). Secondly however, female headed households are not a homogenous group, comprising single working women, single mothers with dependent children, widows, married or cohabiting women whose male partner is absent from the home for much of the year, and a probably smaller group of women headed households whose male partner is present. Not all of these types of female headed households will be disadvantaged to the same extent, and some may not be disadvantaged at all (Rosenhouse, 1989). This thesis aims to establish that sex of household head is not a relevant determinant of inequality or poverty.

Perhaps the most important factor that affects incomes, and hence inequality and poverty, is education. Firstly evidence from several countries demonstrates that earnings and education are strongly correlated. Bonelli and Ramos' (1995) decomposition of Brazilian income inequality shows that differences in incomes between men with

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[14] The domestic cycle has been tested with data from a number of countries, including Kenya, (Hunt, 1979), Taiwan (Greehalgh, 1983), Bangladesh (Rahman, 1986) and Swaziland (Low, 1986).

different levels of education accounts for around a third of total income inequality, and Ramos (1993) argues that inequality of earnings is strongly related to inequality in the distribution of educational endowments. Multivariate analysis of poverty determinants for a number of Latin American countries shows that the probability of being poor is significantly lower for those households with better educated heads (Wodon, 1999). Secondly, several studies have shown that productivity levels and incomes are much higher among farmers with higher levels of education, even after controlling for farm size (measured in hectares), perhaps because of faster and more appropriate adoption of new agricultural technology or better marketing of products (Foster and Rosenzweig, 1996).

Regarding changes in poverty and inequality over the period, a number of studies have shown that trends in poverty and inequality are closely related to the macroeconomic environment, particularly to inflation and unemployment. Camargo and Ramos (1988) illustrate that inequality and inflation are strongly positively related, a fact that hampered attempts to stabilise inflation. Rocha (2000) for example shows that poverty was closely related to the path of inflation during the 1980s and early 1990s but that since inflation stabilised in 1995 poverty has reached low and constant levels. However the aggregate poverty picture hides significant regional differences, with unemployment increasing recently in Sao Paolo among unskilled workers.

1.4. CONCLUSIONS

There is thus a large empirical literature on Brazilian poverty and inequality levels and changes over time, with detail on the characteristics of the poor population and on the structure of inequality, from which it is possible to gain considerable understanding of the evolution of the income distribution. However, the existing studies suffer from a number of limitations. Firstly, much of the analysis is based on secondary analysis of published summary data. Fox (1990) and Fox and Morley (1993) used household frequency tables of incomes for the 1960 and 1970 census and the PNAD numbers of households. Secondly several of the authors (Fox, 1990, Tolosa, 1991 and Barros et al,

[15] This is partly because of the definition of "head": in many household surveys the male of a couple is

1993) use two sources of data for the 1980s, comparing results derived from census data with those derived from household survey data. Differences in questionnaires, sampling methods and response rates (the Census being compulsory and the PNAD voluntary) may lead to substantial bias in estimates of such complex variables as incomes. Thirdly, some of the income definitions and reference groups adopted by different authors introduce further limitations. For example, Almeida Reis et al (1991) and Barros, Mendonça and Rocha (1995) use individual income, defined as total personal income (labour, pensions, government transfers and rents) for each individual in the economically active population. Using individual incomes neglects the fact that many individuals pool incomes and other resources with other family members. Furthermore a large proportion of the population is neglected by considering only the economically active population, namely children and pensioners. Finally the structure of inequality and poverty is analysed somewhat unsatisfactorily, in part because authors were reliant on published summary data, but also because inappropriate techniques were applied. For example, it is now well known that the Gini coefficient is not an appropriate measure to use to analyse the structure of inequality.[16]

Given the availability of comprehensive and comparable micro-data for the period 1981-1995 it is now possible to provide a much richer analysis of the Brazilian income distribution. The aims of this thesis are to estimate an extensive battery of poverty and inequality measures; to apply other tools of distributional analysis that extend the analysis beyond summary measures and to broader concepts of social welfare, and to examine in greater depth the structure and evolution of inequality and poverty, building on features that have been highlighted by some of the existing studies and incorporating new dimensions, such as race, language and ethnicity.

Chapter 2 of this thesis provides a technical background to analysing poverty and inequality in Brazil. The analysis in the thesis is conducted using an annual nationally representative household survey, *Pesquisa Nacional por Amostra do Domicilios* (PNAD) collected by the *Instituto Brasileiro de Geografia e Estatistica (IBGE).* The

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automatically labelled as head, so a female-headed household only occurs in the absence of an adult male.

PNAD is collected each year from a nationally representative sample of households and is formed of two questionnaires. The core questionnaire, common to each year, contains a range of data pertaining to the dwelling, the household and to all individuals within the household. Information is recorded on the geographic location of the household; characteristics of the dwelling such as size, building materials and access to utilities; on the relationships between individuals in the household; activities of individuals; income in cash and in-kind from labour; transfers and other incomes; hours of work, occupation and other labour characteristics; age, sex, education, race and literacy. Population weights are also included. In addition to this core survey, a supplementary survey is available for most years on a particular area of interest. These include education, health and fertility, labour and social attitudes. The sample size varies in each year (due to progressive funding cuts) between approximately 290,000 and 525,000 individuals (see Table 2.2 for precise numbers in each year). Chapter 2 also discusses some of the problems involved in measuring incomes using Brazilian household survey data and provides some tests of the consistency of household survey incomes with other sources. Finally the chapter presents the key techniques that are used in the thesis.

Chapter 3 aims to provide a detailed analysis of the evolution of the income distribution in Brazil, for each year between 1981 and 1995 inclusive. This is achieved using a range of summary measures of inequality and poverty, and ranking tools that allow broader inter-temporal comparisons of social welfare to be made. Sensitivity analysis of the results to various methodological choices, such as poverty line and equivalence scale, are also presented. This chapter revises research conducted with Francisco Ferreira (Ferreira and Litchfield, 1996, and extended to the 1990s as Ferreira and Litchfield, 2000) with additonal references to other studies of poverty and inequality and also places much more emphasis on statistical inference: standard errors and confidence intervals are calculated for all inequality and poverty measures so allowing changes over time to be assessed more meaningfully.

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[16] The Gini coefficient is not decomposable, that is, total inequality as measured by the Gini can not be related consistently to inequality among sub-groups of the population (Cowell, 1995).

Chapter 4 focuses on examining the structure of inequality and how it has changed over time using inequality decomposition techniques. Households and household incomes are diverse and complex concepts. Households vary in size and composition, in the age of members and in their economic activities, and these differences can be important correlates or determinants of inequality and poverty. Income sources are also diverse, with households receiving income from a variety of sources, including labour and capital markets, the state and family and friends. Households in developing countries, particularly poor households, usually derive their income from a variety of sources: earnings in cash and in-kind, incomes from capital such as land and other assets, income from farm production, in cash and in-kind, gifts and state transfers, in cash and in-kind. It has become standard practice to approach the analysis of household income inequality by considering the heterogeneity of households, or income recipients, and the heterogeneity of income sources, the income package, in separate analyses (see for example, Jenkins, 1995). This chapter will analyse the structure of inequality by examining key characteristics of households: the age, sex, race and education of the household head, the family type and the geographic location – region and urban or rural zone – of the household itself. Changes in inequality over time will also be examined. Inequality arsing from different sources of income will also be examined by applying an income source decomposition technique, and by examining changes in source incoem inequality over time. Results are presented for 1981, 1985, 1990 and 1995. This chapter extends work by Ferreira and Litchfield (1996) by firstly including household composition variables in the decompositions, secondly by extending the analysis to the 1990s and thirdly by conducting the decomposition of total inequality by income source for the period 1981-1995.

Chapter 5 aims to examine to what extent the characteristics of the poor have changed since 1981. First a profile of poverty for 1981 and 1995 is presented showing the key characteristics of the poor population in each year: headcounts, population and poverty shares are calculated for key sub-groups of the population, using a set of household characteristics and geographical location, analogous to the inequality decomposition techniques applied in Chapter 4. Finally an analysis of the correlates of poverty in each year is presented, for urban and rural areas.

The focus of the thesis is therefore on the "micro" processes of household characteristics and incomes. However the results may also be relevant to the relationship between income distribution and macroeconomic performance. The Conclusion picks up this theme.

CHAPTER 2. MEASURING BRAZILIAN POVERTY, INEQUALITY AND SOCIAL WELFARE

2.1. INTRODUCTION

Measuring poverty and inequality involves a wide range of technical or methodological choices, from choosing a suitable data source, defining a welfare indicator and setting a poverty line to choosing appropriate tools for measuring poverty and inequality. Section 2 of this chapter discusses the data that are available for such a study, section 3 the measurement of an appropriate indicator of well-being, together with an analysis of the income variable in the chosen data set and section 4 methods for measuring poverty and inequality. Appendix 2 contains further details of the variables available in each year of the household survey and translates key sections of the questionnaire.

2.2. DATA FOR MEASURING POVERTY AND INEQUALITY IN BRAZIL

The analysis in this thesis is based on national household survey data sets for Brazil, the *Pesquisa Nacional por Amostra de Domicílios*, (PNAD) for 1981-1995[17] collected and distributed produced by the *Instituto Brasileiro de Geografia e Estatística* (IBGE). Data is collected each year from a representative national sample of households, selected according to a three-level multi-stage sampling procedure, covering every state in the Federation, with a sample size of between 290,000 to 525,000 observations on individuals in each year. As such this survey is the most comprehensive data source on incomes and other socio-economic data available for Brazil, in terms of coverage of population, comparability over a long period of time and completeness of data. The data sets are well documented by IBGE: each year's survey is accompanied by a questionnaire, variable definitions and a code manual.

2. 2. 1. Sampling Methodology and Sample Sizes

The sampling procedure is identical for all years of the survey and is conducted in three stages, identifying municipalities, census sectors and individual households. All capital

municipalities, metropolitan municipalities, municipalities with high populations and those with a special economic or social characteristic are automatically selected. Other municipalities are grouped according to size, and from each group at least two are selected according to the most recent population census. For each municipality selected in the first stage (all self-governing municipalities and a stratified sample of the remainder), census sectors are identified and selected according to population proportions of the census. Finally, within each selected census sector, individual households are sampled.

The sampling methodology is important for accurate calculation of summary statistical measures and their standard errors. Howes and Lanjouw (1998) show that assumptions made about sample structure can significantly influence estimates of welfare indicators. One way of assessing the effect of the sample design on sampling variance is to examine the design effect or *deff*, defined as the ratio of the variance of an estimate to the variance the estimate would have had under simple random sampling (s.r.s.). Stratification of samples (e.g. into rural and urban sub-sample) typically means that *deff* is less than one, i.e. that estimates based on the assumption of s.r.s. are less precise than those that incorporate stratification. This is because the overall variance of say the mean in a stratified sample is just the sum of the variances in each stratum, whereas the variance from the simple random sample would depend additionally on the between-strata variance. If there are substantial differences between strata, and this is likely to be the case between urban and rural sectors, then the stratified variance is likely to be much lower than the s.r.s. variance, and hence estimates more precisely estimated. Clustering, on the other hand, tends to raise the *deff* above 1, i.e. s.r.s. estimates are more precisely estimated, partly because those households within each cluster are more likely to have similar characteristics (especially in rural areas) and partly because there is less information gained than when sampling across clusters. Combining both stratification and clustering, as the PNAD does, is likely to cause the *deff* to be greater

[17] No survey was conducted in 1991, the year of the Population Census, nor in 1994.

than one, i.e. the clustering effect dominates over the stratification effect, so that s.r.s. estimates have lower variances (Deaton, 1997). [18]

However, although IBGE clearly did not adopt a simple random sampling methodology the PNAD data sets do not include the necessary variables to identify sample clusters and strata. Hence the analysis presented in this thesis calculates all welfare indicators using the simple random sample assumption. Mahmoudi (2001) finds that for the Iranian case no significant difference is found between estimates under different assumptions although this is unlikely to be the case for Brazil where regional disparities are large (see the results in Chapter 4 for incomes and income inequality and Chapter 5 for poverty). It is possible that standard errors based on the erroneous assumption of s.r.s are underestimates of the true standard errors and this may lead to inaccurate inferences about the statistical significance of differences between poverty and inequality measures. In particular if the standard errors are biased downwards then the analysis in this thesis is likely to over-state the statistical significance of any changes in poverty and inequality.

The only part of the country not covered by the survey is the rural population in the Northern states of Rondônia, Acre, Amazonas, Roraima, Pará and Amapá (see the Map of Brazil at the beginning of this thesis). These states are situated in the Amazon area of Brazil. Remoteness, sparse population densities and perceived danger to survey interviewers are cited as reasons for exclusion from the survey. The rural population in these states is estimated to be 3% of the total national population in 1990 (IBGE, 1993). The sample covers all separate[19] and independent[20] private and collective households[21] in Brazil, where the household dwelling is formed of one or more rooms. The resident population comprises all those individuals resident or temporarily absent for a period of no more than twelve months from, a household (private or collective) at the date of

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[18] This discussion is based on Deaton (1997, chapter 1, pages 14-15 and pages 57-58) citing Kish (1965) and Groves (1989).
[19] The dwelling is separated from neighbouring dwellings by walls, roof and fences and where individuals share part or all of their food (IBGE, 1990).
[20] The dwelling has direct access and does not require passing through another dwelling (IBGE, 1990).

interview. The main exclusions from the population are individuals resident in embassies and consulates, the armed forces resident in military barracks and bases, prisoners in prisons, interns in schools, orphanages, asylums and hospitals and residents of religious institutions such as convents and monasteries.

The survey was conducted in the last quarter of each year, using a reference period of one week at the end of September or early October for collecting data on income and work. The 1982 PNAD was conducted with reference to 12 weeks, unlike the remaining years which all refer to one week in the year. Hence the data from 1982 is not strictly comparable with other years and is not used in this analysis. There is a smaller discrepancy between the November reference week in 1981 and the September/October reference weeks in later years but the seasonal effects should be small. Table 2.1 shows the reference week for each year.

TABLE 2.1. REFERENCE WEEKS FOR PNAD SURVEYS

Year	Reference week
1981	8th to 14th November
1983	25th September to 2nd October
1984	23rd to 29th September
1985	22nd to 28th September
1986	28th September to 4th October
1987	27th September to 3rd October
1988	25th September to 1st October
1989	24th to 30th September
1990	23rd to 29th September
1992	20th to 26th September
1993	19th to 25th September
1995	24th to 30th September

Source: IBGE(1993) for 1981-1990 and IBGE(1996) for 1992-1995.

The sample size varies from around 289,783 to 525,000 individuals in each year, corresponding to approximately 70,000 to 140,000 households. The samples in each year between 1981 and 1990 were selected using the population probabilities established in the 1980 Brazilian Demographic Census. Samples for 1992 through to

[21] Households are classified as private when occupied by one person, or group of people related by family ties or social reasons. Collective households are those formed by groups of individuals for administrative purposes (IBGE, 1990).

1995 were selected using the population probabilities calculated in the 1991 Brazilian Demographic Census. Population weights are used to ensure representatives of the sample.

Although the basic sampling methodology remained constant through time, the sample size was cut from 1986 in an effort to reduce costs. Between 1981 and 1985 the average sample size was just under 510,000, rising in line with population projections. In 1986 the sample size dropped by almost half to 290,000. IBGE state that the change in sample size reflects a lower number of households sampled from each census sector, rather than any other change in sampling methodology, and hence comparability between earlier and later years is maintained (IBGE, 1990). Table 2.2 shows the sample information for each year.[22]

[22] No data is shown for 1982. A survey was conducted that year but incomes were collected using a different reference period.

TABLE 2.2. PNAD SAMPLE SIZES

	1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
Households	103955	114085	116346	119597	65446	68739	69065	72520	73165	76229	81326	85270
Individuals	482568	513532	514569	525455	289783	299704	298360	309146	306352	317355	323451	334263
Weighted Sample millions	117.83	122.84	126.68	131.16	133.90	136.17	138.55	141.73	144.01	139.71	141.86	146.21

Note: weighted sample refers to individuals.
Source: Author's calculations from PNAD 1981-1995.

2.2.2. The Survey Questionnaire

The survey questionnaire changed little during the period 1981 to 1995, except for occasional supplementary questionnaires on additional topics.[23] Small changes include the absence of any question about race or ethnicity until 1988,[24] the expansion of the set of consumer durables covered in the household level questionnaire[25] and an increase in detail on activities other than the primary activity.[26] The only discernible difference that may have implications for estimates of the level and distribution of incomes occurs in 1990 only, when for no apparent reason the questions relating to receipt of income from sources other than employment – pensions, dependant's allowances, rental income and dividends - are missing from the data set. However, the variables v601 (income from all employment activities) and v602 (income from all sources) are different: on average the difference at the household level is 12.5% of total household income. The difference between the two corresponding variables in 1995 is 12.4%. This suggests that the data on these other income sources was indeed collected but not included as separate variables in the data set, but no documentary evidence exists to verify this.

The survey questionnaire has two components, the first collects household-level information and the second individual level data. Household-level data includes the physical characteristics of the dwelling, such as construction materials, the existence of piped water or a private toilet, and the number of rooms and bedrooms in the dwelling, and physical assets, such as radios, televisions and refrigerators, and (after 1990) freezers, telephones and washing machines. Individual-level data covers a wide range of topics. Questions are asked on the age, sex and race of each household member. Relationships between members of the household are also established. A set of questions relates to the literacy and level of education of each member. All individuals

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[23] Supplementary surveys were conducted in 1981 (Health), 1982 (Education), 1983 (Labour), 1984 (Fertility), 1985 (Youth) and 1988 (Social Attitudes).
[24] 1988 was the centenary of the abolition of slavery in Brazil.
[25] The wider set of consumer durables available in later years also affected the format of the question. For example question v218 "Do you have a television?" in 1981-1990 was split into two questions: "Do you have a colour television?" and "Do you have a black and white television?" for the 1992-1995 surveys. See the Appendix for the variables and questionairres.
[26] Income in cash and the value of own-production from secondary activities was consistently collected throughout the period 1981-1990 but income in kind was not.

are asked about main activity (for example, student, employed, retired, unemployed etc) and those aged 10 or above are asked about the nature of their activity. These questions cover sector of employment, occupation, size of firm, position in firm, duration of employment or unemployment, and types and cash-equivalents of income from a range of sources, including employment and business income, income from savings, investments and private insurance (pensions and health), private remittance and state social security transfer payments. A full list of variables, cross-referenced by year along with the questionnaire for years 1992-1995, are shown in the Appendix.

2.3. Measuring Incomes in Brazil

Central to any analysis of poverty, inequality and social welfare is the choice of indicator. A wide range of objective and subjective indicators can be considered and these are not always strongly correlated, identifying different groups of people as poor and providing different pictures of the distribution of welfare. Even adopting a narrow indicator such as income, as in this thesis, does not remove all the methodological issues. This section first describes the derivation of a definition of income and the unit of analysis, and the methods of treating a number of problems, such as zero and missing incomes and under-reporting or mis-reporting of incomes; second provides a set of consistency checks made between income estimates derived in this thesis from the PNAD data sets and those reported by IBGE and national accounts income estimates, and third provides details of the method used to convert nominal incomes to real 1995 incomes measured in Reais.

2.3.1. Income Definitions and Analysis Units

The principal indicator of household welfare used in this thesis is income, specifically gross monthly household income per capita, measured in real terms in 1995 Brazilian Reais. The reasons for this choice, and its possible limitations, are described in this section.

1. Income is chosen as the indicator of household welfare for purely pragmatic reasons. The only sources of expenditure data are the 1975 expenditure study, *Estudo Nacional da Despesa Familiar* (ENDEF) and the 1987 expenditure survey,

Pesquisa de Orçamentos Familiares (POF). Apart from the fact that these datasets cover only two years, rather than the 15-year roughly annual span of the PNAD, the two expenditure surveys are not comparable, being based on different sampling methodologies and different questionnaires. Hence the PNAD, which does not collect expenditure data, is the only source of a comparable welfare indicator collected frequently over a reasonably long period.

There are two main limitations of income data compared to expenditure data. Firstly, income data generally is likely to be "dirtier" than expenditure data, i.e. subject to more measurement error in the form of under-reporting of income from some sources, be more prone to contain erroneous zero incomes (each of these are discussed below) and in some surveys, subjected to top-coding of upper incomes.[27] Expenditure data is usually collected by recall or observation methods over a short period of time so, while not entirely free of measurement error, are generally regarded as being "cleaner" than income data. The second reason why expenditure is usually the preferred indicator is the belief that households and individuals smoothe consumption over the life-cycle and hence is a better guide to life-time standards of well being, or permanent income. Income on the other hand is only current income, and therefore a weaker guide to living standards. The permanent income hypothesis is partly based on the assumption that individuals can smooth consumption, via formal savings and credit institutions. This may not be true of developing countries generally, although informal insurance and credit arrangements may exist instead (see Ray, 1998, for a discussion of informal arrangements). It is possible that if annual incomes are more variable over time than expenditure, and if the extent of variability of incomes over time differs at different points of the underlying permanent income distribution, then inequality estimates based on income data may be over-estimated. In the absence of expenditure and income data from the same household it is not possible to assess how serious a

[27] Top-coding means that incomes larger than an upper threshold are all given the same value. Bottom-coding may also exist. There appears to have been top-coding in the 1984 dataset: Bonelli and Sedlacek (1991) report that only 7 digits were made available for coding incomes, hence incomes higher than 9999999 were coded as 9999998. These observations (corresponding to 25 people) were dropped from the analyisis, hence the 1984 inequality estimates must be taken as a lower bound estimate.

limitation this is, but it is likely to be non-trivial. A valuable exercise could be conducted if such data were available.

2. The concept of income[28] in the PNAD is as follows:

   - Income from employment: payments in cash and in-kind from 1,2,3 or more jobs.

   - Incomes from self-employment: payments in cash and in-kind from 1,2,3 or more jobs. This includes income from farm production, although the survey questionnaire is not detailed enough for a complete survey for rural farm incomes (see the discussion below on under-reporting).

   - Social Insurance receipts in cash: old-age, disability or survivors pensions, sickness and maternity benefits, work injury, unemployment benefit and family allowances, paid through a state agency, such as the National Institute of Social Security.

   - Other income: rental income from property, dividends, and interest payments on savings and investments, gifts from individuals not resident in the household, and other undefined income.

   This is a fairly comprehensive coverage of income sources but there are limitations to it because some of these elements of household income may be under-reported. Evidence from other household surveys in other countries suggests that the value of incomes in kind and production for own consumption and of income from capital are likely to be significantly under-reported and this is probably also true for Brazil (see Ferreira et al, 1999). Deaton (1997) provides a general discussion of these kinds of problems relating to Living Standards Measurement Survey (LSMS) data, and Ferreira and Litchfield (1999) discuss this problem in the context of the Chilean case. The reasons for under-reporting of these types of income are two-fold.

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[28] This corresponds to variable v410 for 1981 through to 1990, and v0905314 for 1992-1995, divided by household size. See the Appendix for the complete listing of variables and definitions.

a) Incomes in-kind and from home production are difficult to value given problems in collecting price data and in comparing tradables and non-tradables, which are particularly acute in rural areas of developing countries.[29]

b) The survey instrument is not sophisticated enough to allow for collection of detailed data on different forms of income in kind, own-consumption of different types, farm incomes and income from capital (interest, dividends etc.).

Without reliable data on these elements it is difficult to ascertain the extent of under-reporting, but it is likely that estimates of income, especially of rural households where income in kind and production for own consumption are usually important, are underestimated. Furthermore, given the importance of incomes in kind and own consumption for the lower part of the distribution, it is likely that poverty levels are overestimated. The effect on inequality of under-reporting of these two sources is more ambiguous. Under-estimating income in kind and production for own consumption is more likely to be a problem among households in the lower tail of the distribution while under-reporting of income from capital is more likely to be a problem among households in the upper part of the income distribution. Hence inequality estimates are likely to be biased upwards by under-reporting of incomes in the lower tail but downwards by under-reporting in the upper tail. The precise aggregate affect on inequality will depend on the measure of inequality that is used. Those measures sensitive to the distribution in the lower tail (e.g. members of the Generalised Entropy Class with parameter $\alpha \leq 0$) may therefore over-estimate inequality, while those more sensitive to upper tail incomes (e.g. the Generalised Entropy measures with $\alpha \geq 2$) may under-estimate inequality.

3. The PNAD data sets only includes gross income receipts, i.e. net of income tax so only takes account of part of the redistributive effect of government taxation and expenditure, namely public cash transfers. No information is available in the data on actual tax deductions, either at source or through tax returns. Given the emphasis in developing countries on indirect taxation for raising government revenue and the

[29] See Ferreira et al (1999) for a discussion of the reliability of the PNAD survey in this context.

(anecdotally) high extent of tax avoidance and evasion in Brazil it was decided to forego a simulation exercise to estimate net incomes and adopt a definition of gross income. Furthermore little information is available on whether households are recipients of non-cash transfers in health and education for example. A study of the social expenditure in Chile in the 1990s suggests that inequality levels are statistically significantly reduced when the monetary value of such in-kind public transfers, especially provision of free education, are added to household income (Bravo et al, 2000). Such an exercise has not been conducted for Brazil but would make a very interesting extension.

4. Income is expressed in per capita terms to allow for comparisons with other studies of income distribution and poverty in Brazil and the rest of Latin America. It is rare to see other equivalence scales used for developing countries, although this practice is changing. Adjusting for differences in household size and composition is an important methodological issue for distributional analysis and the choice of equivalence scale can affect not just levels of mean income, poverty and inequality but inter-temporal or spatial comparisons. Firstly there are likely to be important economies of scale to be gained by larger households, particularly in household public goods such as rental, heating and lighting, but also in expenditure on food. Secondly there are differences in need between household members of different ages, and maybe even sexes. Dividing household income by household size is a rather simplistic approach that fails to capture either of these effects. There are various ways of calculating equivalence scales, and so assigning each household a weight that equals the number of equivalent adults in the household, but these methods require data on expenditure, either on child versus adult goods (known as the Rothbarth method) or on food relative to total expenditure (the Engel method).[30] In the absence of expenditure data in the PNAD, and of an equivalence scale estimated from either of the two existing expenditure surveys for Brazil, a simpler approach has to be adopted. One such simple method is to use n^{θ} as the equivalence scale, where n represents the number of household members and θ is a parameter

[0,1] that accounts for household size, in the equation $y_i = \frac{Y_i}{n^\theta}$, where y_i is equivalised income, Y_i is total household income and n is household size. The case where θ=0 is equivalent to using household income so assumes implicitly that economies of scale are very high, e.g. 2 can live as cheaply as 1. If θ=1 then we have per capita income but this assumes no economies of scale and also no variation in the needs of different household members. Intuitively, a value of θ somewhere between 0 and 1 is probably more appropriate. The sensitivity of poverty and inequality estimates to the choice of equivalence scale is discussed in Chapter 3.

5. The unit of analysis is the individual, rather than the household, with the value of household income per capita assigned to each household member. Adopting a distribution of income across household - as many of the existing studies discussed in Chapter 1 do - gives households equal weight in the distribution. Hence the distribution of income across households would tend, assuming that larger households are generally poorer than small households, to understate the incidence of poverty and level of inequality. However, weighting households by their size, and so analysing the distribution of household income per capita across individuals, potentially increases the number of low income observations, and so raises estimates of poverty and inequality.

6. Incomes in each year of the survey are collected in the currency of the year. Even in a low inflation country this would create problems in making comparisons over time but in Brazil during a period of several changes of name of currency and extremely high inflation rates the problems are acute. Hence nominal incomes need to be converted to real incomes. Incomes from each of the PNAD surveys are converted to 1995 Reais, the most recent survey year examined in this thesis, using the inflation index described below in section 2.3.4. A single national price index is used because there is no systematic survey of urban and rural prices available for Brazil for the period under consideration. Ideally, one would like to be able to

[30] See Deaton (1997) for a full description of each of these approaches and examples using data from India and Pakistan.

deflate incomes by a regional and/or urban and rural price index that captures variations in the cost of living across the country. Assuming that prices are the same across the whole country is somewhat simplistic, given that it is almost certain that some costs, e.g. housing, are likely to be higher in urban than rural areas and that the prices of other goods may vary because of transport costs etc.[31]

The two Brazilian expenditure surveys that are available for the period covered by this thesis provide some data on the spatial variation of prices and these have been incorporated in the regional poverty lines used to identify the poor by Rocha (1993) and adopted in this thesis. However the regional poverty lines themselves are not a regional set of price indices.[32] More recent work on Brazil by Ferreira and Barros (1999) using the 1996 living standards survey, *Pesquisa sobre Padroes de Vida*, (PPV) of the Northeast and Southeast of Brazil, concludes that prices varied substantially across urban areas in different parts of the country. This will clearly affect estimates of levels of poverty and inequality: if incomes in rural areas or other low-cost areas are effectively under-valued (because it is cheaper to live there) then inequality and (to a lesser extent given the regional poverty lines) poverty estimates are almost certainly biased upwards. For inter-temporal comparisons, the effect of not taking account of regional price variations depends on how stable relative prices were over time. Little time-series data is available on relative prices across regions in Brazil except for a few urban areas. Ferreira and Barros (1999) reviewed this data and concluded that relative prices across regions remained fairly constant over time. Hence while failing to account for regional price variations may mean estimates of poverty and inequality are on the high side, comparisons over time are less likely to be affected.

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[31] Regional price data from Chile suggests that prices in the far north and deep south are as much as 20% higher than in Greater Santiago (in the middle of the country) (World Bank, 1997).

[32] Although they show the cost of a food bundle in different regions and urban and rural locations of the country, Rocha allowed the food bundle itself to vary across these locations. The fact that the cost of a food bundle may be 50% higher in an urban area than a rural area may simply reflect substitution decisions between high-priced and low-priced foods, and/or tastes.

2.3.2. Comparisons of PNAD income estimates with other data sources

Despite the apparent comprehensiveness of the PNAD it is still important to check the consistency of income estimates derived from it with other possible sources. The two obvious alternative sources in Brazil are national accounts data, i.e. GDP per capita and data from other surveys that cover a similar period, such as the PME the *Pesquisa Mensal de Emprego*, a quarterly labour survey, also collected by IBGE, but covering metropolitan areas only. Table 2.3 shows estimates of monthly income per capita from the PNAD for each year expressed in constant September 1995 Reais and monthly GDP per capita for each year expressed in constant September 1995 Reais. Both series are real monthly income per capita series and hence comparable. Income estimates from PME are discussed in the text below.

Four separate issues regarding these estimates of mean household incomes per capita presented in this table should be addressed. The first is a disparity in levels between the PNAD incomes and the GDP per capita figures from the National Accounts. This is a consequence of the general problem of comparability between national accounts-based and household survey-based statistics, which is by no means restricted to Brazil. For the specific case of Brazil, it has been argued that this is due chiefly to under-reporting of capital incomes, and therefore likely to lead to underestimates of both the mean and the dispersion of the income distribution (see Lluch, 1982, for a detailed discussion). Given the fact that all available data sets suffer from this problem, the usual practice is to rely more heavily on the national accounts data for the behaviour of income aggregates, while using the survey data to obtain a lower-bound estimate of inequality.

TABLE 2.3. BRAZILIAN INCOMES: HOUSEHOLD SURVEY AND NATIONAL ACCOUNTS ESTIMATES (1995 REAIS)

	1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
PNAD	136	117	117	140	207	154	144	163	150	128	134	166
GDP per capita	249	237	234	246	262	265	259	263	246	237	242	260

Notes: Income definitions are as follows: PNAD series shows author's calculations using monthly household income per capita, across all individuals in the survey reference month; GDP series is annual GDP per capita per month;
Sources: PNAD: Author's calculations from PNAD 1981-1995. GDP per capita (IMF, 1996)

The second issue is a disparity in changes, as well as levels, between the two series. Table 2.3 reveals an 18% growth in mean monthly incomes between 1981 and 1995. This is at odds with the picture of relative stagnation that emerges from examination of GDP per capita figures over the same period. In this specific instance, a plausible hypothesis to explain the growth disparity is that there might have been a shift in the composition of income towards formal labour earnings - which are more accurately reported - and away from other sources more commonly understated. Tentative backing for this conjecture comes from the reported fall in open unemployment during the 1980s (Thomas, 1996) and from evidence of a formalisation of work relations (Amadeo et al, 1994).

Third, the mean reported household income per capita figures display a pronounced volatility in the middle of the decade, rising by 42% from 1985 to 1986, and falling sharply again thereafter, while the GDP per capita figure rose by only 6% from 1985 to 1986. 1986 was an atypical year with stronger growth than in other years and sharply reduced inflation: nevertheless, the magnitude of the changes in mean household income per capita around 1986 does seem implausible. While this could be due to the sampling changes that took place in 1985, both the IBGE documentation about those changes and the fact that the figures return to a "normal" range in 1987 suggest that this is unlikely. The PNAD series is widely regarded as comparable over the decade, and there were no changes to the questionnaire or interviewing procedures around that time. It is probably more likely that reduced inflation in 1986 had a substantial impact on income under-reporting, both as a result of enhanced respondent memory between earning and reporting, and as a result of an increase in the formal labour share of national income, which is usually less prone to under-reporting. Further support for this hypothesis explaining the volatility of incomes in 1986 comes from Cardoso, Barros and Urani (1995) who present a similar pattern of volatility in the middle of the decade, using data from the employment survey, *Pesquisa Mensal de Emprego*. Their index of real incomes (1982=100) jumps from around 70 in 1985 to 110 in 1986 and then falls back to 75-80 after 1986 (Cardoso et al, 1995:153). As the macroeconomic data presented in chapter 1 suggests, 1986 and 1989 (both years of pronounced rises in reported mean incomes) combined real GDP growth with the lowest unemployment

rates in the decade. In 1986, furthermore, the consumption boom widely attributed to the sharp reduction in the (highly regressive) inflation tax led to a tight labour market and a rise in real wages (Thomas, 1996).

While the *direction* of the changes revealed by the data around 1986 is unlikely to be spurious, the *magnitude* of the changes does suggest that welfare results for that year should be viewed as upper bounds and treated with caution. In addition, the likely reduction in the importance of under-reporting of capital incomes (relative to total incomes) should make estimates of inequality less biased downwards this year.

Finally, the trend in mean incomes obtained from the PNAD data set also differs from that found by some other studies, such as Barros and Mendonça (1995), who find a decline in reported mean incomes.[33] This is due to two separate reasons: first, those studies compare 1980, rather than 1981, with 1990. 1981 was a severely recessionary year, with a 7% fall in GDP from 1980. Second, different income concepts can behave quite differently and, as Barros and Mendonça (1995:22) say of their income definition (total personal incomes for economically active individuals *with incomes*): "the temporal evolution of this distribution can be quite different from, for example, the temporal evolution of the distribution of all individuals according to their household per capita income". This might arise from an increase in low-paid employment, through which previously income-less individuals receive incomes below the average total personal income. Whereas this would lead to an increase in mean household per capita incomes for the whole population, it would clearly reduce the mean of the distribution analysed by Barros and Mendonça (1995). The fact that the Brazilian economically active population rose from 47.5 million in 1981 to 64.5 million in 1990 might therefore also contribute to explaining the divergence in the mean trend for the two studies (Amadeo et al, 1994).

To summarise, it is clear that mis-reporting of incomes in the PNAD household survey is not a negligible problem leading to differences in the level and magnitude of changes in household incomes when compared to national accounts data. However since the

PNAD remains the best available instrument for investigating the evolution of poverty, inequality and welfare for the whole of Brazil's population over this period, the analysis has considerable value. Given the existing data availability constraints, the analysis that follows is the best that can be achieved in seeking an understanding of Brazil's distributional dynamics during the turbulent 1980s and 1990s.

2.3.3. Zero Incomes

The underestimation of mean incomes is likely to be due to a combination of three types of data contamination, namely missing (non-response) incomes, zero incomes and under- or mis-reporting of incomes for one or more income sources or for one or more individuals within the household. These problems can affect all parts of the income distribution, although not necessarily in a uniform fashion. It is this non-uniformity of reporting biases that makes the problem so important for distributional analysis: if everyone consistently under-reported by the same nominal or proportional amount then the problem would be trivial. However, different people will mis- or not report different types of incomes to different extents. Two of the forms of income most difficult to measure accurately are a) rural incomes, where a large number of people are employed in the agricultural sector, where part of incomes may be paid in kind rather than in cash, many households are subsistence farmers, and where many will have some production for home consumption, and b) informal urban sector incomes where incomes may also be part in-kind. One would expect this type of under- or mis-reporting to be more common amongst those households at the lower end of the income distribution, where own-consumption and payment in kind for labour forms a larger part of total household income. Income from capital is also difficult to capture: not only is this form of income potentially very complex involving a range a financial instruments, it is not easily captured by household surveys, which tend to be designed for capturing income from labour and standard socio-economic data. It seems reasonable to expect that this form of under-reporting or non-response would be more common at the upper end of the income distribution.

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[33] It might be noted that their finding of a 14% decline in mean incomes from 1980 to 1990 is also at odds with the national accounts figures, albeit in the opposite direction.

In the PNAD datasets around 1% of households in each year are assigned missing income, usually because either the head or the spouse failed to record an individual item of income, i.e. item-non-response. In addition around 1% in each year report zero household incomes, that is zero income from any source. Zero incomes pose a particular problem for measuring inequality as some otherwise very useful inequality measures become undefined in the presence of zero incomes. Table 2.4 shows the percentage of individuals with zero and missing household income per capita.

TABLE 2.4. ZERO AND MISSING INCOMES

	1981	1985	1990	1995
Zero incomes	1.07%	1.03%	0.99%	0.92%
Missing incomes	0.80%	0.79%	1.25%	1.02%

Notes: Figures show percentages of individuals reporting zero or missing incomes.
Source: Author's calculations from PNAD 1981, 1985, 1990 and 1995.

Each of these problems can be dealt with in a number of ways. One standard approach is to impute values to missing and zero income values, or to income sources believed to be under- or mis-reported. Average levels of income defined over household groups, where the group is defined by a partition according to a number of variables, including region, age and sex, educational attainment and occupational sector are sometimes imputed to individuals reporting zero or missing incomes. Under-reporting of incomes can be dealt with by scaling up reported values to represent those suggested by national accounts data. Apart from being rather laborious and data-intensive, this approach potentially introduces new biases into the data, if a) non-missing income levels reported were genuine responses; b) the distribution of under-reporting has a wide variation or c) or the extent of under-reporting varies by household or individual characteristics not used in the imputation procedure. Hence no attempt has been made to impute incomes to households to adjust for potential under-reporting or missing values. However a sensitivity analysis of estimates of mean incomes to the presence of zero incomes is conducted.

In order to examine the sensitivity of measured income to reported zero incomes three exercises were conducted: a) zero household incomes per capita left in the distribution; b) zero household incomes per capita dropped from the distribution and c) zero household incomes per capita replaced by 25% of the mean. The sensitivity analysis was conducted with the 1990 data only because, as already stated in Section 2, the income questions appear to be less comprehensive than previous or subsequent years and so zero incomes may be more of a concern in that year than others. Table 2.5 shows the results of the sensitivity analysis.

TABLE 2.5. ZERO INCOMES: SENSITIVITY ANALYSIS OF 1990 HOUSEHOLD INCOME PER CAPITA

	Whole Distribution	Zero Incomes Dropped	Zero Incomes Imputed[a]
Mean	148.67	149.82	148.98
Median	72.00	72.17	72.00
Gini	0.6091	0.6059	0.6064
	(0.0023)	(0.0022)	(0.0021)
GE(0)	∞[b]	0.7053	0.7048
		(0.0057)	(0.0053)
GE(1)	0.7544	0.7454	0.7473
	(0.0132)	(0.0129)	(0.0114)
GE(2)	2.0432	2.0191	2.0325
	(0.2778)	(0.2523)	(0.2289)

Notes: [a]25% of mean income of whole distribution imputed to zero income observations. [b] GE(0) attains its maximum value (infinity) in the presence of zero incomes.
All incomes are shown in 1995 Reais. Entries in brackets below inequality estimates show boot-strapped standard errors.
Source: Author's calculations from PNAD 1990.

The results show that summary measures of income distribution (except GE(0), which attains its maximum value in the presence of zero incomes,) are not very sensitive to the presence or method of treating zero incomes. The standard errors reveal no significant difference between the three sets of measures. Given this small difference in estimates of income and income inequality it was decided to simply drop the small number of zero household incomes per capita from the distribution rather than impute an arbitrary and potentially contestable amount to these households.

2.3.4. Converting Nominal Incomes to Real Incomes

For a country with astronomical inflation rates such as Brazil in the late 1980s and early 1990s, the importance of having time-series income data expressed in real terms is obvious. One of the problems with the local currency is that it changed name and value several times in the relevant period. There were five anti-inflation plans during the period: Table 2.6 shows the date and name of each plan and the conversion rate for the new currency.

TABLE 2.6. ANTI-INFLATION PLANS, BRAZIL 1981-1995

Name	Date	Conversion rate (new for old)
Cruzado Plan	28th February 1986	1 Cruzado=1000 Cruzeiros
Summer Plan	15th January 1989	1 Novo Cruzado=1000 Cruzados
Collor Plan 1	16th March 1990	1 Cruzeiro=1 Novo Cruzado
Immediate Action Plan	1st August 1993	1 Cruzeiro Reais=1000 Cruzeiros
Real Plan	1st July 1994	1 Real=2750 Cruzeiros Reais

Fortunately all incomes collected in the survey relate to the same reference month, so there is no need to apply deflators within years. Instead, nominal incomes in each year are converted to real 1995 Reais using the Brazilian Consumer Price Index as adjusted by Marcelo Neri (Neri, 1997). There are many different ways that can be considered to convert nominal incomes to real incomes, but each requires an index of prices. Maintaining an accurate consumer price index in times of high inflation is difficult and even more so when the domestic currency changes name and value overnight. The official consumer price index (INPC) in Brazil, collected by IBGE is shown in row 1 of Table 2.7 below. Row 2 contains an adjustment made by IPEA to correct for the fact that Reais in July 1994 were compared to a URVs (*Unidade Real de Valor*) in June 1994, which was partly a currency and partly a price index itself. The adjustment involves increasing the price index by a factor of 1.2199 from July 1994 onwards. Row 3 shows the geometric mean of the adjusted price index, $INPC_t$ and $INPC_{t+1}$. The use of the INPC price deflator from the month for which income is earned may overstate real incomes in periods of accelerating inflation. The INPC reports inflation from the beginning to the end of the month, and is hence centered on the 15th day. Neri (1997) argues that a geometric average of $INPC_t$ and $INPC_{t+1}$ (i.e. one centered on the end of

the month) is a better deflator for the earnings of the largest categories of workers who are paid at the end of the month.[34] The difference between that deflator and the simple $INPC_t$ rises with accelerating inflation, so in periods of high and rising inflation the geometric mean of the two month's index values will be greater than the simple one month value (see for example 1990 when inflation reached 3000 percent per annum). The upward bias in real incomes from the adoption of the $INPC_t$ would thus rise with inflation, which was substantially higher in the end of the decade than in the beginning. Hence using Neri's geometric mean price index lowers estimates of mean income during times of inflation, and by proportionately more in times of high inflation.

Table 2.8 contains three estimates of the pattern of mean income over the period, using each of the estimates of the INPC described above. That is, row 1 shows the estimate of mean income using the official price index of the national statistics institute, IBGE. Row 2 is very similar to row 1 and merely contains the adjustment made by IPEA to correct for the change in method of calculating the INPC after July 1994. Row 3 contains an estimate of mean income using the geometric mean of the value of the index at time t and t+1 so as to centralise the index at the end of each month, following the work of Neri (1997). Comparing the third row with rows 1 and 2 reveals that the geometric-mean adjusted INPC does indeed result in greatest differences during high inflation years, such as 1989 and 1990, but very little difference in low inflation years, such as 1986 and 1995.[35]

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[34] The geometric mean is calculated as $\sqrt[n]{y_1 y_2 .. y_i .. y_n}$

[35] Recall the discussion about the reliability of the 1986 figure in section 2.3.2 of this chapter.

TABLE 2.7. CONSUMER PRICE INDEXES (OCT 1981, SEP 1983-95)

	1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
IBGE	2.4E9	1.2E8	3.4E8	1.1E7	2.2E7	8.5E7	6.5E6	8.5E5	2.8E3	0.165	3.317	100
IPEA	2.4E9	1.2E8	3.4E8	1.1E7	2.2E7	8.5E7	6.5E6	8.5E5	2.8E3	0.165	3.317	122
NERI	2.5E9	1.2E8	3.6E8	1.1E7	2.2E7	9.0E7	7.3E6	1.0E4	3.0E3	0.186	3.841	123

Notes: IBGE: official CPI; IPEA: adjusted CPI; NERI: geometric mean of adjusted CPI.
Source: Neri (1997).

TABLE 2.8. REAL INCOMES (1995 REAIS): INFLATION INDEXES COMPARED

	1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
IBGE	140	123	122	147	208	162	162	192	160	142	154	201
IPEA	140	123	122	147	208	162	162	192	160	142	154	165
NERI	136	117	117	140	207	154	144	163	150	128	134	166

Notes: IBGE: Real income estimates using official CPI; IPEA: Real income estimates using adjusted CPI; NERI: Real income estimates using geometric mean of adjusted CPI.
Source: Author's calculations from PNAD 1981-95.

2.4. Measuring Poverty, Inequality and Social Welfare

The final section of this chapter describes the key tools and techniques used in this thesis to define and measure poverty, inequality and social welfare. Each of these concepts – poverty, inequality and social welfare – can be defined in many different and different definitions may give rise to different estimates of the levels and changes in levels of poverty inequality and social welfare over time. Hence the first step of any attempt to measure each of these concepts must be to define exactly what is being measured. This sort of definitional problem arises in many aspects of economics and social policy: development economists argue over what is meant by "development", and thus what indicator(s) should be used to measure progress over time or to make comparisons across countries.[36]

However defined, each of these concepts - poverty, inequality and social welfare – are attempts to measure the level and distribution of well-being (or its negative in the case of poverty – ill-being) in a society. Inequality, poverty and welfare are often studied together, but these three concepts need to be thought of as distinct. Inequality is a broader concept than poverty in that it is defined over the whole distribution, not only the censored distribution of individuals or households below a certain poverty line, z. Incomes at the top and in the middle of the distribution may be just as important to perceptions and measures of inequality as those at the bottom, and indeed some measures of inequality are driven largely by incomes in the upper tail. Inequality is a much narrower concept than welfare. Although both of these capture the whole distribution of a given indicator, inequality is independent of the mean of the distribution (or at least this is a desirable property of an inequality measure as is discussed below) being concerned with the second moment, the dispersion, of the distribution. However these three concepts are closely related and are sometimes used in composite measures. Some poverty indices incorporate inequality in their definition:

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[36] Contrast the narrow approach of Robert Lucas and others who believe that as income is well-correlated with other aspects of development, such as infant mortality and life expectancy, and so that development can be measured by GNP or GDP, with that of Paul Streeten and others who argue that the link between income and human development is not "rigid" and therefore use of income alone provides a misleading picture of a country's level and progress in development (Lucas, 1988) and Streeten (1994).

for example Sen's poverty measure contains the Gini coefficient among the poor (Sen, 1976) and the Foster-Greer-Thorbecke measure with parameter $\alpha \geq 2$ weights income gaps from the poverty line convexly, so taking account of the distribution of incomes below the poverty line (Foster et al, 1984). Inequality may also appear as an argument in social welfare functions which are based on both the mean and the dispersion of a distribution of well-being. The approach adopted in this thesis is to use *income* as the indicator of an individual's level of well-being. This is because a) income at a country level and at a household level is reasonably well-correlated with other concepts of well-being,[37] b) because income can be constructed relatively easily at the individual and household level (unlike infant mortality or life expectancy for example), c) there are advantages in focussing on a single indicator of well-being rather than either several different indicators or a composite indicator; d) because income and income distributions lend themselves to the sort of statistical and econometric analysis used in this thesis more so than other concepts of well-being, and perhaps most importantly, e) income data in Brazil is superior in coverage and quality than other well-being indicator.

Social welfare is the broadest of the three concepts, seeking to capture the level of well-being of an individual, household or population. It is usually proxied in household survey studies by income or consumption, and the social welfare function conceptualised as a separable function of the distribution mean and the distribution dispersion or inequality. Measuring social welfare is closely related to measuring income poverty and income inequality. Poverty can be thought of as the negative of a welfare function, but over a censored distribution, i.e. below an income threshold or poverty line: a rise in poverty, everything else constant, would correspond to a fall in welfare. Poverty measures measure the welfare of those below the (arbitrary) poverty line. Inequality, like welfare, is measured over the whole distribution but is independent of the mean of the distribution. Section 4.1 discusses issues in measuring poverty, the

[37] The correlation coefficients between GDP per capita and private consumption per capita (as indicators of income) and infant mortality, adult literacy and life expectancy (broader indicators of a country's level of well-being) are in excess of ± 0.5 (see for example Ray, 1998, for estimates from samples of developing and transition countries)

choice of poverty line and poverty measure and making poverty comparisons. Section 4.2 discusses inequality measurement. Section 4.3 expands the discussion to social welfare and dominance criteria.

2.4.1. Measuring Poverty

There are two key issues in measuring poverty: identifying the poor themselves and then aggregating information on the poor into a single summary statistic (Sen, 1981).

2.4.1.1. Identification

Identifying the poor population requires specifying a poverty threshold, or a poverty line, which separates the poor from the non-poor. Using a relatively narrow concept of welfare such as income (more specifically gross monthly household income per capita) requires specifying a monetary poverty line, in the same currency units as the income data. The debate on the measurement of poverty includes views that poverty should be seen in relative terms and alternative views that poverty is a concept inherently distinct from inequality. For example, in the UK and some other European countries poor households are often defined as those whose equivalised income[38] is less than 40% (or some other percentage) of mean income (DSS, 1997, Mercader, 1996, Jäntti and Danziger, 2000). On the other hand, poor households in the US are identified using the cost of a basket of basic goods and services and an Engel[39] coefficient (Glennerster, 2000, Jäntti and Danziger, 2000). Hence poverty lines – the income or expenditure amount that separates the poor from the non-poor can take relative or absolute forms. Relative poverty lines take the form of some percentage of mean or median income, for example 40%, 50% or 60%. This type of poverty line is widely used in developed countries, especially for European comparisons, where the chief concern is over an individual's ability to participate in society rather than merely satisfy basic human needs for food, clothing and shelter. However, in developing countries, absolute poverty

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[38] Household income is usually divided by a household-specific number capturing size and composition: often just household size, although increasingly equivalence scales which give smaller weight to children, are used.

lines are usually more relevant and seek to capture the cost of survival. The distinguishing feature is related to the focus axiom of poverty analysis: for a given poverty line, measures of poverty satisfying this axiom do not change if there is no change in the incomes of the poor, regardless of what happens to the incomes of the non-poor. It follows immediately that the choice of a poverty line, which separates the poor from the non-poor, determines whether the focus axiom is met. Whichever type of poverty line is chosen, the level and nature of poverty can only be understood with reference to that line. As the discussion in Chapter 1 demonstrated, most studies of poverty in Brazil adopted an absolutist approach to poverty, by using the cost of a basket of goods or the value of the minimum wage. This thesis continues with this tradition, following Sen (1983), who argues for an "irreducible absolutist core in the idea of poverty"(p.159), and adopts an absolute poverty line approach. There are three main methods used to estimate absolute poverty lines.

1. The food energy method (FEM) specifies a minimum calorie requirement then determines the average level of income or consumption at which this minimum is typically met. Individuals with incomes below this level are assumed not to be meeting minimum calorie intakes and therefore to be poor.

2. The cost of basic needs (CBN) method sets a food-poverty line as the level just sufficient to buy a 'low-cost adequate diet'. Sometimes the food-poverty line is scaled up to incorporate other basic needs such as clothes and shelter using the inverse of the Engel coefficient (the share of food in total expenditure among poor households).

3. The purchasing-power-parity (PPP) method sets the poverty line at a minimum command over a 'global consumption bundle' – typically $1 (US) per person per day in constant purchasing power of 1985. This adjusts for differences across countries and times in purchasing power and exchange rates.

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[39] Engel's law states that the share of food in total expenditure defined as the Engel coefficient, rises with income, that is, richer individuals or households spend proportionately less (not necessarily absolutely less) on food than do poorer individuals or households.

The first of these methods has a number of problems. Firstly, recommended minimum calorie levels are themselves somewhat arbitrary and likely to vary by age, possibly by sex and certainly by type of activity. Urban calorie requirements are usually assumed to be lower than in rural areas, but this is probably not always the case given the physical nature of some urban jobs such as pulling rickshaws. Secondly, it ignores the possibility that households trade-off calories for other welfare-providing consumption goods, such as clothing and shelter, particularly in colder climates or seasons. Finally consumption of food is only a partial indicator of welfare: where food is relatively expensive, people will consume less of it relative to other goods, resulting in higher poverty lines even though consumers may be compensated by lower prices of other goods in their consumption bundle (Deaton, 1997). The second method is not without its drawbacks however. The CBN method requires detailed price data on a wide range of goods and services that form the basic consumption basket. Price data is difficult to collect and many developing countries only collect price data in urban areas. An application comparing the two methods in Indonesia has shown that higher food prices in urban areas and lower calorie requirements of more sedentary activities combine to raise urban poverty lines (the expenditure required to purchase a given number of calories) significantly above rural poverty lines with the apparent counter-intuitive conclusion that urban poverty is higher than rural poverty (Ravallion and Bidani, 1994). The third method of setting absolute poverty lines is useful for international comparisons, particularly when national poverty lines vary greatly, but less useful for conducting poverty analyses within a particular country.

The poverty analysis in this thesis uses a variant of the cost of basic needs method and uses a set of regionally specific poverty lines calculated by Sonia Rocha (see Rocha, 1993 and Rocha, 1997) for use with PNAD 1990 data. Rocha computed the minimum cost of food baskets required to attain the FAO recommended caloric requirements. Because of substantial differences across the country's regions - and within these regions, from metropolitan to other urban areas and then to rural areas - in both consumption patterns and prices, a food basket was calculated for each area

specifically.[40] The food costs for each area therefore respect not only price differences, but also differences in tastes and local food availability. The Engel coefficient (the share of food in total expenditure) was very unstable because of substantial relative price changes between food and non-food items during the decade to obtain the poverty line so Rocha estimated non-food expenditure amongst the poor directly for each separate metropolitan area.[41] The sum of the non-food expenditure amongst the poor and the cost of the basic food basket gives the set of regional poverty lines. The values of the regionally specific poverty lines, in 1995 Reais, for the relevant PNAD regions are reported in Table 2.8, which is converted from table XIII in Rocha (1993).

The poverty lines vary from a minimum of R32.28 in the rural areas of Region IV, to a maximum of R107.33 in the metropolitan region of São Paulo. Urban poverty lines are generally higher than rural poverty lines, with metropolitan lines being the highest. This reflects the higher cost of food in urban and metropolitan areas. Although the analysis in this thesis is based on just one set of poverty lines, a sensitivity exercise is conducted in Chapter 3 to check the robustness of poverty orderings to the level of the poverty line.

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[40] In fact, this was done for the nine metropolitan areas (Belém, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, Curitiba and Porto Alegre), as well as Brasília and Goiânia, using the 1987 expenditure survey - *Pesquisa de Orçamentos Familiares* (POF). For the other urban and rural areas, conversion factors were borrowed from an earlier work by Fava (1984), which were based on the most recent available data for these areas, the 1975 Estudo Nacional da Despesa Familiar (ENDEF). These were updated to 1995 prices using the INPC price index.

[41] The "poor" amongst whom Rocha computes non-food expenditures are those who, according to information recorded by the *Pesquisa de Orçamentos Familiares* (POF), were unable to meet *minimum* caloric requirements as specified by FAO.

TABLE 2.9. BRAZILIAN MONTHLY PER CAPITA POVERTY LINES, SEPT 1995 REAIS

PNAD Regions		Value
Region I	Metropolis of Rio de Janeiro	100.73
	Urban	62.45
	Rural	45.33
Region II	Metropolis of São Paulo	107.33
	Urban	67.62
	Rural	42.93
Region III	Metropolis of Curitiba	86.27
	Metropolis of Porto Alegre	59.89
	Urban	54.81
	Rural	36.54
Region IV	Metropolis of Belo Horizonte	82.78
	Urban	55.46
	Rural	32.28
Region V	Metropolis of Fortaleza	62.94
	Metropolis of Recife	83.79
	Metropolis of Salvador	96.19
	Urban	56.68
	Rural	34.01
Region VI	Brasilia	102.98
Region VII	Metropolis of Belem	58.36
	Urban	51.94
	Rural[1]	38.22
Region VIII	Goinia	97.86
	Urban	74.37
	Rural[1]	38.22

Notes:[1] The rural poverty line in Regions VII and VIII is the unweighted average of all other rural poverty lines.
Source: Rocha (1993, table XIII).

2.4.1.2. Aggregation

The second step in measuring poverty is to aggregate the information on the poverty status of each individual or household into one or more summary measures of poverty. There are many ways of aggregating this information and therefore many measures of poverty. Atkinson (1987), Foster et al (1984), Jäntti and Danziger (2000), and Lipton and Ravallion (1995) provide surveys. One way of choosing an appropriate set of poverty measures is to establish some desirable properties or axioms of poverty measures. The axiomatic approach is based on Sen (1976) who provides a number of

criteria by which to judge the usefulness of poverty measures.[42] Defining a vector of incomes (or other indicator of well-being) as $y=(y_1, y_2, y_3, y_n)$, the poverty line as z and a generic poverty measure as P, the following poverty axioms can be considered.

Anonymity: P is invariant to permutations of y.

Monotonicity: P is decreasing in y, for all $y_i<z$.

Transfers: a poorer-to-richer income transfer must increase P.

Transfer sensitivity: for a poorer-to-richer income transfer, the increase in P must be greater the poorer is the poor person.

Focus: P is independent of incomes y_i above z.

Additive decomposability: P is a (weighted) sum of sub-group k poverty, P_k.

One set of measures that is widely used is the parametric Foster-Greer-Thorbecke (FGT) class of poverty measures whose general formula can be expressed as:

$$P(\alpha) = \frac{1}{n}\sum_{i=i}^{k}\left(\frac{z-y_i}{z}\right)^{\alpha}$$

where y_i is the income of individual i, i=1....k poor individuals among a population of n individuals, z is the poverty line and α is a weight given to income gaps below the poverty line (Foster et al, 1984). The FGT class takes into account the "three *I*s" of poverty: incidence, intensity and inequality amongst the poor (Jenkins and Lambert, 1997). If $\alpha=0$ the formula simplifies to k/n, the headcount ratio or P_0, which measures the incidence of poverty. When $\alpha=1$ the measure becomes the poverty gap, P_1, and the difference between a poor person's income and the poverty line is used to weight the sum, therefore measuring the average shortfall of a poor person's income below the poverty line, or the incidence of poverty. When $\alpha=2$ the measure becomes the squared

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[42] Experiments recording attitudes to these poverty axioms have been conducted by Amiel and Cowell (1998) among others. Briefly, they find that there is little support for the monotonicity principle and that most people seem more concerned with absolute rather than relative poverty, i.e. the focus axiom.

poverty gap or P_2, which gives greater weight to larger gaps between a poor individual's income and the poverty line and so incorporates inequality among the poor. The FGT class of measures therefore can incorporate a degree of distributional sensitivity. Note that not all members of the FGT class of measures meet all of the axioms listed above. The Headcount ratio, for example, does not satisfy the monotonicity or the transfer principle and the poverty gap is not transfer sensitive. However they all satisfy the focus axiom, and for values of $\alpha \geq 2$ satisfy the transfer sensitivity axiom.

2.4.2. Measuring Inequality

Inequality means different things to different people: whether inequality should encapsulate ethical concepts such as the desirability of a particular system of rewards or simply mean differences in income is the subject of much debate.[43] In this thesis a narrow approach is adopted and inequality is conceptualised as the dispersion of a distribution, and in the Brazilian case, the distribution of income.

There are many ways of measuring inequality, all of which have some intuitive or mathematical appeal.[44] However many apparently sensible measures behave in perverse fashions. For example, the variance, which must be one of the simplest measures of inequality, is not independent of the income scale: simply doubling all incomes would register a quadrupling of the estimate of income inequality. Most people would argue that this is not a desirable property of an inequality measure and so it seems appropriate to confine the discussion to those that conform to a set of axioms. Even this however may result in some measures ranking distributions in different ways and so a complementary approach is to use stochastic dominance. There are five key axioms to consider.[45] Some notation is useful. Define a vector $\mathbf{y}$ of incomes, $y_1, y_2 \ldots y_i \ldots y_n$, $y_i \in \Re$, where n represents the number of units in the population (such as households, families,

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[43] See Atkinson (1983) for a brief summary.
[44] Cowell (1995) contains details of at least 12 summary measures of inequality.
[45] See Cowell (1985) on the axiomatic approach. Alternative axioms to those listed below are possible and the appropriateness of these axioms has been questioned. See Amiel (1998), Amiel and Cowell (1992, 1998), Harrison and Seidl (1994) amongst others for questionnaire experimental tests of the desirability of these axioms, and Cowell (1999), for an introduction to alternative approaches to inequality.

individuals or earners for example). Let $F(y)$ be the cumulative distribution function of y, and $I(y)$ an estimate of inequality.

2.4.2.1 Axioms of Inequality Measurement

The Pigou-Dalton Transfer Principle (Dalton, 1920, Pigou, 1912). This axiom requires the inequality measure to rise in response to a mean-preserving spread: an income transfer from a poor person to a richer person should register as a rise in inequality and an income transfer from a rich to a poorer person should register as a fall in inequality (see Atkinson, 1970, 1983, Cowell, 1985, Sen, 1973). Consider the vector $\mathbf{y}'$ which is a transformation of the vector $\mathbf{y}$ obtained by a transfer δ from y_j to y_i , where $y_i > y_j$, and $y_i + \delta < y_j - \delta$, then the transfer principle is satisfied iff $I(\mathbf{y}) > I(\mathbf{y}')$. Most measures in the literature, including the Generalised Entropy class, the Atkinson class and the Gini coefficient, satisfy this principle, with the main exception of the logarithmic variance and the variance of logarithms (see Cowell, 1995).

Income Scale Independence. This requires the inequality measure to be invariant to uniform proportional changes: if each individual's income changes by the same proportion (as happens say when changing currency unit) then inequality should not change. Hence for any scalar $\lambda > 0$, $I(\mathbf{y}) = I(\lambda \mathbf{y})$. Again most standard measures pass this test except the variance since $\text{var}(\lambda \mathbf{y}) = \lambda^2 \text{var}(\mathbf{y})$. This axiom is also sometimes applied to uniform absolute changes in income and combinations of the form $\lambda_1 \mathbf{y} + \lambda_2 \mathbf{1}$ (see Cowell, 1999).

Principle of Population (Dalton, 1920). The population principle requires inequality measures to be invariant to replications of the population: merging two identical distributions should not alter inequality. For any scalar $\lambda > 0$, $I(\mathbf{y}) = I(\mathbf{y}[\lambda])$, where $\mathbf{y}[\lambda]$ is a concatenation of the vector $\mathbf{y}$, λ times.

Anonymity. This axiom requires that the inequality measure be independent of any characteristics of individuals other than their income (or the welfare indicator whose distribution is being measured). Hence for any permutation $\mathbf{y}'$ of $\mathbf{y}$, $I(\mathbf{y}) = I(\mathbf{y}')$.

Decomposability. This requires overall inequality to be related consistently to constituent parts of the distribution, such as population sub-groups. For example if inequality is seen to rise amongst each sub-group of the population then it would be expected that inequality overall would also increase. Some measures, such as the Generalised Entropy class of measures, are easily decomposed and into intuitively appealingly components of within-group inequality and between-group inequality: $I_{total} = I_{within} + I_{between}$. Other measures, such as the Atkinson set of inequality measures, can be decomposed but the two components of within- and between-group inequality do not sum to total inequality, and there is a residual term. The Gini coefficient is only decomposable if the partitions are non-overlapping, that is the sub-groups of the population do not overlap in the vector of incomes.

It can be shown that any measure *I(y)* that satisfies all of these axioms is a member of the Generalised Entropy (GE) class of inequality measures, hence this thesis uses this set of measures. Given its popularity, the Gini coefficient is also calculated. See Cowell (1995) for a review of inequality measures, their formulae and properties.

2.4.2.2. Inequality Measures

Members of the Generalised Entropy class of measures have the general formula as follows:

$$GE(\alpha) = \frac{1}{(\alpha^2 - \alpha)} \sum_{i=1}^{n} \left(\bar{y} - y_i \right)^2$$

where n is the number of individuals in the sample, y_i is the income of individual i, $i \in (1, 2,...,n)$, and $\bar{y} = (1/n) \sum y_i$, the arithmetic mean income. The value of GE(α) ranges from 0 to ∞, with zero representing an equal distribution (all incomes identical) and higher values representing higher levels of inequality.[46] The parameter α in the GE class represents the weight given to distances between incomes at different parts of the income distribution, and can take any real value. For more negative values of α GE

becomes more sensitive to gaps between incomes in the lower tail of the distribution, and for more positive values GE becomes more sensitive to changes that affect the upper tail. The commonest values of α used are 0,1 and 2: hence a value of α=0 gives more weight to distances between incomes in the lower tail, α=1 applies equal weights across the distribution, while a value of α=2 gives proportionately more weight to gaps in the upper tail. The GE measures with parameters 0 and 1 become, with l'Hopital's rule, two of Theil's measures of inequality (Theil, 1967, 1979), the mean log deviation and the Theil index respectively, as follows:

$$GE(0) = \frac{1}{n}\sum_{i=1}^{n} \log \frac{y_i}{\bar{y}}$$

$$GE(1) = \frac{1}{n}\sum_{i=1}^{n} \frac{y_i}{\bar{y}} \log \frac{y_i}{\bar{y}}$$

With α=2 the GE measure becomes 1/2 the squared coefficient of variation, CV:

$$CV = \frac{1}{\bar{y}}\left[\frac{1}{n}\sum_{i=1}^{n}\left(y_i - \bar{y}\right)^2\right]^{1/2}$$

The Gini coefficient is defined as follows:

$$Gini = \frac{1}{2\, n^2 \bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| y_i - y_j \right|$$

The Gini coefficient takes on values between 0 and 1 with zero interpreted as no inequality and higher values indicate higher levels of inequality.[47]

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[46] In the presence of any zero income values GE(0) will always attain its maximum, ∞. Negative incomes restrict the choice of α to values greater than 1.

[47] Zero incomes pose no problem for the Gini. However it may take a negative value if mean income is negative or a value greater than 1 if there are some very large negative incomes (see Scott and Litchfield, 1994).

2.4.2.3. Decomposing Inequality Measures

Decomposability of inequality measures is desirable for both arithmetic and analytic reasons. Researchers and policy analysts may wish to assess the contribution to overall inequality of inequality within and between different sub-groups of the population, for example within and between workers in agricultural and industrial sectors, or urban and rural sectors. Decomposability of inequality measures allows the researcher and policy maker to understand both the structure and the dynamics of inequality. Inequality decomposition is a standard technique for examining the contribution to inequality of particular characteristics and can be used to assess income recipient characteristics and income package influences. Bourguignon (1979), Cowell (1980), Jenkins (1995) and Shorrocks (1982a, 1982b, 1984) provide full details on the methodologies and Deaton (1997) provides applications to developing countries.

Decomposition by population sub-group

The point of this decomposition is to separate total inequality in the distribution into a component of inequality between the chosen groups (I_b), and the remaining within-group inequality (I_w). Two types of decomposition are of interest: firstly the decomposition of the level of inequality in any one year, i.e a static decomposition, and secondly a decompsoition of the change in inequality level over a period of time, i.e. a dynamic decomposition.

The static decomposition. When total inequality, I, is decomposed by population subgroups, the Generalised Entropy class can be expressed as the sum of within-group inequality, I_w, and between group inequality, I_b. Within-group inequality I_w is defined as:

$$I_w = \sum_{j=1}^{k} w_j GE(\alpha)_j$$
$$w_j = v_j^{\alpha} f_j^{1-\alpha}$$

where f_j is the population share and v_j the income share of each partition j, j=1,2,..k. In practical terms the inequality of income within each sub-group is calculated and then

these are summed, using weights of population share, relative incomes or a combination of these two, depending on the particular measure used. Between-group inequality, I_b, is measured by assigning the mean income of each partition j, $\overline{y_j}$, to each member of the partition and calculating:

$$I_b = \frac{1}{\alpha^2 - \alpha}\left[\sum_{j=1}^{k} f_j \left(\frac{\overline{y_j}}{\overline{y}}\right)^{\alpha} - 1\right]$$

Cowell and Jenkins (1995) show that the within- and between-group components of inequality, defined as above, can be related to overall inequality in the simplest possible way: $I_b + I_w = I$. They then suggest an intuitive summary measure, R_b, of the amount of inequality explained by differences between groups with a particular characteristic or set of characteristics, $Rb = I_b / I$. Hence it can be concluded that x% of total inequality is "explained" by between group inequalities, and (100-x)% is explained by inequalities within groups. By increasing the number of partitions it is possible to account for the effect of a wider range of structural factors.

The dynamic decomposition. Accounting for changes in the level of inequality by population sub-group must entail at least two components: one caused by a change in inequality between the groups and one by a change in inequality within the groups. The second one is the "pure inequality" effect, but the first one can be further disaggregated into an effect due to changes in relative mean incomes between the subgroups - an "income effect" - and one due to changes in the size of the subgroups - an "allocation effect". Hence the change in total inequality can be decomposed into three components: an allocation effect arising from changes in the number of people within different sub-groups, an income effect arising from changes in relative incomes between sub-groups, and finally a pure inequality effect arising from changes in inequality within sub-groups (Mookerjee and Shorrocks, 1982). The arithmetic becomes complicated for some measures, so this is usually only applied to GE*(0)*, as follows:

$$\Delta GE(0) = \begin{bmatrix} \sum_{j=1}^{k} \overline{f_j} \Delta GE(0)_j \\ + \sum_{j=1}^{k} \overline{GE(0)_j} \Delta f + \sum_{j=1}^{k} \left[\overline{\lambda_j} - \overline{\log(\lambda_j)} \right] \Delta f_j \\ + \sum_{j=1}^{k} \left(\overline{v_j} - \overline{f_j} \right) \Delta \log(\mu(y)_j \end{bmatrix}$$

where y is income, Δ is the difference operator, λ_j is the mean income of group j relative to the overall mean, i.e. $\mu(y_j)/\mu(y)$ and the over-bar represents a simple average. The first term captures the pure inequality effect, the second and third term capture the allocation effect and the final term the income effect. By dividing both sides through by the initial value of GE(0), proportionate changes in inequality can be compared to proportionate changes in the individual effects.[48]

Decomposition by income source

Total income is usually made up of more than one source: earnings, private and public transfers etc and so it is useful to express total inequality I as the sum of factor contributions, where each contribution depends on the incomes from a given factor source, f, i.e.

$$I = \sum_f S_f$$

where S_f depends on incomes from source f. Factor income source f provides a disequalising effect if $S_f > 0$, and an equalising effect if $S_f < 0$. Now define

$$s_f \equiv \frac{S_f}{I}$$

so $\sum_f s_f = 1$. S_f is the absolute contribution of factor f to overall inequality, while s_f is the proportional factor contribution. The exact decomposition procedure way depends

[48] This is actually an approximation of the true decomposition, but both Mookherjee and Shorrocks (1982) and, later, Jenkins (1995) argue that for computational purposes this approximation is sufficient.

on the measure of inequality used, but whichever measure is used it must be decomposable and, given the large number of income sources, it must be defined for zero incomes. In practice the easiest measure to decompose in this way is GE(2). In that case:

$$S_f = s_f GE(2) = \rho_f \chi_f \sqrt{GE(2).GE(2)_f}$$

where ρ_f is the correlation between component f and total income and $\chi_f = \mu_f / \mu$ is f's factor share. A large value of S_f suggests that factor f is an important source of total inequality. For the dynamic decomposition we can write

$$\Delta GE(2) = GE(2)_{t+1} - GE(2)_t = \sum_f \Delta S_f = \sum_f \Delta\left[\rho_f \chi_f \sqrt{GE(2).E(2)_f}\right]$$

and proportionate inequality changes as

$$\%\Delta GE(2) = \Delta GE(2) / GE(2)_t = \sum_f s_f \%\Delta S_f$$

A large value of $s_f \%\Delta S_f$ suggests that changes in factor f have a large influence in changes in total inequality. See Jenkins (1995) for the complete methodology and an application to the UK.

2.4.3. Measuring Social Welfare: Stochastic Dominance

Social welfare is a broader concept than either poverty or inequality although can incorporate elements of both income levels and income distribution. Using a broader concept also helps to resolve cases where different inequality or poverty measures rank distributions differently, for example one measure may suggest that inequality has fallen between two years while another may suggest inequality has risen. This situation is possible simply because different measures have different levels of sensitivity to income gaps at different parts of the distribution, through the choice of α in either the FGT(α) class of poverty measures of the GE(α) of inequality measures. When rankings are ambiguous - when different inequality or poverty measures provide apparently

contradictory stories - stochastic dominance can be applied that also allow conclusions about social welfare to be drawn.

First it is useful to define social welfare in terms of a function of mean income and/or the inequality of income, i.e. $W(y)=W[\bar{y}, I(y)]$. Higher levels of mean income, $\bar{y}$, will indicate higher levels of social welfare whereas higher levels of income inequality will indicate lower levels of social welfare. In some cases, one effect may offset the other. There are four types of stochastic dominance techniques considered here.

First order stochastic dominance

Consider two income distributions y_1 and y_2 with cumulative distribution functions (CDFs) $F(y_1)$ and $F(y_2)$. If $F(y_1)$ lies nowhere above and at least somewhere below $F(y_2)$ then distribution y_1 displays first order stochastic dominance over distribution y_2: $F(y_1) \leq F(y_2)$ for all y. Hence in distribution y_1 there are fewer individuals with income less than a given income level than in distribution y_2, for all levels of income. We can express this in an alternative way using the inverse function $y=F^{-1}(p)$ where p is the share of the population with income less than a given income level: first order dominance is attained if $F_1^{-1}(p) \geq F_2^{-1}(p)$ for all p. The inverse function $F^{-1}(p)$ is known as a Pen's Parade (Pen, 1974) which simply plots quantiles of the distribution against cumulative population: ranking two distributions therefore requires comparing income quantiles.[49] The dominant distribution is that whose Parade lies nowhere below and at least somewhere above the other. First order stochastic dominance of distribution y_1 over y_2 implies that any social welfare function that is increasing in income, will record higher levels of welfare in distribution y_1 than in distribution y_2 (Saposnik, 1981, 1983). Figure 2.1 illustrates.

[49] The original Pen's Parades of Jan Pen were conceptualised by comparing the incomes of every individual in a population. The example that Pen gave was of lining up individuals in ascending order of income and re-scaling their heights to represent their income level. If these individuals were to be paraded past an observer she would typically see a large number of dwarves (poor people), eventually followed by individuals of average height (income) and finally followed by a small number of giants (very rich people). In practice some degree of aggregation is usually employed and quantiles are compared.

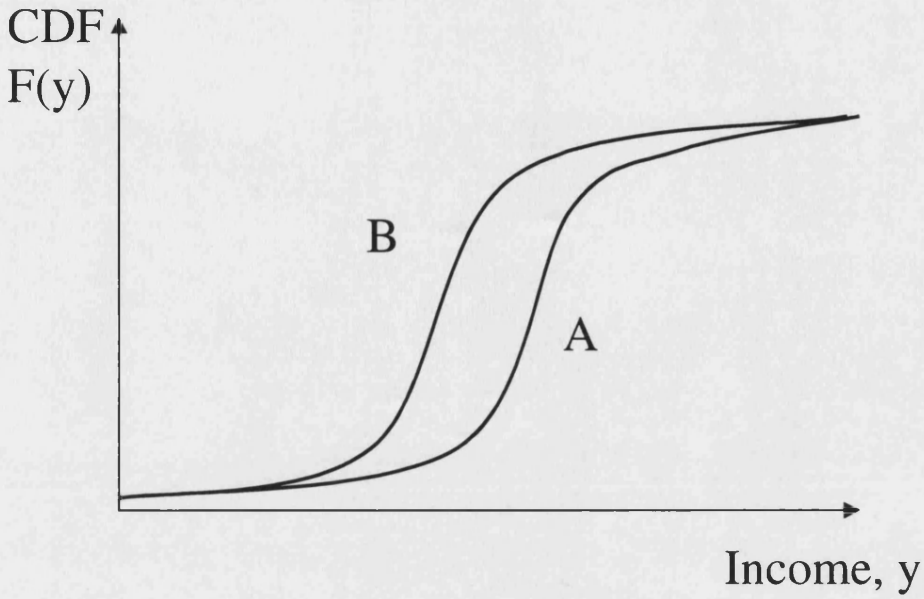

Figure 2.1. Distribution A displays 1st order dominance over distribution B if $F_A(y) \leq F_B(y)\ \forall y$

Second order stochastic dominance

Consider now the deficit functions (the integral of the CDF) of distributions y_1 and y_2: $G(y_{i,k}) = \int_0^{y_k} F(y_i)dy$ i=1,2. If the deficit function of distribution y_1 lies nowhere above and somewhere below that of distribution y_2, then distribution y_1 displays second order stochastic dominance over distribution y_2: $G(y_{1,k}) \leq G(y_{2,k})$ for all y_k. The dual of the deficit curve is the better known Generalised Lorenz curve (Shorrocks, 1983) defined as $GL(p) = \int_0^{y_k} ydF(y)$, which plots cumulative income shares scaled by the mean of the distribution against cumulative population, where the height of the curve at p is given by the mean of the distribution below p. Following Atkinson and Bourguignon (1989) and Howes (1993a), second order dominance established by comparisons of the deficit curves implies is implied by Generalised Lorenz dominance: $GL_1(p) \geq GL_2(p)$ for all p. Second order dominance of distribution y_1 over distribution y_2 implies that any social welfare function that is increasing and concave in income will record higher levels of welfare in y_1 than in y_2 (Shorrocks, 1983). It should now be apparent that second order

stochastic dominance is therefore implied by first order stochastic dominance, although not the reverse. Figure 2.2 illustrates the second-order dominance case.

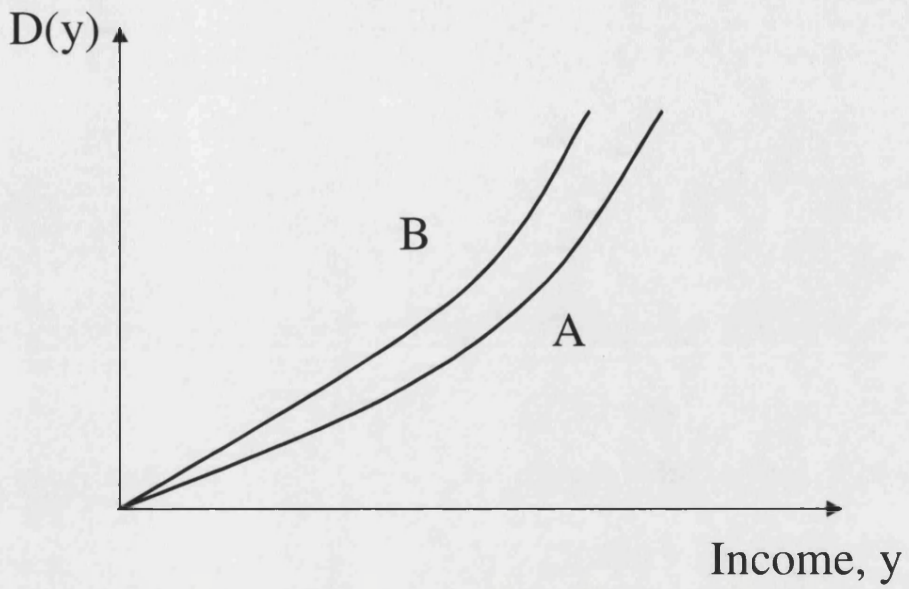

Figure 2.2. Distribution A displays 2nd order dominance over distribution B if $D_A(y) \leq D_B(y)\ \forall y$

Lorenz dominance[50]

In order to rank distributions in terms of inequality alone, or social welfare functions that are independent of the level of average incomes, a third concept (also known as Lorenz dominance) is applied. If the Lorenz curve, the plot of cumulative income shares against cumulative population shares, of distribution $\mathbf{y}_1$ lies nowhere below and at least somewhere above the Lorenz curve of distribution $\mathbf{y}_2$ then $\mathbf{y}_1$ Lorenz dominates $\mathbf{y}_2$. Any inequality measure which satisfies the Pigou-Dalton transfer principle will rank the two distributions in the same way as the Lorenz curves (Atkinson, 1970). Figure 2.3 shows Lorenz dominance.

[50] Lorenz dominance is soemtimes referred to as mean-normalised second order domiance, as it is independent of the mean of the distributions.

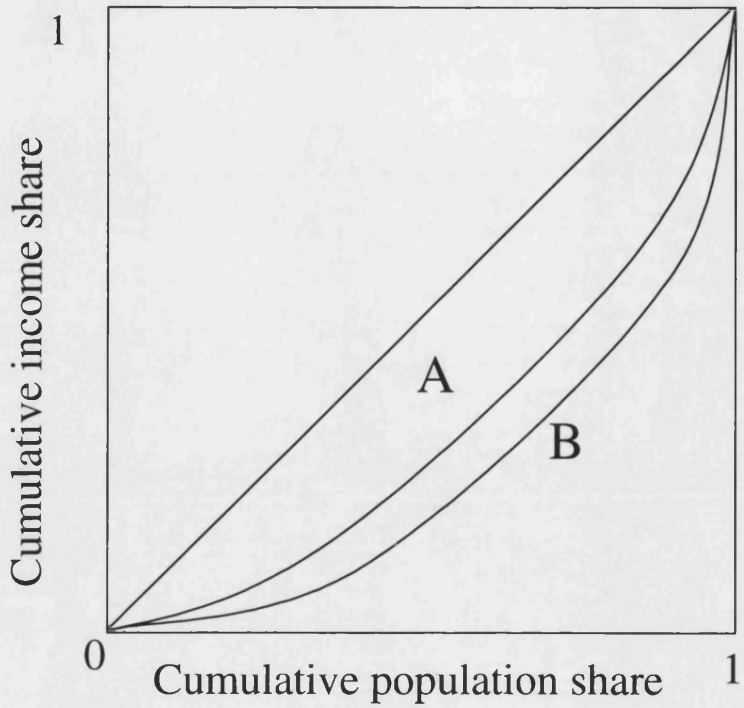

Figure 2.3 Distribution A displays Lorenz dominance over distribution B if $L_A \geq L_B$

Poverty dominance

Just as inequality estimates can give conflicting stories about the direction of change, different poverty estimates can also give ambiguous conclusions. It is possible for the headcount ratio to fall but the poverty gap to rise, if individuals close to the poverty line move above the poverty line leaving a smaller but on average poorer group below. In addition, poverty estimates can only be interpreted in the context of the poverty line used to identify the poor. Poverty lines are somewhat arbitrary and hence poverty estimates can be subject to criticism. Poverty estimates and comparisons over time may not be robust to the choice of poverty line. The dominance techniques described above can also be applied to poverty by testing whether poverty rankings are consistent for a range of poverty lines, $[z^-, z^+]$, where z^- is a lower poverty line and z^+ an upper poverty line. If within this poverty line range distribution A first order dominates distribution B then it is possible to conclude that any poverty measure that satisfies the focus axiom, for example all those in the FGT(α) class, will rank distribution A as having lower

poverty than distribution B. There are extensions to techniques of poverty dominance that are described and applied in Chapter 3.

2.5. CONCLUSIONS

Measuring poverty and inequality – just as any other quantitative exercise – requires a number of methodological decisions and in order for results to be accurately presented and interpreted a clear, transparent discussion of these issues is vital. This chapter has examined some of these technical issues in measuring levels and changes in incomes, poverty inequality and social welfare in Brazil. Data sources and comparability of income were examined, with the PNAD (*Pesquisa Nacional de Amostra do Domicilios*) being chosen as the most comprehensive, annually comparable and nationally representative source of data on incomes available. Incomes in the PNAD underestimate those derived from national accounts largely because of under-reporting of incomes, and displaying much more volatility than GDP per capita. However incomes derived from other surveys display a similar pattern over the period, both under-estimating GDP estimates and being more volatile. The definition of income adopted in this thesis is gross monthly household income per capita, distributed across all individuals, measured in 1995 Reais, deflated using an adjusted price index that takes into account difficulties in measuring price changes during periods of high inflation. Finally methods of measuring and comparing levels of poverty, inequality and social welfare are discussed with the FGT(α) class of poverty measures chosen to measure poverty, the GE(α) class of inequality measures chosen to measure inequality and dominance techniques used to measure changes in social welfare and robustness of poverty results to the choice of the poverty line.

CHAPTER 3. INEQUALITY, POVERTY AND SOCIAL WELFARE IN BRAZIL, 1981-1995

3.1.INTRODUCTION

This chapter presents a detailed analysis of the evolution of incomes, poverty, inequality and social welfare in Brazil between 1981 and 1995. The aim is to provide as clear a picture as possible of household incomes, levels and changes in inequality and poverty and make some broader welfare comparisons using recent developments in concepts and techniques of distributional analysis. In addition, a sensitivity analysis is conducted to measure the effect on inequality and poverty estimates of varying the equivalence scale. The aim is to complement and contribute further to the existing knowledge by providing a comprehensive picture of income distribution, inequality, poverty and social welfare for the whole period spanning 1981 to 1995, with an emphasis on changes within the period.

The chapter is organised as follows. Section 2 analyses the changes in the distribution of gross household income per capita, and presents results on incomes, summary measures of inequality and decile group mean incomes and income shares. Section 3 extends the analysis from summary statistics using dominance criteria and standard ranking tools, Pen's Parades, Lorenz and Generalised Lorenz curves, for looking at whole distributions. Section 4 contains the results on the evolution of poverty with three poverty indices for each year in the period, as well as the poverty mixed dominance comparisons. Section 5 tests the robustness of the conclusions to changes in the choice of equivalence scale. Section 6 concludes.

As described in Chapter 2 the data sets are the *Pesquisa Nacional por Amostra de Domicilios* (PNAD) for 1981-1995, produced by the *Insituto Brasileiro de Geografia e Estatistica* (IBGE). The definition of income throughout the main analysis is gross monthly household income per capita and the population is all individuals in the population. Monetary amounts are all expressed in 1995 Brazilian Reais.[51] The

[51] For reference, in 1995 , one real was equal to approximately 0.953 US dollars.

Brazilian *INPC* is used to convert nominal incomes into real incomes. For a more detailed description of the data set and methodology used to derive real estimates of income see Chapter 2.

3.2. INCOMES AND INEQUALITY

This section presents summary measures of income distribution and inequality results. Mean and median incomes are presented for each comparable year of the series along with four summary measures of inequality. These are the Gini coefficient and three members of the Generalised Entropy (GE) class of measures. The Generalised Entropy class of measures is chosen because its members satisfy all of the desired axioms of inequality measures described in Chapter 2. Whilst the Gini will only satisfy these principles under certain conditions it is included in the analysis to allow some degree of comparability with other studies. Their formulae are repeated here:

$$Gini = \frac{1}{2\,n^2\bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| y_i - y_j \right|$$

$$GE(\alpha) = \frac{1}{(\alpha^2 - \alpha)} \sum_{i=1}^{n} \left(\bar{y} - y_i \right)^2$$

where n is the number of individuals in the sample, y_i is gross per capita household income for individual i, $i = (1, 2,...,n)$, and $\bar{y} = (1/n)\,\Sigma y_i$, the arithmetic mean income. The parameter α in the Generalised Entropy class represents the weight given to distances between incomes at different parts of the income distribution. A value of α=0 gives more weight to distances between incomes in the lower tail, while a value of α=2 gives proportionately more weight to gaps in the upper tail. The Generalised Entropy measures with parameters 0 and 1 become, with l'Hopital's rule, Theil(L) and Theil(T), as follows:

$$GE(0) = \frac{1}{n} \sum_{i=1}^{n} \log \frac{y_i}{\bar{y}}$$

$$GE(1) = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\bar{y}}\log\frac{y_i}{\bar{y}}$$

With α=2 the Generalised Entropy measure becomes 1/2 the squared coefficient of variation.

Table 3.1 also shows the standard error of each estimate, estimated in STATA by bootstrapping with replacement over 200 replications. The entries in brackets are 95% confidence intervals. Inspection of the standard errors and the confidence intervals allows one to infer whether changes in inequality over time are statistically significant, which depends not just on the difference between two estimates but on the precision of the estimates.

There are two main features of the distribution, as shown in Table 3.1 below. The first is the difference between mean and median income. In each year, median income is only approximately half of mean income. This indicates that the distribution was extremely skewed to the right, with 50% of the population receiving incomes less than half of the arithmetic mean.

The second key feature of Table 3.1 is the growth in inequality over the period, as demonstrated by the four summary measures. Between 1981 and 1995, the Gini coefficient rose by 3%, GE (0) rose by 7%, GE (1) by 9% and GE(2) by just over 20%. This increase is statistically significant at the 5% (at least) for all measures of inequality, as shown by inspection of the standard errors and the 95% confidence intervals in Table 3.1.

However, this rise in inequality was not monotonic over the period. During the 1980s, the Gini coefficient increased by more than five percent, GE (0) and GE (1) both rose by 15%, and GE(2) doubled, while during the 1990s inequality fell, with all measures falling: the Gini by 3%, GE (0) and GE (1) each by around 6% and GE(2) by almost 20%. The larger proportionate changes in GE(2) during the 1980s suggest that the increase in inequality was driven by a relatively large increase in incomes in the upper tail. The increase in inequality between 1981 and 1990 is shown to be statistically significant for all inequality measures. Changes in inequality during the 1990s are

smaller and fairly similar across the four measures, but the slightly larger decline in GE(2) may be due to smaller proportionate gains in incomes at the top of the distribution. The decline in inequality between 1990 and 1995 is statistically significant only for the Gini coefficient and GE(0), despite the larger fall in GE(2) over the 1990s.

TABLE 3.1. BRAZIL 1981-1995: INCOMES AND SUMMARY MEASURES OF INEQUALITY

		1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
Mean income		136.2	117.3	116.8	139.8	206.7	154.1	144.1	162.6	149.8	128.2	134.2	165.9
Median income		71.4	59.6	59.8	69.0	106.7	78.0	68.6	73.0	72.2	69.3	67.8	81.4
Inequality													
Gini		0.574	0.584	0.577	0.589	0.581	0.592	0.609	0.617	0.606	0.573	0.595	0.59
	s.e.	0.0014	0.0021	0.0019	0.0016	0.0027	0.0024	0.002	0.0022	0.0022	0.0021	0.0017	0.0021
	CI	(0.571, 0.577)	(0.580, 0.588)	(0.573, 0.581)	(0.586, 0.592)	(0.575, 0.587)	(0.588, 0.597)	(0.606, 0.613)	(0.613, 0.622)	(0.601, 0.610)	(0.569, 0.577)	(0.592, 0.598)	(0.586, 0.594)
GE0		0.613	0.631	0.612	0.649	0.626	0.666	0.715	0.738	0.705	0.628	0.676	0.656
	s.e.	0.0034	0.0053	0.0061	0.004	0.006	0.0056	0.0053	0.0058	0.0058	0.0066	0.0089	0.0062
	CI	(0.605, 0.619)	(0.618, 0.644)	(0.599, 0.625)	(0.642, 0.657)	(0.614, 0.642)	(0.656, 0.679)	(0.795, 0.726)	(0.727, 0.748)	(0.691, 0.717)	(0.613, 0.643)	(0.656, 0.696)	(0.642, 0.670)
GE1		0.647	0.676	0.653	0.696	0.694	0.71	0.75	0.795	0.745	0.666	0.736	0.703
	s.e.	0.0048	0.0037	0.0043	0.0077	0.0177	0.0111	0.0076	0.0137	0.0119	0.0089	0.0112	0.0099
	CI	(0.637, 0.655)	(0.668, 0.684)	(0.644, 0.662)	(0.686, 0.711)	(0.664, 0.729)	(0.690, 0.734)	(0.736, 0.767)	(0.772, 0.825)	(0.722, 0.771)	(0.648, 0.684)	(0.713, 0.759)	(0.683, 0.723)
GE2		1.336	1.519	1.337	1.625	2.172	1.788	1.746	2.323	2.019	1.874	1.994	1.629
	s.e.	0.0287	0.0458	0.0344	0.0573	0.3922	0.1452	0.0487	0.2261	0.2523	0.0675	0.0986	0.0482
	CI	(1.282, 1.390)	(1.429, 1.609)	(1.276, 1.397)	(1.539, 1.783)	(1.605, 2.996)	(1.575, 2.203)	(1.665, 1.875)	(2.002, 2.748)	(1.591, 2.618)	(1.750, 1.998)	(1.813, 2.175)	(1.541, 1.717)

Notes: Incomes are gross monthly household income per capita per individual, expressed in real 1995 Reais. Each inequality measure has a boot-strapped standard error and an associated 95% confidence interval.
Source: Author's calculations from PNAD 1981-1995.

The summary statistics also shed some light on the relationship between the macro-economic cycle and the distribution of income. All four measures increased substantially during the recession of 1981-83, fell with the resumption of growth in 1984, and then resumed an upward trend, peaking in 1989, before declining until 1995. 1986 was an atypical year,[52] in that both the Theil indexes and the Gini fell, indicating falling inequality with respect to the bottom and the middle of the distribution. The sharp rise in GE(2) suggests a greater dispersion amongst higher incomes. These changes go against the general trend and are almost surely due to the redistributional effects of lower inflation brought about by the 1986 Cruzado Plan. This plan lowered inflation substantially, with a positive impact upon those least able to protect their incomes against imperfect indexation. In addition to lower inflation, the lower inequality amongst the relatively poor in 1986 may also reflect the accumulated effect of three years of growth. The fall in all four inequality measures in 1990, albeit to levels much higher than the decade average - and than any year up to 1987 - also coincides with a strong, if short-lived, reduction in inflation in the second and third quarters. Similarly the fall between 1993 and 1995 may also reflect the distributional benefits of lower inflation after the *Plano Real* of 1994.

The results contained in Table 3.1 provide some evidence on how different parts of the income distribution gained in different ways over time. Stronger support can be found by examining mean incomes per decile group (see Table 3.2).[53] First consider the changes over the whole period, 1981-1995. Overall mean incomes rose by just over 21% between 1981 and 1995, but not all groups shared equally in this rise in the average living standard. Mean incomes of all parts of the income distribution rose over the period but the gains accruing to each decile group rose with income level: the first decile group gained by only about 8%, while the top decile group gained by just over 26%. Hence all groups benefited from growth but not equally - the relatively large gains by the rich are reflected in the increase in inequality over the period as a whole. In the

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[52] Recall again the discussion relating to 1986 in Chapter 2 (section 2.3.2) where the estimate of mean income in 1986 is compared to that obtained by Cardosa et al (1995).

[53] Deciles were used for reporting income shares and means, whilst all graphs and dominance results were generated using percentiles.

sub-period 1981-1985 the bottom 60% saw a fall in mean income, with gains by the richer rising with income. Between 1985 and 1990 the poorest 40% continued to see a decline in mean income while incomes of the remaining 60% rose. During the next five years to 1995 all of the lower income groups saw a reverse in the decline and all incomes rose to above their 1981 levels. Here growth benefited everyone, and this time there was a progressive redistribution as lower income groups enjoyed larger proportionate gains than upper income groups. This supports the idea presented above that the larger decline in GE(2) may have been due to smaller proportionate gains by the rich.

A notable feature is the behaviour of mean incomes during the recession of 1981-1983, and the periods of low inflation in 1986 and 1995. All groups saw a decline in income between 1981 and 1983, with the poorest 10% and richest 10% losing approximately 13% of real income, while middle income groups lost around 16% of real income. The gains that accrued to all decile groups from 1985 to 1986 (i.e. the period when inflation fell dramatically) were almost completely eroded by 1987. By the end of the 1980s, the mean income of the poorest 40% had fallen to below 1981 levels, and only when inflation began to fall again after the 1994 *Plano Real* did real incomes recover to levels similar to the beginning of the 1980s.

TABLE 3.2. BRAZIL 1981-1995: MEAN INCOMES PER DECILE GROUP (1995 REAIS)

Decile	1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
1	13.3	11.6	12.0	12.9	19.9	13.0	10.7	11.9	11.6	10.5	10.6	14.3
2	25.1	21.0	21.9	24.3	37.2	25.3	21.9	24.1	22.8	22.9	22.7	28.3
3	35.7	29.6	30.5	34.6	53.8	37.2	32.5	35.0	33.9	34.0	33.5	41.3
4	47.9	39.6	40.5	46.8	71.5	51.0	44.5	47.9	46.5	46.6	45.5	56.0
5	62.2	51.6	52.2	60.8	93.2	67.8	59.6	64.4	62.9	60.8	59.6	74.1
6	80.6	67.2	68.0	80.0	121.6	89.5	79.2	86.7	83.0	79.2	77.5	94.5
7	106.4	89.9	90.1	106.7	159.8	119.1	106.2	118.2	111.9	102.8	100.0	125.2
8	146.4	125.9	124.5	148.4	219.2	164.7	148.5	169.6	158.1	138.6	137.6	174.3
9	225.8	198.8	193.6	231.7	338.7	255.3	237.0	267.1	250.6	210.1	214.6	272.1
10	613.9	541.2	533.6	654.5	952.8	722.3	698.2	803.8	719.1	575.8	640.6	779.1
Overall	136.2	117.3	116.8	139.8	206.7	154.1	144.1	162.6	149.8	128.2	134.2	165.9

Notes: Incomes are gross monthly household income per capita per individual, expressed in real 1995 Reais.
Source: Author's calculations from PNAD 1981-1995.

Further insight may be gained by focusing on the income shares of different deciles of the distribution. This abstracts from changes in the absolute income levels to look exclusively at inequality. Table 3.3 below shows shares of total income accruing to each decile. Between 1981 and 1995 the shares of total income for all except the richest 10% fell, with the lower income groups losing proportionately more than the richer groups. Between 1985 and 1990 the poorest 70% continued to lose their share of total income, so that by the end of the 1980s, the shares of all but the richest 20% fell, and these gained chiefly at the expense of the poorest groups. Between 1990 and 1995 there was some improvement for the majority of the population in the form of a progressive redistribution: income shares of all but the richest 30% rose. However the improvement was not enough to offset the losses of the 1980s so that by 1995, 90% of the population were worse off in relative terms than in 1981.

Again we see that the recession early in the decade led to an increase in inequality augmenting, as deciles 2 to 8 lost income share to deciles 9 and 10. Between 1983 and 1984, shares of deciles 1 to 7 rose at the expense of the top three deciles. This pattern was partly reversed in 1985 but between 1985 and 1986 the lowest eight deciles recovered some of their original share in total income. After 1986, there is a continuing deterioration of the distribution of income for three years, with 1989 recording the highest share for decile 10, and the lowest for deciles 2 to 7. There is some improvement in 1990 but it is still much worse than earlier in the decade. In 1990, all but the richest 20% were worse off than in 1981, in relative terms.

TABLE 3.3. BRAZIL 1981-1995: INCOME SHARES BY DECILE GROUP (%)

Decile	1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
1	0.97	0.99	1.03	0.92	0.96	0.84	0.70	0.73	0.77	0.82	0.79	0.86
2	1.85	1.78	1.88	1.73	1.80	1.64	1.52	1.48	1.52	1.78	1.69	1.71
3	2.63	2.51	2.61	2.48	2.60	2.41	2.26	2.15	2.26	2.65	2.50	2.49
4	3.53	3.37	3.47	3.33	3.46	3.30	3.09	2.94	3.10	3.63	3.39	3.38
5	4.59	4.39	4.48	4.35	4.51	4.39	4.14	3.95	4.19	4.74	4.44	4.46
6	5.94	5.71	5.83	5.71	5.88	5.79	5.50	5.32	5.53	6.18	5.78	5.70
7	7.84	7.64	7.72	7.62	7.73	7.71	7.38	7.25	7.46	8.02	7.45	7.54
8	10.78	10.70	10.67	10.59	10.60	10.66	10.35	10.41	10.54	10.82	10.25	10.51
9	16.64	16.90	16.59	16.54	16.38	16.52	16.48	16.40	16.70	16.40	15.99	16.40
10	45.23	46.00	45.72	46.73	46.08	46.74	48.54	49.35	47.93	44.94	47.73	46.95

Source: Author's calculations from PNAD 1981-1995.

It now becomes possible to assess the relative importance of growth and redistribution over the period. Gains by deciles 5 to 8 between 1981 and 1990, in terms of their mean incomes, can be attributed to economic growth rather than to redistribution: their income gains did not come about through receiving a larger share of the cake since we have seen that income shares declined. In relative terms, the top 20% of the distribution gained at the expense of the poorest 80%. In fact, despite growth in the overall mean, these inequality-augmenting redistributions caused the poorest 40% to lose out even in absolute terms. This is in line with the findings of Datt and Ravallion (1992), who use a parametric method to decompose changes in poverty into a growth and a redistribution component. Comparing Brazil's performance in the 1980s with that of India, they state that:

> "With Brazil's worsening distribution (from the point of view of the poor), far higher growth rates than those of the 1980s would have been needed to achieve the same impact on poverty as India attained" (p.294).

Hence the 1980s were a period characterised by worsening inequality and losses in real incomes for many of the poorest people in society. The term "lost decade" to summarise the lack of progress on welfare across Latin America in the 1980s is especially relevant for Brazil. The 1990s (at least the first half) see some progress, with declines in inequality after the *Plano Real* in 1994 and gains in real incomes across the whole income distribution. Table 3.4 below summarises very briefly the conclusions of the analysis of inequality and welfare.

TABLE 3.4. BRAZIL 1981-1995: WINNERS AND LOSERS (DECILE GROUPS)

	1981-1985		1985-1990		1990-1995		1981-1995	
	Winners	Losers	Winners	Losers	Winners	Losers	Winners	Losers
Absolute terms	7-10	1-6	5-10	1-4	1-10	None	1-10	None
Relative terms	10	1-9	9-10	1-8	1-7	8-10	10	1-9
Both	10	1-6	9-10	1-4	1-7	None	10	None

3.3. INCOME DISTRIBUTION AND SOCIAL WELFARE

Making welfare comparisons is somewhat more complex than comparing absolute and relative gains: depending on the arguments of the social welfare function, comparison of two distributions can lead to welfare improvements or declines. For example a welfare function defined solely on absolute real income levels would record an improvement if everyone's income increases whereas a welfare function defined on income shares will record the opposite result if incomes of richer groups have increased by proportionately more than incomes of poorer groups. By extension welfare functions can contain both an element of real income and income share. The objective of the remainder of this section is to incorporate the inequality and income trends into a broader framework of social welfare analysis.

So far the analysis has been conducted at a fairly aggregated level, with summary statistics and decile means and shares. Now a finer degree of analysis will be applied using ranking tools and dominance tests. Three types of ranking techniques will be used: Pen's Parades, Lorenz curves and Generalised Lorenz curves. These will be drawn using percentile level co-ordinates. The tests of statistically significant dominance will be applied to the complete income vectors to provide decisive evidence of the changes in inequality and welfare over time.

These three ranking techniques encapsulate three different approaches to welfare - income levels, income shares and a combination of the two. Pen's Parades plot quantiles of the distribution: ranking two distributions therefore requires comparing income quantiles. This is defined as establishing first order dominance. Lorenz curves plot cumulative income share against cumulative population share, and hence abstract from actual income levels: Lorenz dominane is sometimes known as mean-normalised second-order dominance as it is independent of the mean. If income shares are scaled by the overall mean then both average living standards and income shares are incorporated. Plotting this vector against cumulative population share gives a generalised Lorenz curve. Ranking two distributions establishes second-order dominance, hence Generalised Lorenz dominance.

An approximation to Pen's Parades is to plot percentiles for each of the years in the sample. Graphs for 1981, 1990 and 1995 are shown in Figure 3.1. The usefulness of this tool for comparisons of social welfare is that if the parade for year A lies nowhere below and at least at one point above the parade for year B, then social welfare is higher in A than in B for any social welfare function that is individualistic, additively separable and increasing in income. See Saposnik (1981, 1983) and Cowell (1995) for details and proofs of this theorem.

The striking feature of Figure 3.1 is that between 70 and 80% of the population in each year receive an income of less than the overall average income, and that incomes of the top percentile group are between 140 and 200 times the incomes of the poorest percentile. According to the Pen's Parades, welfare in 1990 is higher than in 1981 for the top 57% but lower for the poorest 43%. This reflects again the fact that growth in the 1980s, even if it was as high as the survey data suggests, did not benefit the poorest households in Brazil. Between 1981 and 1995 all but the poorest two percent of the population became better off.

Lorenz curves plot the cumulative share of income against the cumulative share of population, ranked in increasing order of income. Plots for 1981, 1990 and 1995 are shown in Figure 3.2. Lorenz dominance indicates that inequality is lower in the dominant distribution for any inequality measure that satisfies the Pigou-Dalton Transfer Principle (Atkinson, 1970). The Lorenz curves show that 50% of the population receive only around 15% of total income, and that inequality increased between 1981 and 1990, shown by the outward shift of the curves, and then fell slightly during the 1990s. The Lorenz curves confirm the picture of rising inequality over the period, with dominance of the 1981 curve over all those from 1985 onwards, except for 1992. The middle years of 1983, 1984 and 1985 dominate most or all subsequent years. Inequality was therefore unambiguously lower in the early stages of the decade than at almost any subsequent time.

Finally, the Generalised Lorenz curve plots the cumulative share of income scaled up by the distribution mean, against the cumulative share of population ranked in increasing order of income. Graphs for 1981, 1990 and 1995 are shown in Figure 3.3. Generalised

Lorenz dominance is diagrammatically analogous to Lorenz and indicates that social welfare is higher in the dominant distribution for any social welfare function that is individualistic, additively separable, increasing in income and strictly concave (Shorrocks, 1983). One consequence of Generalised Lorenz dominance is that if mean income in year A is higher than in year B then year A cannot be dominated: it does not necessarily follow that it will dominate year B however. In terms of Generalised Lorenz dominance, as for Pen's Parade dominance, the most remarkable feature is that 1986 G-dominates every other year in the sample. Since mean income in 1986 was higher than in any other year in the period, it clearly could not be dominated by them. But in fact, the mean was so high that 1986 not only G-dominates 1987, 1988, 1989 and 1990 (years in which mean incomes were lower and inequality was higher), it also dominates 1981 and 1984, when inequality was unambiguously lower, and 1983 and 1985, whose Lorenz curves it crossed.

Since there are twelve years of data, each of the three comparisons described above is possible for 66 pair-wise combinations. For each of them, four outcomes are possible: A may dominate B, B may dominate A, or the curves may cross or coincide. Table 3.5 below summarises all 198 possible dominance comparisons.

Let *i* be the row number, *j* the column number. Cell (i, j) has an L (G, P) if year i Lorenz (Generalised Lorenz, Pen's Parade) dominates year j. For example, if i = 1984 and j = 1983, the 1984 distribution Lorenz dominates that of 1983, i.e. inequality was unambiguously lower in 1984 than in 1983. A cell (i, j) may be empty of any of these three letters for two reasons: cell (j, i) may be full (i.e. the dominance is reversed), or the relevant curves for i and j may cross or coincide.

The distributions are initially compared at the percentile level of aggregation, and the entries in Table 3.5 thus refer to sample dominance at that level. This procedure is clearly statistical, in the sense that it is a comparison based on sample averages, and the inference of population dominance from the results should therefore be subject to a statistical test. One such test, based on a simple test of sample mean differences, is given by Howes, (1993a). Dominance over the complete distribution is rather a strict requirement, i.e. the curves must not cross anywhere. But we may be willing to rank

distributions on slightly less harsh criteria if the crossing occurs in one (or both) of the tails of the distributions, especially if there is reason to suspect that incomes in the tails are subject to measurement error. Using Howes's endogenous bounds method,[54] Table 3.5 indicates those percentile dominance results which were found to be statistically significant at the 5% level, for an unbroken range of 99% (*) or 100% (**) of the distribution, based on checking the complete disaggregated sample. Inspection of the table reveals that most dominance results obtained from a comparison at the percentile level of aggregation are found to be statistically significant when based on a comparison at the fully disaggregated sample level. This allows us to interpret the results as referring to the Brazilian population, in a much stricter dominance test than any previously applied to Brazilian data.

[54] So called because bounds are not pre-set by the analyst, rather two distibutions are compared and the maximum unbroken range for which one distributtion dominates the other is reported.

Figure 3.1. Brazil 1981-1995: Pen's Parades

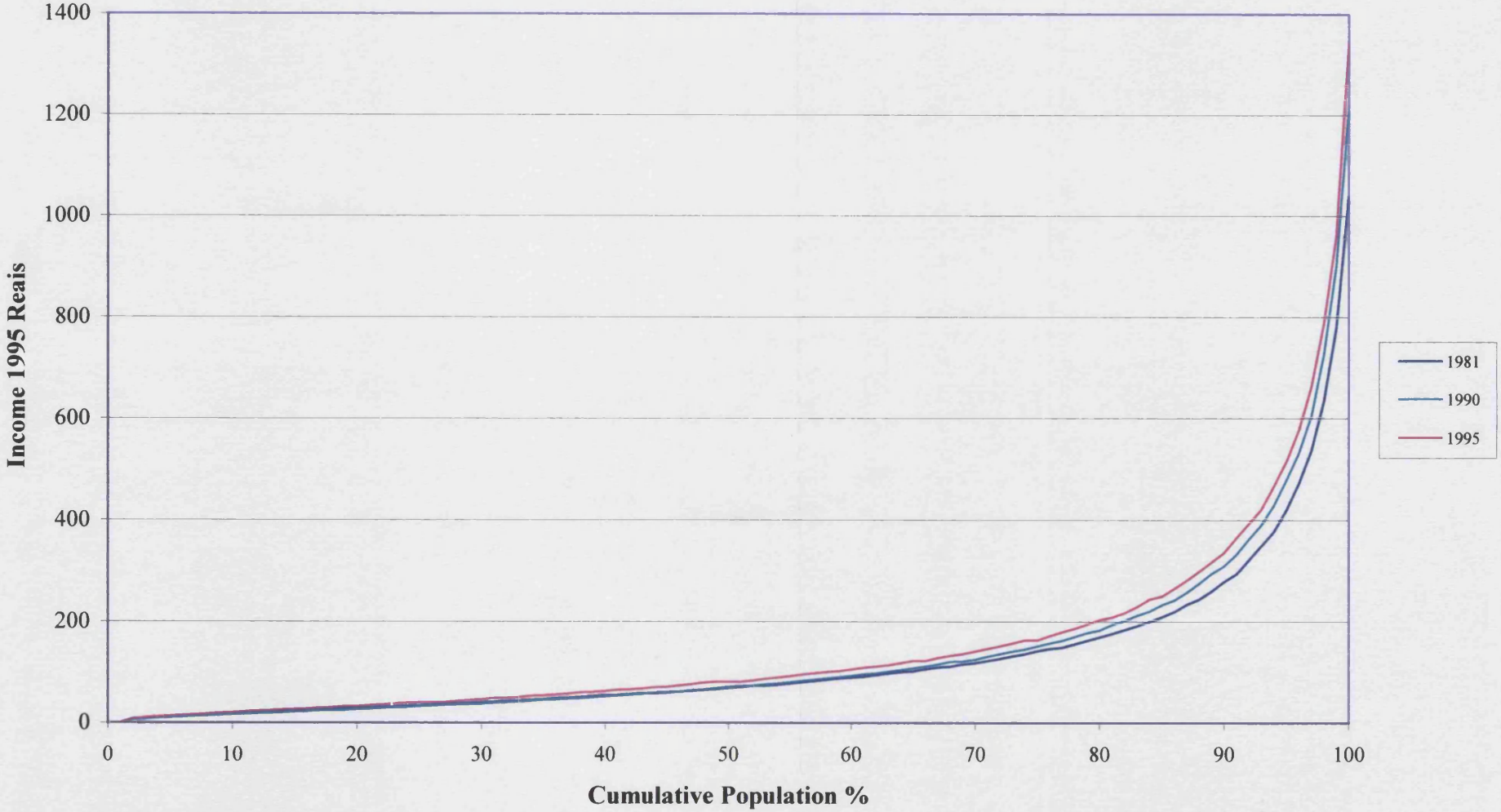

Figure 3.2. Brazil 1981-1995: Lorenz Curves

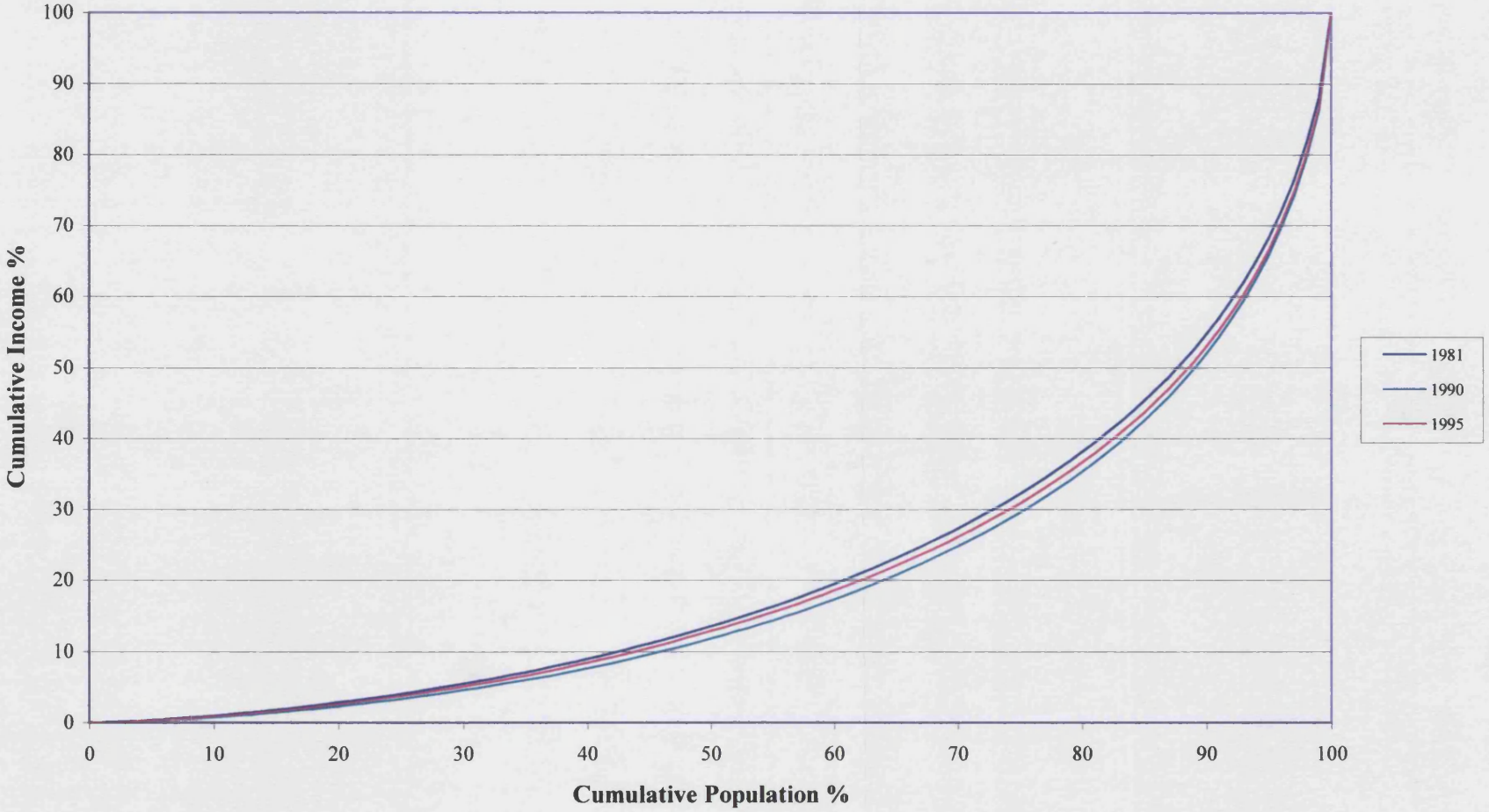

Figure 3.3. Brazil 1981-1995: Generalised Lorenz Curves

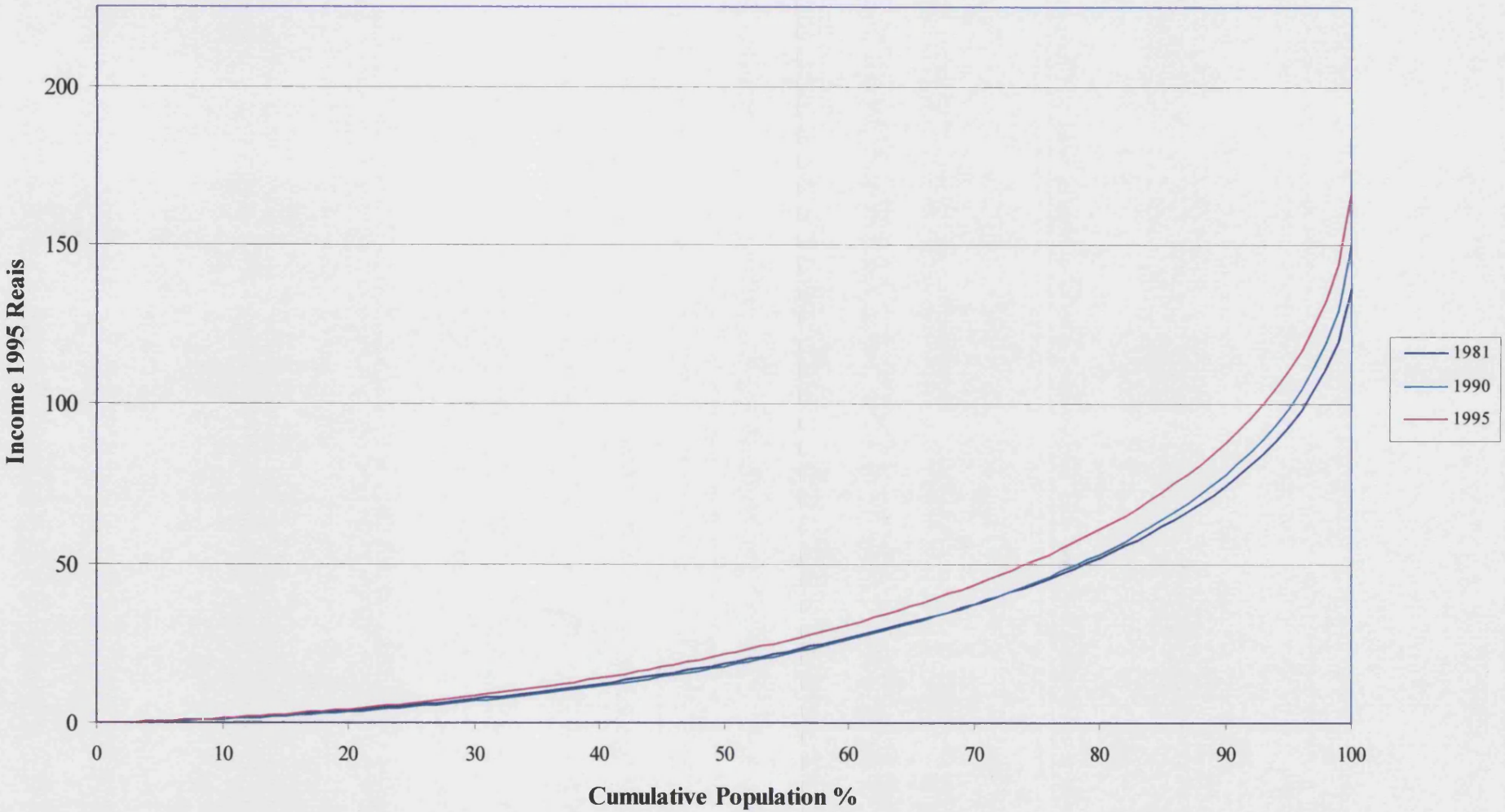

TABLE 3.5. BRAZIL 1981-1995: INEQUALITY AND WELFARE DOMINANCE

	1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
1981		G,P	G,P	L**	L	L**	L**	L**	L**	G	L,G	L
1983				L		L	L*	L**	L*		L	L
1984		L		L	L	L**	L**	L**	L**		L	L
1985							L**	L**	L**	G	G,P	
1986	G,P	G,P	G,P	G,P		L,G,P	L*,G,P	L**,G,P	L,G,P	G,P	L,G,P	L,G,P
1987							L*,G	L**	L,G	G,P	G,P	
1988												
1989							G,P			G	G,P	
1990							L,G,P	L**			G	
1992							L				L	
1993												
1995		G,P	G,P	G,P		G,P	L,G,P	L*,G	L*,G,P	G,P	L,G,P	

Notes. Cell (i, j) has an L (G, P) if year i Lorenz (Generalised Lorenz, Pen's Parade) dominates year j. Statistically significant differences at the 5% level are indicated by * if true for 99% of the distribution and ** for 100% of the distribution.
Source: Author's calculations from PNAD 1981-1995.

The two most remarkable features of the table are, first, that there are many cases of Lorenz (L) dominance but relatively few Generalised Lorenz (G) or Pen's Parade (P) dominance results, and secondly, that during the 1980s, Lorenz dominance results are heavily concentrated above the diagonal. The interpretation of the first observation is that there was a marked trend for increasing inequality in the decade. For example, 1988, 1989, 1990, 1993 and 1995 are all Lorenz dominated by every single year between 1981 and 1986. The interpretation of the second observation is that clear-cut welfare dominance results are much harder to find, since growth in mean reported income in the decade was offset by the increase in inequality, preventing social welfare from rising unambiguously for the aforementioned wide classes of social welfare functions. With the exception of 1986 when mean income was much higher than trend, 1995 is the only year that welfare dominates most of the earlier years. However, 1995 does not dominate 1981 in any sense. Although overall mean income and mean incomes per decile were higher in 1995 than in 1981, the Pen's Parades cross in the bottom 2% of the distribution and inequality was unambiguously higher in 1995 than in 1981.

In summary, inequality increased unambiguously during the 1980s, causing welfare (in terms of both absolute and relative incomes) amongst the poorest 40% of the population to decline, despite growth in the (reported) overall mean income. The bottom of the distribution experienced a temporary improvement in 1986. During the 1990s inequality fell slightly, with both growth and redistribution benefiting 70% of the population. However, despite the growth in incomes at all levels between 1981 and 1995, inequality was unambiguously higher in 1995 than in 1981.

3.4. POVERTY

Chapter 2 of this thesis justified the use of a set of absolute, rather than relative, poverty lines. The poverty analysis uses a set of regionally specific poverty lines calculated by Rocha (1993) for use with PNAD 1990 data, described in Chapter 2. The poverty lines are shown again here in Table 3.6.

TABLE 3.6. PER CAPITA POVERTY LINES, SEPT 1995 REAIS

PNAD's Regions		Value
Region I	Metropolis of Rio de Janeiro	100.73
	Urban	62.45
	Rural	45.33
Region II	Metropolis of São Paulo	107.33
	Urban	67.62
	Rural	42.93
Region III	Metropolis of Curitiba	86.27
	Metropolis of Porto Alegre	59.89
	Urban	54.81
	Rural	36.54
Region IV	Metropolis of Belo Horizonte	82.78
	Urban	55.46
	Rural	32.28
Region V	Metropolis of Fortaleza	62.94
	Metropolis of Recife	83.79
	Metropolis of Salvador	96.19
	Urban	56.68
	Rural	34.01
Region VI	Brasilia	102.98
Region VII	Metropolis of Belem	58.36
	Urban	51.94
	Rural[1]	38.22
Region VIII	Goinia	97.86
	Urban	74.37
	Rural[1]	38.22

Note:[1] The rural poverty line in Regions VII and VIII is the unweighted average of all other rural poverty lines.
Source: Rocha (1993).

Three measures were chosen to summarise poverty in each year, and changes in poverty during the decade. These indices can all be expressed as members of the parametric FGT(α) class and are the headcount index with α=0, the normalised poverty deficit with α=1 and the FGT2 measure with α=2:

$$P(\alpha) = \frac{1}{n}\sum_{i=1}^{k}\left[\frac{z - y_i}{z}\right]^{\alpha}$$

where n is the total population, k is the number of poor people in the population, z is the poverty line and y_i the income of individual i.

Poverty estimates using each measure, the boot-strapped standard errors of the estimates and 95% confidence intervals[55] are presented below in Table 3.7. Between 1981 and 1995 the proportion of people in poverty fell, the poor were on average less poor and inequality amongst the poor also fell. The fall in poverty is statistically significant at the 5% for all three poverty measures. However, given the results of the previous section - particularly the absolute fall in mean incomes for the bottom four decile groups - it is not surprising that poverty increased over the 1980s as a whole, even after adjusting for lower costs of consumption bundles in non-metropolitan areas. Between 1981 and 1990, a rise in poverty according to all measures is observed. The rise in the headcount index indicates that a slightly larger proportion (and because of population growth, more people in absolute numbers) of the population were poor by the end of the decade than in the beginning (although the rise is not statistically significant). In addition, the fact that the poverty gap grew by proportionately more than the headcount index (6% versus 1%) is evidence that the poor were, on average, further away from the poverty line. Finally, the 10% rise in FGT(2) suggests that incomes among the poor were also distributed more unequally. Both the increase in the poverty gap and the squared poverty gap are statistically significant. During the early 1990s poverty as indicated by all 3 measures continued to rise, peaking in 1993, but falling between 1993 and 1995 to a level below that of any other earlier year since 1981 (with the exception of 1986). The fall in poverty during the 1990s, (i.e. 1990 compared with 1995) is statistically significant, as is the fall in poverty for the whole period 1981-1995.

[55] Standard errors were calculated by boot-strapping from 200 replications with replacement and were used to calulate 95% confidence intervals.

TABLE 3.7. BRAZIL 1981-1995: POVERTY ESTIMATES

		1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
Headcount		0.445	0.553	0.52	0.457	0.296	0.417	0.439	0.403	0.450	0.461	0.471	0.377
	s.e.	0.002	0.0019	0.0019	0.0017	0.0024	0.0025	0.0024	0.0025	0.0024	0.0022	0.0022	0.0022
	CI	(0.441,	(0.550,	(0.517,	(0.453,	(0.290,	(0.412,	(0.434,	(0.399,	(0.445,	(0.457,	(0.466,	(0.372,
		0.449)	0.556)	0.523)	0.461)	0.302)	0.422)	0.444)	0.407)	0.455)	0.465)	0.476)	0.382)
Poverty Gap		0.187	0.235	0.232	0.195	0.109	0.178	0.194	0.177	0.199	0.208	0.213	0.156
	s.e.	0.001	0.0012	0.0011	0.001	0.0011	0.0014	0.0013	0.0009	0.0012	0.0014	0.0014	0.001
	CI	(0.185,	(0.233,	(0.230,	(0.193,	(0.107,	(0.175,	(0.191,	(0.175,	(0.196,	(0.206,	(0.211,	(0.154,
		0.189)	0.237)	0.234)	0.197)	0.111)	0.181)	0.197)	0.179)	0.202)	0.21)	0.215)	0.158)
FGT(2)		0.104	0.135	0.132	0.109	0.056	0.099	0.112	0.101	0.114	0.123	0.126	0.086
	s.e.	0.0007	0.0009	0.0008	0.0008	0.0007	0.001	0.0009	0.001	0.0009	0.0011	0.0011	0.001
	CI	(0.103,	(0.134,	(0.130,	(0.107,	(0.054,	(0.097,	(0.110,	(0.099,	(0.112,	(0.122,	(0.124,	(0.083,
		0.105)	0.136)	0.134)	0.111)	0.058)	0.101)	0.114)	0.103)	0.116)	0.124)	0.128)	0.089)

Notes: Poverty lines based on Rocha (1993).
Source: Author's calculations from PNAD 1981-1995.

Poverty appears to have behaved more (anti-) cyclically than inequality, with sharp increases during recession periods and substantial declines when growth resumed. All three measures indicate a sharp increase in poverty from 1981 to 1983, during the recession. Indeed, all of the measures have 1983 as their peak year for the whole period. All measures then declined monotonically until 1986, although until 1985 each was still above its 1981 level. The really sharp reductions in poverty came in 1986 and in 1995, as was to be expected from the previous welfare dominance results for that year. All three measures were at their minimum in 1986 and then, except for a temporary decline in 1989, rose until 1993, and then fell again between 1993 and 1995. Overall, the sharp increases in poverty during the early recession years, reinforced by the increases in the post-1986 inflationary period, more than offset the gains made in 1984-86 and again between 1993 and 1995. Hence it seems that the negative distributional impacts of recession and high inflation were greater than the gains that accrued when inflation fell, although a robust conclusion would require examination of longer periods of sustained low inflation.

The final issue to be considered in relation to changes in poverty is whether the patterns that are suggested in Table 3.7 hold for different poverty lines. Because estimates of poverty can vary enormously with different poverty lines, as the discussion of earlier studies of poverty in Brazil in Chapter 1 showed, it is important to test how well conclusions stand up to changes in the way the poor are identified. Testing for poverty mixed dominance, similar to the dominance analysis from section 3, will demonstrate whether poverty comparisons are robust to choice of poverty line. This technique was developed by Howes (1993b), as an extension of the application of second order dominance to poverty analysis by Atkinson (1987). Mixed dominance consists essentially of first defining lower and upper bounds, z^- and z^+, of the poverty line z, and checking for second order dominance from zero to the lowest poverty line, and first order dominance between the lowest and the highest poverty lines.

In deriving the dominance comparisons presented below, z^- was set equal to the lowest of the set of Rocha's lines, presented in Table 3.6 above (R32.28), and z^+ as the highest (R107.33), as these appeared to be natural bounds for a single nation-wide poverty study. Whereas in deriving the scalar measures reported in Table 3.7, regional

household income per capita vectors were compared with their specific poverty lines; in the dominance analysis, the national distribution is analysed as a whole, with the set of pertinent poverty lines ranging from z^- to z^+. The interval between the two is a large one, so that poverty mixed dominance in this analysis involves a stringent requirement of first order dominance over a large percentile range of the distributions.

First order dominance covers a very wide class of poverty measures, that only need to be decreasing in income and respect the focus axiom, but it is a very stringent test, requiring incomes at each point in the income distribution to be higher in the dominating distribution. First order dominance implies all subsequent higher order dominance but not the reverse and referring back to Table 3.5 reveals that there were indeed fewer cases of first order (or Pen's Parade dominance) than either second order or second order mean-normalised dominance. Second order dominance, used in Atkinson's (1987) paper which pioneered dominance analysis of poverty, is less demanding, but has one shortcoming. The class of functions it covers is much smaller, and it requires that poverty measures satisfy the transfer axiom throughout the distribution. This excludes the commonest of all poverty measures, the headcount index.

Howes (1993b) demonstrates that mixed dominance covers an intermediate class of functions, requiring that they be increasing with income and that they satisfy the focus and transfer axioms. Poverty mixed dominance would then imply that all poverty measures in this class rank poverty in the two distributions in the same way. Poverty mixed dominance of year i (e.g. 1981) over year j (e.g. 1983) signifies that poverty is higher in j than in i for all measures in the class, and for all poverty lines in (z^-, z^+). Therefore establishing poverty mixed dominance of one year over another proves that poverty is unambiguously lower in the dominating year for all poverty lines between z^- and z^+, i.e. R32.28 and R107.33, and for a very wide range of measures, including all those in the Foster-Greer-Thorbecke parametric family, including the headcount index.

In practice if a distribution displays both Pen's Parade dominance and Generalised dominance, then poverty mixed dominance follows. Where neither P nor G dominance can be established because the Pen's Parades or Generalised Lorenz curves cross,

poverty mixed dominance is possible if the crossing of the relevant curves occurred at an income level higher than z^+.

The poverty mixed dominance results are shown in Table 3.8, which is analogous to Table 3.5, but where D in cell (i, j) indicates that year i displays poverty mixed dominance over year j. The results confirm the thrust of the results inferred from the scalar measures. Its first striking feature is the dominance of 1986 over every other year in the sample, including 1995, indicating that poverty was unambiguously lower in 1986, for any choice of poverty line between R32.28 and R107.33 monthly gross income per capita. This is consistent with the much lower values for all three reported scalar poverty measures in that year, as well as with the welfare dominance results of Table 3.5. In fact, since 1986 displayed both G- and P-dominance over every other year, this result had to follow. The overall picture clearly confirms that the rapid growth in the years leading to and including 1986, combined with the dramatic reduction in inflation, had a substantial poverty reducing effect. The last year of the period, 1995, also dominates most other years, but not 1981. Even though all the estimates of poverty are lower in 1995 than in 1981, the result does not hold for the entire range of possible poverty lines between R32.28 and R107.33, because the Pen's Parades cross around the second percentile and hence first order dominance up to the lower poverty line is not satisfied.

Another way to look at Table 3.8 is to look for the years most often dominated i.e. those with most entries in their columns. These are years when poverty was most often unambiguously greater than at other times. The worst periods were the end of the 1980s and the 1983 recession, with a lagged effect lasting into 1984. Despite the stringent requirements embodied in the mixed dominance comparisons, 1986 dominated all subsequent years, and subsequent years, with the exception of 1995, often dominate later years.

TABLE 3.8. BRAZIL 1981-1995: POVERTY MIXED DOMINANCE

	1981	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1995
1981		D	D								D	
1983												
1984												
1985										D	D	
1986	D	D	D	D		D	D	D	D	D	D	D
1987							D		D	D	D	
1988												
1989							D		D		D	
1990												
1992												
1993												
1995		D	D	D		D	D	D	D	D	D	

Source: Author's calculations from PNAD 1981-1995.

The final observation is that poverty behaved anti-cyclically: it rose in the recession of 1983, fell following the resumption of growth in the mid-80s, and reached a pronounced minimum in 1986. Then it rose again, with 1988 and 1990 being the most often dominated years in the period. While all three measures in Table 3.7 suggest that poverty was higher in 1990 than in 1981, the fact that there was no dominance of 1981 over 1990 suggests that the poverty increase over the decade observed for a given poverty line was more ambiguous than the increase in inequality. Similarly the lack of poverty dominance of 1995 over 1981 provides a weaker picture than that of the unambiguous increase in inequality.

3.5. Sensitivity of Distributional Conclusions to Choice of Equivalence Scale

The analysis so far has been based on per capita household incomes, with each individual as the income recipient. Nevertheless, if the objective is a comparison of interpersonal levels of welfare, this approach clearly represents a strong assumption on household scale economies, namely that there are no economies of scale. Children generally have fewer needs than adults, large households probably have less waste in food, clothing etc and probably have economies in housing costs. Lanjouw and Ravallion (1995) and numerous other studies show that estimates of poverty and inequality are extremely sensitive to assumptions about differences in need and economies of scale within households

Whilst this is a fairly common assumption made in studies of poverty and inequality in Latin America, and other developing countries, it is at odds with best practice in distributional analysis for developed countries and now also a small but growing number of developing countries. The usual way of taking into account differences in needs and characteristics across households is through the adoption of an equivalence scale. Coulter, Cowell and Jenkins (1992a) review that "personal well-being", or equivalised income, y_i, can be seen conceptually as a function $y_i = f(x_i, \boldsymbol{p}_i, \boldsymbol{a}_i)$, where x denotes household money income, $\boldsymbol{p}$ is the relevant price vector, and $\boldsymbol{a}$ is a vector of household characteristics. Households are indexed i = 1,..., h. Equivalence scales,

usually denoted m_i, map money incomes x into equivalised incomes y, as follows: $y_i = x_i/m_i$, for each i = 1,..., h, where m_i is given as follows:

$$m_i = \frac{C(u, \underline{p}, \underline{a_i})}{C(u, \underline{p}, \underline{a_r})}$$

This equation is the ratio of two 'cost functions', where u is some common level of well-being or utility, the prices faced by different household types are assumed to be the same, and the household characteristics vary. The subscript r is for a reference household type.

There are a number of different approaches to estimate m_i, but all require detailed expenditure data, and such an exercise has not yet been conducted using the Brazilian expenditure survey. As this is not available a simple parametric class of equivalence scales given by $m_i = n_i^{\theta}$, where n_i is the size of household i (due to Buhmann et al, 1988) can, by appropriate choice of the parameter θ, proxy for most of the more complex scales. Equivalised income, y_i , is then calculated as $y_i = \frac{Y_i}{n_i^{\theta}}$, where Y_i is total income of household *i*. A value of θ=1 gives y_i=per capita income, i.e. zero economies of scale are assumed. A value of θ=0 gives y_i=household income, i.e. the assumption that economies of scale are so great that additional household members impose no additional costs.

This section follows Coulter, Cowell and Jenkins (1992a, b) in using this scale to discuss the sensitivity of the poverty and inequality measures presented above to changes in equivalence scale. This does not imply that household size is the only conceptually important family attribute to help determine differences in needs – the demographic composition (i.e. age and sex of household members) of the household may be just as or more important than the number of people in the household. However, in the absence of an econometrically estimated equivalence scale for Brazil, the Buhmann et al scale allows the behaviour of scalar inequality and poverty measures under very different assumptions about household scale economies to be investigated, simply by varying the parameter θ.

Following Coulter et al (1992b), the empirical results below take the form of values for a number of scalar poverty and inequality measures for five different values of θ (0.00; 0.25; 0.50; 0.75; 1.00). Results are presented in Figures 3.4 and 3.5 for the three inequality measures belonging to the Generalised Entropy class (G(0), G(1), and GE(2)) and three poverty measures (the headcount index, the poverty gap and FGT(2)). The variation of these poverty measures with θ is investigated for a relative poverty line equal to 84% of median income in each year.[56] This change is necessary because if a fixed absolute poverty line defined on a per capita basis was maintained, lowering theta to take account of household economies of scale would necessarily lower estimates of poverty, while varying both the poverty line facing each household and the vector of incomes with θ would lead to no change in poverty (Coulter et al, 1992b). It will be seen that the ranking using θ=1 for the equivalence scale analysis is slightly different to that in the main analysis because a different poverty line has to be used. The regionally-specific poverty lines based on Rocha (1993) rank 1995 as having lower poverty than 1981, but the relative poverty line used here for equivalence scale robustness ranks 1995 as having higher poverty than 1981. It will be recalled that the poverty dominance analysis suggested that the poverty rankings of 1981 and 1995 were not robust to the choice of poverty line.

These figures reveal that, for Brazil as for the United Kingdom, scalar measures of inequality and poverty are reasonably sensitive to the choice of equivalence scale. Four points deserve special mention. First, Figure 3.4 reveals that the trend of increasing inequality during the 1980s, shown first by the rise in scalar measures of inequality and then by the Lorenz dominance results of 1981 over later years, and the trend of falling inequality in the 1990s but not to levels below those of 1981, is robust to the choice of equivalence scale and, furthermore, that this robustness does not depend on the choice of particular scalar measure. For all four measures investigated, inequality was higher in 1995 than in 1981, higher in 1990 than in 1985 and 1981 and higher in 1985 than in

[56] In choosing a relative poverty line, the choice of proportion of the median is often arbitrary. In this instance, faithful to the absolutist core of poverty discussed in Section 4.1, a value (of 84%) was chosen to give the income earned by the percentile equal to the 1981 headcount, i.e the implied 'national average' poverty line.

1981, and for all values of theta. In this respect, it seems that the choice of per capita income ($\theta = 1$) as unit of analysis, in this and most other works on Brazil, does not affect conclusions regarding inequality trends over time.

Second, the analysis shows that for Brazil in the 1980s, all three inequality measures rose monotonically with theta. This suggests that if one is concerned with levels rather than trends of inequality, the choice of per capita income implies a choice for the upper bound of inequality values. In this respect, the choice of per capita income, assuming away all economies of scale within the household, seems to exaggerate the level of inequality. Since most researchers would probably agree that the marginal cost of an extra person in the household does decline, however moderately, within a normal range, future analysis of inequality levels in Brazil should address the issue of equivalence scales.

In addition, it is noteworthy that the monotonicity with which the indices vary with theta is at odds with the stylised U-shaped curve found by Coulter et al (1992b) for the UK and by Rodrigues (1993) for Portugal. Coulter et al (1992b) propose that the U-shaped curve observed in their data set is likely to be the result of the varying relative strengths of two effects: a concentration effect which should cause the index I to fall with θ when the correlation between household income and size is positive, and a re-ranking effect which could cause I to rise with θ. The Brazilian pictures suggest that the re-ranking effect might be outweighing the concentration effect over the entire range. One plausible reason for this is that the correlation between household size and income in Brazil[57] is likely to be much lower than in Europe, given the concentration of very large families amongst poorer households.

Turning to the robustness of poverty rankings, different measures seem to be more robust than others to the choice of equivalence scale. While the poverty gap and FGT(2) give consistent rankings of distributions, the headcount is very sensitive to the choice of

[57] The correlation coefficient between household size and household income in the PNAD sample was 0.033 in 1981, 0.004 in 1985, 0.007 in 1990 and 0.008 in 1995.

θ. [58] The headcount ranks the years, in ascending order of poverty, as 1995, 1981, 1990, 1985 with θ=0, but as 1985, 1981, 1995, 1990 with θ=1. [59] Inspection of Figure 3.5 shows that the estimates of the headcount are actually very close (i.e. within a few percent of each other) for different values of θ, and turn out not to be statistically significantly different. [60] Hence although the choice of equivalence scale, which did not affect the picture of inequality trends at all, does appear to matter for the study of poverty trends, at least for the headcount, it is plausible that the sensitivity arises from "noise" rather than any underlying shifts in the relationship between household income and household size among the poor.

Fourth, these poverty findings confirm the general conclusions of Coulter et al (1992b) as regards the widely different effects of varying the equivalence scale on poverty analysis for absolute poverty lines vis-a-vis relative poverty lines. For fixed, absolute poverty lines defined in terms of per capita income, a move to take account of household scale economies (i.e. lowering theta) is bound to lower any measure of poverty substantially. It is only when the poverty line itself is allowed to change in response to the change in the vector of equivalised incomes that the U-curve may arise. Indeed, as Figure 3.5 illustrates, when measuring poverty relative to a line defined as 84% of the contemporary median income, U-curves for the behaviour of two of the three poverty measures with respect to changes in theta are found.

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[58] Given the pattern of all poverty measures with respect to theta revealed by Figure 3.5, the value of the 1990 headcount for θ = 0 appears slightly suspect. The computations have been rechecked, and it seems to be correct.

[59] Note that one would not expect the ranking with θ=1 here to be the same as that shown by inspection of the headcount estimates for each year using the regionally-specific poverty lines of Rocha (1993) presented in Table 3.7. The analysis in this section uses instead a relative poverty line and recall that rankings of 1981 and 1995 were found to be not robust to choice of poverty line.

[60] Boot-strapped standard errors were calculated for 1981 and 1995 for each of the five values of θ, and although are small, generate overlapping 95% confidence intervals.

In conclusion, examining the sensitivity of poverty and inequality estimates to the choice of equivalence scales yields a number of interesting insights. Reassuringly, the inequality trends, which were quite marked both in terms of scalar measures for per capita income and in terms of Lorenz dominance, are robust to the choice of equivalence scales. However, choice of equivalence scale does substantially effect the level of inequality that is estimated and using per capita income results in estimates of inequality higher than for any other equivalised income. The second cautionary news is that using per capita income can lead to re-rankings for some poverty measures, if their values are not substantially different. However, although Brazilian data conforms to the stylised U-shaped curve of relative poverty when plotted against theta, this is not the case for any of the four inequality measures studied. A tentative suggestion is that this may be due to a much lower correlation between household income and size in Brazil than in other countries for which studies are available.

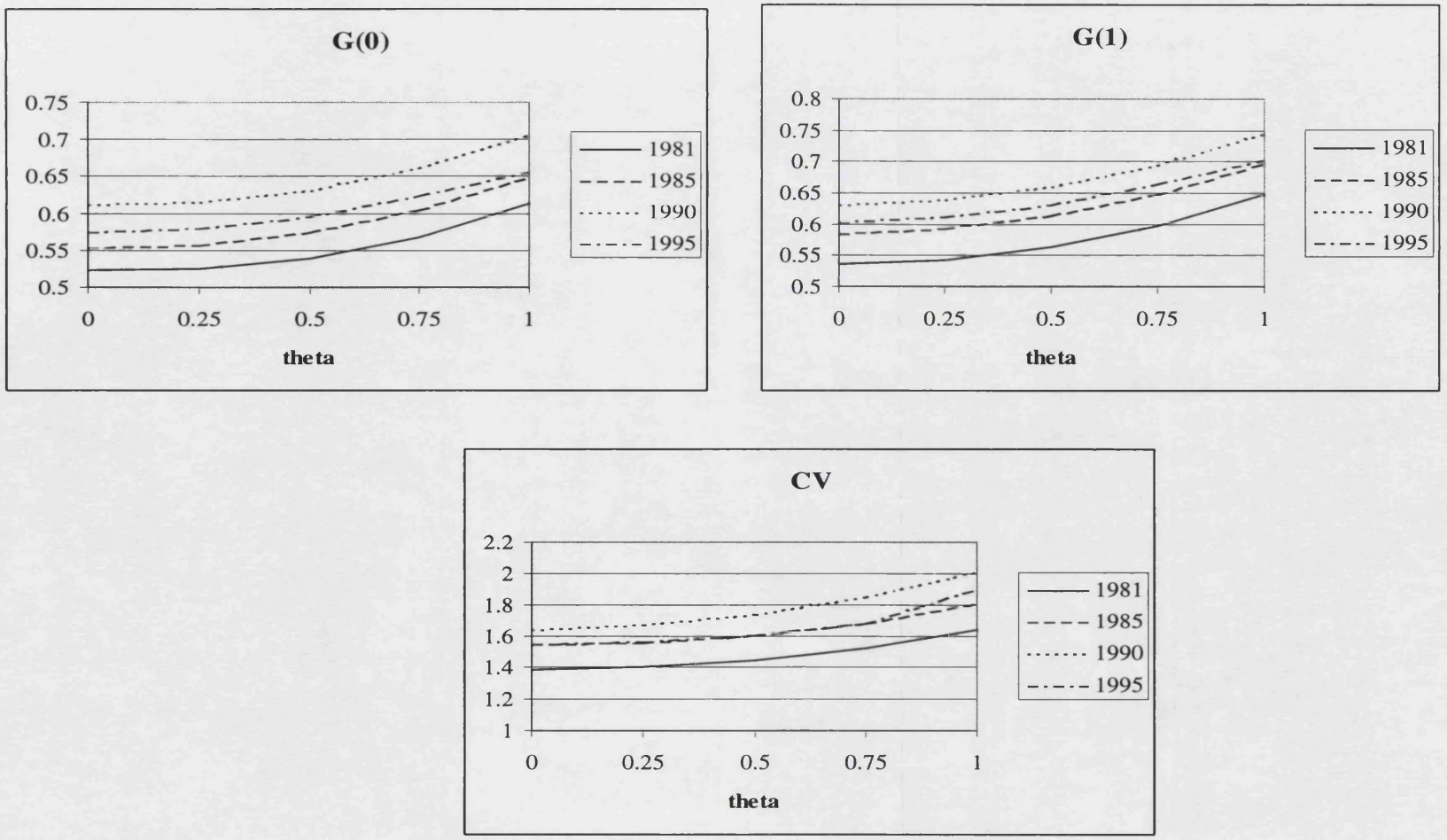

Figure 3.4. Brazil 1981-1995: Inequality and Equivalence Scales

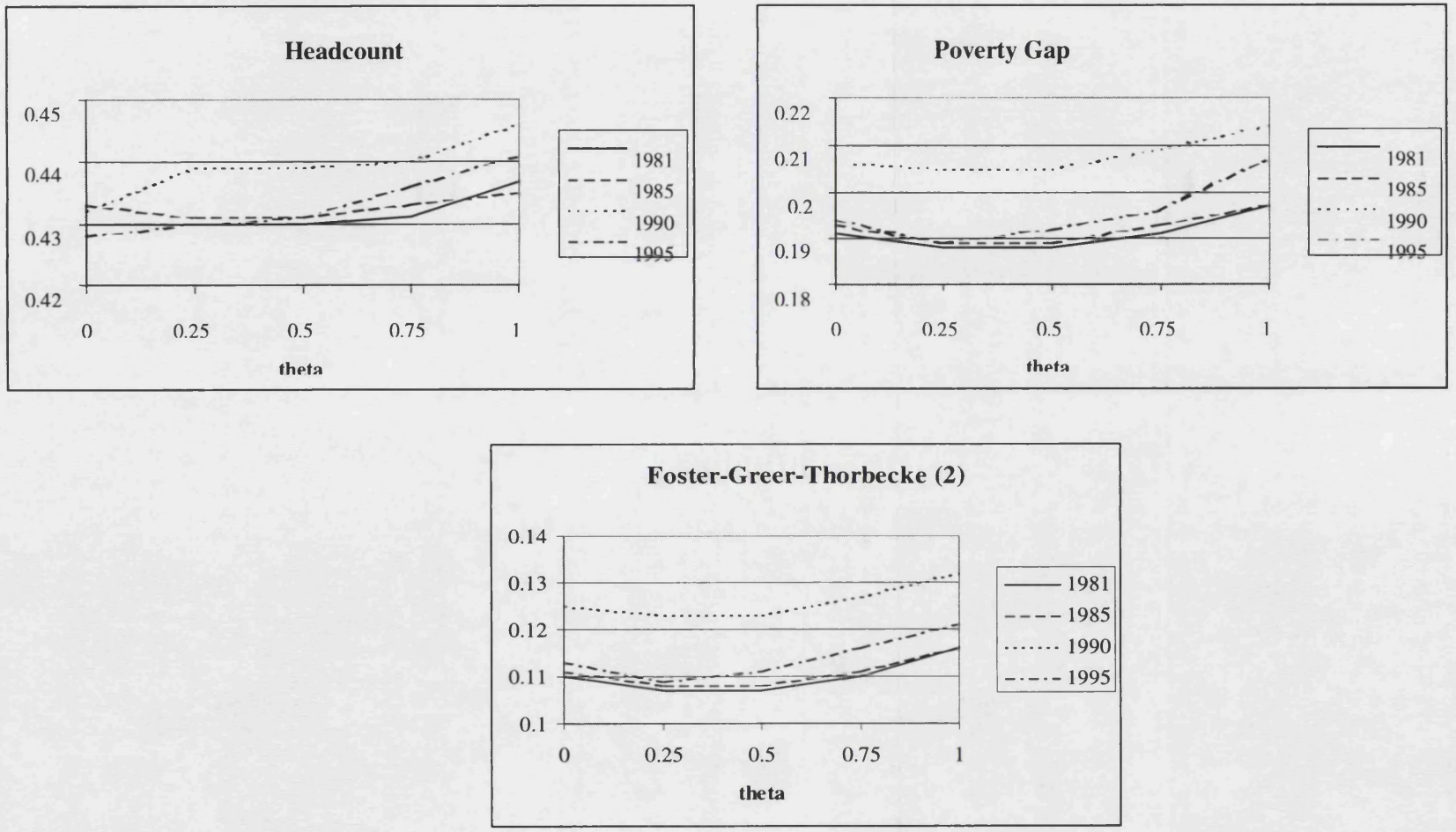

Figure 3.5. Brazil 1981-1995: Poverty and Equivalence Scales

3.6. CONCLUSIONS

This chapter has analysed the evolution of the distribution of income in Brazil during the 1980s and early 1990s, based on the PNAD data set. The main findings relate to inequality, poverty and social welfare.

Inequality increased unambiguously, although not monotonically, in Brazil during the period as a whole. This trend was evident from the evolution of scalar measures, whether they were more sensitive to the bottom (e.g. the Theil indexes), the middle (e.g. the Gini coefficient) or the top of the distribution (e.g. GE(2)). This rise in inequality was found to be statistically significant at the 5% level for all inequality measures. It was confirmed by an examination of decile shares, whence it was observed that the richest decile gained income share at the expense of the rest of the population. Furthermore, each Lorenz curve for 1981 through to 1987 dominates every Lorenz curve for 1988 through to 1990, and those of 1981 to 1984 dominate most other years until 1995. This implies that any inequality measure satisfying the Pigou-Dalton transfer principle would indicate a rise in inequality in Brazil from the beginning to the end of the period. Furthermore, this trend was found to be robust to the choice of equivalence scale. The trend was reversed somewhat in the mid-1990s: although inequality continued to rise between 1990 and 1993, there was a decline between 1993 and 1995. However inequality in 1995 was unambiguously higher than in 1981: all scalar measures were statistically significantly greater and the Lorenz curve for 1981 dominated that of 1995.

Poverty also increased during the 1980s, although its behaviour was characterised by wider fluctuations, and these appeared to be driven by the level of economic activity to a greater degree than in the case of inequality. All three measures of poverty rose substantially and statistically significantly with the recession of the early eighties, and fell with subsequent growth. 1986 displayed poverty mixed dominance over every other year in the period, but this result is subject to the qualifying remarks in Chapter 2 (see section 2.3.2). Poverty rose again with the return of inflation and the deceleration of growth after 1986, reaching peaks in 1988, 1990 and 1993. Although 1981 does not dominate 1990 according to the demanding criterion used, 1988, 1990, 1992 and 1993

were the years most often dominated by other years in the sample suggesting that poverty was higher at the end of the decade than in earlier years. Mean incomes were lower in 1990 than in 1981 for the bottom four decile groups, and 1990 had greater poverty than either 1981 or 1985, according to all measures for all tested values of the equivalence scale parameter theta, with only one exception. The growth in mean income in 1995 is reflected in the reduction of poverty that resulted in the lowest levels of poverty since 1986, and lower levels than in 1981, although this does not hold in the poverty dominance analysis. 1995 dominates most earlier years with the notable exception of 1981. Even though the scalar measures of poverty suggest that poverty was lower in 1995 than in 1981, this result relies on the choice of poverty line: for low poverty lines scalar measures would rank 1981 as having less poverty than 1995.

Whilst the focus was on inequality and poverty comparisons, some of the analysis lends itself to interpretation in terms of general social welfare. It can be stated that most social welfare functions would rank social welfare in Brazil as unambiguously lower in 1983 and 1984 than in 1981, or indeed in every other year in the whole period than in 1986. Although welfare in 1995 was consistently higher than in many other years of the period, welfare comparisons between the beginning and the end of the period of study are ambiguous. This ambiguity is due to the fact that growth in the overall mean reported income between 1981 and 1995 was offset by greater inequality. Between 1990 and 1995 the shares of some groups recovered but not to their 1981 level, so by 1995 all but the very richest were worse off in relative terms while all but the poorest were better off in absolute terms.

If the growth implied by the household survey data is exaggerated - as suggested by the picture of stagnation revealed by the national accounts data - then these welfare results are upper bounds: a smaller increase in mean income over the period would lead to a reduction in the perceived welfare-enhancing effect of growth. The poverty results would be similarly affected, with the trend just described possibly underestimating the increases in poverty during the decade. Even without a downward revision in the growth rates implicit in the PNAD data, however, the 1980s were a bad decade for equity in Brazil, with rises in both poverty and inequality. Recessions and high levels of inflation are clearly both bad for poverty and inequality: experience in 1986 and in 1995

suggests that distributional losses can be in part reversed by low inflation provides some guidance for policy makers.

The final section of the paper used a simple but intuitively appealing method of testing sensitivity of inequality and poverty estimates to one of the key methodological choices in distributional analysis: the choice of equivalence scale.

The results showed that the *levels* of both inequality and poverty in each year were very sensitive to the choice of equivalence scale. The per capita distribution produces estimates of inequality and poverty higher and substantially so in the inequality analysis than any other obtained through different assumptions of household economies. For the 1995 data GE(0) and GE(1), for example, increase by 16% and 20% respectively and when an assumption of complete economics of scale (θ=0) is replaced by no economics (θ=1). While the precise extent of economies of scale in Brazil remains the subject for future research it is plausible that they are not trivial. That being the case it would be appropriate to adopt an equivalence scale somewhere between the two extreme assumptions of complete and zero economics of scale, as has been done for some developed country comparisons, where a value of θ=0.5 is used to estimate equivalised income.[61]

However *trends* in inequality (but not poverty) do seem to be robust to the choice of equivalence scale, as shown by the non-crossing of the majority of curves in Figures 3.4. This suggests that there have not been any significant changes in the relationship between household income and household size during the period under consideration. This also suggests that if one is more interested in trends than in exact levels then choice of equivalence scale is less of an issue. This may well be the case for those interested in evaluating the effect on inequality of a particular policy initiative.

Poverty trends are less robust to choice of equivalence scale but this may be due to noise. While the poverty gap and squared poverty gap give consistent rankings of years for different choices of the parameter θ, trends in the headcount measure are very

[61] See for example Atkinson et al, 1995.

susceptible to the equivalence scale. This is probably because the estimates are not statistically significantly different from each other: the headcounts for $\theta=0$ range from 0.429 to 0.434, and for $\theta=1$ from 0.435 to 0.445. Hence one recommendation in the absence of an econometrically estimated equivalence scale would be to rely less on the headcount, which gives similar estimates of poverty for different assumptions about economies of scale, and more on other measures such as the poverty gap, which give rankings of poverty that appear to be more robust to the equivalence scale.

Hence it should be concluded that while inequality and poverty estimates based on per capita income, as in this thesis, are likely to be over-estimated, equivalence scale choice seems to make little difference to the ranking of distributions over time as long as one is prepared to disregard the headcount.

CHAPTER 4. THE STRUCTURE OF INEQUALITY IN BRAZIL, 1981-1995

4.1. INTRODUCTION

The aim of this chapter is to examine the relationship between structural factors and the distribution of income. These structural factors cover a range of household characteristics, including demographic and socio-economic characteristics such as age, education, sex, race and family composition, and geographic characteristics such as region and the urban or rural location of households, and the structure of household incomes. The central questions of this chapter are to discover which of these structural factors are most strongly linked to the income distribution and how much of the level and the change in the level of total inequality can be attributed to these factors. This will be explored using simple descriptive statistics on incomes, the income distribution within different population groups and the distribution of different sources of income. Standard inequality decomposition analysis will be applied to the estimates of inequality to assess the relative importance of within- and between-group differences and of different sources of incomes.

Section 2 of this chapter outlines why some of these structural factors - differences between income recipients and between income package - may be important in determining the distribution of income and presents some evidence from other studies; section 3 describes the technical issues involved in the analysis. Section 4 analyses the structure of inequality with reference to different household characteristics, and section 5 with reference to different income sources. Section 6 concludes.

4.2. BACKGROUND

Households and household incomes are diverse and complex. Households vary in size and composition, in the age of members and in their economic activities. Income sources are also diverse, with households receiving income from a variety of sources, including the labour market, the state and private investments. Hence it has become common practice to approach the analysis of the distribution of household income by considering the heterogeneity of households -the income recipients -, and the heterogeneity of income sources - the income package - in separate analyses (see for

example, Jenkins, 1995). This thesis follows the same approach, examining first heterogeneity of households and second heterogeneity of incomes.

Several theories of income distribution provide a rationale for investigating personal characteristics of households and their members. Human capital theories stress the role of education, age and experience in models where individuals maximise utility over the life-cycle by the optimal choice of investments in human capital (Becker, 1965; Mincer, 1958). Other theories incorporate market imperfections. Labour market segmentation and dual economy models use personal characteristics such as education, sex or geographic location, either as examples of signals which lead to discrimination, or as institutional barriers that prevent access to or mobility between different labour market segments (e.g. Becker, 1957; Lewis, 1954, Cain, 1986).

There is also some empirical support for such partitions, from studies using regression analysis, inequality decomposition or analysis of variance techniques. For example Cowell and Jenkins (1995) show that individual characteristics such as age, race, sex and the presence of one or more earners in the household together explain around 25-30% of total inequality in the United States. A survey of inequality decompositions in developing countries shows that personal attributes, such as age, sex and education can account for similar proportions of income inequality (Fields, 1980). However it is unlikely that total inequality will ever be fully explained by between group differences, because inequality within even quite narrowly defined groups is still high.

4.2.1 Demographics

Demographics and changes in the demographic structure of the population are usually prime candidates for explaining levels and changes in the income distribution. The discussion of the structure of poverty and inequality in Chapter 1 identified from a survey of the literature at least three demographic factors that may be important in explaining the level of inequality and how it has changed over time: age, household structure and sex. It was hypothesised there that age of the household head was unlikely to provide much power in explaining the level of inequality. Decompositions of *individual* income inequality by age of individual (in a sub-sample of economically active, urban males) showed that differences between age-groups were significant

determinants of inequality (Bonelli and Ramos, 1995). However it is not clear whether in a decomposition exercise of household income inequality that age will be a significant factor, and this would suggest that another "family age" variable might be more relevant. Drawing on the literature of the domestic cycle of households (Fortes, 1970, and Tanner, 1987) and standard practice in studies of UK inequality to examine household types (DSS, 1997, Jenkins, 1995), a classification of households is developed and applied. It is hypothesised that this family age or family type variable will provide greater insight into the structure of inequality than the more simplistic age of household head. Finally, sex is often put forward as a candidate for explaining inequality. In Brazil in 1989 20.8% of households in the lowest quintile group were headed by women, compared to 17.4% in the top quintile group. There is some evidence that Brazilian women are discriminated against in the labour market: Birdsall and Fox (1985) showed that female teachers earned significantly less than their male colleagues, after controlling for factors such as area, age and years of experience. However, just as in the case of age of household head, sex of head may not be a significant determinant of inequality. This is not because gender is irrelevant but because it is hypothesised that female headed households are too heterogeneous a group to make conclusions about the relationship between gender and inequality when only the sex of household head is analysed and when the definition of household head is not based on economic circumstances.

A final demographic characteristic that may be related to income distribution is race or ethnicity. Woods and Carvalho (1988) find that ethnic variations in income and also basic needs indicators, such as life expectancy at birth, infant mortality rates, educational attainment and access to household utilities, are significant. Indigenous populations across Latin America have been found to have higher than average poverty rates, lower incomes relative to national average (or even rural averages where they are more likely to be located) and that these remain even after controlling for other factors such as education (López and Valdés, 2000, Psacharopoulus and Patrinos, 1993, Wodon, 1999). However, identifying race or ethnicity is difficult. Distinguishing "indigenous" people from "non-indigenous" people can be difficult, as different definitions may be used, such as language and class. Psacharopoulus and Patrinos (1993) and Wodon (1999) use a fairly common definition of language, where

individuals are identified as indigenous if their mother tongue is an indigenous language.[62] The issue is doubly complicated in the Brazilian data sets because ethnicity is defined according to a combination of language and colour. Brazilians of (predominantly) Japanese and Korean origin are defined literally as "yellow" in the datasets, indigenous people by language and the remainder as white, black or mixed race. Despite this complication, and the assumption that the race of the head is assumed to be the same as the rest of the household, it is hypothesised that race will be an important factor in explaining the level of inequality.

4.2.2. Education and Schooling

Another important structural factor is education.[63] Brazil has low educational attainment levels, especially when compared with other Latin American countries: Chile and Argentina both have a national average of just over 8 years of schooling, compared to 5 years in Brazil. The distribution of schooling is also very unequal, certainly more than in other Latin American countries. Adults in the bottom quintile group have an average of 2.1 years of schooling compared to nearly 9 years in the top quintile group. Literacy rates are also much lower amongst low-income households and children of low-income households are also more likely to miss school than their peers in upper income groups (Psacharopoulos et al, 1993). Several studies highlight education as one of the most significant personal attributes in the determination of the income distribution (see Bonelli and Ramos, 1995, Fishlow, 1972, Lam and Schoeni, 1993, and Langoni, 1973, 1974, Wodon, 1999). Bonelli and Ramos (1995) decompose inequality using a similar set of partitions to that considered here and with a similar methodology, but only consider economically active, urban males between the ages of 18 and 65, working for more than 20 hours a week. Here the education of the household head will be used, which is taken to be a proxy for the general level of education of the household. It is not clear whether education will be a more or less important factor in determining inequality, when only the

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[62] However, Korzeniewicz (2000) argues that economic activity is also important, and that indigenous people might be regarded as *mestizos* if they become more involved in market activity, and *mestizos* regarded as indigenous if they move from rural areas to towns and cities.

[63] Whilst it is possible to draw some inferences about the direction of causality between *fixed* attributes such as sex or race, and incomes, it is more difficult to do so between *variable* attributes, such as education, and incomes.

education of the head is used and when the sample is representative of the entire Brazilian population.

4.2.3. Geographic Location

Partitioning the sample by demographic factors and education are ways of identifying characteristics of income recipients. A different sort of income recipient characteristic is geographic location. Models of development often adopt a dualist approach with a modern, growing urban sector, and a traditional, more backward rural sector (Kuznets, 1955; Harris and Todaro, 1970). Industrialisation in Brazil has been heavily concentrated in the South and Southeast regions, while agriculture remains the predominant activity of the poorer Northeast. In more recent years, the Service sector has expanded dramatically in the South and Southeast (Thomas, 1996). Differences between urban and rural areas in Latin America are also strong, and the rural population is generally poorer, less well educated, and has worse access to basic utilities and services (Valdés, 2000). Differences in incomes between regions and between rural and urban areas may be responsible for the level of inequality in Brazil, and if these differences have narrowed or widened over time, then they may be responsible for the change in inequality.

4.2.4. Sources of Income

Just as households can be very heterogeneous so can be the sources of income that they receive. Households in developing countries often have incomes from several different sources, perhaps from more than one job, one or more of which may be in the informal sector and paid in kind rather than in cash. Remittances from family members tend to be more significant in developing countries, as a proportion of household income, whereas generally state transfers are less important. Some households, most likely richer households, will also receive income from capital. It is possible that the level of overall inequality is due to the inequality in the distribution of individual components of total income, and that some sources of income are more equal than others. Analyses of the structure of income inequality in developed countries have examined the contribution to overall household inequality of different sources of incomes, including earnings, and found that earnings are the major source of both incomes and income inequality

(Jenkins, 1995, Rodrigues, 1993). Studies of wages and earnings in Brazil demonstrate that the earnings are distributed very unequally (Almeida Reis et al, 1991, Amadeo et al, 1994, Sedlacek and Barros, 1989), and assuming that earnings make up the largest proportion of total household income for the bulk of the population, it is hypothesised that earnings inequality drives the overall level of total income inequality.

4.3. METHODS

Methodological details, such as the definition of income, remain the same as in Chapter 3: "income" is gross monthly household per capita income, recipients are individuals and population weights are used throughout. The currency unit is the Brazilian Reais, valued in September 1995. The main technique to be used in this chapter is inequality decomposition, supplemented by simpler summary statistics.

4.3.1. Inequality Decomposition.

There is an extensive body of literature that seeks to define desirable properties of inequality measures (see Cowell, 1995). One such property is decomposability. This allows overall inequality to be related consistently to constituent parts of the distribution, whether these parts are types of income which sum to total income, or population sub-groups. Not only is this desirable for arithmetic reasons but also on economic grounds. Economists and policy analysts need to account for changes in overall inequality by changes in different sectors, for example within and between agricultural and industrial sectors, or urban and rural sectors. Effects of new legislation, for example anti-discrimination laws, may be measured by comparing changes in inequality between and within target and non-target groups. The impacts of changes in the tax and benefits system may be assessed by examining changes within different sub-groups of taxpayers or benefit recipients. Decomposability of inequality measures therefore allows the researcher and policy maker to understand the structure and the dynamics of inequality.

Inequality decomposition is a standard technique for examining the contribution to inequality of particular characteristics and can be used to assess income recipient characteristics and income package influences. The point of this decomposition is to separate total inequality in the distribution into a component of inequality between the

chosen groups (I_b), and the remaining within-group inequality (I_w). These groups are defined by each of the attributes discussed above: at first each characteristics is considered individually, and then a finer partition is created by considering all attributes together, to give a measure of total inequality explained by all characteristics. This is the technique I will use for assessing the impact of characteristics such as household type, sex and age on household income inequality.

Not all inequality measures are decomposable, notably the Gini coefficient except under the special circumstance of non-overlapping partitions, i.e. when the incomes of every individual in one sub-group are greater than the incomes of every individual in another sub-group.[64] One set that is decomposable is the Generalised Entropy class, described in Chapter 2 and calculated for the entire Brazilian income distribution between 1981 and 1995 in Chapter 3.

Two types of decomposition are of interest: firstly the decomposition of inequality by population sub-groups (income recipients) where the level of inequality in any one year and the change in inequaity between years can be analysed applying static and dynamic decompositions, and secondly a decompsoition of total inequality by income source, also conducted for the level and change over time.

The static decomposition of inequality by population sub-group

When total inequality, I, is decomposed by population subgroups, the Generalised Entropy class can be expressed as the sum of within-group inequality, I_w, and between group inequality, I_b. Cowell and Jenkins (1995) show that the within- and between-group components of inequality can be related to overall inequality in the simplest possible way: $I_b + I_w = I$. They then suggest an intuitive summary measure, R_b, of the amount of inequality explained by differences between groups with a particular characteristic or set of characteristics, $Rb = I_b / I$. Hence we can conclude that x% of total inequality is "explained" by between group inequalities, and (100-x)% is explained by inequalities within groups. By increasing the number of partitions we can account for

[64] See Cowell, 1995, for decomposition techniques for the Gini coefficient.

the effect of a wider range of structural factors. Chapter 2 describes the technique in more detail.

The dynamic decomposition of inequality by population sub-group

Accounting for changes in the level of inequality by means of a partition of the distribution into sub-groups must entail at least two components of the change: one caused by a change in inequality between the groups and one by a change in inequality within the groups. The second one is the "pure inequality" effect, but the first one can be further disaggregated into an effect due to changes in relative mean incomes between the subgroups, an "income" effect, and one due to changes in the size of the subgroups - an "allocation" or "population" effect. Hence we can decompose the change in total inequality into three components: a) an allocation effect arising from changes in the number of people within different partitions; b) an income effect arising from changes in relative incomes between partitions, and finally c) a pure inequality effect arising from changes in inequality within partitions (Mookerjee and Shorrocks, 1982). The arithmetic becomes complicated for some measures, so this is usually only applied to GE(0), as described in Chapter 2.

The static decomposition of inequality by income source

This chapter also examines the income sources of each household and their relationship with inequality of total household income per capita. These sources are earnings, incomes received under the state social insurance system, and other receipts including rental income, interest on savings, dividends, gifts and any other sources. The main aim is to see how much of total inequality is caused by inequality within a particular income source, and whether increases (decreases) in the level of factor inequality are responsible for rises (falls) in overall income inequality. Total inequality I can also be expressed as the sum of factor contributions, where each contribution depends on the incomes from a given factor source, f, the inequality within that source, and the relative proportion of total income that is derived from that source. In practice the decomposition is usually applied to GE(2) measure of inequality because it needs to be defined in the presence of zero incomes: not all sources of income will be received by all households.

The dynamic decomposition of inequality by income source

The dynamic decomposition examines changes in the contribution of different factors, and identifies which changes in factors have been most important.

4.3.2 Definitions of Household Characteristics

Households are classified according to the following characteristics: the age, sex, education and where possible the race of the household head, the family type of the household (based on the presence of children below the age of 14) and the region and urban/rural location of the household. Choosing the partitions themselves, for example the break points between age groups, can be somewhat arbitrary. In this chapter partitions are based on those used in other studies where possible, or on standard classifications such as the five official geographic regions of Brazil and the classification of urban and rural areas. Each partition is as follows:

- *Age of household head.* Households are grouped into six categories by the age of the household head: i) under 25, ii) 25-34, iii) 35-44, iv) 45-54, v) 55-64 and vi) 65+ years. This follows the convention set by Brazilian researchers, such as Bonelli and Ramos (1995).

- *Educational attainment of household head.* This is measured as years of schooling, categorised into five groups: i) illiterates or those with less than one year schooling, ii) elementary school - 1-4 years, iii) intermediate school - 5 to 8 years, iv) high school - 9 to 11 years, and v) college education, with 12 or more years of schooling. Again this follows Bonelli and Ramos (1995).

- *Sex of household head.* Simply male or female.

- *Race of household head.* This is split into three categories: i) white, ii) Asian and iii) black and mixed race, including indigenous. Unfortunately very little data are available for the entire period. In 1981 the question did not appear in the core questionnaire and in 1985 less than 5% of the sample responded to the question. Only for the last two or three years of the 1980s was there a significant response rate to the question. Hence race will only be used for the analysis of 1990 and 1995. Because of

difficulties in classifying race, discussed above, and the small sample size of those identified as black and indigenous, mixed race heads of households are considered together with black and indigenous heads.

- *Household type.* Five types of households are identified: i) "single adult" households comprised of only 1 adult; ii) "couple, no kids" households comprised of only adults, i.e. all aged over 14 or over; iii) "couples with kids" households with more than 1 adult plus children; iv) "single parent" households with a single adult plus children and v) elderly households whose head is aged 65 or over, with or without children. This is a simplification of the categories used by Tanner (1987) for Northeast Brazil.

- *Region.* There are five official, standard geographical regions in Brazil: North, Northeast, Southeast, South and Centre-West. See Figure 4.1.

- *Urban/Rural location of household.* Urban and rural areas are those defined by IBGE and used in the PNAD.

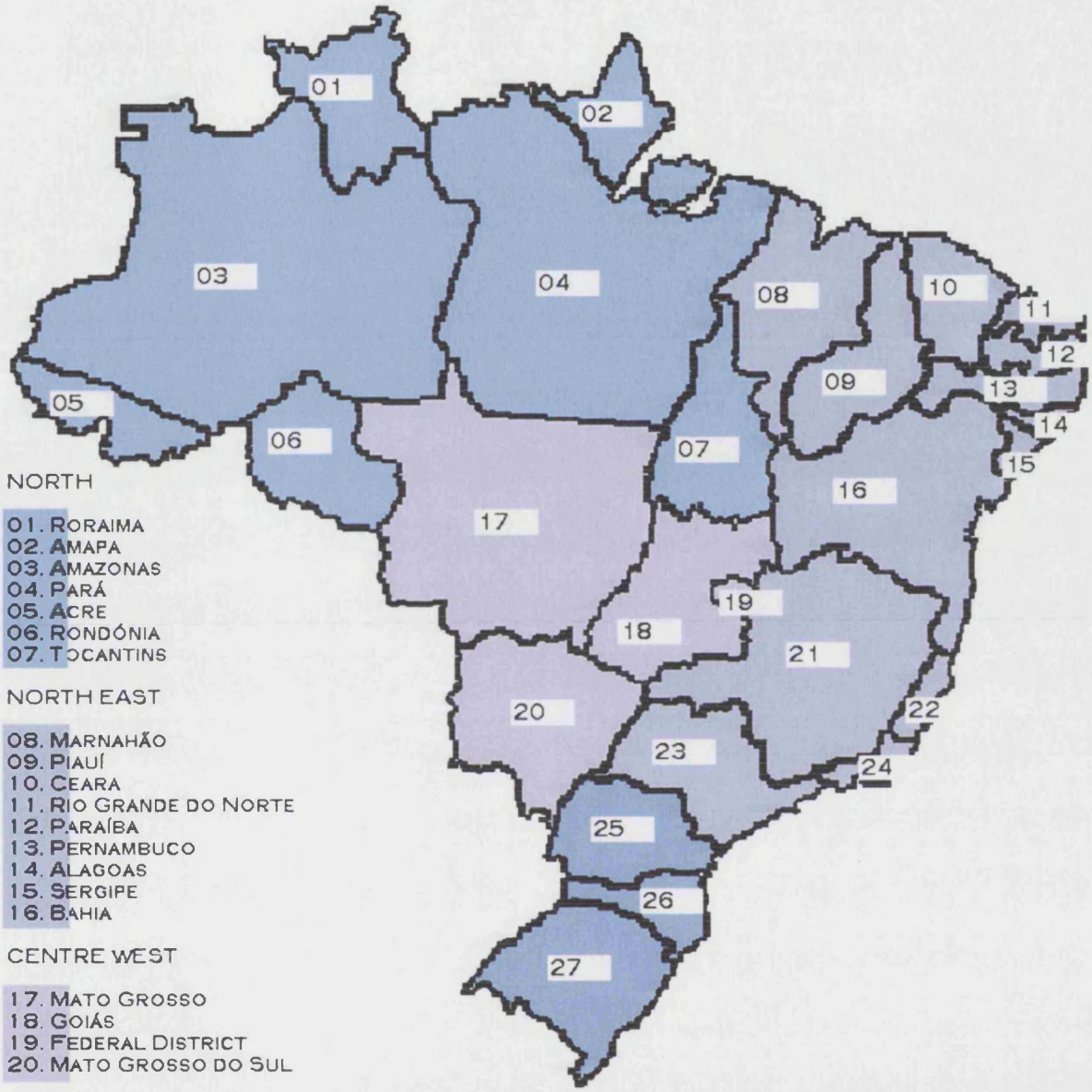

Figure 4.1. Regions of Brazil.

4.3.3. Income Sources

Although there are many different sources of incomes that make up household income, and it would be interesting to examine the contribution of each individual source, for practical reasons (e.g. ease of computation, comparability across years and data availability), some sources need to be aggregated. For example it would be interesting to examine the contribution of specific types of government transfers to total income inequality and compare which ones have a more or less equalising effect. However, because slightly different aggregations were used in different years of the PNAD, the decomposition can not be conducted at a very fine level of disaggregation. The total income of an individual is made up of the sum of several separate incomes. Total individual income is then summed across all members of the household to give a distribution of household income, as follows:

- Income from employment: payments in cash and in-kind from 1,2,3 or more jobs,
- Incomes from self-employment: payments in cash and in-kind from 1,2,3 or more jobs;
- Social Insurance receipts: old-age, disability or survivors pensions, sickness and maternity benefits, work injury, unemployment benefit and family allowances, paid through a state agency, such as the National Institute of Social Security.
- Other income: rental income from property, dividends, and interest payments on savings and investments, gifts from individuals not resident in the household, and other undefined income.

4.4. Differences between Households

Summary statistics for each sub-group of the population using the classifications above are presented in the following tables. These include the mean income of each sub-group, together with their share of the total population plus three inequality measures,

GE(0), GE(1) and GE(2).[65] Three features will be considered: first how the mean income of each sub-group compares to the overall mean and the mean income of other sub-groups and how this comparison changes over time; second the relative size of each sub-group and how this changes over time, and third the level of within-group inequality as measured by the three members of the GE class.

4.4.1. Geographic Location

In order to set the regional pattern of incomes of sub-groups in context first consider the statistics by geographic region and urban/rural location, shown in Table 4.1. Both the urban/rural split and the partition by region suggest that geographic location was an important explanatory factor of the level of overall inequality in each year. Mean incomes varied considerably across regions and across the urban/rural divide.

On average the urban population was about three times richer than the rural population, and this ratio appears to have been stable over the whole period. This is not to say that urban dwellers had levels of welfare three times higher than those in rural areas, because no account has been taken of variations in prices between urban and rural areas. One particularly important issue is the relative price of food in the two sectors: food is often more expensive in urban areas than in rural areas, and since expenditure of food forms a large part of a lower income household's total expenditure, the differential in welfare levels may be lower than that suggested by average incomes. Rural mean incomes were on average substantially less than the highest poverty line, although were higher than the average of the rural poverty lines.

The measures of inequality provide some interesting information on the shape of the distribution of income within each location. In each year, GE(0) and GE(1) were lower in rural areas than in urban areas, but the opposite is true for GE(2). This suggests that even though average rural incomes were lower than urban average incomes, the gap between the richest and the not-so-rich in rural areas was greater than that in urban areas, i.e. that rural income distribution lay to the left of the urban income distribution

[65] The values of some of the overall statistics may vary slightly from figures reported in chapter 3 because of item non-response, i.e. to questions on particular characteristics such as age and education.

but the upper tail of the income distribution was more stretched out in rural areas than in urban areas. This most likely reflects the presence of very rich households who reside in the country, with incomes derived probably from a combination of large-scale farming and possibly industrial or entrepreneurial activities centred in the cities. Tolosa (1991) calculated Gini coefficients for urban and rural areas and found that inequality so measured was higher in rural areas than in urban areas, thus providing similar evidence.

Inequality levels, particularly when measured by GE(0) and GE(1), whilst not low were lower than overall inequality and this, together with the large between group differences in differences in average incomes, suggests that between group inequality may be important in determining the overall level of inequality in each year. Inequality within urban and rural areas behaved the same over time as the overall inequality measures, rising when overall inequality rose, i.e. between 1981 and 1990, and falling in the 1990s, which suggests that much of the change in overall inequality may be attributed to changes in within group inequality over time rather than changes between urban and rural areas.

Turning now to the regional pattern of incomes and inequality, a similar story emerges. The richest regions in Brazil throughout the period were the Southeast and South: incomes in the Southeast were on average about two and a half times those of the Northeast and this ratio is consistent over time. Similar qualifications need to be made vis-à-vis relative prices, as prices can vary substantially across geographic areas. Northeast average incomes were also below the upper poverty line, although very similar to the average poverty line for the Northeast (Region V in Table 3.6). Regional inequality levels varied, with some regions, for example the Northeast, showing more inequality than the country as a whole and than other regions such as the richer Southeast. Again it seems that poorer areas – those with lower average income – had higher levels of inequality than richer areas. Over time the measures moved in line with overall inequality, with the largest changes occurring in the Southeast, where inequality was generally lower than in the rest of the country. Hence the summary data suggest that while regional differences may be important in explaining the level of inequality in any one year, the change in overall inequality is likely to be due to changes in within-region inequality.

TABLE 4.1. BRAZIL 1981-1995: SUMMARY STATISTICS OF HOUSEHOLD INCOME PER CAPITA, BY GEOGRAPHIC LOCATION

	1981					1990					1995				
Urban/ Rural	Mean	Pop %	GE2	GE1	GE0	Mean	Pop %	GE2	GE1	GE0	Mean	Pop %	GE2	GE1	GE0
Urban	168	71	1.09	0.57	0.54	183	74	1.71	0.67	0.62	195	78	1.43	0.65	0.60
Rural	56	29	1.64	0.53	0.44	57	26	1.83	0.59	0.53	68	22	1.65	0.61	0.53
All	136	100	1.34	0.65	0.61	150	100	2.02	0.74	0.70	167	100	1.63	0.70	0.66
Region															
Southeast	182	44	1.06	0.56	0.53	192	45	1.74	0.64	0.59	216	44	1.32	0.62	0.57
South	139	16	1.09	0.55	0.51	156	16	1.38	0.64	0.61	189	15	1.39	0.62	0.57
Northeast	70	30	1.84	0.68	0.57	76	29	2.55	0.84	0.70	88	29	2.33	0.77	0.64
C-West	128	7	1.47	0.65	0.58	173	7	1.83	0.74	0.68	167	7	1.37	0.65	0.59
North	121	3	1.09	0.51	0.44	160	3	2.48	0.72	0.62	133	5	1.63	0.68	0.59
All	136	100	1.34	0.65	0.61	150	100	2.02	0.74	0.70	167	100	1.63	0.70	0.66

Note: all incomes measured in September 1995 Reais.
Source: Author's calculations from PNAD 1981, 1990 and 1995.

4.4.2. Age of Household Head

Now consider the first of the characteristics defined on the head: summary statistics for each age group are shown in Table 4.2. As expected, the age of the household head does not appear to be a very promising candidate for explaining much of total inequality, either in any one year or over time.

The mean incomes per age group were fairly close to each other, varying only slightly around the overall mean, although they did follow a rough "life-cycle" path in each year, rising from youth through to middle age, with a slight drop around the age when families are probably at their largest, rising again until retirement age. Differences between groups were not great, certainly not as great as those between urban and rural areas or between regions, and were fairly constant over the period.

Inequality within each age group however appears to have been fairly high, at levels very close to the overall level. Inequality within the oldest age group was higher than the overall level, in particular when measured by GE(2), which suggests the presence of a number of elderly heads either living with high income generating younger adults or able to generate a large income themselves. Inequality amongst the youngest group was much lower than overall inequality, suggesting that young heads in the 1980s and early 1990s were much more homogenous than other groups. The high level of inequality within most age groups suggests that the between group inequality component is not likely to be large. Over time the measures of within group inequality behaved in a similar way to overall inequality, i.e. rising in the 1980s and falling in the 1990s.

Hence it would appear that differences between households with heads of different ages age of household head are not strong determinant of either the level of inequality in any one year or changes over time.

TABLE 4.2. BRAZIL 1981-1995: SUMMARY STATISTICS OF HOUSEHOLD INCOME PER CAPITA, BY AGE OF HEAD

	1981					1990					1995				
Age	Mean	Pop %	GE2	GE1	GE0	Mean	Pop %	GE2	GE1	GE0	Mean	Pop %	GE2	GE1	GE0
< 25 yrs	118	4	0.81	0.45	0.43	115	4	1.36	0.61	0.56	112	4	1.55	0.56	0.49
25-34 yrs	141	22	1.17	0.63	0.62	143	22	1.54	0.69	0.68	146	21	1.55	0.69	0.65
35-44 yrs	121	28	1.38	0.67	0.64	149	29	1.67	0.74	0.73	164	28	1.53	0.69	0.68
45-54 yrs	139	24	1.32	0.63	0.60	154	22	1.67	0.72	0.70	184	22	1.63	0.72	0.69
55-64 yrs	154	13	1.38	0.65	0.61	166	14	1.71	0.74	0.70	184	14	1.62	0.70	0.64
65 yrs +	144	8	1.65	0.70	0.61	150	10	5.41	0.94	0.73	180	11	1.76	0.71	0.59
All	136	100	1.34	0.65	0.61	150	100	2.02	0.74	0.70	167	100	1.63	0.70	0.66

Note: all incomes are measured in September 1995 Reais.
Source: Author's calculations from PNAD 1981, 1990 and 1995.

4.4.3. Family Type

The second household characteristic to be discussed is family type, which was introduced in order to overcome the problem of relating the head of household's age to household per capita income, which is usually generated by more members of the household. Table 4.3 shows summary statistics.

There is considerable variation across family types: mean per capita incomes were higher for single adults, with their income being between 4 and 5 times the average per capita income of single parents, and about 3 times the overall average. Elderly heads were on average no worse off than the overall average, and better off than any other families with children. Differences between mean incomes for family types appear to narrow slightly between 1981 and 1990 and then to widen again by 1995, with slightly wider gaps than in 1995. This suggests that differences between different family types may explain the level of inequality in any given year but that changes in inequality are not substantially due to changes in these differences, being more likely due to changes in inequality within different family types.

Inequality is generally lowest amongst couples with no children but highest amongst single adults. Most households are comprised of both adults and children, although the structure has changed slightly over time. Between 1981 and 1995 the population share of households classified as "couple, with children", i.e. adults aged less than 65 and children living together, fell from 74% to 67% to be replaced mainly by adult only households, but also by households with elderly heads and single parent households. The pattern of inequality over time within each group does not always follow the pattern of overall inequality. Couples, with and without children, and those households headed by the elderly, saw a rise in inequality during the 1980s followed by a small fall in the 1990s, whereas inequality amongst the remainder, i.e. single adults and single parents, rose through the whole period. Given that couples, with and without children, form the bulk of the population, it is likely that this drives the changes in overall inequality, and hence that changes in inequality are largely due to changes in within-group inequality.

TABLE 4.3. BRAZIL 1981-1995: SUMMARY STATISTICS OF HOUSEHOLD INCOME PER CAPITA, BY FAMILY TYPE

	1981					1990					1995				
Family Type	Mean	Pop %	GE(2)	GE(1)	GE(0)	Mean	Pop %	GE(2)	GE(1)	GE(0)	Mean	Pop %	GE(2)	GE(1)	GE(0)
Single adult	391	1	1.55	0.74	0.68	376	1	1.72	0.87	0.90	493	1	1.76	0.81	0.74
Couple, no children	255	15	0.84	0.50	0.49	207	34	1.31	0.62	0.61	278	19	1.07	0.57	0.54
Couple, children	108	74	1.09	0.58	0.55	110	54	1.46	0.68	0.65	128	67	1.34	0.64	0.61
Single adult, children	67	1	1.14	0.60	0.56	92	1	1.69	0.81	0.75	108	2	1.74	0.75	0.68
Elderly head	144	8	1.65	0.70	0.61	150	10	5.41	0.94	0.73	180	11	1.76	0.71	0.59
All	136	100	1.34	0.65	0.61	150	100	2.02	0.74	0.70	167	100	1.63	0.71	0.66

Note: all incomes measured in September 1995 Reais.
Source: Author's calculations from PNAD 1981, 1990 and 1995.

4.4.4. Education of Household Head

The partition by years of schooling of the household head appears more promising as a candidate for explaining the level of total inequality. Table 4.4 contains the summary data.

Sub-group means rose considerably with education level and display substantial variation around the overall mean. Mean incomes of the two least educated groups were below the upper poverty line, suggesting that a large number of those with no or only elementary schooling were poor. In 1981, the mean income of households with a functionally illiterate head was half of those with elementary education and only around 10% of those with a college education. By 1995 the gap between those with an illiterate head and those with a college-educated head had widened somewhat. These large differences between households with heads with different education suggests that the level of education may be a strong determinant of overall inequality in each year and that widening differences may explain some of the change in inequality.

Within-group inequality measures were well below the level of overall inequality in each year, with less educated heads displaying the highest levels of inequality in each year. These observations suggest that education explains a large part of overall inequality and that widening differences in income between low and high education groups may explain some of the change in inequality over time.

TABLE 4.4. BRAZIL 1981-1995: SUMMARY STATISTICS OF HOUSEHOLD INCOME PER CAPITA, BY EDUCATION OF HEAD

	1981					1990					1995				
Education	Mean	Pop %	GE2	GE1	GE0	Mean	Pop %	GE2	GE1	GE0	Mean	Pop %	GE2	GE1	GE0
Illiterate	57	30	0.71	0.39	0.38	52	25	1.33	0.45	0.42	59	24	0.76	0.39	0.39
Elementary	104	46	0.71	0.41	0.40	104	40	1.08	0.50	0.47	111	38	0.91	0.45	0.44
Intermediate	176	14	0.80	0.43	0.40	153	18	2.26	0.52	0.45	156	20	0.79	0.44	0.41
High School	311	7	0.53	0.35	0.36	272	10	0.79	0.44	0.43	345	11	0.81	0.44	0.42
College +	592	5	0.39	0.28	0.29	608	7	0.62	0.36	0.35	826	7	0.56	0.37	0.38
All	136	100	1.34	0.65	0.61	150	100	2.02	0.74	0.70	167	100	1.63	0.71	0.66

Note: all incomes measured in September 1995 Reais.
Source: Author's calculations from PNAD 1981, 1990 and 1995.

4.4.5. Sex of Household Head

The partition by sex of household head does not reveal much evidence of substantial between-group inequality, although it does highlight some interesting trends. Table 4.5 contains the summary data.

Mean incomes of household headed by women were less than those headed by men in each year although the level of inequality with female-headed households is similar to the overall level and the level for male-headed households. Hence it is possible to conclude that households headed by women are not a homogenous group, and that some female headed households will not be disadvantaged to the same extent – if at all – as other female headed households. Given that both sub-group means are above the highest poverty line it is difficult to conclude whether female-headed households are more likely to be poor than male-headed households. However this should not be interpreted as meaning that there is little discrimination against women: the data here relate to total household income per capita, not individual earnings, using a definition of head which may be open to question.

Over time the number of female-headed households increased, as Fox (1990) suggested, indicating either increased ability and/or willingness of women to set up and maintain independent households, or for adult males in a household to acknowledge the status of women within the household.

Inequality amongst male and female-headed households followed the same pattern as overall inequality. When inequality is measured with GE(2), i.e. the measure most sensitive to incomes at the upper end of the distribution, male inequality increased by proportionately more than female inequality during the 1980s. If GE(1) or GE(0) is used however, the opposite is true: female inequality increased by more. This suggests that the increases in inequality are due to a proportionately larger stretching of the upper tail among men (i.e. the gaps at the top becoming larger) and a stretching at the bottom of the distribution among women.

TABLE 4.5. BRAZIL 1981-1995: SUMMARY STATISTICS OF HOUSEHOLD INCOME PER CAPITA, BY SEX OF HEAD

	1981					1990					1995				
Sex	Mean	Pop	GE2	GE1	GE0	Mean	Pop	GE2	GE1	GE0	Mean	Pop	GE2	GE1	GE0
Male	137	89	1.35	0.65	0.62	152	86	2.07	0.75	0.71	169	84	1.63	0.71	0.67
Female	126	11	1.24	0.59	0.55	136	14	1.59	0.71	0.65	159	16	1.59	0.68	0.61
All	136	100	1.34	0.65	0.61	150	100	2.02	0.74	0.70	167	100	1.63	0.70	0.66

Note: all incomes measured in September 1995 Reais.
Source: Author's calculations from PNAD 1981, 1990 and 1995.

4.4.6. Race of Household Head

The final partition is by race of household head. Data is only available for 1990 and 1995, and summary results are shown in Table 4.6. This partition seems to suggest that race is an important determinate of overall inequality. Mean incomes by racial group vary considerably, with households with black or mixed race heads earning on average substantially less than either white or Asian heads, and have a mean income below the upper most poverty line. In 1990 households headed by a black (or mixed race or indigenous) person received incomes just over half of the national average, around a third of the mean income of white headed households and around a quarter of households headed by an ethnic Asian. Similar differences existed in 1995. These large racial differences in incomes suggest that the level of inequality can be partly explained by race, although is unlikely to explain changes over time.

Inequality levels within each group were also lower than the overall inequality level in each year which further suggests that the between group inequality component will be high. The measures of inequality among the ethnically Asian population were very low in both 1990 and 1995, suggesting a very homogenous community. Those among households with black heads were not significantly different from those among white headed households.

All groups experienced a fall in inequality between 1990 and 1995 and this combined with the almost stable between group differences over time suggests that the fall in inequality between 1990 and 1995 will be due to falls in within group inequality.

TABLE 4.6. BRAZIL 1990-1995: SUMMARY STATISTICS OF HOUSEHOLD INCOME PER CAPITA, BY RACE OF HEAD

	1981					1990					1995				
Race	Mean	Pop	GE2	GE1	GE0	Mean	Pop	GE2	GE1	GE0	Mean	Pop	GE2	GE1	GE0
White	n.a.					201	54	1.73	0.68	0.66	225	53	1.37	0.65	0.61
Black	n.a.					85	45	1.46	0.60	0.56	97	46	1.29	0.57	0.53
Asian	n.a.					385	1	0.71	0.44	0.47	438	1	0.42	0.36	0.44
All						150	100	2.02	0.74	0.70	167	100	1.63	0.70	0.66

Note: all incomes measured in September 1995 Reais.
Source: Author's calculations from PNAD 1990-1995.

Hence the evidence from summary statistics suggest that some of the structural factors may be important determinants of overall inequality, namely family type, education, race and geographic location. The levels of inequality within each of the sub-groups were generally lower than the overall level and there was considerable difference in mean incomes across each group. Of these only educational differences appeared to have changed over time, becoming greater over the period. The apparent limitations of age and sex may be due to the problem of relating characteristics of the household head to household income per capita, and with the definition of household head itself.

4.4.7. Static Decomposition of Inequality by Household Characteristics

Having examined the summary statistics and hypothesised which structural factors are important in explaining levels and changes in overall inequality, it is now possible to present the decomposition results. Table 4.7 below shows the proportion of inequality explained by each partition in turn, and by all partitions together, for each of the three Generalised Entropy measures. The percentage explained by any particular characteristic varies depending on the measure employed. This is partly because different measures are sensitive to different parts of the income distribution and partly because the weights used to sum the within-group inequality estimates differ. GE(0) is more sensitive to incomes at the lower end of the distribution and weights the within-group estimates by the population share. GE(1) is also more sensitive to incomes at the lower end of the distribution and uses relative mean incomes as weights. GE(2) is much more sensitive to incomes at the top end of the distribution and uses both population share and relative mean incomes to weight sub-group inequality measures.

As expected age and sex of household head have negligible explanatory power. This may be due to the problems of using the head as the representative member of the household or simply because within age groups and within each sex, households are very heterogeneous.

The most important determinant of overall inequality is the years of education of the household head. Differences between groups, arising because of substantial differences

in mean incomes, account for between 21% and 42% of overall inequality. Family type, race, region and the urban or rural location of the household are also important determinants of overall inequality. Differences between households of different family type account for between 3 and 12% of total inequality. Racial differences explain between 5% and 13% of total inequality. Regional differences account for as much as 12% of total inequality and differences between urban and rural areas explain as much as 17% of total inequality.

TABLE 4.7. THE PERCENTAGE OF TOTAL INCOME INEQUALITY EXPLAINED BY HOUSEHOLD DIFFERENCES

	1981			1990			1995		
	R_b			R_b			R_b		
	GE(0)	GE(1)	GE(2)	GE0)	GE(1)	GE(2)	GE(0)	GE(1)	GE(2)
Age	1	1	0	0	0	0	1	1	0
Education	37	42	30	37	40	21	37	41	27
Sex	0	0	0	0	0	0	0	0	0
Race	n.a.	n.a.	n.a.	13	11	4	13	12	5
Family type	11	12	7	8	8	3	10	11	5
Region	12	10	4	10	8	3	10	8	3
Urban/rural	17	13	5	15	11	3	12	8	3

Notes: Racial characteristics are not available in 1981.
Source: Author's calculations from PNAD 1981-1995.

4.4.8. Dynamic Decomposition of Inequality by Household Characteristics

Whilst the static decomposition of inequality levels revealed that some structural factors account for a substantial percentage of overall inequality, it is not clear that much has changed over time in terms of differences between groups, except in the case of educational attainment of the head of household, and even then the constantly widening gap between low and highly educated heads is neither large enough or moving in the right direction to explain the rise in inequality in the 1980s or the fall in the 1990s. The summary data above did not suggest any large changes in differentials across groups over time nor the emergence of large groups of households at either extreme of the distribution. Hence the changes in inequality over time may not be due to changing differences between certain groups, but to changing inequality within groups. Hence the structural factors which explain overall inequality in any one year may not be responsible for changes in inequality over time.

Table 4.8 below shows the dynamic decomposition results for the three time periods, 1981 to 1990 when inequality rose substantially, 1990 to 1995 when inequality fell, and 1981 to 1995 when overall inequality rose. The change in overall inequality can be split into three effects: firstly the change in within group inequality, secondly the allocation effect arising from changes in the relative number of people within each group, such as that caused by migration or demographic change; and thirdly an income effect caused by changes in relative incomes between groups.

In all time periods and for all of the structural factors considered, the pure inequality effect is largest, i.e. changes in inequality within each sub-group were the chief determinants of the overall change, whether inequality fell or rose. The only household characteristics that deviates from this is education of the household head, for which the allocation effect is also large during the periods when inequality rose, and family type, where both the allocation effect and the income effect are strong. Recalling the data in Tables 4.4 the percentage of households headed by illiterate individuals or those with only elementary schooling fell, with a rise in the percentage of heads with intermediate or higher levels of education. This means that the gradual upgrading of schooling levels

of heads of households of some percentage of the population would on its own lead to an increase in inequality caused by greater initial differences between groups, i.e. a greater polarisation between those with little or no education and those with more. But the income effect of the decomposition is negative, suggesting that the rise in education standards of the household heads, led to a decrease in returns to education, and so in inequality. Differences between family types narrowed between 1981 and 1990 and then widened, hence the income effect and there was a shift in the population from couples with children to other family types.

TABLE 4.8. THE PERCENTAGE OF INEQUALITY EXPLAINED OVER TIME BY HOUSEHOLD CHARACTERISTICS

	1981-1990				1990-1995				1981-1995			
Percentage change in GE(0)		14.8				-6.4				7.5		
	a	b	c	d	a	b	c	d	a	b	c	d
Age	14.9	0.1	0.0	-0.2	-7.0	0.0	0.0	0.6	7.1	-0.2	0.0	0.5
Education	10.0	-0.5	4.5	0.9	-4.4	0.0	-0.1	-1.9	4.9	-0.4	4.9	-1.4
Family Type	18.0	-1.2	4.1	-5.2	-9.3	1.2	-1.4	3.0	7.7	-0.2	1.8	-1.8
Sex	15.0	-0.3	0.0	0.01	-6.1	-0.2	0.0	-0.1	8.0	-0.5	0.0	-0.0
Race	n.a.	n.a.	n.a.	n.a.	-6.0	-0.1	0.0	-0.4	n.a.	n.a.	n.a.	n.a.
Region	15.2	-0.1	-0.2	-0.1	-5.9	0.0	0.0	-0.5	8.6	-0.2	-0.2	-0.8
Urban/rural	14.2	0.5	-1.5	1.7	-2.7	0.5	-1.8	-2.4	11.1	1.0	-3.3	-1.3

Note: term a is the pure inequality effect; terms b and c are the allocation effect; term d is the income effect.
Source: Author's calculations from PNAD 1981-1995.

4.5. Differences in the Income Package

This section examines the structure of income inequality related to income sources. Table 4.9 presents the results of the decomposition by income source. For each income type *f*, mean income, GE(2), plus the correlation with total household income are shown. S_f is the absolute share of a particular income source *f* and so summing across this row gives the value of GE(2) overall. A large value indicates a large contribution to overall inequality. S_f is the proportionate share of total inequality, and so this row sums to one. Again a large value indicates a large contribution.

The value of GE(2) varies a lot by income source. Remember that this shows the level of inequality across all households regardless of whether they actually receive a particular type of income. This means that for some types of income many households will have a zero entry: for example employee earnings are received by most households (73%) whereas private transfers are received by only 5% of households. The value of GE(2) drops considerably for all income sources once only those households with a particular income source are included. Hence the very high value of GE(2) for capital income, 38.43 is largely driven by the large proportion of households (90%) with zero income from that source, but drops to under 3 when only those households with capital income are considered. However for the decomposition of total household income inequality all households need to considered in each calculation.

TABLE 4.9. THE CONTRIBUTION OF INCOME TYPES TO TOTAL HOUSEHOLD INCOME INEQUALITY IN 1995

	Total Household Income	Total Household Earnings	Total Household Self-Employment Income	Total Household Social Insurance Transfers	Total Household Capital Income
Mean	664	341	220	86	18
GE(2)	1.17	1.49	4.85	6.32	38.43
Correlation with household income (ρ_f)	1	0.718	0.619	0.354	0.328
Relative mean (χ_f)	1	0.514	0.331	0.129	0.027
Absolute factor contribution (S_f)	1.17	0.42	0.57	0.12	0.06
Proportionate factor contribution (s_f)	1	0.36	0.48	0.10	0.05
GE(2), $y_f>0$	1.17	0.929	1.902	1.66	2.940
Pop share with $y_f>0$	1	0.73	0.44	0.32	0.09

Notes: all incomes are measured in September 1995 Reais.
Source: Author's calculations from PNAD 1981-1995.

Earnings for employees show the lowest inequality (1.49) probably because most households have earnings and on average earnings make up over 50% of total household income. Self-employment earnings inequality is higher because of the higher contribution to total household income at the extremes of the distribution - and GE(2) gives greatest weight to incomes at the upper end of the distribution. Social insurance transfers show more inequality than either of the two earnings sources, partly because only 32% of households receive income from public transfers, so there are a very large number of zeroes in the vector of household receipts from social insurance. In addition most transfers are related to past earnings so past earnings inequality are likely to be replicated in the distribution of transfers.

The largest contribution to overall inequality comes from self-employment incomes. This income type is responsible for 48% of total household inequality. Earnings are the next most important source of household inequality, contributing 36% towards total inequality. This is to be expected since earnings are such an important share of total household income at all income levels.

The next question is to assess how much of the change in household income inequality can be attributed to changes in component sources of income. The income data for 1981 and 1995 are not available in precisely the same way as for 1995, so to make the analysis over time consistent, just two types of income can be considered: earnings (both as employees and a self-employed) and other income, which includes public and private transfers and capital income. This is unfortunate, as it would be interesting to test hypotheses about the different contributions of different sources under different macroeconomic conditions. For example it is possible that households who do well in times of high inflation are the self-employed because they can adjust their prices or wages much more easily than employees. Table 4.10 contains summary statistics for each distribution in each year.

The figures on the distribution of total household income display a different trend to that of the per capita income distribution analysed in Chapter 3. Whilst the per capita income distribution showed a steady increase in mean income throughout the fifteen

year period, mean household incomes fell steadily. This is in line with other studies of income distribution of Brazil. For example, Barros and Mendonça (1995) analyse the evolution of the distribution of household income during the 1980s and report that mean incomes fell. However despite the different behaviour of mean income, both distributions show an increase in inequality, as measured by GE(2), during the 1980s with a fall in the first half of the 1990s.

The distribution of household earnings (that is from both self-employment and as an employee) follows the same pattern as the total household income, rising during the 1980s from 1.01 to 1.45, and then falling to a level of 1.32 in 1995. Household earnings explain most of overall household income inequality in each year: 85% in 1981, 86% in 1990 and 84% in 1995. This suggests that an analysis of earnings inequality may provide interesting information on the evolution of household income inequality, and also per capita income inequality.

TABLE 4.10. THE CONTRIBUTION OF INCOME SOURCES TO HOUSEHOLD INCOME INEQUALITY, 1981-1995

	1981			1990			1995		
	Total Household Income	Total Household Earnings	Total Household Other	Total Household Income	Total Household Earnings	Total Household Other	Total Household Income	Total Household Earnings	Total Household Other
Mean	659	577	82	643	563	80	664	561	103
GE(2)	0.969	1.010	6.675	1.344	1.450	8.619	1.165	1.321	5.860
Correlation	1	0.9464	0.4714	1	0.9497	0.4322	1	0.9381	0.4489
Rel. mean	1	0.875	0.125	1	0.875	0.125	1	0.845	0.155
Abs. Cont.	0.969	0.820	0.150	1.344	1.161	0.183	1.165	0.983	0.182
Prop. Cont.	1	0.846	0.154	1	0.864	0.136	1	0.843	0.156

Notes: Incomes measured in September 1995 Reais.
Source: Author's calculations from PNAD 1981-1995.

Finally the change in total household income inequality can be decomposed into changes in the contributions of income types. Table 4.11 shows the percentage change in total household income inequality over the whole period and for each sub-period together with the percentage changes in source contributions. Between 1981 and 1990 household income inequality rose by 38.7%: earnings inequality rose by a similar amount of 35%, thereby being the largest contributor to the change in household income inequality. Throughout the decade changes in household income inequality, both rises and falls, can be accounted for by rises and falls in the inequality of household earnings.

TABLE 4.11. CONTRIBUTIONS TO CHANGES IN TOTAL HOUSEHOLD INCOME INEQUALITY, 1981-1995

	Percentage change in:		
	Household income inequality	Household earnings inequality	Household other income inequality
1981-1990	38.7	35.2	3.5
1990-1995	-13.3	-13.24	-0.1
1981-1995	20.2	16.8	3.4

Source: Author's calculations from PNAD 1981-1995.

4.6. CONCLUSIONS

This chapter examined the importance of structural factors such as household characteristics and income sources in determining the overall income distribution. These structural factors firstly related to characteristics of the household, namely age, sex, race and education of the head of household, the family type, based on the presence of children, and the geographic location of the household, and secondly to sources of income that make up the income package. The analysis was conducted by applying inequality decomposition techniques, by population sub-group and by income source, in 1981, 1990 and 1995 and the changes over time.

The chief findings relating to the decomposition of inequality by household characteristics, i.e. of income recipients, are that significant inequality exists between households headed by individuals with different levels of education. A smaller amount

of inequality can be explained by differences between racial groups, between family types, and between households located in urban and rural areas and between the five main regions of the country. Differences between male and female headed households are not significant, which may be partly explained by the definition of head used in the survey but also by the heterogeneity within each sex. Similarly the age of the household head had negligible explanatory power, probably for similar reasons.

The results show that in any one year, a significant amount of overall inequality can be explained by some of these structural factors, namely education and race of the household head, family type and geographic location, because of very large differentials in average incomes of each sub-group. However, the changes in inequality over time are not well explained by changing income differentials between population sub-groups which were mostly stable, even if large, over the period. For most partitions, changes in within-group inequality "explain" the change in total inequality.

The chief exception to this is the partition by education of the household head. The rise in inequality over the period as a whole was driven equally by increases in within-group inequality and by relatively large increases in the proportions of the sample heads with high education levels. The proportion of heads with a college education increased by almost 50%, but from a very small base (5%), whereas the proportion of those at the other extreme with no education fell by around 20% but from a large base share of 30%. Hence improvements in the distribution of educational attainment from this starting point of extreme educational inequality are associated with, other things being equal, increases in income inequality.[66] To offset these disequalising forces of increasing within-group inequality and increasing but still small shares of heads in the highest education bracket, differences in incomes between educational sub-groups fell slightly, which would have led, other things being equal, to a fall in inequality.

The second set of results, discussed in section 4.5, relate to the importance of different types of income in the household income package. Most of household income inequality can be explained by the household earnings distribution, and in particular by

earnings from self-employment. The data suggests that self-employment earnings are more important for households in the upper and lower tails of the distribution, while those in the middle of the distribution receive a greater share of income from employee earnings. Although inequality of earnings is not as high as for other types of income, its large share in the total household income package of a very large proportion of the population means that it accounts for between 84 and 86% of total household income inequality.

Most of the change in household income inequality over the whole period and within sub-periods is accounted for by changes in inequality of the household earnings distribution. Hence the underlying earnings distribution, both for employees and the self-employed, is a significant determinant of the distribution of total income.

In conclusion then, education of the household head and total earnings of the household appear to be the two most important determinants of the levels of income inequality in Brazil, in each year of the analysis. This is consistent with every other study of Brazilian inequality and reflects a broad concern that education is the key factor in income inequality. It is most likely that the effect of education of the household head on household income inequality works through earnings: heads with higher levels of education are likely to receive higher earnings (either as employees or self-employed) while those heads with lower levels of education are likely to have lower, if any, earnings. Hence the explanatory power of education of the head of household in the sub-group inequality decompositions is derived from its underlying relationship with earnings. There is sufficient evidence form studies of Brazilian earnings, and for other countries, that earnings inequality is strongly related to education (see Almeida Reis et al, 1991, Amadeo et al, 1994, Sedlacek and Barros, 1989 and Ramos, 1993, among others, for analyses of earnings inequality).

There is some evidence that the average rate of return to education (and experience) for all educational levels increased between 1981 and 1985 but then fell between 1985 and 1996, but that changes in returns in both directions were proportionately larger for

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[66] Ramos, 1993, observes a similar effect in earnings inequality decompositions between 1976 and 1985,

better-educated individuals (Menezes-Filho et al, 2000). This may support the hypothesis of Camargo and Ramos (1988) among others that workers in the small export sector, large firms and in professional occupations (all of whom could be argued to have better education levels) were able to protect themselves from the effects of inflation but bore the brunt of adjustment after each stabilisation plan, especially after 1986 and 1994. Or it could simply reflect relatively high excess demand for highly educated workers in the import substituting years (pre 1987) followed by a shift towards to more labour-intensive economic activities as trade and financial reform began in the late 1980s and early 1990s. Possibly in response to demand, educational levels improved, shifting individuals shifting up the flattening earnings-education slope. This combined with the increase in participation rates, especially among women. Hence changes in earnings inequality (and by extension household income per capita) were not simply due to changes in returns to education, but by more subtle transformations in the composition of the labour force, on the labour supply side (in particular an upgrading of education and changes in employment decisions) and on the demand side as the economy liberalised. [67]

The analysis suggests further work on examining the structure of inequality and how it has changed over time would be useful. There are a number of ways this could be conducted and a number of interesting questions that could be pursued. These are taken up in Chapter 6.

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and describes this composition effect as a Kuznets effect.

[67] See Ferreira and Barros (1999) for a simulation model of inequality changes between 1976 and 1996, and earlier works by Ramos (1993), Almeida Reis et al (1991), Amadeo et al (1994).

CHAPTER 5: THE BRAZILIAN POVERTY PROFILE, 1981-1995

5.1. INTRODUCTION

Between 1981 and 1995, the level of poverty in Brazil fell, in terms of incidence, intensity and the inequality of incomes among the poor, as shown by the estimates in Chapter 3. However as yet the analysis has said nothing about the poor people themselves at any one point in time or whether the same types of people were poor throughout the period. During the period of analysis there was a great deal of economic instability with poverty increasing during periods of recession and high inflation and falling during better times of economic recovery and stable prices. It is possible that the characteristics of the poor population changed during this period and that different types of people were poor at different times in response to different levels of economic performance. Identifying the poor population also has obvious policy relevance: international experience suggests that poverty alleviation is most likely to be achieved not just with sustained economic growth but with the addition of effective public policy in the spheres of health, education and infrastructure and social assistance. The aim of this chapter is to identify the poor population in terms of some key characteristics and to examine whether different types of people were more likely to be poor at different times. The strength of the poverty profile in this chapter is not solely that it provides a detailed profile of the poor population across the whole country but that it does so over time, and over a particularly interesting recent period of Brazilian economic history.

There are several factors that may be associated with poverty. The literature review in Chapter 1 and the analysis of the structure of income inequality in Chapter 4 suggests a number of characteristics that may be useful in describing the poor population. These range from the demographic and socio-economic structure of the household, characteristics of the household head, to the geographic location of the household itself. The particular focus here is on the age, sex, race, educational attainment and sector of employment of the household head, household composition, in terms of numbers of workers and numbers of children, regional location and urban or rural location. There is also some evidence in the empirical literature that these factors are associated with

poverty and therefore it is possible that changes in these underlying features may be associated with changes in poverty over time.

The most detailed existing profile of the poor population in Brazil is that provided by Sonia Rocha using data from the 1990 PNAD, which forms the basis for the World Bank poverty assessment of Brazil (Rocha, 1993, World Bank, 1995). Her results, and those of other authors of the report, showed that poverty disproportionately affects young people, particularly children, and particularly those in female-headed households. Rocha estimated that approximately half of poor Brazilians live in the Northeast, with urban and rural areas contributing equally to national poverty. Poor households in rural areas have an illiterate household head employed in agriculture, half of whom are share-croppers or smallholders, and the other half employees or temporary workers. Poor urban households have heads who are young and either illiterate or have less than 4 years of primary education, and are mostly employed in services and in the informal sector. Poor households everywhere are larger than better off households, and in rural areas have almost twice as many children.

Although Rocha's study is extremely comprehensive and addresses a wide range of important poverty issues, it is limited by the fact that it describes the poor at only one point in time, 1990. There are other studies of poverty at other points in time which contain descriptions of the poor population, and some of these do contain a temporal perspective, but they use either official published summary data (e.g. Fox, 1990, Fox and Morley, 1993) or compare micro-data from household surveys with Census data (e.g. Tolosa, 1991).

Another, more recent poverty profiles for Brazil (and none other Latin America countries) was conducted by Wodon (1999). Using summary statistics and per capita regressions Wodon measured extreme poverty headcounts (defined using a single national poverty line based on the cost of a 2100 calorie basket of food) within sub-groups of the population and the marginal impact on per capita incomes of household demographic structure of the household, sex, education and employment of the head of household for urban and rural areas separately. His results for Brazil relate to 1995 and support most of the results in this chapter. Having large numbers of children, especially

babies, belonging to a household with a poorly educated head, or with a head employed in agriculture were all strongly associated with being poor, and with lower incomes, in both urban and rural areas. Poverty rates among elderly headed households were not as high as other groups and age of head did not have a very large impact on household income per capita – as the results in this thesis have suggested. However, Wodon did find that sex of household head was important once other factors – education, age, employment etc – were taken into account. The results for Brazil were qualitatively and quantitatively similar for both urban and rural areas, with education having a slightly lower impact on incomes in rural areas.

This chapter presents a profile of the poor population through the period 1981-1995 and examines who the poor are at any one point in time, and how these characteristics have changed over time, using the same definition of income, the same set of absolute poverty lines (adjusted for inflation) and the most comprehensive and comparable data set that is available. The analysis presented here builds on both Rocha's and Wodon's work in two ways. Firstly probit analysis is used to measure the probability of being poor given certain characteristics and secondly the analysis is also conducted for 1981, so changes in the relative importance of different characteristics, or between urban and rural areas, can be assessed.

This chapter examines the characteristics of the poor population in order to determine which types of people are poor, or have a higher probability of being poor, and whether changes in poverty over time can be attributed to changes in these underlying characteristics. Section 2 presents a profile of poverty in 1981 and 1995 using some of these attributes, using a decomposition analysis of the level of poverty in each year. Section 3 extends the analysis beyond descriptive statistics to a multivariate analysis of the determinants of poverty. Section 4 concludes.

5.2. The Profile of Poverty

The review of the literature provides a number of key factors that are associated with a given household being poor, which can be grouped into 3 sets. Household head characteristics such as age, education, sex, race, and employment; household level factors such as household composition and dependency ratio; and location factors, such

as whether the household is urban or rural, and in which region it is to be found. Poor households, and therefore by extension the individuals within them, are identified using a set of regionally specific poverty lines estimated by Rocha (1993) for use with PNAD data. Details of these poverty lines, and the sensitivity of poverty estimates to the poverty line, are provided in Chapter 3.

The level of poverty within each sub-group of the population is estimated together with the distribution of the poor population across sub-groups, which can be viewed as the contribution to overall poverty of sub-group poverty. The level of sub-group poverty is measured using the headcount index, the proportion of the population that is poor, described earlier in Chapter 4. One useful feature of the headcount index is that it can be decomposed, that is, the level of overall poverty can be related to poverty within sub-groups of the population and their relative size in the overall population. All members of the FGT class are sub-group decomposable but clearly decompositions of the poverty gap could yield different results from the headcount decomposition, if for example, subgroup *i* had a lower incidence of poverty than subgroup *j* but a higher poverty gap, that is there were fewer poor people in sub-group *j* but those that were poor were further below the poverty line. Only the headcount decomposition is estimated here as the focus is on which households are poor, i.e. the *incidence* of poverty, not on how poor they are, as would be indicated by decomposition of the poverty gap.

Total poverty can be expressed as the (weighted) sum of poverty within each sub-group of the population, as follows:

$$P(\alpha) = \sum_{j=1}^{k} m_j P_j(\alpha)$$

where m_j is the population share of sub-group j $(j=1,..k)$, there are k mutually exclusive sub-groups, and $P_j(\alpha)$ is the poverty estimate for sub-group j. So in terms of the headcount, total poverty can be expressed as:

$$P(0) = \sum_{j=1}^{k} m_j P_j(0)$$

It is possible to estimate standard errors of the sub-group poverty headcounts to test if poverty in sub-group i is statistically significantly greater or less than that in sub-group j. These have not been calculated here but it should be borne in mind that the low sample sizes of some sub-groups (e.g. very young and very old heads of households) are likely to make inference based on the poverty decompositions less robust. In addition, one of the drawbacks of the poverty decomposition method is that it does not control for other characteristics, so higher headcounts in for example, female headed-households may not be robust to controlling for other characteristics such as age and education. Hence inference about the association between household characteristics and poverty status is left to the regression analysis in section 5.3.

Tables 5.1 and 5.2 show the results of the decomposition exercise for household head characteristics and regional level characteristics respectively. The column labelled Headcounts shows the proportion of sub-group j that is poor, in each year. The population share shows the relative size of the whole sub-group (poor and non-poor) in the total population, i.e. m_j, and the poverty share shows the relative size of the poor in sub-group j in the poor population, i.e. $m_j P_j(0)/P(0)$. The decomposition allows us to assess whether some groups are over or under-represented in the poor population. If a sub-group j forms a larger part of the poor population than it does of the total (poor and non-poor) population, then we can conclude that it is over-represented in the poor population.

Table 5.1 below shows the decomposition of poverty using household head characteristics: age, education, sex, race, whether the head is employed in agriculture and whether the head has a formal sector job. Age and education are both expressed in intervals of years identical to those used in the inequality decompositions of Chapter 4. Formal employment is defined as working with a *carteira de trabalho assinada,* a work card or permit, which confers entitlement to state insurance programs but also a tax liability, similar in function to a National Insurance number in the UK. There is no data on race in the 1981 survey.

Demographic information on the head of household seems to be generally less useful in identifying the poor population compared to other characteristics, just as in the inequality decompositions. The distribution of the poor by age of household head is very similar to that of the total population, with slightly more of the poor having young and early middle-aged heads (35-44 years old in both 1981 and 1995, and 25-44 years old in 1995) than the population as a whole. This may be associated with the presence of young children, a hypothesis that will be tested in the probit regressions in section 5.2.

A rise in female headship is evident from the data on sex, with both the poor and the non-poor experiencing increases in the proportion with female heads, with only slightly more of the poor having female heads than the average for the population. Hence there appears little evidence form the poverty profile that households headed by women are more likely to be poor than male headed households.

The race of the household head is a much more strongly associated with being poor, with 62% of the poor living in households with a black or mixed race head. The risk of being poor was much higher for households with a black or mixed race head: over half of the population with a mixed race head was poor in 1995, they formed 40% of the total population but over 50% of the poor population. The strong differences that were observed when examining the structure of inequality are reinforced when examining the structure of poverty. These figures support the evidence on racial inequalities in living standards such as life expectancy and literacy in Woods and Carvalho (1988).

TABLE 5.1. BRAZIL 1981-1995: ACCOUNTING FOR THE INCIDENCE OF POVERTY AMONG INDIVIDUALS BY HOUSEHOLD HEAD CHARACTERISTICS

		Headcounts		Population Share		Poverty Share	
		1981	1995	1981	1995	1981	1995
Age	<25	39	47	4	4	4	5
	25-34	43	45	22	21	22	24
	35-44	49	42	28	28	33	30
	45-54	40	37	24	22	22	21
	55-64	35	33	13	14	11	12
	65+	38	30	8	11	8	8
Education	None	62	60	30	24	44	36
	1-4	43	43	46	38	46	41
	5-8	27	33	14	20	9	17
	9-11	9	15	6	11	1	4
	12 +	2	5	5	7	0	1
Sex	Male	42	39	89	84	88	83
	Female	45	41	11	16	12	17
Race	White		27		53		37
	Black		54		6		8
	Mixed		53		40		54
	Indigenous		67		<0.1		<0.1
	Asian		12		1		<0.1
SECTOR	Agriculture	54	56	32	26	41	37
	Other	25	25	78	74	59	63
	Formal	34	33	65	66	53	53
	Informal	58	56	35	34	47	47
Overall Headcounts		43	38				

Notes. Race data was not available in 1985. Item non-response (i.e. of household head characteristics) may cause discrepancies between the overall headcounts and those implied by sub-group data.
Source: Own calculations PNAD 1981, 1995.

The same is true when examining the education of household heads. In 1981, 62% of individuals living in households with heads with no education were poor, and their risk of being poor was 44%, even though they formed only 30% of the population. However their risk of this sub-group being poor dropped over the period, partly as the headcount fell but mainly because the size of the sub-group fell. One surprising feature is that individuals with heads with higher levels of education had increasing risks of being poor over the decade and not just because their sub-group sizes rose, but because they experienced an increase in sub-group poverty. However, sub-group inequality also rose

during the period, with all inequality measures recording an increase in inequality among each sub-group between 1981 and 1995, as shown by Table 4.4 in Chapter 4. Although mean incomes rose for each sub-group between 1981 and 1995, clearly the distribution within each sub-group worsened, with a stretching of both tails.

Heads of poor households were more likely to be employed in agriculture than the average household head, and the decline in agricultural employment is much greater for the non-poor. They are also more likely to be employed in the informal sector, with little apparent change between 1981 and 1995.

Table 5.2 shows the distribution of the poor across regions and between urban and rural areas. Headcounts in the Northeast in each year were higher than other regions and individuals living in the Northeast had a higher risk of being poor than other those in other regions. Headcounts within each region fell between 1981 and 1995, except in the North where during the 1980s, clearance and settlement of the Amazon, with small plots of cleared land being allocated to landless farmers, together with substantial mining activities, and continued efforts to introduce market based land reform attracted many migrants from all over Brazil (Hall, 1989, Preston, 1987). Although the strong regional differences in headcounts and poverty risks support the evidence on the structure of inequality, it does not support the hypothesis that there has been a shift in the regional location of poverty.

However there does appear to have been an "urbanisation" of poverty between 1981 and 1995, as argued by Tolosa (1991) and others with regard to the 1980s. This was not driven by increases in poverty within urban areas however: rather the growing population share of urban areas, which increased proportionately more than poverty fell, means that the urban population were at greater risk of being poor in 1995 than in 1981.

TABLE 5.2. BRAZIL 1981-1995: ACCOUNTING FOR THE INCIDENCE OF POVERTY AMONG INDIVIDUALS BY GEOGRAPHIC LOCATION

		Headcounts		Population Share		Poverty Share	
		1981	1995	1981	1995	1981	1995
Region	North	35	39	3	5	2	5
	North-east	61	58	30	30	43	44
	Centre-west	50	45	7	7	8	8
	South-east	35	31	44	44	37	35
	South	28	23	16	15	11	9
Urban/Rural	Urban	39	37	71	79	65	74
	Rural	52	49	29	21	35	26
Overall Headcounts		43	38				

Source: Author's calculations PNAD 1981, 1995.

Table 5.3 shows some additional demographic characteristics of poor households. Poor individuals in each year belonged to larger households than the non-poor, with an average of 2.4 children in 1995 compared to 1.1 among the non-poor. The poor also had fewer workers than the non-poor and as a result the dependency ratio (defined as the number of household members per worker) among poor households was higher than among non-poor households. This goes some way to support the findings in Chapter 4 that households of different structures have different incomes and that these differences are an important source of inequality.

TABLE 5.3. BRAZIL 1981-1995: DEMOGRAPHIC STRUCTURE OF POOR AND NON-POOR HOUSEHOLDS

	1981		1995	
	Poor	Non-poor	Poor	Non-Poor
Household size	6.8	5.2	5.7	4.4
Number of children	3.3	1.6	2.4	1.1
Number of workers	1.6	2.1	1.5	1.9
Dependency ratio	4.9	3.1	4.1	2.6

Source: Author's calculations from PNAD 1981-1995.

In summary, examining the characteristics of the poor population shows that the poverty is associated with belonging to households whose head has little or no

education, is black or of mixed race, who have more children and fewer workers, are rural and/or live in the Northeast.

Some interesting contrasts in the changes in poverty headcounts and poverty shares can be made, pulling together some of the results from Chapter 4 on the levels and distribution of sub-group income. Some groups saw a fall in their headcount but a rise in their share of total poverty. For example both urban households and female-headed households made up larger proportions of the poor population because of the increase in their population shares, despite the fact that one group (urban) had above average income and the other (households headed by women) had below average income. Female-headed households in both years were on average poorer than male-headed households and their incomes were distributed more evenly than those of male-headed households. Urban households on the other hand were richer on average than rural households, but incomes were more unequally distributed – certainly among the lower tail - than rural households. Hence a poorer and relatively equal group (female-headed households) becoming larger and a richer but relatively unequal group (urban households) becoming larger had the same net effect on their contribution to total poverty. In contrast, households with an illiterate head, whose incomes are lower but more equally distributed than average saw a decline in their contribution to overall poverty because of the decline in their numbers.

5.3. CORRELATES OF POVERTY

The poverty decomposition analysis is useful for providing a profile of poverty and how it changed over the period but the analysis can be extended from this univariate approach by examining the correlates of poverty in a multivariate analysis where all household characteristics can be considered simultaneously. This section describes a probit model of the determinants of poverty status, i.e. poor or non-poor, and presents regression results.

First define a variable $p_i=1$ if income y_i of household i is less than the poverty line, z, and $p_i=0$ otherwise. The probability of a household i being poor can be expressed as:

$$P[p_i = 1] = P[y_i < z] = \Phi[g(z) - X_i'\beta^*]$$

where $g(y_i) = X_i'\beta + \varepsilon_i$ defines the underlying process of income generation of household i, X_i is a set of explanatory characteristics and g is a any monotonic transformation that gives ε_i~N(0,1) and Φ is the standard normal cumulative distribution function. The estimate of the intercept is given by $g(z)-\beta_0$ but as long as the estimate of the intercept is not needed then the model can be estimated as:

$$P[p_i = 1] = P[y_i < z] = \Phi[X_i'\beta^*]$$

where the slope coefficients $\beta_j = -\beta_j^*$. [68] Note that the function g has not been specified but it can effectively be any monotonic non-decreasing transformation[69] of y_i as long as it results in a normally distributed error term. This means that there is no functional form imposed on the data and the relation can take a variety of forms including non-linear and log-linear transformations (Stewart and Swaffield, 1997). [70]

However, there are drawbacks to this sort of limited dependent variable modelling. It has been argued (e.g. Deaton, 1997) that reducing a continuous variable, such as household income per capita (y_i), to a binary variable ($p_i=0,1$), "throws" information away on the variation in y with respect to the variation in explanatory variables. More seriously, on statistical grounds, is the requirement that g be a monotonic transformation of income. Pudney (1999) demonstrates that it is possible that this condition may not be satisfied if either g is decreasing locally and/or if "the derivatives of some elements of β are of opposite sign to the corresponding elements of X" (Pudney, 1999: 387). In his Hungary example, Pudney shows that among some sub-groups of the population (e.g. young people) β may take on different signs for different individuals within the group. There may be some who are on a trajectory into deeper, persistent poverty and others who are poor simply because they are the beginning of their economic life. Hence $\beta>0$ for the former group but $\beta<0$ for the latter. [71] Pudney proposes an alternative "semi-non-parametric" model but despite the drawbacks of the probit model finds little

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[68] Stewart and Swaffield (1997).
[69] See below for a brief discussion of this monotonocity requirement.
[70] I am grateful to Stephen Jenkins for raising this point.
[71] Pudney (1999) provides futher examples of locally decreasing coefficients but in a context of relative poverty lines.

difference between probit results and his proposed new technique.[72] In summary then, the probit model does have some disadvantages but it is still useful as a tool for profiling the poor population.

Although it is difficult to establish causality in regression models the results can at least be interpreted as proving insight into the correlates of poverty. Probit models are particularly useful for predicting which households are poor, and hence for targeting of anti-poverty policies. The probit model is estimated using maximum likelihood estimation and the results show the marginal effect on the probability of being poor, other things being equal, of a change in the independent variable. Using the **dprobit** command in STATA produces marginal effects (as opposed to the coefficients β_j^*) i.e. the effect on the probability of being poor for an infinitesimal change in the continuous independent variable or for a switch from 0 to 1 for the discrete dummy variable, evaluated at the mean. [73]

The dependent variable in the poverty probit shows the poverty status of household *i*, taking a value of 1 if poor and 0 if not poor. The model is estimated for the urban and rural populations separately. The independent variables included in the regression are as follows:

1. A set of location dummies

- Four regional dummies, Northeast *(NE)*, Centrewest *(CW)*, South *(S)* and North*(N)*, with the Southeast the omitted dummy;

2. A set of household head characteristics

- The age and age squared (*age, age2*) in years of the household head;

- The number of years of education, *edyears*, of the household head;

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[72] Pudney (1999) finds that for all "reasonable" poverty lines (i.e. above 35% of median income) the condition of globally non-decreasing coefficients is satisfied.

[73] Homogeneity across individuals within the same household is controlled for by calculating robust standard errors by clustering on household identification number.

- A dummy variable for sex of the household head: *head_fem*=1 if head is female;
- A dummy variable for race of the household head: *head_race*=1 if head is black, indigenous or of mixed race (1995 only);
- A dummy variable for occupation of the household head: *head_ag*=1 if head is employed in agriculture
- A dummy variable for sector of employment of the household head: *head_informal*=1 if head is employed in the informal sector, instrumented by working without a work card.[74]

3. A set of household level characteristics that capture household composition:

- The number of workers per household member in each household, *workers_hh*
- The number of children aged below 14 per household member in each household, *kids_hh*

Table 5.4 presents the results for each year, for both urban and rural areas. The results broadly confirm those of Rocha (1993), Wodon (1999) and the results shown above in the univariate analysis.

Region matters: households in the Northeast and Centrewest were more likely to be poor than those living in the Southeast, and other regions, all other things being equal, in both years, and in both urban and rural areas. Both the Northeast and Centrewest had lower than average mean income levels in each year and the highest headcounts in each year. Hence even after controlling for other important factors - education for example – those living in these two regions are at much greater risk of poverty than those in other regions.

Age of the household head has a very small effect on the probability of being poor in urban and rural areas in both 1981 and 1995. The sign on *age2* suggests that there are

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[74] Formal employment is defined as working with a *carteira de trabalho assinada,* a work card or permit. See earlier in this chapter.

some diminishing returns to age, although the effect is small. These results confirm the conclusions of Chapter 4 on the structure of inequality that the age of the household head is not a useful way of examining household income per capita distributions.

Education of the household head on the other hand is a much stronger correlate of poverty. In 1981 in urban areas, a small increase in education, led to a fall in the probability of being poor of 7 percentage points but in 1995, a small increase in schooling would have caused the poverty probability to fall by less than 5 percentage points. Similar results are obtained for rural areas but the magnitudes are slightly smaller at around 6 percentage points in 1981 and 4 percentage points in 1995. Hence in both urban and rural areas the marginal effect of education fell over time. This may reflect a "cohort" effect: the average age of household heads in the sample increased slightly over the period, so the decline in "returns" to schooling (in terms of reduced probability of being poor) may actually be due to an ageing population of household heads.

TABLE 5.4. BRAZIL 1981-1995: CORRELATES OF HOUSEHOLD POVERTY STATUS

	1981			1995		
	Marginal effect	Standard error	Sample Mean	Marginal effect	Standard error	Sample Mean
URBAN						
Regional Dummies						
North	-0.1672	0.0073	0.038	-0.1042	0.0083	0.057
Northeast	0.1011	0.0067	0.225	0.1116	0.0066	0.236
South	-0.1316	0.0068	0.142	-0.0885	0.0065	0.149
Centre-West	0.1878	0.0082	0.068	0.1347	0.0083	0.070
Household Head Characteristics						
Age	-0.0042	0.0002	44.130	-0.0077	0.0009	45.032
Age2	0.0000	0.0000	2152.010	0.0000	0.0000	2221.770
Edyears	-0.0688	0.0009	3.945	-0.0465	0.0007	5.401
Head_fem	0.1343	0.0078	0.134	0.0773	0.0066	0.179
Head_race				0.1130	0.0053	0.433
Head_ag	0.0734	0.0107	0.084	0.1220	0.0100	0.093
Head_inf	0.1409	0.0083	0.131	0.0889	0.0078	0.124
Household Level Characteristics						
Workers_hh	-0.7576	0.0139	0.373	-0.4551	0.0107	0.480
Kids_hh	0.0878	0.0022	0.407	0.0852	0.0027	0.337
Pseudo R^2		0.3302			0.2951	
Observed Poor		0.388			0.352	
Predicted Poor		0.333			0.293	
RURAL						
Regional Dummies						
North[a]				0.0703	0.0373	0.012
Northeast	0.1460	0.0110	0.485	0.1137	0.0141	0.521
South	0.0224	0.0136*	0.213	0.0255	0.0175*	0.165
Centre-West	0.2626	0.0121	0.061	0.2371	0.0175	0.060
Household Head Characteristics						
Age	-0.0013	0.0004	44.866	-0.0054	0.0022	45.868
Age2	0.0000	0.0000	2268.000	0.0001	0.0000	2313.150
Edyears	-0.0567	0.0026	1.475	-0.0414	0.0024	2.152
Head_fem	0.0597	0.0159	0.067	0.0134	0.0181*	0.098
Head_race[b]				0.0775	0.0123	0.570
Head_ag	0.0336	0.0105	0.715	0.1547	0.0126	0.718
Head_inf	0.1500	0.0099	0.274	0.0579	0.0141	0.198
Household Level Characteristics						
Workers_hh	-0.5059	0.0223	0.399	-0.2929	0.0264	0.328
Kids_hh	0.0754	0.0030	0.622	0.0969	0.0053	0.531
Pseudo R^2		0.217			0.244	
Observed Poor		0.524			0.470	
Predicted Poor		0.530			0.463	

Notes: See text for definitions of variables. [a] No rural population in the North in 1981 sample; [b] No data on race in 1981. All effects are statistically significant at the 5% level or better except those marked with a *.

Source: Author's calculations from PNAD 1981 and 1995.

Sex of the household head finally exerts some impact on poverty. In this multivariate analysis, belonging to a female-headed household increased the risk of being poor in each year and in both urban and rural areas, just as Wodon (1999) found. By holding a number of potentially important factors constant, and so controlling for some of the heterogeneity, it can be seen that female headed households are more likely to be poor than male-headed households with otherwise identical characteristics. The effect is much stronger in urban areas, where having a female head increases the probability of being poor by 13 percentage points in 1981 and 7 percentage points in 1995. In rural areas, the marginal effects are much lower: 6 in 1981 and only around 1 in 1995, and that not statistically significant. The lower effects in rural areas may be explained by migration: individuals from rural households are probably more likely to migrate to urban areas, leaving behind spouses and families but probably continuing to support the household through remittances. Hence belonging to a female-headed household in a rural area may simply indicate that the male head has migrated but is continuing to generate income for the household.

The race variable in 1995 is also strong. Belonging to a household with a black, indigenous or mixed race head raised the probability of being poor by around 11 percentage points in urban and 7 percentage points in rural areas. This means that individuals from two otherwise identical households will face quite different poverty risks simply because of the race of the household head. But it also suggests that whatever the nature of the discrimination that results in higher poverty among the black, mixed race and indigenous populations, is more severe in urban areas. This may be because employment in rural areas is predominantly agriculture-based where the wage distribution may be lower than among the broader range of occupations and sectors in urban areas, where both formal and informal sectors exist. Note that while most (around 70%) heads of households in rural areas are employed in agriculture very few urban heads are employed in agriculture.

The employment sector of the household head is useful in identifying the poor. Having a head employed in agriculture raised the probability of being poor, other things being

equal, by 7 percentage points in 1981 and 12 percentage points in 1995 in urban areas and by 3 and 15 percentage points respectively in rural areas. The increase in the marginal effect between 1981 and 1995 in both urban and rural areas may reflect the broadening of the economy as opportunities in manufacturing grew.

Formal and informal workers faced quite different poverty risks: in 1981 employment in the informal sector raised the probability of being poor by around 15 percentage points in both urban and rural areas, and by between 6 and 9 percentage points in 1995, even after controlling for other factors. The marginal effects fell between 1981 and 1995, suggesting that wage differentials may have narrowed between the two sectors, although it is difficult to test this for household heads.

Finally the household level variables reveal that having more workers per household member reduces the probability of being poor while having more children per household member increases the probability of being poor. This is true for both urban and rural areas and for both years analysed here. This suggests then that a key to escaping poverty is through employment, which supports findings by Wodon (1999) that households where both the head and spouse work have much lower probabilities of being poor. Wodon also found that large numbers of children increased the probability of being poor, a results borne out in this analysis.

5.4. CONCLUSIONS

This chapter provides a profile of poverty in Brazil over the period 1981 and 1995, analysing the structure of poverty in 1981 and 1995 using key characteristics of households and individuals, and also estimating the effects on the probability of being poor of some of these features. The analysis complements that of Rocha (1993) and Wodon (1999) by providing a multivariate analysis of poverty rather than per capita income regressions, and further extends their work by considering the temporal dimension of changes in poverty structure and correlates over time.

A number of household characteristics emerge from the analysis as being important correlates of poverty, from both the univariate and multivariate analysis. Living in the Northeast and Centrewest is associated with greater probabilities of being poor, even

after controlling for other differences. This suggests that geographic targeting of anti-poverty policies may be effective in these regions. There is also a case for tacking racial inequalities, as race of the household head is another factor strongly associated with poverty. Employment also matters, in terms of both sector of employment and how many earners there are in each household. Individuals living in households with a head working in agriculture, and those with fewer earners per household member faced an increased chance of being poor given their levels of education and other factors. This suggests a need to diversify income sources out of agriculture in rural areas and to create employment opportunities that allow more members to work, but in a way that does not exclude those with child care responsibilities.

The analysis presented in this chapter suggests that structure of poverty in Brazil has not undergone significant changes between 1981 and 1995. The types of characteristics that defined the poor population in 1981 are similar to those in 1995, hence it is possible to conclude that the same types of people who were poor in 1981 are the same types as those who were poor in 1995.

CHAPTER 6. CONCLUSIONS

This thesis has examined the Brazilian income distribution through the period 1981 to 1995, analysing levels and changes in poverty, income inequality and social welfare and investigating the structure of inequality and poverty. The focus has been on the micro level: factors that differentiate individuals and households, including geographical location, education, age, sex, race, household composition, employment and sources of income. The research has been based on application of current "best practice" techniques of distributional analysis to provide a statistical description of the levels and trends in poverty and inequality and in the structure of the income distribution. This research therefore provides knowledge and understanding of some of the structural features of the Brazilian income distribution that may be useful for analysing further the causes of poverty and inequality, and their changes through time, and of the possible effects of particular types of policy.

This concluding chapter discusses the results, limitations of the methodology and policy conclusions from each chapter in turn.

Chapter 1 of the thesis provided the motivation for analysing poverty and inequality in Brazil, described the economic climate during the 1980s and 1990s, and reviewed the literature on poverty and inequality in Brazil. A number of gaps or limitations in previous analyses of the Brazilian income distribution were highlighted.

Chapter 2 described how to fill in these gaps and improve upon the methods used by existing studies. Different sources of data were examined, the comparability of income estimates derived from different sources was examined and the implications of methodological decisions, such as converting from nominal to real incomes and the treatment of zero incomes, were assessed. Chapter 2 also discussed the measurement of poverty, inequality and social welfare, describing the main tools of distributional analysis used in the thesis and their advantages over other alternatives. The chapter argued that the best available, but not ideal, source of income data that allows for an analysis of poverty and inequality for the whole population of Brazil and for a comparable inter-temporal analysis is the *Pesquisa Nacional por Amostra de*

Domicílios, (PNAD), an annual household survey that is nationally representative and available for most years between 1981 and 1995. The definition of income is gross monthly household income per capita, distributed across individuals, and deflated over time using an adjusted consumer price index that takes into account changes in the way prices were collected and centres the index on the end of the survey reference month. The implications of this choice of welfare indicator on measured levels of income, poverty and social welfare were also discussed.

Chapter 3 examined the level of poverty, inequality and social welfare in Brazil over the period 1981 to 1995. Estimates of mean and median income were presented together with summary measures of poverty and inequality, together with standard errors, for each year. Average income rose substantially during the period, with all decile groups experiencing a rise in mean income. In fact all percentile groups with the exception of the very poorest 2%, experienced a rise in real income between 1981 and 1995. Incomes in Brazil were distributed extremely unequally throughout the period, with an increase between 1981 and 1995 in all inequality measures, all of which were statistically significant, and statistically significant Lorenz dominance of 1981 over 1995 indicating that inequality has unambiguously increased over the period. Poverty, based on a set of regional poverty lines, fell during the period 1981 to 1995. Although this result was not robust to varying the poverty line through the entire (wide) range of the regional poverty lines, the fall in poverty between 1981 and 1995 was statistically significant for all poverty measures.

However, the changes between 1981 and 1995 were not monotonic during the period. Incomes were particularly volatile, falling in real terms during the recession of 1981-1983, rising rapidly during the (short) period of low inflation in 1986, falling again as inflation again picked up but eventually rising in real terms by 1995. Inequality increased significantly and unambiguously between 1981 and 1990 and then fell (again unambiguously and statistically significantly) between 1990 and 1995. The year-on-year results show that inequality rose during periods of recession (e.g. 1981-1983), rose during periods of very high inflation (e.g. between 1986 and 1989 and between 1990 and 1993) and fell during periods of low inflation (e.g. 1985-1986, 1993-1995). Poverty

too appeared to behave (anti) cyclically, rising in periods of recession and inflation and falling during better years.

Finally Chapter 3 examined the inter-temporal robustness of poverty and inequality comparisons to the choice of equivalence scale. The results showed that although the level of inequality in any one year varied considerably, with estimates based on per capita income being the highest, comparisons over time were broadly robust to the equivalence scale parameter. With respect to poverty, the poverty gap and squared poverty gap gave consistent rankings of distributions across time, but using the headcount led to inconsistent rankings of distributions across time. It was suggested that this inconsistency was due largely to noise as estimates obtained for the headcount under different equivalence scales were very similar.

There are some limitations to the results obtained in Chapter 3. Firstly, there is an issue about variations in prices across regions. Although the poverty analysis takes into account to a certain extent regional differences in prices of certain goods consumed by the poor, a more appropriate analysis would adjust all incomes by a regional price index and then estimate levels of incomes, inequality and poverty, using a single poverty line, as has been done recently for Chile for the period 1987-1994 (World Bank, 1997) and for the Brazilian urban income distribution (Ferreira and Barros, 1999). In the Chilean case, where the geography of the country causes transport costs to be an important component of prices, although changes over time appeared relatively robust to the introduction of a regional price index, levels of income, poverty and inequality varied significantly, with higher estimates of poverty and inequality, and lower levels of mean incomes. Incomes in the extreme north and south were effectively devalued by almost 20% because the price index increased substantially with distance from Santiago. The Brazilian study used an index of prices based on the 1996 *Pesquisa sobre Padroes de Vida* (PPV), an expenditure survey of the Northeast and Southeast of Brazil. Price vectors for other regions are interpolated from these. The price index showed substantial variation for 1996, although Ferreira and Barros (1999) concluded that - for the urban distribution – little changes occurred for comparisons over the 1990s. Using such an index for the PNAD 1981 through to 1995 could change the results obtained in

this thesis, in terms of levels but may have a smaller or little impact on changes over time. This would be an important extension to the methodology.

The second methodological issue concerns the choice of a welfare indicator. This thesis has adopted a very narrow definition, household income per capita, but it is possible that this is not well-correlated with other indicators of welfare such as expenditure, calorie intake, health status, and access to public utilities or housing conditions. Glewwe and van der Gaag (1990) show that the indicator used to identify the poor can affect who is identified as being poor and hence the composition of poverty, with obvious policy implications. This thesis has not examined the association between income and other indicators, but a recent study on Brazil suggest that income estimates from the 1996 PNAD substantially underestimate those from the 1996 PPV indicators, leading to much higher estimates of poverty particularly for rural areas (Ferreira et al, 1999). Although expenditure data is not available for much of the period, it would be insightful to test this result with other indicators such as access to public utilities and housing quality.

The two policy conclusions from Chapter 3 relate to the role of macroeconomic performance. Inequality and poverty trends appear to approximate the trends in some of the key macroeconomic indicators for the period: GDP per capita, unemployment and inflation. Table 6.1 shows correlation coefficients between each poverty and inequality measure and a range of macroeconomic indicators. They indicate that while poverty and inequality do indeed have strong associations with macroeconomic performance, different forces may actually drive poverty and inequality. Poverty seems to have a much stronger relationship with GDP per capita and unemployment, while inequality is closely related to inflation.

TABLE 6.1. CORRELATION COEFFICIENTS: POVERTY, INEQUALITY AND MACROECONOMIC INDICATORS

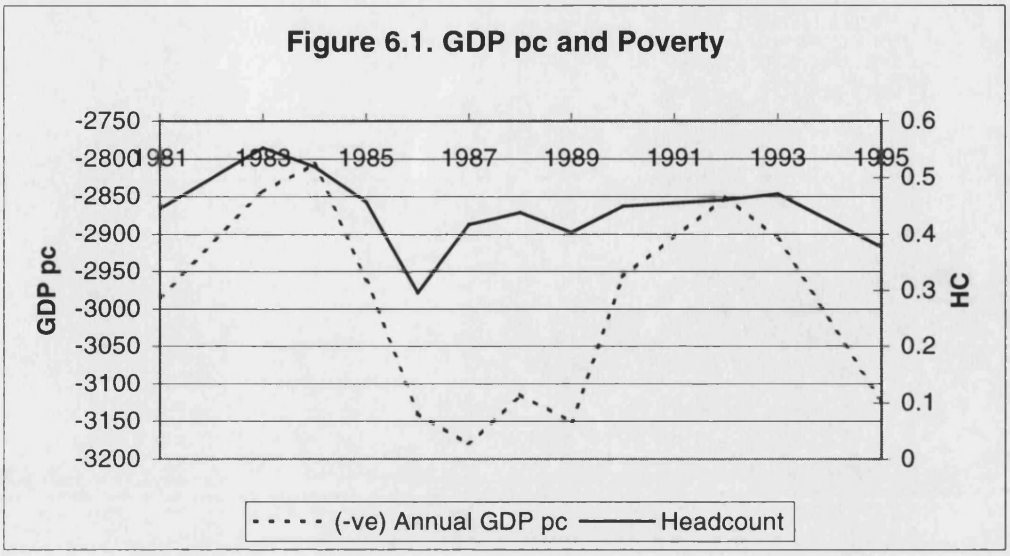
	HC	PG	FGT2	Gini	GE0	GE1	GE2
Inflation	0.099	0.217	0.274	*0.527*	*0.588*	*0.573*	*0.554*
Log Inflation	0.129	0.274	0.344	*0.582*	*0.668*	*0.645*	*0.623*
GDP per capita	*-0.800*	*-0.785*	*-0.779*	0.501	0.490	*0.535*	0.455
Unemployment	*0.628*	*0.624*	*0.638*	-0.468	-0.413	-0.487	*-0.575*
GDP growth	-0.422	-0.410	-0.419	-0.014	-0.069	0.088	0.204

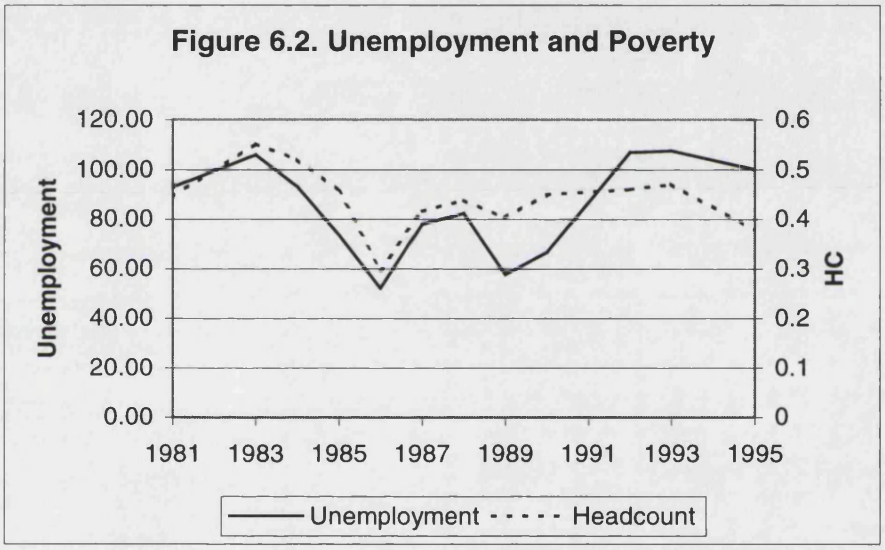
Notes: italics mean statistically significant at 5% or better. Underlying macroeconomic data appears in Table 1.1, inequality and poverty estimates in Tables 3.1 and 3.7.

Figures 6.1 and 6.2 examine the trends in poverty, GDP per capita and unemployment. They show that although the poverty trend is reasonably closely related to that of GDP per capita, it is much more strongly related to unemployment. This confirms the belief that while growth is a necessary condition for poverty reduction, it is probably not a sufficient one (IFAD, 2001, Anderson and White, 2000, World Bank, 2000). Periods of recession and low growth in the early 1980s were associated with periods of rising poverty and when growth resumed, briefly in the latter part of the 1980s and more strongly in the 1990s, poverty did indeed fall. However the insignificant change in poverty over the 1980s as a whole however despite the fairly strong growth of mean incomes suggests that the pattern of growth was not pro-poor, further supported by the rise in inequality over the 1980s. In a country as unequal as Brazil, in income and in assets, particularly land[75] and education[76], there must be a role for both redistribution and growth in tackling poverty. The importance of employment is picked up again in Chapter 5.

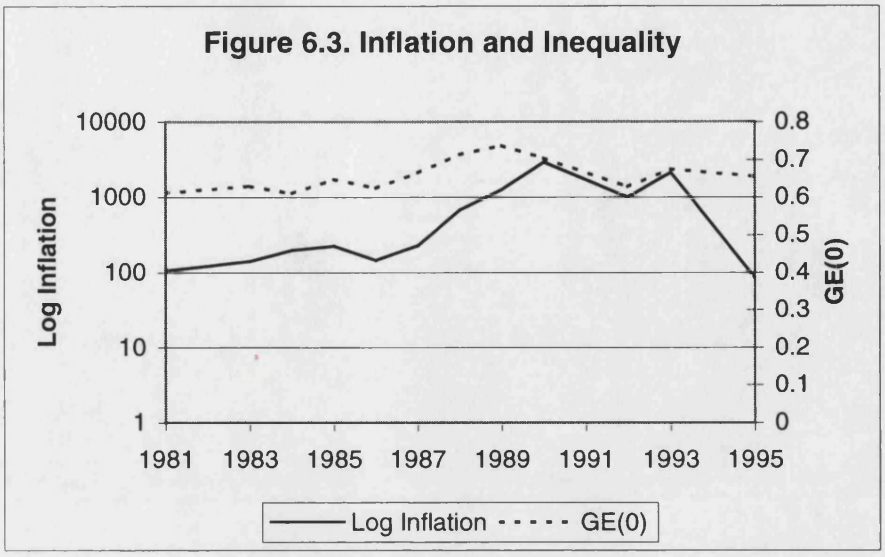
[75] See Barros et al (2000) for a study of land inequality in northeast Brazil and the possible impact on poverty of land reform. Briefly, the authors show that there is indeed an inverse relationship between farm size and productivity and that there is sufficient un/under-used land available for redistribution to reduce poverty.

[76] See for example, Amsberg et al (2000) on the inequalities in attendance and expenditure on education.





However, it appears that inflation is bad for inequality, as shown by the rises in inequality during periods of high inflation and falls when inflation was low (immediately after the *Cruzado Plan* of 1986 and again after the *Real Plan* of 1994). Figure 6.3 shows that inequality follows the log inflation trend very closely, rising in time if high inflation and falling again when inflation falls.



There are a number of reasons why inflation is not distributionally neutral that work through several different transmission mechanisms, including interest rates, liquidity, wages and taxation. While there is no doubt that there is imperfect and differential indexation of wages across income groups, and that government tax revenues did fall dramatically in the late 1980s,[77] Kane and Morisett (1993) suggest that interest rates and liquidity are the most important mechanisms, and this is supported by later work by Neri (1997). Firstly there are large economies of scale in financial transactions from which the rich (making larger financial transactions) can benefit. Secondly, there are significant barriers to entry in financial markets, as revealed by the differential access to dollar accounts. There may be other effects, such as the ability to transfer cash into consumer goods that retain their value better: by Engel's law, the rich will be able to do this much more easily. Neri (1997) also suggests that technology may have a role: richer individuals have storage for food (refrigerators and freezers) that allows them to purchase larger amounts at lower unit costs so boosting the purchasing power of their incomes. These effects though are unlikely to show up in the PNAD data that does not value assets or expenditure. However Kane and Morisett demonstrate that by far the biggest effect is via the ability of richer income groups to insulate themselves from the

[77] In Brazil in the 1980s income taxes on earnings were due in the follwing calendar year, without any inflation adjustment (Simonsen, 1983, cited by Kane and Morisett, 1993:2).

effects of inflation by taking advantage of high real interest rates of demand deposits[78] supported by evidence of shifts in the composition of financial wealth from cash (including currency and current deposits) to indexed assets during the 1980s, and increasingly so in times of higher inflation. They argue that the regressive effect of inflation in their model, although large, is likely to be underestimated because they do not include real assets (and land must be one of the most important of these) that are held disproportionately by the rich and whose real rates of return are likely to be significant.

Camargo and Ramos (1988) argue that the *Cruzado Plan* of 1986 initiated a reversal in relative power between different social groups. They argue that in the year prior to the Cruzado Plan, exporters, large firms and unionised workers were best able to protect real incomes from the effects of inflation because of indexation, while the price freeze and wage re-adjustments introduced in 1986 removed this insulation but had little power to touch small businesses and the informal sector. They argue that because the "adjustment costs" of the Cruzado Plan were borne disproportionately by richer income groups then future attempts to control inflation will have been hampered by distributive conflict between different social groups, and may explain why the Summer and Bresser Plans that followed the Cruzado Plan failed so quickly. Similarly Kane and Morisett (1993) argue that since inflation seems to, at worst, do no harm to upper income groups and at best actually enrich them further, it is likely that attempts at stabilising inflation would be difficult. Of course further stabilisation plans were designed and implemented, notably the Real Plan in 1994. This Plan was conceived in a context of soaring inflation levels, higher than in the 1980s, and in a context of moves to adopt neo-liberal economic policies of trade and financial reform, privatisation etc. Saad-Filho and Coelho Saraiva (1999) argue that distributive conflict was "repressed" by processes of liberalisation and opening the Brazilian economy to international markets and hence this is what allowed the Real Plan to be implemented. Since implementing the Real Plan

[78] Real interest rates during the periods of high inflation were substantial (Kane and Morisett, 1993).

inflation has been low and reasonably stable. Perhaps as a consequence, poverty and inequality have both also fallen (Rocha, 2000).[79]

It would be possible to examine the distributional effects of inflation, unemployment and a number of other macroeconomic indicators. One method would be to adopt the Blinder and Esaki (1978) approach, and applied to UK data by Nolan (1987), where shares of income of each quantile i in time t are regressed against the macroeconomic indicators of choice, i.e. $s_{it} = \alpha_i + \beta_{ij} X_t$ where X may include inflation and unemployment for example, and where the coefficients α, β vary for each quantile. If inflation does have a regressive effect then we would expect the coefficient on inflation to be positive for the upper income groups and negative for those lower down. Similarly the unemployment coefficient would be expected be negative as it reduces the shares of lower income groups.

A second method that could be applied to examine the relationship between poverty, growth and inequality is that used by Datt and Ravallion (1992) for Brazil, referred to in Chapter 3. They find that in the 1980s rising inequality prevented the gains from growth being translated into poverty reduction: it would be useful to extend this to the 1990s.

Chapter 4 examined the structure of Brazilian inequality. The literature review conducted in Chapter 1 suggested a number of structural characteristics that may be important determinants of inequality. These included characteristics of the household head (age, sex, education and race), characteristics of the household, (family structure and geographic location) and types of incomes. The chapter examined mean incomes, population shares and levels of inequality within each of the population sub-groups and applied inequality decomposition techniques to analyse the relative importance of differences between sub-groups of the population and differences within these sub-groups, and how these had contributed to the change in inequality over time. A second type of decomposition analysis examined the contribution of inequality in different sources of household income, using earnings from employment, disaggregated into self-

[79] There are questions about whether the fall in inequality and poverty after the Real Plan is due to inflation being reduced (Saad-Filho and Coelho Savaira, 1999).

employment and employee income, income from state transfers, income from capital and private remittances.

The results suggest that education and earnings are key factors associated with inequality. There is much evidence that education expenditure in Brazil is highly biased towards university education, that there are wide disparities in educational spending across regions and that educational enrolment rates and attainment levels are much lower among lower income groups (see for example recent evidence presented by Amsberg et al, 2000, Menezes-Filho et al, 2000, Guimarães de Castro, 2000). The results from this thesis support this broadly but warrant further research.

It would be useful to examine more closely the relationship between employment and inequality. Two avenues suggest themselves from the analysis in Chapter 4. Firstly it is possible that another source of inequality is between those households with earners and those without, or with differing numbers of full and part-time earners or with earners in different sectors, especially given the move from import substitution to an open economy over the period covered. Secondly, given that earnings make up the bulk of household income for most households in Brazil, and are the major source of household income inequality, it would be useful to model the determinants of earnings at the individual level and to see which personal characteristics, and area effects, are most relevant. This fuller analysis of earnings inequality would also incorporate a broader set of labour market characteristics, such as occupation, sector of employment, firm size and experience.

Chapter 5 examined the structure of Brazilian poverty. First a profile of poverty was constructed and secondly the correlates of poverty were analysed using a probit model of the probability of a household being poor. The results showed that some household characteristics were important in shaping the structure of poverty in each year: race and education of the household head are strong correlates of poverty, with poorly educated, and black or mixed race facing much greater probabilities of being poor. The results also showed the importance of household composition: households with fewer workers per household member were more likely to be poor, as were those with more children per household member. These results support the hypothesis presented earlier on this chapter that poverty was closely related to unemployment. Finally there is a strong

regional aspect to poverty, with some regions (the Northeast and Centrewest) facing much higher probabilities of being poor than others.

One possible extension to both the poverty and inequality decomposition analysis relates to the concept of household head. Decompositions of inequality (and poverty) suggest that differences between households with heads of different ages or sexes are not important determinants of the level of poverty or inequality in any year. This goes somewhat against the conventional wisdom that elderly and female headed households are over-represented in the poor population because of low income generation capacity. However, the multivariate analysis showed that, at least in the case of sex, once other differences were controlled for, having a female head did significantly increase the chance of being poor. Rosenhouse (1989) argued that headship as defined by most surveys was not a useful concept and that other ways of defining the head of the household should be adopted. Her observation and the results of this thesis suggests that households need to be "unpicked" with the head of the household redefined, not as the person that other members identify as the head, but as the person who is the primary income earner of the household. Some household head characteristics are probably shared with other members of the household, for example education and race, although this needs to be tested, but sex and age may not. Hence it might be useful to redefine the heads of household as the person who contributed the greatest proportion of household income.[80] This would also contribute to a better understanding of the relationship between employment and inequality, as the head would now be the main income earner.

Having done this it would be useful to examine the robustness of the poverty and inequality decompositions, but in particular the result from Chapter 5, that although female headed households were more likely to be poor than male headed household in both urban and rural areas, the effect was much weaker in rural areas. One hypothesis may be that income earning opportunities may be greater in rural areas where women can produce and sell small quantities of agricultural produce, textiles or crafts, if they

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[80] This is not to say that this person is the "head" in terms of decision making, or reflects the division of power within the household, but for analysis of poverty and inequality where income is the welfare indicator, the primary income earner may be the more appropriate to use as the household reference person.

have some access to land, whereas urban female headed households may not, or alternatively that rural female headed households receive a greater amount of income from remittances. A similar type of reasoning may apply to elderly headed households.

The poverty profiling results suggest some role for anti-poverty policy targeting, a recommendation also made by Ferreira, Lanjouw and Neri (1999) in their profile of urban poverty in 1996. Many studies have shown that the poor – in many developing countries – are concentrated in rural areas, in remote regions, in mountainous areas with little access to roads, other infrastructure such as health, education and public utilities, and to markets (IFAD, 2001).[81] The results obtained in this thesis show that area effects are strong: even after controlling for a range of household characteristics, individuals in different regions face very different chances of being poor, with those in the Northeast facing much higher probabilities of being poor than those in other regions. Hence there is a strong role for area-based targeting of resources, complemented with policies aimed at improving enrolment and attainment rates in education.

In sum up, this thesis has examined the Brazilian income distribution through a period of difficult economic and political change. Estimates of incomes, poverty and inequality have been calculated, changes over time have been examined and the structure of inequality and poverty have been analysed. The methodology, although not without limitations, has used best practice techniques of distributional analysis using the best available source of data for such an analysis. The contribution of the thesis goes beyond merely providing more "statistics" on the income distribution however, as the results are relevant to much broader debates on growth, macro-economic instability and policies aimed at reducing poverty and inequality. Further research is needed to

[81] However, individual countries may not conform to this general characterisation. A recent study of poverty in Latin America (that did not include Brazil) suggests that area affects are more important in Peru and Colombia, whereas in Chile, Paraguay, Honduras and El Salvador geographical location does not have a significant impact on poverty once other factors such as household characteristics and endowments are taken into account (López and Valdés, 2000).

consolidate some of the results and to test fully the policy implications and suggestions as to how this could be conducted have been described in this chapter.

TABLE A1 KEY VARIABLES FROM PNAD 1981-1995

	Year											
Sample information	**1981**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1992**	**1993**	**1995**
Household identification number	v101	v101	v101	v101	v101	v101	v101	v101	v101	numero	numero	numero
State	v10	v10	V10	v10	v10	v10	v10	v10	v10	uf	uf	uf
Situation (urban/rural)	v3	v3	v3	v3	V3	v3	v3	v3	v3	v0104	v0104	v0104
Individual Sample weight	v9991	v9991	v9991	v9991	V9991	v9991	v9991	v9991	v9991	v4729	v4729	v4729
Household Level data												
Household size	v107	v107	v107	v107	v107	v107	v107	v107	v107	v0105	v0105	v0105
Number of members aged 10+	v108	v108	v108	v108	v108	v108	v108	v108	v108	v0106	v0106	v0106
Type of household (private/shared)	v201	v201	v201	v201	v201	v201	v201	v201	v201	v0201	v0201	v0201
Type of dwelling (house, flat etc)	v202	v202	v202	v202	v202	v202	v202	v202	v202	v0202	v0202	v0202
Wall material	v203	v203	v203	v203	v203	v203	v203	v203	v203	v0203	v0203	v0203
Floor material	v204	v204	v204	v204	v204	v204	v204	v204	v204	n/a	n/a	n/a
Roof material	v205	v205	v205	v205	v205	v205	v205	v205	v205	v0204	v0204	v0204
Water source	v206	v206	v206	v206	v206	v206	v206	v206	v206	v0212	v0212	v0212
Sewage disposal method	v207	v207	v207	v207	v207	v207	v207	v207	v207	v0217	v0217	v0217
Bathroom	v208	v208	v208	v208	v208	v208	v208	v208	v208	v0215	v0215	v0215
Rubbish disposal method	v209	v209	v209	v209	v209	v209	v209	v209	v209	v0218	v0218	v0218
Light (electric y/n for 1981-90, type 1992-95)	v210	v210	v210	v210	v210	v210	v210	v210	v210	v0219	v0219	v0219
Number of rooms	v211	v211	v211	v211	v211	v211	v211	v211	v211	v0205	v0205	v0205
Number of bedrooms	v231	v231	v231	v231	v231	v231	v231	v231	v231	v0206	v0206	v0206
Occupation status	v212	v212	v212	v212	v212	v212	v212	v212	v212	v0207	v0207	v0207
Monthly rent/mortgage	v213	v213	v213	v213	v213	v213	v213	v213	v213	v0208 (rent) v0209 (mortgage)	v0208 (rent) v0209 (mortgage)	v0208 (rent) v0209 (mortgage)

Water filter	v214	v214	v214	v214	v214	v214	v214	v214	v214	v0224	v0225	v0226
Stove	v215	v215	v215	v215	v215	v215	v215	v215	v215	v0221 (2+rings) v0222 (1 ring)	v0221 (2+rings) v0222 (1 ring)	v0221 (2+rings) v0222 (1 ring)
Cooking fuel	-	-	-	-	-	-	-	-	-	v0223	v0223	v0223
Refrigerator	v216	v216	v216	v216	v216	v216	v216	v216	v216	v0228	v0228	v0228
Radio	v217	v217	v217	v217	v217	v217	v217	v217	v217	v0225	v0225	v0225
Telephone	n/a	n/a	N/a	n/a	n/a	n/a	n/a	n/a	n/a	v0220	v0220	v0220
Freezer	n/a	n/a	N/a	n/a	n/a	n/a	n/a	n/a	n/a	v0229	v0229	v0229
Washing machine	n/a	n/a	N/a	n/a	n/a	n/a	n/a	n/a	n/a	v0230	v0230	v0230
Television	v218	v218	v218	v218	v218	v218	v218	v218	v218	v0226 (colour) v0227 (b&w)	v0226 (colour) v0227 (b&w)	v0226 (colour) v0227 (b&w)
Type of construction	v409	v409	v409	v409	v409	v409	v409	v409	v409			
Total household monthly income, nominal	v410	v410	v410	v410	v410	v410	v410	v410	v410	v0905314	v0905314	v0905314
Individual Level Data	**1981**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1992**	**1993**	**1995**
Sex	v303	v303	v303	v303	v303	v303	v303	v303	v303	v0302	v0302	v0302
Race	-	-	-	-	v304	v304	v304	v304	v304	v0404	v0404	v0404
Member absent/present	v304	v304	v304	v304	-	-	-	-	-	-	-	-
Relationship to head of household	v305	v305	v305	v305	v305	v305	v305	v305	v305	v0401	v0401	v0401
Age (in reference week)	v805	v805	v805	v805	v805	v805	v805	v805	v805	v03034	v03034	v03034
Literacy	v311	v311	v311	v311	v311	v311	v311	v311	v311	v0601	v0601	v0601
Primary activity	v501	v501	v501	v501	v501	v501	v501	v501	v501	v09001	v09001	v09001
More than one job (y/n)	v502	v502	v502	v502	v502	v502	v502	v502	v502	v09005	v09005	v09005
Position in primary job	v505	v505	v505	v505	v505	v505	v505	v505	v505	v090061	v090061	v090061
Social Security card for primary job	v506	v506	v506	v506	v506	v506	v506	v506	v506	v09042	v09042	v09042
Cash income from primary activity	v537	v537	v537	v537	v537	v537	v537	v537	v537	v090532	v090532	v090532
Income from primary commercial production activity	v538	v538	v538	v538	v538	v538	v538	v538	v538	v090535 (includes in-kind income	v090535 (includes in-kind income	v090535 (includes in-kind income
Income in kind from primary activity	v5072	v5072	v5072	v5072	V5072	v5072	v5072	v5072	v5072			
Hours normally worked in	v508	v508	v508	v508	v508	v508	v508	v508	v508	v09058	v09058	v09058

primary activity (week)												
Position in second job	-	-	-	-	-	-	-	-	v2408	v09092	v09092	v09092
Social Security card for secondary activity (y/n)	-	-	-	-	-	-	-	-	-	v09097	v09097	v09097
Cash income from secondary activities	v549	v549	v549	v549	v549	v549	v549	v549	v549	v090982 + v091022	v090982 + v091023	v090982 + v091024
Income from production from secondary activities	v550	v550	v550	v550	v550	v550	v550	v550	v550	v090985 + v091025 (includes in kind)	v090985 + v091025 (includes in kind)	v090985 + v091025 (includes in kind)
Income in kind from secondary activities	-	-	-	-	-	-	-	-	-			
Hours normally worked in secondary activities (week)	v510	v510	v510	v510	v510	v510	v510	v510	v510	v09101	v09102	v09103
Pension	v578	v578	v578	v578	v578	v578	v578	v578	-	v0912502 (public) v0912508 (private)	v0912502 (public) v0912508 (private)	v0912502 (public) v0912508 (private)
Dependent's pension	v579	v579	v579	v579	v579	v579	v579	v579	-	v0912505 (public) v0912511 (private)	v0912505 (public) v0912511 (private)	v0912505 (public) v0912511 (private)
Long service bonus	v580	v580	v580	v580	v580	v580	v580	v580	-	v0912514	v0912514	v0912514
Income from rent	v581	v581	v581	v581	v581	v581	v581	v581	-	v0912517	v0912517	v0912517
Any other income (private remittances, savings etc)	v582	v582	v582	v582	v582	v582	v582	v582	-	v0912520 (remittances) v0912523 (other)	v0912520 (remittances) v0912523 (other)	v0912520 (remittances) v0912523 (other)
Years of education	v318	v318	V318	v318	v318	v318	v318	v318	v318	v06073	v06073	v06073
Total individual monthly income, main activity, nominal	v600	v600	V600	v600	v600	v600	v600	v600	v600	v0905311	v0905311	v0905311
Total individual monthly income, all activities, nominal	v601	v601	V601	v601	v601	v601	v601	v601	v601	v0905312	v0905312	v0905312
Total individual monthly income, all sources, nominal	v602	v602	V602	v602	v602	v602	v602	v602	v602	v0905313	v0905313	v0905313
Occupation sector main job	v5040	v5040	v5040	v5040	V5040	v5040	v5040	v5040	v5040	v090072	v090072	v090072
Total hours worked in all jobs	v5100	v5100	v5100	v5100	V5100	v5100	v5100	v5100	v5100	v090581	v090581	v090581
Position in main occupation	v5050	v5050	v5050	v5050	V5050	v5050	v5050	v5050	v5050	v090291	v090291	v090291

Source: Annual Documentation for PNAD 1981-1995.

TABLE A2. QUESTIONNAIRE AND CONSTRUCTED VARIABLES FOR PNAD 1992-1995 (VARIABLES USED IN THE ANALYSIS ARE TRANSLATED FROM PORTUGUESE INTO ENGLISH)

Household Identification and Location

Uf	Código da unidade da federação *Federal State*
Numero	número sequencial único para os domicílios *Household Identifier*
Pes_dom	peso para dados domiciliares *Household Weight*
V0101	Para a PNAD de 1992: 1992 - para a PNAD de 1993: 1993 - para a PNAD de 1995: 1995
V0102	Identifica a área censitária selecionada
V0103	Corresponde ao número de domicílios selecionados dentro do setor
V0104	Classifica o tipo da situação encontrada na unidade domiciliar selecionada (excluida)
V0105	Identifica o total de moradores encontrados no domicílio selecionado *Household Size*
V01051	Variável derivada para tipo de família
V01052	Variável derivada para número de componentes da família i, considerando-se as pessoas com a condição de agregado na família
V01053	Variável derivada para número de componentes da família ii, sem considerar as pessoas com a condição de agregado na família
V0106	Moradores do domicílio com 10 anos ou mais de idade

Characteristics of the House/dwelling

V0201	Espécie de domicilio *Type of Dwelling (private/shared etc)*
V0202	Tipo de domicilio *Type of Dwelling (House, flat etc)*
V0203	Qual o material que predomina na construção das paredes externas deste prédio? *Wall Material.*
V0204	Qual e o material que predomina na cobertura (telhado) deste prédio? *Roof Material.*
V0205	Quantos cômodos tem este domicílio? *Number of Rooms.*
V0206	Quantos cômodos estão servindo permanentemente de dormitório para os moradores deste domicílio? *Number of Bedrooms.*
V0207	Este domicilio é: (forma de ocupação do domicílio) *Tenancy status.*
V0208	Qual foi o valor do aluguel pago, ou que deveria ter sido pago, no mês de referência (setembro do ano)? *Rent.*

V02081	Código atribuído ao valor mensal do aluguel pago, ou que deveria ter sido pago, no mês d referência.
V0209	Qual foi o valor mensal da prestação paga, ou deveria ter sido paga, no mês de referência (setembro do ano)? *Mortgage.*
V02091	Código atribuído ao valor mensal da prestação paga, ou que deveria ter sido paga, no mês de referência
V0210	O terreno onde está localizado este domicílio é próprio?
V0211	Este domicílio tem água canalizada para, pelo menos um cômodo? *Piped Water*
V0212	A água utilizada neste domicílio é proveniente de:
V0213	A água utilizada neste domicílio é canalizada de rede geral de distribuição para a propriedade?
V0214	A água utilizada neste domicílio é de poço ou nascente localizado na propriedade?
V0215	Neste domicílio, ou na propriedade, existe banheiro ou sanitário? *Bathroom or Toilet.*
V0216	Este banheiro ou sanitário é de uso:
V0217	De que forma é feito o escoadouro deste banheiro ou sanitário? *Sewage Disposal*
V0218	O lixo deste domicílio é: *Rubbish Disposal*
V0219	Qual é a forma de iluminação deste domicílio? *Lighting.*
V0220	Este domicílio tem telefone? *Telephone.*
V0221	Este domicílio tem fogão de duas ou mais bocas? *Stove.*
V0222	Este domicílio tem fogão de uma boca?
V0223	O fogão deste domicílio utiliza predominantemente:
V0224	Este domicílio tem algum tipo de filtro d'água? *Water Filter*
V0225	Este domicílio tem rádio? *Radio.*
V0226	Este domicílio tem televisão em cores? *Colour Television.*
V0227	Este domicílio tem televisão em preto e branco? *Black and White Television.*
V0228	Este domicílio tem geladeira? *Refrigerator.*
V0229	Este domicílio tem freezer? *Freezer.*
V0230	Este domicílio tem máquina de lavar roupa? *Washing Machine.*
V02301	Renda Familiar (variável construida)

Individual Characteristics: demographics

V0301	Número de ordem da pessoa no domicílio *Person Identifier.*

V0302	Sexo *Sex*
V03031	Dia de nascimento da pessoa
V03032	Mês de nascimento da pessoa
V03033	Ano de nascimento da pessoa
V03034	Idade calculada do morador no data de referência *Age at reference date.*

Individual Characteristics: family relations and race.

V0401	Condição na unidade domiciliar *Status in Household (Head=1)*
V0402	Condição na família
V0403	Número da família
V0404	A cor ou raça do (a) é: *Race*
V0405	Tem mãe viva?
V0406	A mãe do (a) mora neste domicílio?
V0407	Número de ordem da mãe

Individual Characteristics: place of birth, migration.

V0501	Nasceu neste município? *Born in this municipality.*
V0502	Nasceu neste estado (ou unidade da federação)? *Born in this State.*
V0503	Em que estado (ou unidade da federação) ou país estrangeiro nasceu?
V0503	Código atribuído ao estado (ou unidade da federação) ou país estrangeiro nasceu
V0504	Já morou em outro estado (ou unidade da federação) ou país estrangeiro?
V0505	Na data de referência (26 de setembro de 1992, ou equivalente), morava neste estado (ou unidade da federação)?
V05061	Identifica a faixa de tempo sem interrupção (até 4 anos) até a data de referência que a pessoa morava neste estado (ou unidade da federação)
V05062	Na data de referência, fez quanto tempo que morava, sem interrupção, neste estado (ou unidade da federação) (até 4 anos)
V05063	Identifica a faixa de tempo sem interrupção, (de 5 a 9 anos) até a data de referência, que a pessoa morava neste estado (ou unidade da federação)
V05064	Na data de referência, fez quanto tempo que morava, sem interrupção, neste estado (ou unidade da federação) (de 5 a 9 anos)
V05065	Identifica a faixa de tempo sem interrupção (de 10 anos ou mais) até a data de referência que a pessoa morava neste estado (ou unidade da federação)

V0507	Cinco anos atrás morava neste estado (ou unidade da federação)?
V0508	Em que estado (ou unidade da federação) ou país estrangeiro morava cinco anos atrás?
V0508	Código atribuido ao estado (ou unidade da federação) ou país estrangeiro que a pessoa morava cinco anos atrás.
V0509	Qual foi o último estado (ou unidade da federação) ou país estrangeiro em que morou anteriormente?
V0509	Código atribuido ao último estado (ou unidade da federação) ou país estrangeiro que a pessoa morou anteriormente
V0510	Na data de referência (26 de setembro), morava neste município?
V0511	Já morou em outro município neste estado (ou unidade da federação?
V05121	Identifica a faixa de tempo (até 4 anos) sem interrupção até a data de referência que a pessoa morava neste município
V05122	Na data de referência, fez quanto tempo que morava, sem interrupção, neste município (até 4 anos)
V05123	Identifica a faixa de tempo sem interrupção até a data de refeerência, que a pessoa morava neste município (de 5 a 9 anos)
V05124	Na data de referência, fez quanto tempo que morava, sem interrupção, neste município (de 5 a 9 anos)
V05125	Identifica a faixa de tempo sem interrupção (10 anos ou mais), até a data de referência, que a pessoa morava neste município

Individual Characteristics: education.

V0601	Sabe ler e escrever? *Literacy*
V0602	Freqüenta escola? *Attending School.*
V0603	Qual é o curso que freqüenta?
V0604	Este curso que freqüenta é seriado?
V0605	Qual é a série que freqüenta?
V0606	Anteriormente freqüentou escola?
V0607	Qual foi o curso mais elevado que freqüentou anteriormente?
V06071	Variável derivada para grau e série que freqüentavam (i)
V06072	Variável derivada para grau e série que freqüentavam (ii)
V06073	Variável derivada para anos de estudo *Years of schooling.*
V0608	Este curso que freqüentou anteriormente era seriado?
V0609	Concluiu, com aprovação, pelo menos a primeira série deste curso que freqüentou anteriormente?
V0610	Qual foi a última série que concluiu, com aprovação, neste curso que freqüentou anteriormente?
V0611	Concluiu este curso que freqüentou anteriormente?

Individual Characteristics: employment history.

V0701	Teve algum trabalho nos últimos 12 meses? *Worked in last 12 months.*
V0702	Nos últimos 12 meses, exerceu tarefas em cultivo, pesca ou criação de animais destinados à própria alimentação das pessoas moradoras no domicílio?
V0703	Nos últimos 12 meses exerceu tarefas em construção de prédio, cômodo, poço ou outras obras de construção destinadas ao próprio uso das pessoas moradoras no domicílio?
V0704	Trabalhou na semana de referência (20 a 26 de setembro, para 1992)? *Worked in reference week.*
V0705	Na semana de referência, tinha algum trabalho remunerado do qual estava temporariamente afastado (a) por motivo de férias, licença, falta voluntária, doença, más condições do tempo ou por outra razão?
V0706	Qual era a ocupação que exercia no trabalho que teve nos últimos 12 meses?
V0706	Código atribuido à ocupação que a pessoa exercia no trabalho que teve nos últimos 12 meses.
V0707	Qual era atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) em que teve esse trabalho?
V0707	Código atribuido a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) no trabalho que a pessoa tinha no período de 27 de setembro de 1982 a 26 de setembro de 1987
V0708	Nesse trabalho que teve, era:
V0709	Qual era a ocupação que exercia no trabalho da semana de referência? *Occupation in reference week.*
V0709	Código atribuido a ocupação que a pessoa exercia no trabalho que tinha na semana de referência
V0710	Qual era a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) em que tinha no trabalho da semana de referência
V0710	Código atribuido a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) que a pessoa tinha na semana de referência.
V0711	Nesse trabalho, era:
V07121	Identifica que o rendimento mensal que a pessoa ganhava normalmente, no mês de referência, no(s) trabalho(s) que tinha na semana de referência era em dinheiro
V07122	Qual era o rendimento mensal em dinheiro que ganhava normalmente, no mês de referência, no(s) trabalho(s) que tinha na semana de referência? *Income in cash from employment in reference week.*
V07123	Código atribuído ao valor do rendimento mensal (em dinheiro) que a pessoa ganhava normalmente, no mês de referência, no(s) trabalho(s) que tinha na semana de referência.
V07124	Identifica que o rendimento mensal que a pessoa ganhava normalmente, no mês de referência, no(s) trabalho(s) que tinha na semana de referência, era em produtos ou mercadorias
V07125	Qual era o rendimento mensal (em produtos ou mercadorias) que ganhava normalmente, no mês de referência, no(s) trabalho(s) que tinha na semana de referência? *Income in-kind from employment in reference week.*
V07126	Código atribuído ao valor do rendimento mensal (em produtos ou mercadorias) que a pessoa ganhava normalmente, no mês de referência, no(s) trabalho(s)

	que tinha na semana de referência.
V07127	Identifica que o rendimento que a pessoa ganhava normalmente, no mês de referência, no(s) trabalho(s) que tinha na semana de referênia, era somente em benefício
V07128	Identifica que a pessoa era não remunerada, e portanto não recebia rendimento no mês de referência, no(s) trabalho(s) que tinha na semana de referência.
V0713	Quantas horas trabalhava normalmente por semana no(s) trabalho(s) que tinha na semana de referência? *Hours normally worked in job(s) held in reference week.*

Individual Characteristics: education - highest level completed.

V0801	Concluiu curso supletivo de primeiro grau?
V0802	Antes de concluir este curso supletivo de primeiro grau, freqüentou curso regular de primeiro grau?
V0803	Antes de concluir este curso supletivo de primeiro grau, freqüentou curso regular de médio primeiro ciclo (ginasial, etc)?
V0804	Antes de concluir este curso supletivo de primeiro grau, freqüentou curso elementar (primário)?
V0805	Concluiu, com aprovação, pelo menos a primeira série deste curso regular (de primeiro grau, médio primeiro ciclo ou elementar)?
V0806	Qual foi a última série que concluiu, com aprovação, neste curso regular (de primeiro grau, médio primeiro ciclo ou elementar)?
V0807	Concluiu curso supletivo de segundo grau?
V0808	Antes de concluir este curso supletivo de segundo grau, freqüentou curso regular de segundo grau?
V0809	Antes de concluir este curso supletivo de segundo graus, freqüentou curso regular de médio segundo ciclo (científico, clássico...)?
V0810	concluiu, com aprovação, pelo menos a primeira série deste curso regular (de segundo grau ou médio segundo ciclo) ?
V0811	Qual foi a última série que concluiu, com aprovação, neste curso regular (de segundo grau ou médio segundo ciclo) ?

Individual Characteristics: current employment and income

V09001	Trabalhou na semana de referência? *Worked in reference week (Y/N)*
V090011	Condição de atividade na semana de referência (para as pessoas de 10 anos ou mais de idade) *Economically active in reference week (aged 10 years +)*
V090012	Variável derivada para condição de ocupação na semana de referência (para as pessoas de 5 anos ou mais de idade)
V090013	Variável derivada para condição de atividade no ano (para pessoa de 10 anos ou mais de idade)
V090014	Variável derivada para condição de ocupação no ano (para pessoa de 5 anos ou mais de idade)
V09002	Na semana de referência, exerceu tarefas em cultivo, pesca ou criação de animais destinados à própria alimentação das pessoas moradoras no domicílio?
V09003	Na semana de referência exerceu tarefas em construção de prédio, cômodo, poço ou outras obras de construção destinadas ao próprio uso das pessoas moradoras no domicílio?

V09004	Na semana de referência, tinha algum trabalho remunerado do qual estava temporariamente afastado(a) por motivo de férias, licença, falta voluntária, greve, doença, más condições de tempo ou por outra razão?
V09005	Quantos trabalhos tinha na semana de referência? *Number of jobs in reference week.*
V09006	Qual era a ocupação que exercia no trabalho que tinha na semana de referência? *Occupation in reference week(400+categories)*
V09006	Código atribuido a ocupação que a pessoa exercia no trabalho que tinha na semana de referência
V090061	Variável derivada para posição na ocupação no trabalho principal da semana de referência (para pessoas de 10 anos ou mais de idade)
V090062	Variável derivada para grupos de ocupação do trabalho principal da semana de referência (para pessoa de 10 anos ou mais de idade) *Occupation in reference week(8 categories)*
V090063	Variável derivada para grupos de ocupação no trabalho principal do ano (para pessoa de 10 anos ou mais de idade)
V09007	Qual era a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) em que tinha esse trabalho?
V09007	Código atribuido a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) em que a pessoa tinha no trabalho da semana de referência
V090071	Variável derivada para atividade no trabalho principal da semana de referência (para pessoa de 5 anos ou mais de idade)
V090072	Variável derivada para ramos de atividade no trabalho principal da semana de referência (para pessoa de 5 anos ou mais de idade)
V090073	Variável derivada para atividade do trabalho principal do ano (para pessoa de 5 anos ou mais de idade)
V090074	Variável derivada para ramos de atividade do trabalho principal do ano (para pessoa de 10 anos ou mais de idade)
V09008	Nesse trabalho era: *Employee, employer, self-employed etc.*
Questions for those employed in agriculture	
V09009	Nesse emprego, recebia do empregador alguma área para produção particular?
V09010	Nesse emprego, tinha parceria com o empregador?
V09011	No mês de referência, foi contratado somente por pessoa(s) responsável(eis) pelo(s) estabelecimento(s) em que trabalhou como empregado temporário?
V09012	No mês de referência, foi contratado como empregado temporário somente por intermediário (empresa empreiteira, empreiteiro, "gato", etc)?
V09013	No mês de referência, teve ajuda, nesse emprego, de pelo menos uma pessoa não remunerada, moradora no domicílio?
V09014	Quantas pessoas não remuneradas, moradoras no domicílio, ocupou, nesse emprego, no mês de referência?
V0901501	Identifica a área do primeiro ou único estabelecimento que compõe o empreendimento da pessoa que foi classificada como empregador na agricultura, silvicultura, criação de bovinos, bubalinos, caprinos, ovinos ou suínos
V0901502	Qual era a área total do empreendimento em que tinha esse trabalho?
V0901503	Código atribuído conforme a quantidade de algarismos utilizados para o registro da área na variável 9152
V0901504	Identifica a equivalência em metros quadrados referente a unidade de medida de superfície que foi informada na variável 9152
V0901505	Código atribuído conforme a quantidade de algarismos utilizados para o registro da variável 9154

V0901506	Identifica a área do segundo estabelecimento que compõe o empreendimento da pessoa que foi classificada como empregador na agricultura, silvicultura, criação de bovinos, bubalinos, caprinos, ovinos ou suínos
V0901507	Qual era a área total do empreendimento em que tinha esse trabalho?
V0901508	Código atribuído conforme a quantidade de algarismos utilizados para o registro da área na variável 9157
V0901509	Identifica a equivalência em metros quadrados referente a unidade de medida de superfície que foi informada na variável 9157
V0901510	Código atribuído conforme a quantidade de algarismos utilizados para o registro da variável 9159
V0901511	Identifica a área do terceiro e mais estabelecimentos que compõem o empreendimento da pessoa que foi classificada como empregador na agricultura, silvicultura, criação de bovinos, bubalinos, caprinos, ovinos ou suínos
V0901512	Qual era a área total do empreendimento em que tinha esse trabalho?
V0901513	Código atribuído conforme a quantidade de algarismos utilizados para o registro da área na variável 9162
V0901514	Identifica a equivalência em metros quadrados referente a unidade de medida de superfície que foi informada na variável 9162
V0901515	Código atribuído conforme a quantidade de algarismos utilizados para o registro da variável 9164
V09016	No mês de referência, tinha pelo menos um emprego temporário nesse trabalho?
V09017	Quantos empregados temporários tinha, nesse trabalho, no mês de referência?
V09018	no mês de referência, tinha pelo menos um empregado permanente nesse trabalho?
V09019	Quantos empregados permanentes tinha, nesse trabalho, no mês de referência?
V0902001	Identifica a área do primeiro ou único estabelecimento que compõe o empreendimento da pessoa que foi classificada como conta-própria na agricultura, silvicultura, criação de bovinos, bubalinos, caprinos, ovinos ou suínos
V0902002	Qual era a área total do empreendimento em que tinha esse trabalho?
V0902003	Código atribuído conforme a quantidade de algarismos utilizados para o registro da área na variável 9202
V0902004	Identifica a equivalência em metros quadrados referente a unidade de medida de superfície que foi informada na variável 9202
V0902005	Código atribuído conforme a quantidade de algarismos utilizados para o registro da variável 9204
V0902006	Identifica a área do segundo estabelecimento que compõe o empreendimento da pessoa que foi classificada como conta-própria na agricultura, silvicultura, criação de bovinos, bubalinos, caprinos, ovinos ou suínos
V0902007	Qual era a área total do empreendimento em que tinha esse trabalho?
V0902008	Código atribuído conforme a quantidade de algarismos utilizados para o registro da área na variável 9202
V0902009	Identifica a equivalência em metros quadrados referente a unidade de medida de superfície que foi informada na variável 9207
V0902010	Código atribuído conforme a quantidade de algarismos utilizados para o registro da variável 9209
V0902011	Identifica a área do terceiro e mais estabelecimentos que compõem o empreendimento da pessoa que foi classificada como conta-própria na agricultura, silvicultura, criação de bovinos, bubalinos, caprinos, ovinos ou suínos

V0902012	Qual era a área total do empreendimento em que tinha esse trabalho?
V0902013	Código atribuído conforme a quantidade de algarismos utilizados para o registro da área na variável 9212
V0902014	Identifica a equivalência em metros quadrados referente a unidade de medida de superfície que foi informada na variável 9212
V0902015	Código atribuído conforme a quantidade de algarismos utilizados para o registro da variável 9214
V09021	Nesse trabalho, era:
V09022	Qual foi a parceria contratada nesse trabalho?
V09023	Qual foi a forma contratada de pagamento de pagamento do arrendamento nesse trabalho?
V09024	Nos últimos 12 meses assumiu, previamente, o compromisso de vender alguma parte da produção principal desse trabalho?
V09025	Ns últimos 12 meses, vendeu alguma parte da produção principal desse trabalho?
V09026	Quem comprou o total, ou a maior quantidade, dessa produção principal que vendeu?
V09027	Tinha, neste empreendimento, algum tipo de produção que foi consumida, no mês de referência, como alimentação pelas pessoas moradoras no domicílio?
V09028	no mês de referência, que parcela da alimentação consumida pelas pessoas moradoras no domicílio foi retirada dessa produção?
Questions for all occuaption types.	
V09029	Nesse trabalho, era:
V090291	Variável derivada para posição na ocupação no trabalho principal do ano (para pessoa de 10 anos ou mais de idade) *Position in principal occupation (self-employed, employee, employer, etc)*
V09030	A jornada normal desse trabalho estava totalmente compreendida no período de 5 horas da manhã às 10 horas da noite?
V09031	A jornada normal desse trabalho estava totalmente compreendida no período noturno de 10 horas da noite às 5 horas da manhã seguinte?
V09032	Esse emprego era no setor: *Public or Private sector.*
V09033	Esse emprego era na área: *Federal, State or municipal public sector.*
V09034	Nesse emprego, era militar?
V09035	Nesse emprego, era funcionário público estatutário?
V09036	no mês de referência, prestava serviço doméstico remunerado em mais de um domicílio? *Domestic service*
V09037	Habitualmente exercia esse trabalho pelo menos uma vez por semana?
V09038	Quantos dias por semana habitualmente exercia esse trabalho? *Days per week normally worked.*
V09039	Quantos dias por mês habitualmente exercia esse trabalho? *Days per month normally worked.*
V09040	Quantas pessoas ocupadas havia, nesse emprego, no mês de referência?
V09041	Nesse emprego a remuneração era contratada: *Payment (weekly, daily, monthly, piece-rate, commision, in-kind etc)*

V09042	Nesse emprego, tinha carteira de trabalho assinada? *Work Card.*
V09043	Nesse emprego, recebeu auxílio para moradia no mês de referência? *Reimbursed accomodation expenses.*
V09044	Nesse emprego, recebeu auxílio para alimentação no mês de referência? *Reimbursed food expenses.*
V09045	Nesse emprego, recebeu auxílio para transporte no mês de referência? *Reimbursed transport expenses.*
V09046	Nesse emprego, recebeu auxílio para educação ou creche no mês de referência? Reimbursed training/school expenses.
V09047	Nesse emprego, recebeu auxílio para saúde ou reabilitação no mês de referência? Reimbursed health expenses.
V09048	Quantos empregados ocupava, nesse trabalho, no mês de referência? *Number of workers employed in firm.*
V09049	no mês de referência, tinha pelo menos um sócio ocupado nesse trabalho?
V09050	Quantos sócios ocupados tinha, nesse trabalho, no mês de referência?
V09051	no mês de referência, ocupou pelo menos um trabalhador não remunerado nesse trabalho?
V09052	Quantos trabalhadores não remunerados tinha, nesse trabalho, no mês de referência?
V090531	Identifica que o rendimento mensal que a pessoa ganhava normalmente, no mês de referência, nesse trabalho era em dinheiro
V0905311	Variável derivada para valor do rendimento mensal do trabalho principal *Monthly Income (Cash and in Kind) from Main Job*
V0905312	Variável derivada para valor do rendimento mensal de todos os trabalhos *Monthly Income (Cash and in Kind) from All Jobs*
V0905313	Variável derivada para valor do rendimento mensal de todas as fontes *Monthly Income (Cash and in Kind) from All Sources*
V0905314	Variável derivada para valor do rendimento médio mensal domiciliar *Monthly Household Income from All Sources.*
V0905315	Variável derivada para rendimento mensal familiar, considerando-se as pessoas com a condição de agregado na família
V0905316	Variável derivada para valor do rendimento mensal familiar ii, não considerando as pessoas com a condição de agregado na família
V090532	Qual era o rendimento mensal (em dinheiro) que ganhava normalmente, no mês de referência, nesse trabalho? *Monthly Income in Cash, Main Job*
V090533	Código atribuído ao valor do rendimento mensal (em dinheiro) que a pessoa ganhava normalmente, no mês de referência, nesse trabalho?
V090534	Identifica que o rendimento mensal que a pessoa ganhava normalmente, no mês de referência, nesse trabalho era em produtos ou mercadorias
V090535	Qual era o rendimento mensal (em produtos ou mercadorias) que ganhava normalmente, no mês de referência, nesse trabalho? *Monthly Income in Kind from Main Job*
V090536	Código atribuído ao valor do rendimento mensal (em produtos ou mercadorias) que a pessoa ganhava normalmente, no mês de referência, nesse trabalho
V090537	Identifica que o rendimento que a pessoa ganhava normalmente, no mês de referência, nesse trabalho era somente em benefícios
V09054	Esse trabalho, tinha estabelecimento em:
V09055	Na semana de referência, morava em domicílio que estava no mesmo terreno ou área do estabelecimento em que tinha esse trabalho?
V09056	Ia direto do domicílio em que morava para esse trabalho?

V09057	Quanto tempo levava para ir do domicílio em que morava até o local desse trabalho?
V09058	Quantas horas trabalhava normalmente por semana nesse trabalho? *Hours worked per week in main job.*
V090581	Variável derivada para horas trabalhadas por semana em todos os trabalhos na semana de referência (para pessoa de 10 anos ou mais de idade) *Hours worked per week in all Jobs*
V09059	Era contribuinte de instituto de previdência por esse trabalho?
V090591	Variável derivada para contribuição para instituto de previdência em qualquer trabalho da semana de referência
V09060	Nesse trabalho, contribuía para instituto de previdência:
V090611	Na data de referência, fazia quanto tempo (em anos) que estava neste trabalho *Years in Main Job*
V090612	Na data de referência, fazia quanto tempo (em meses) que estava neste trabalho *Months in Main Job.*
V09062	Saiu de algum trabalho nos últimos 12 meses? *Previous job (if in last 12 months)*
V09063	De quantos trabalhos saiu nos últimos 12 meses?
V09064	Nos últimos 12 meses, quantos meses permaneceu nesse trabalho anterior?
V09065	Nesse trabalho anterior, era empregado com carteira de trabalho assinada?
V09066	Depois que saiu desse emprego anterior, recebeu seguro desemprego?
V09067	Teve algum trabalho nos últimos 12 meses?
V09068	Nos últimos 12 meses, exerceu tarefas em cultivo, pesca ou criação de animais destinados à própria alimentação das pessoas moradoras no domicílio?
V09069	Nos últimos 12 meses, exerceu tarefas em construção de prédio, cômodo, poço ou outras obras de construção destinadas ao próprio uso das pessoas moradoras no domicílio?
V09070	De quantos trabalhos saiu nos últimos 12 meses?
V09071	Qual era a ocupação que exercia no trabalho anterior que teve nos últimos 12 meses?
V09071	Código atribuido a ocupação que a pessoa exercia no trabalho anterior que teve no período dos últimos 12 meses
V09072	Qual era a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) em que teve esse trabalho anterior?
V09072	Código atribuido a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) no trabalho anterior que a pessoa teve nos últimos 12 meses
V09073	Nesse trabalho anterior era:
V09074	Nesse emprego anterior, recebia do empregador alguma área para produção particular ?
V09075	Nesse emprego anterior, tinha parceria com o empregador ?
V09076	Nesse trabalho anterior, era:
V09077	Nesse trabalho anterior, era:

V09078	Esse emprego anterior era no setor:
V09079	Esse emprego anterior era na área:
V09080	Nesse emprego anterior, era militar ?
V09081	Nesse emprego anterior, era funcionário público estatutário ?
V09082	Nos últimos trinta dias em que esteve nesse trabalho anterior, prestava serviço doméstico remunerado em mais de um domicílio ?
V09083	Nesse emprego anterior, tinha carteira de trabalho assinada?
V09084	Depois que saiu desse emprego anterior, recebeu seguro-desemprego?
V09085	Era contribuinte de instituto de previdência por esse trabalho anterior?
V090861	Durante quanto tempo (em anos) esteve nesse trabalho anterior
V090862	Durante quanto tempo (em meses) esteve nesse trabalho anterior
V09087	no mês de referência, era associado a algum sindicato?
V09088	Esse sindicato era de:
V090891	Identifica a idade que a pessoa começou a trabalhar
V090892	Com que idade começou a trabalhar *Age when began work.*
V09090	Qual era a ocupação que exercia no trabalho secundário que tinha na semana de referência? *Second Occupation in reference week*
V09090	Código atribuido a ocupação que a pessoa exercia no trabalho secundário que tinha na semana de referência
V09091	Qual era a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) em que tinha esse trabalho secundário?
V09091	Código atribuido a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) no trabalho secundário que a pessoa tinha na semana de referência.
V09092	Nesse trabalho secundário, era:
V09093	Esse emprego secundário era no setor:
V09094	Esse emprego secundário era na área:
V09095	Nesse emprego secundário, era militar?
V09096	Nesse emprego secundário, era funcionário público estatutário?
V09097	Nesse trabalho secundário, tinha carteira de trabalho assinada? *Work Card for Second Job*
V090981	Identifica que o rendimento mensal que a pessoa ganhava normalmente, no mês de referência, nesse trabalho secundário era em dinheiro
V090982	Qual era o rendimento mensal (em dinheiro) que ganhava normalmente, no mês de referência, nesse trabalho secundário? *Monthly Income (in Cash) from 2nd Job*
V090983	Código atribuído ao valor do rendimento mensal (em dinheiro) que a pessoa ganhava normalmente, no mês de referência, nesse trabalho secundário

V090984	Identifica que o rendimento mensal que a pessoa ganhava normalmente, no mês de referência, nesse trabalho secundário era em produtos ou mercadorias
V090985	Qual era o rendimento mensal (em produtos ou mercadorias) que ganhava normalmente, no mês de referência, nesse trabalho secundário? *Monthly Income (in Kind) from 2nd Job.*
V090986	Código atribuído ao valor do rendimento mensal (em produtos ou mercadorias) que a pessoa ganhava normalmente, no mês de referência, nesse trabalho secundário
V090987	Identifica que o rendimento mensal que a pessoa ganhava normalmente, no mês de referência, nesse trabalho secundário era somente em benefícios
V09099	Era contribuinte de instituto de previdência por esse trabalho secundário?
V09100	Nesse trabalho secundário, contribuía para instituto de previdência:
V09101	Número de horas trabalhadas normalmente por semana no trabalho secundário na semana de referência? *Hours worked per week in 2nd Job.*
V091021	Identifica o tipo de rendimento mensal que a pessoa recebia normalmente no mês de referência nos outros trabalhos que tinha na semana de referência.
V091022	Qual era o rendimento mensal (em dinheiro) que ganhava normalmente, no mês de referência, no(s) outro(s) trabalho(s) que tinha na semana de referência? *Monthly Income in cash from other jobs.*
V091023	Código atribuído ao valor do rendimento mensal (em dinheiro) que a pessoa ganhava normalmente, no mês de referência, no(s) outro(s) trabalho(s) que tinha na semana de referência.
V091024	Identifica que o rendimento mensal que a pessoa ganhava, normalmente, em no mês de referência, no(s) outro(s) trabalho(s) que tinha na semana de referência, era em produtos ou mercadorias
V091025	Qual era o rendimento mensal (em produtos ou mercadorias) que ganhava normalmente, no mês de referência, no(s) outro(s) trabalho(s) que tinha na semana de referência? *Monthly Income in Kind from other Jobs*
V091026	Código atribuído ao valor do rendimento mensal (em produtos ou mercadorias) que a pessoa ganhava normalmente, no mês de referência, no(s) outro(s) trabalho(s) que tinha na semana de referência.
V091027	Identifica que o rendimento que a pessoa ganhava, normalmente, no mês de referência, no(s) outro(s) trabalho(s) que tinha na semana de referência era somente em benefícios
V091028	Identifica que a pessoa era não remunerada, e portanto não recebia rendimento do(s) outro(s) trabalho(s) que tinha na semana de referência.
V09103	Era contribuinte de instituto de previdência por esse(s) outro(s) trabalho(s)?
V09104	Nesse(s) outro(s) trabalho(s) contribuía para instituto de previdência:
V09105	Quantas horas trabalhava normalmente por semana nesse(s) outro(s) trabalho(s)? *Hours worked per week in other jobs.*
V09106	Teve algum trabalho antes de 12 meses atrás? *Jobs more than one year ago.*
V09107	Antes de 12 meses atrás, exerceu tarefas em cultivo, pesca ou criação de animais destinados à própria alimentação das pessoas moradoras no domicílio?
V09108	Antes de12 meses atrás, exerceu tarefas em construção de prédio, cômodo, poço ou outras obras de construção destinadas ao próprio uso das pessoas moradoras no domicílio?
V091091	(Para a pessoa que somente foi ocupada antes do período de referência de 365 dias:) na data de referência, fez quanto tempo (quantidade de anos) que saiu do último trabalho que teve ?

V091092	(Para pessoa que somente foi ocupada antes do período de referência de 365 dias:) na data de referência, fez quanto tempo (quantidade de meses) que saiu do último trabalho que teve ?
V09110	Qual era a ocupação que exercia nesse último trabalho que teve?
V09110	Código atribuido a ocupação que a pessoa exercia no último trabalho que teve antes do período de referência de 365 dias
V09111	Qual era a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) em que exercia esse último trabalho que teve?
V09111	Código atribuido a atividade principal do empreendimento (negócio, firma, empresa, instituição, entidade, etc) em que a pessoa exercia no último trabalho que teve antes do período de referência de 365 dias
V09112	Nesse último trabalho que teve, era:
V09113	Nesse último emprego que teve, era militar ou funcionário público estatutário?
V09114	Tinha carteira de trabalho assinada nesse último emprego?
V09115	Tomou alguma providência para conseguir trabalho na semana de referência?
V09116	Tomou alguma providência para conseguir trabalho no último mês?
V09117	Tomou alguma providência pra conseguir trabalho no mês anterior?
V09118	Tomou alguma providência para conseguir trabalho no ano, até o mês anterior?
V09119	Qual foi a última providência que tomou, a data de referência, para conseguir trabalho?
V09120	no mês de referência, era contribuinte de alguma entidade de previdência privada?
V09121	Na semana de referência, cuidava dos afazeres domésticos?
V09122	Na semana de referência, era aposentado de instituto de previdência federal (INSS), estadual ou municipal ou do governo federal?
V09123	Na semana de referência, era pensionista de instituto de previdência federal (INSS), estadual ou municipal ou do governo federal?
V09124	no mês de referência, recebia normalmente rendimento de pensão alimentícia ou de fundo de pensão, abono de permanência, aluguel, doação, juros de caderneta de poupança, dividendos ou outro qualquer?
V0912501	Identifica o rendimento que a pessoa recebia normalmente, no mês de referência, de: aposentadoria de instituto de previdência ou do governo federal
V0912502	Qual era o rendimento (em dinheiro) que recebia normalmente no mês de referência, de: aposentadoria de instituto de previdência ou do governo federal *State Pension (Retirement, Disability, War Veteran etc)..*
V0912503	Código atribuido ao valor do rendimento que a pessoa recebia normalmente no mês de referência, de: aposentadoria de instituto de previdência ou do governo federal
V0912504	Identifica o rendimento que a pessoa recebia normalmente, no mês de referência, de: pensão de instituto de previdência ou do governo federal
V0912505	Qual era o rendimento (em dinheiro) que recebia normalmente, no mês de referência, de: pensão de instituto de previdência ou do governo federal *State Dependent's Pension (retirement, disability, war veteran).*
V0912506	Código atribuido ao valor do rendimento que a pessoa recebia normalmente, no mês de referência, de: pensão de instituto de previdência ou do governo federal

V0912507	Identifica o rendimento que a pessoa recebia normalmente, no mês de referência, outro tipo de aposentadoria
V0912508	Qual era o rendimento (em dinheiro) que recebia normalmente, no mês de referência, de: outro tipo de aposentadoria *Private Pension*
V0912509	Código atribuido ao valor do rendimento que a pessoa recebia normalmente, no mês de referência, de: outro tipo de aposentadoria
V0912510	Identifica o rendimento que a pessoa recebia normalmente, no mês de referência, de: outro tipo de pensão
V0912511	Qual era o rendimento (em dinheiro) que recebia normalmente, no mês de referência, de: outro tipo de pensão *Private Dependent's Pension*
V0912512	Código atribuido ao valor do rendimento que a pessoa recebia normalmente, no mês de referência, de: outro tipo de pensão
V0912513	Identifica o rendimento que a pessoa recebia normalmente, no mês de referência, de : abono de permanência
V0912514	Qual era o rendimento (em dinheiro) que recebia normalmente, no mês de referência, de: abono de permanência *Value of Length of Service Bonus*
V0912515	Código atribuido ao valor do rendimento que a pessoa recebia normalmente, no mês de referência, de: abono de permanência
V0912516	Identifica o rendimento que a pessoa recebia normalmente, no mês de referência, de: aluguel
V0912517	Qual era o rendimento (em dinheiro) que recebia normalmente, no mês de referência, de: aluguel *Value of Rent Received*
V0912518	Código atribuido ao valor do rendimento que a pessoa recebia normalmente, no mês de referência, de: aluguel
V0912519	Identifica o rendimento que a pessoa recebia normalmente, no mês de referência, de: doação recebida de não morador
V0912520	Qual era o rendimento (em dinheiro) que recebia normalmente, no mês de referência, de: doação recebida de não morador *Remittances received*
V0912521	Código atribuido ao valor do rendimento que a pessoa recebia normalmente, no mês de referência, de: doação recebida de não morador
V0912522	Identifica o rendimento que a pessoa recebia normalmente, no mês de referência, de: juros de caderneta de poupança e de outras aplicações, dividendos e outros rendimentos
V0912523	Qual era o rendimento (em dinheiro) que recebia normalmente, no mês de referência, de: juros de caderneta de poupança e de outras aplicações, dividendos e outros rendimentos *Income received from savings, dividends etc.,*
V0912524	Código atribuido ao valor do rendimento que a pessoa recebia normalmente, no mês de referência, de: juros de caderneta de poupança e de outras aplicações, dividendos e outros rendimentos
V0912525	Totaliza a quantidade de informações registradas no quesito 125 da parte 9
Individual Characteristics: Marriage and Fertility	
V1001	vive em companhia de esposo(a) ou companheiro(a) ?
V1002	Esta união é proveniente de:
V1003	já viveu em companhia de esposo(a) ou companheiro(a) ?
V1004	é :
V1101	teve algum filho nascido vivo (ou seja, que apresentou algum sinal de vida ao nascer) ?
V11041	Dos filhos (do sexo masculino) que teve, quantos moram neste domicílio?

V11042	Dos filhos (do sexo feminino) que teve, quantos moram neste domicílio?
V11051	Dos filhos (do sexo masculino) que teve, quantos moram em outro local?
V11052	Dos filhos (do sexo feminino) que teve, quantos moram em outro local?
V11053	Para a mulher que "não sabe" informar dos filhos do sexo masculino que teve, quantos moram em outro local
V11054	Para a mulher que "não sabe" informar dos filhos do sexo feminino que teve, quantos moram em outro local
V11061	Dos filhos (do sexo masculino) nascidos vivos que teve, quantos já morreram?
V11062	Dos filhos (do sexo feminino) nascidos vivos que teve, quantos já morreram?
V11063	Para a mulher que "não sabe" informar dos filhos do sexo masculino nascidos vivos que teve, quantos já morreram
V11064	Para a mulher que "não sabe" informar dos filhos do sexo feminino nascidos vivos que teve, quantos já morreram
V1107	Qual foi o sexo do último filho nascido vivo que teve ?
V11081	Qual foi o mês de nascimento do último filho nascido vivo que teve?
V1109	O último filho nascido vivo que teve, ainda está vivo ?
V1110	teve algum filho, com 7 meses ou mais de gestação, que nasceu morto ?
V11111	Quantos filhos (do sexo masculino) nascidos mortos teve ?
V11112	Quantos filhos (do sexo feminino) nascidos mortos teve ?
V11113	Para a mulher que "não sabe" informar quantos filhos do sexo masculino nascidos mortos que teve
V11114	Para a mulher que "não sabe" informar quantos filhos do sexo feminino nascidos mortos que teve
V11802	Qual foi o ano de nascimento do último filho nascido vivo que teve?
Sample information.	
V4101	Código do município censitário
V4102	Código do distrito censitário
V4103	Código do subdistrito censitário
V4104	Código do setor censitário
V4105	Código de situação censitária
V4106	Código de tipo de setor
V4107	Código de área censitária
V4600	Dia de referência: para a PNAD de 1992 - 26 de setembro de 1992 - para a PNAD de 1993 - 25 de setembro de 1993 - para a PNAD de 1995 -30 de setembro de 1995

V4601	Mês de referência da pesquisa - para a PNAD de 1992: setembro de 1992 - para a PNAD de 1993: setembro de 1993 - para a PNAD de 1995: setembro de 1995
V4602	Estrato
V4603	Marca de formação de pseudo de município
V4604	Número de municípios selecionados no estrato
V4605	Probabilidade de seleção do município
V4606	Número de setores selecionados no estrato
V4607	Probabilidade de seleção do setor
V4608	Intervalo de seleção dos domicílios dentro do setor
V4609	Estimativa independente da população residente
V4610	Inverso da fração
V4611	Peso utilizado para expansão de variáveis de domicílio
V4727	Código da área censitária
V4728	Código de situação censitária
V4729	Peso da pessoa *Individual Weight*

Note: the first two digits refer to sections in the questionaire; the following two digits (or the last three for section 9) refer to question numbers; and the following digits refer to sub-questions or constructed variables. Source: PNAD 1992-1995 Documentation.

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