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THE SLIPPERY SLOPE: EXPLAINING THE INCREASE IN EXTREME POVERTY IN URBAN BRAZIL, 1976-1996

FRANCISCO H.G. FERREIRA

RICARDO PAES DE BARROS

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THE SLIPPERY SLOPE:
Explaining the Increase in Extreme Poverty in Urban Brazil, 1976 - 1996

Francisco H.G. Ferreira and Ricardo Paes de Barros [1]

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Abstract: Despite tremendous macroeconomic instability, Brazil's urban income distributions in 1976 and 1996 appear, at first glance, deceptively similar. Mean household income per capita was stagnant, with a minute accumulated growth of 4.3% over the two decades. The Gini coefficient hovered just above 0.59 in both years, and poverty incidence (with respect to a poverty line of R$60/month in 1996 prices) was effectively unchanged at 22%. Yet, behind this apparent stability, a powerful combination of labour market, demographic and educational dynamics were at work, one effect of which was to generate a substantial increase in extreme urban poverty. Using a micro-simulation-based decomposition methodology which endogenizes labour incomes, individual occupational choices and education decisions, we show that the distribution of incomes was being affected, on the one hand, by a decline in average returns to both education and experience, a negative 'growth' effect and immiserizing changes in the structure of occupations and labor force participation (all of which tended to increase poverty), and on the other hand by an increase in educational endowments across the distribution, and a progressive reduction in dependency ratios (both of which tended to reduce poverty). The net effect was small (and negative) for overall measured inequality, and negligible for poverty incidence with respect to 'high' poverty lines. But it was substantially positive (increasing) for extreme poverty, suggesting the creation of a group of urban households excluded from any labour market, and trapped in indigence.

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1. Introduction.

Both by the standards of its own previous growth record, during the 'Brazilian miracle' years of 1968-1973, and by those of other leading developing countries thereafter, notably in Asia, the two decades between 1974 and 1994 – between the first oil shock and the return of stability with the Real plan - were dismal for Brazil. First and foremost, they were characterized by persistent macroeconomic disequilibrium, the main symptoms of which were stubbornly high and accelerating inflation and a GDP time-series marked by unusual volatility and a very low positive trend. Figure 1 below plots annual inflation and GDP per capita growth rates for the 1976-1996 period.

[See Figures 1a and 1b in Appendix 4]

The macroeconomic upheaval involved three price and wage freezes (parts of the Cruzado Plan of 1986, the Bresser Plan of 1987 and the Verao Plan of 1989) - all of which were followed by higher inflation rates; one temporary financial asset freeze (with the Collor Plan of 1990); and finally a successful currency reform followed by the adoption of a nominal anchor in 1994 (the Real Plan). The national currency changed name four times.[2] Throughout the period, macroeconomic policy was almost without exception characterized by relative fiscal laxity and growing monetary stringency.

In addition, substantial structural changes were taking place. Brazil's population grew by 46.6% between 1976 and 1996[3], and became more urban (the urbanization rate rose from 68% to 77%). Average education of the over-ten population rose from 3.2 to 5.3 effective years of schooling.[4] Open unemployment grew steadily more prevalent. The sectoral composition of the labour force changed away from agriculture and manufacturing, and towards services. The degree of formalization of the labour force declined substantially: the proportion of formal workers (wage

[2] The changes were from Cruzeiro to Cruzado in 1986; from Cruzado to Novo Cruzado in 1989; from Novo Cruzado back to Cruzeiro in 1990, and from Cruzeiro to Real in 1994.
[3] See Table A1, Appendix 1, for a complete population series.
[4] 'Effective' years of schooling are based on the last grade completed, and are thus net of repetition.

workers with formal documentation) was almost halved, from just under 60% to just over 30% of all workers. And not least, despite the morass, real GDP per capita and mean household per capita income (for the spatially undeflated national distribution) were both some 22.5% higher in 1996 than 1976.[5] Importantly, however, this increase was closely associated with rural-urban migration; accumulated growth in mean urban household per capita incomes was a mere 4.3% (spatially deflated). See Table 1 below. And yet, despite the macroeconomic turmoil and continuing structural changes, however, a casual glance at the headline inequality indicators and poverty incidence measures reported at the bottom of Table 1 might suggest that little had changed in the Brazilian income distribution between 1976 and 1996.

Table 1: General Economic Indicators for Brazil: 1976, 1981, 1985 and 1996.

	1976	**1981**	**1985**	**1996**
GNP (in constant 1996 Reais – thousands)*	434,059	538,475	599,130	778,820
GNP per capita (in constant 1996 Reais)*	4,040	4,442	4,540	4,945
Annual Inflation Rate[1]	42%	84%	190%	9%
Open Unemployment[2]	1.82%	4.26%	3.38%	6.95%
Average Years of Schooling [3, 4]	3.23	4.01	4.36	5.32
Rate of Urbanization [4]	67.8%	77.3%	77.3%	77.0%
Self-employed as share of Labor Force[4]	27.03%	26.20%	26.19%	27.21%
Share of Formal Employment[4, 6]	57.76%	37.97%	36.41%	31.51%
Mean Household Per Capita Income [4, 5]	265.10	239.08	243.15	276.46
Inequality (Gini) [4]	0.595	0.561	0.576	0.591
Inequality (Theil – T) [4]	0.760	0.610	0.657	0.694
Poverty Incidence (R$ 30/month) [4]	0.0681	0.0727	0.0758	0.0922
Poverty Incidence (R$ 60/month) [4]	0.2209	0.2149	0.2274	0.2176

Notes: *) Annual figures.
1) Percent, from January to December. Based on the IGP-DI for 1976, and on the INPC-R for all other years.
2) Based on the IBGE Metropolitan Unemployment Index.
3) For all individuals 10 years of age or older, in urban areas.
4) Calculated from the PNAD samples by the authors. See Appendix 1.
5) Urban only, monthly and spatially deflated. Expressed in constant 1996 Reais.
6) Defined as the number of employees 'com carteira' as a fraction of the sum of all wage employees and self-employment workers.

[5] See Table 1, and Appendix 1 for details.

But, as is often the case, casual glances may turn out to be misleading. This apparent distributional stability belies a number of powerful, and often countervailing, changes in four realms: the returns to education in the labour markets; the distribution of educational endowments over the population; the pattern of occupational choices; and the demographic structure resulting from household fertility choices. In this paper, we note two puzzles about the evolution of Brazil's urban income distribution in the 1976-1996 period, and suggest explanations for them.

The first puzzle is posed by the combination of growth in mean incomes and stable or slightly declining inequality, on the one hand, and rising extreme poverty on the other. We argue that this can only be explained by the growth in the size of a group of very poor households, who appear to be effectively excluded both from the labour markets and from the system of formal safety nets. This group is trapped in indigence at the very bottom of the urban Brazilian income distribution, and contributes to rises in poverty measures particularly sensitive to the depth (FGT(1)) and severity (FGT(2)) of poverty, particularly when poverty is defined with respect to a low poverty line. E(0) fails to respond to this group because of a rise in the share of families reporting (valid) zero incomes.[6] Other inequality measures, which also fall slightly between 1976 and 1996, compensate for these increases in poverty by declining dispersion further up along the distribution. But the reality of the loss in income to the poorest group of urban households is starkly captured by Figure 3 (in Section 2), which plots the observed (truncated) Pen parades for the four years being studied. The main endogenous channel through which the marginalization of this group is captured in our model is a shift in their occupational 'decisions' away from either wage or self-employment, towards unemployment or out of the labour force.[7] As Table 1 indicates, there was certainly a decline in formal employment as a share of the labour force.

Second, the evidence which we will examine in Section 3 below reveals downward shifts in the earnings-education profile, controlling for age and gender, in both the wage and self-employment sectors.[8] Despite a slight convexification of the profile, the magnitude of the shift implies a decline

[6] See Appendix 1, Table A2.
[7] The use of terms such as 'occupational choice' or 'decision' should not be taken to imply an allocation of responsibility. It will become clear, when the model is presented that, as usual, these are choices under constraints.
[8] This shift is from 1976 to 1996, and takes place after upward shifts in the 1980s. See Figure 4.

in the (average) rate of return to education for all relevant education levels. Similarly, average returns to experience also fell unambiguously for 0-50 years of experience (see figure 5). The combined effect of changes in these returns – the 'price effects' – was an increase in simulated poverty, for all measures, and for both lines. Simulated inequality also rose, albeit much more mildly. Both effects were exacerbated by simulating the changes (to 1996) of the determinants of labor force participation decisions were also taken into account. The second puzzle, then, is what forces counterbalance these price and occupational choice effects, so as to explain the observed stability in inequality and 'headline' poverty.[9] We find that they were fundamentally the combination of increased education endowments, moving workers up along the flattening earnings-education slopes, with an increase in the correlation between family income and family size, caused by a more than proportional reduction in dependency ratios and family sizes for the poor. This demographic factor had direct effects on per capita income – through a reduction in the denominator – and indirect effects – through participation decisions and higher incomes.

Naturally, the co-existence of these two phenomena - or 'puzzles' – implies that this last demographic effect did not extend to all of Brazil's poor. At the very bottom, some are being cut off from the benefits of greater education and economic growth (such as these were), and remain trapped in the sinking valley.

We address these issues by means of a micro-simulation-based decomposition of distributional changes, developed by Bourguignon et. al. (1998), which itself builds upon the work of Almeida dos Reis and Paes de Barros (1991), and Juhn, Murphy and Pierce (1993). The approach is described in Section 3 below, and has two distinguishing features. First, unlike other dynamic inequality decompositions such as that proposed by Mookherjee and Shorrocks (1982), it decomposes the effects of changes on an entire distribution, rather than on a scalar summary statistic (such as the mean log deviation). This allows for much greater versatility: within the same framework, a wide range of simulations can be performed to investigate the effects of changes in specific parameters on any number of inequality or poverty measures (and then for any number of poverty lines or assumptions about equivalence scales). More fundamentally, it allows us to

[9] By 'headline' poverty, we mean poverty incidence computed with respect to the R$60/month poverty line.

observe the effects of particular simulations on the entire distribution, as we do in Figures 6 – 15, rather than merely on a couple of scalar indices. Second, the evolving distribution which it decomposes is a distribution of household incomes per capita (with the recipient unit generally being the individual). Therefore, moving beyond pure labor market studies, the effect of household composition on living standards and participation decisions is explicitly taken into account. As it turns out, these are of great importance for a fuller understanding of the dynamics at hand.

The remainder of the paper is organized as follows. Section 2 briefly reviews the main findings of the literature on income distribution in Brazil over the period of study, and presents summary statistics and dominance comparisons for the four observed distributions we analyze: 1976, 1981, 1985 and 1996. Section 3 outlines the basic model and describes the empirical methodology. Section 4 presents the results of the estimation stage and discusses some of its implications. Section 5 presents the main results of the simulation stage, and decomposes the observed changes in poverty and inequality. Section 6 concludes and draws some policy implications.

2. Income Distribution in Brazil from 1976 to 1996: a brief review of the literature and of our data set.

There is little disagreement in the existing literature about the broad trends in Brazilian inequality since reasonable data first became available in the 1960s. The Gini coefficient rose substantially during the 1960s, from around 0.500 in 1960 to 0.565 in 1970 (see Bonelli and Sedlacek, 1989). There was a debate over the causes of this increase, spearheaded by Albert Fishlow on the one hand, and Carlos Langoni on the other, but there was general agreement that the sixties had seen substantially increased dispersion in the Brazilian income distribution.

The 1970s displayed a more complex evolution. Income inequality rose between 1970 ad 1976, reached a peak on that year, and then fell – both for the distribution of total individual incomes in the economically active population (PEA) and for the complete distribution of household per capita incomes – from 1977 to 1981. This decline was almost monotonic, except for an upward

blip in 1980. See Bonelli and Sedlacek (1989), Hoffman (1989) and Ramos (1993). The recession year of 1981 was a local minimum in the inequality series, whether measured by the Gini or the Theil-T index. From 1981, it rose during the recession years of 1982 and 1983. Some authors report small declines in some indices in 1984, but the increase was resumed in 1985. By that year, the Gini coefficient for the distribution of household incomes per capita had risen from 0.574 in 1981 to 0.589 (see Ferreira and Litchfield, 1996). Hoffman (1989) and Bonelli and Sedlacek (1989) report similar increases.

1986, the year of the Cruzado Plan, saw a break in the series, caused both by a sudden (if short-lived) decline in inflation, and a large increase in reported household incomes. Stability and economic growth led to a decline in measured inequality, according to all authors. Thereafter, with the failure of the Cruzado stabilization attempt and the return to stagflation, inequality resumed its upward trend, with the Gini finishing the decade at 0.606. Table A2.1 in Appendix 2 summarizes the findings of this literature, both for per capita household incomes and for the distribution of total individual incomes in the economically active population.

The general trends identified in the existing literature are mirrored in the statistics for the years with which we concern ourselves in this paper, namely 1976, 1981, 1985 and 1996. The distributions for each of these years come from the Pesquisa Nacional por Amostra de Domicilios (PNAD), run by the Brazilian Geographical and Statistical Institute (IBGE). Except where otherwise explicitly specified, we deal with distributions where the welfare concept is total household income per capita (in constant 1996 Reais, spatially deflated to adjust for regional differences in average cost-of-living), and the unit of analysis is the individual. Details of the PNAD sampling coverage and methodology, sample sizes, the definition of key income variables, spatial and temporal deflation issues, and adjustments with respect to the National Accounts baseline are discussed in Appendix 1.

Table 2 below presents a number of summary statistics for these distributions – in addition to the mean, which was provided in Table 1 above. The four inequality indices, which will be used throughout this paper, are the Gini coefficient and three members of the Generalized Entropy

Class of inequality indices, E(ϕ). This class of measures satisfies a number of desirable properties, such as the strong Pigou-Dalton transfer principle, scale invariance, population replication invariance and decomposability. See Cowell (1995) for a discussion. Specifically, we have chosen E(0), also known as the mean log deviation or the Theil – L index; E(1), more famously known as the Theil – T index, and E(2), which is half of the square of the coefficient of variation. These provide a useful range of sensitivities to different parts of the distribution. E(0) is more sensitive to the bottom of the distribution, while E(2) is more sensitive to higher incomes. E(1) is roughly neutral, whereas the Gini places greater weight around the mean.

We also present three poverty indices from the Foster-Greer-Thorbecke (FGT) additively decomposable class P(α). P(0), also known as the headcount index, measures poverty incidence. P(1) is the normalized poverty deficit; and P(2) is an average of squared normalized deficits, thus placing greater weight on incomes furthest from the poverty line. We calculate each of these with respect to two poverty lines, representing R$1 and R$2 per day, at 1996 prices.

Each of these poverty and inequality indices is presented both for the (individual) distribution of total household incomes per capita, and for an equivalized distribution using the Buhmann et. al. (1988) parametric class of equivalence scales, (with θ = 0.5). This provides a rough test that the trends we describe are robust to different assumptions about the degree of economies of scale in consumption within households. Whereas a per capita distribution does not allow for any such economies of scale, taking the square root of family size allows for them to a rather generous degree. As usual, per capita incomes generate an upper bound for inequality measures, whereas allowing for some extent of local public goods within households raises the income of (predominantly poor) very large households, and lowers inequality. In the case of the poverty measures, in order to concentrate on the household re-ranking effect, and to abstract from the pure mean scaling effect, the poverty lines were adjusted as follows: $z^* = z[m(n)]^{1-q}$, where μ(n) is the mean household size in the distribution.

Table 2: Basic Distributional Statistics for different degrees of household economies of scale				
	1976	1981	1985	1996
Median (1996 R$)*	127.98	124.04	120.83	132.94
Inequality				
Gini - $\theta = 1.0$	0.595	0.561	0.576	0.591
Gini - $\theta = 0.5$	0.566	0.529	0.548	0.567
E(0) - $\theta = 1.0$	0.648	0.542	0.588	0.586
E(0) - $\theta = 0.5$	0.569	0.472	0.524	0.534
E(1) - $\theta = 1.0$	0.760	0.610	0.657	0.694
E(1) - $\theta = 0.5$	0.687	0.527	0.580	0.622
E(2) - $\theta = 1.0$	2.657	1.191	1.435	1.523
E(2) - $\theta = 0.5$	2.254	0.918	1.134	1.242
Poverty - R$30/ month				
P(0) - $\theta = 1.0$	0.0681	0.0727	0.0758	0.0922
P(0) - $\theta = 0.5$	0.0713	0.0707	0.0721	0.0847
P(1) - $\theta = 1.0$	0.0211	0.0337	0.0326	0.0520
P(1) - $\theta = 0.5$	0.0235	0.0315	0.0303	0.0442
P(2) - $\theta = 1.0$	0.0105	0.0246	0.0224	0.0434
P(2) - $\theta = 0.5$	0.0132	0.0226	0.0204	0.0357
Poverty - R$60/ month				
P(0) - $\theta = 1.0$	0.2209	0.2149	0.2274	0.2176
P(0) - $\theta = 0.5$	0.2407	0.2229	0.2382	0.2179
P(1) - $\theta = 1.0$	0.0830	0.0879	0.0920	0.1029
P(1) - $\theta = 0.5$	0.0901	0.0875	0.0927	0.0960
P(2) - $\theta = 1.0$	0.0428	0.0525	0.0534	0.0703
P(2) - $\theta = 0.5$	0.0471	0.0508	0.0521	0.0625
Note: *: For urban areas only, and spatially deflated. See Appendix 1.				

The median incomes in Table 2 behave roughly in tandem with the means reported in Table 1, and in accordance with the macroeconomic cycle: 1981 was a recession year, followed by stagnation in 1982 and a severe recession in 1983, from which the median – unlike the mean – had not yet recovered by 1985. Both subsequently rose to 1996. The table also confirms that the evolution of inequality over the period is marked by a decline from 1976 to 1981, and a subsequent deterioration over the remaining two sub-periods. Furthermore, this trend is robust to the choice of equivalence scale, proxied here by two different values for θ, although the inequality levels are always lower when we allow for economies of scale within households. It is also robust to the choice of inequality measure, at least as regards the inequality increases from 1981 to 1996 and from 1985 to 1996, as the Lorenz dominance results identified in Table 3 indicate.

Figure 2a plots the four Lorenz curves. Their proximity suggests, as we have stated, that even where Lorenz dominance is detected, the changes in inequality over this period are not quantitatively very large. Figure 2b truncates the Lorenz curves for the first 40% of the distribution, so as to show the separation between the curves more clearly. The dominance of 1981 and 1985 over 1996 shows clearly. 1976 also lies everywhere above 1996 for this range, but the lines cross at a higher percentile. Be that as it may, the cumulative income share for the poorest four deciles was certainly lower in 1996 than in 1976.

[See Figures 2a and 2b in Appendix 4]

The results for poverty are more ambiguous. With respect to the higher poverty line, incidence is effectively unchanged throughout the period (and even displays a slight decline for the equivalized distribution). FGT(1 and 2), however, show increases over the period, and these become both more pronounced and more robust with respect to θ, as the concavity of the poverty measure increases. This suggests that depth and severity of poverty, affected mostly by falling incomes at the very bottom of the distribution, were on the rise. This is confirmed by the trend of all three $P(\alpha)$ indicators, with respect to the indigence line. Once again, the trend is more pronounced the higher α. For P(1) and P(2), the monotonicity of the increase is independent of θ. As a result there is only one welfare dominance result among the years studied.

These results are reflected in Table 3 below, where a letter L (F) in cell (i, j) indicates that the distribution for year i Lorenz dominates (first order stochastically dominates) that for year j. 1981 and 1985 both display Lorenz dominance over 1996, as suggested above. There is only one case of first-order welfare dominance throughout the period and, symptomatically, it is not of a later year over an earlier one. Instead, money-metric social welfare was unambiguously higher in 1976 than in 1985, as indicated above. Indeed, all poverty measures reported for both of our lines (and for $\theta = 1.0$) are higher in 1985 than in 1976.[10] This is conspicuously not the case for a comparison

[10] Note that this first-order welfare dominance is not robust to a change in θ to 0.5.

between 1976 and 1996. Whereas poverty measures very sensitive to the poorest are higher for 1996, poverty incidence for 'higher' lines fall from 1976 to 1996, suggesting a crossing of the distribution functions. Figure 3 shows this crossing, by plotting the Pen parades ($F^{-1}(y)$) – truncated at the 60th percentile - for all four years analyzed. Note that whereas 1976 lies everywhere above 1985, all other pairs cross. In particular, 1976 and 1996 cross somewhere near the 17th percentile.

Table 3: Stochastic Dominance Results				
	1976	1981	1985	1996
1976			F	
1981				L
1985				L
1996				

[See Figure 3 in Appendix 4]

Before we turn to the model used to decompose changes in the distribution of household incomes, which will shed some light on all of these changes, it will prove helpful to gather some evidence of the evolution of educational attainment, as measured by average effective years of schooling, and for labour force participation, for different groups in the Brazilian population, partitioned by gender and ethnicity. Table 4 presents these statistics.

As can be seen, there was some progress in average educational attainment in urban Brazil over this period. Average effective years of schooling, as reported in Table 1, rose from 4.2 to 5.3. In fact, this piece of good news will prove of vital importance in having prevented a more pronounced increase in poverty. Table 4 now reveals that the male-female educational gap has been eliminated, with females older than ten being on average slightly more educated than males. Clearly, this must imply a large disparity in favour of girls in recent cohorts. While a cohort analysis of educational trends is beyond the scope of this paper[11], such a rapid reversal may in fact warrant a shift in public policy towards programmes aimed at keeping boys in school, without in any way discouraging the growth in female schooling. Finally, note the remarkable disparity in

[11] See Duryea and Szekely (1998) for such an educational cohort analysis of Brazil and other Latin American countries.

educational attainment across ethnic groups, with Asians substantially above average, and blacks and those of mixed race below it.

Table 4: Educational and Labor Force Participation Statistics, by gender and race

	1976	1981	1985	1996
Average Years of Schooling (Males)	3.32	4.04	4.36	5.20
Average Years of Schooling (Females)	3.14	3.99	4.37	5.43
Average Years of Schooling (Blacks and MR)	-	-	-	4.20
Average Years of Schooling (Whites)	-	-	-	6.16
Average Years of Schooling (Asians)	-	-	-	8.13
Labor Force Participation (Males)	73.36%	74.63%	76.04%	71.31%
Labor Force Participation (Females)	28.62%	32.87%	36.87%	42.00%
Labor Force Participation (Blacks and MR)	-	-	-	55.92%
Labor Force Participation (Whites)	-	-	-	56.41%
Labor Force Participation (Asians)	-	-	-	54.88%

Notes: Average 'effective' years of schooling for persons ten years or older, in urban areas.
Labor Force Participation in urban areas only.

As for labour force participation, the persistent and substantial increase in female participation from 29% to 42% over the two decades, was partly mitigated by a decline in male participation rates. Those trends notwithstanding, the male-female participation gap remains high, at around 30 percentage points. There is little evidence of differential labour force participation across ethnic groups.

3. The Model and the Decomposition Methodology

Let us now turn to the Brazilian version of the general semi-reduced-form model for household income and labor supply in Bourguignon et. al. (1998). It is used here to investigate the evolution of the distribution of household incomes per capita over the two decades from the mid-1970s to the mid-1990s. Specifically, we analyze the distributions of 1976, 1981, 1985 and 1996, and simulate changes between them. The paper covers only Brazil's urban areas (which account for

some three quarters of its population). The general model therefore collapses to two occupational sectors: wage earners and self-employed in urban areas.[12]

Total household income is given by:

$$(1) \qquad Y_h = \sum_{i=1}^{n} w_i L_i^w + \sum_{i=1}^{n} p_i L_i^{se} + Y_{0h}$$

Where w_i are the total wage earnings of individual i, L^w is a dummy variable that takes the value one if individual i is a wage earner (and zero otherwise); π_i is the self-employment profit of individual i: L^{se} is a dummy that takes the value one if individual i is self-employed (and zero otherwise); and Y_0 is income from any other sources, such as transfer or capital incomes. Equation 1 is not estimated econometrically. It aggregates information on right-hand-side term 1 (from equations 2 and 4), 2 (from equations 3 and 4) and 3 directly from the household data set.

The wage-earnings equation is given by:

$$(2) \qquad Logw_i = X_i^P b^w + e_i^w$$

where X_i^P = (ed, ed^2, exp, exp^2 , D_g). Ed denotes completed effective years of schooling. Experience (exp) is defined simply as: age - education – 6, since a more desirable definition would require the age when a person first entered employment, a variable which is not available for 1976.[13] D_g is a gender dummy, which takes the value 1 for females (and zero for males). w_i are the monthly earnings of individual i. This extremely simple specification was chosen so as to make the simulation stage of the decomposition feasible, as described below. It embodies the assumptions that the Brazilian labor market was not segmented by region, firm size, race, or any attribute other than gender.

[12] We will eventually extend the model to cover rural areas too, by incorporating two additional sectors: wage earners and self-employed in the rural areas. In Brazil, wage earners include employees with or without formal documentation ('com ou sem carteira'). The self-employed are own-account workers ('conta propria').

[13] Given the fact that education is given by the last grade completed, and is thus net of repetition, this definition will overestimate the experience of those who repeated grades at school, and hence bias the experience coefficient downwards. The numbers involved are not substantial to alter any conclusions on trends.

Analogously, the self-employed earnings equation is given by:

(3) $$Logp_i = X_i^P b^{se} + e_i^{se}$$

Equations 2 and 3 are estimated by simple OLS. Equation (2) is estimated for all employees, whether or not heads of household, and whether with or without formal sector documentation (com or sem carteira). Equation 3 is estimated for all self-employed individuals (whether or not heads of households). Because the errors ε are unlikely to be independent from the exogenous variables, a sample selection bias correction procedure might be used. However, the standard Heckman procedure for sample selection bias correction requires equally strong assumptions about the orthogonality between the error terms ε and ξ (from the occupational choice multinomial logit below). The assumptions required to validate OLS estimation of (2) and (3) are not more demanding than those required to validate the results of the Heckman procedure. We assume, therefore, that all errors are independently distributed, and do not correct for sample selection bias in the earnings regressions.

We now turn to the labor force participation model. Because we have a two-sector labor market (segmented into the wage employment and self-employment sectors), labor force participation and the choice of sector (occupational choice), could be treated in two different ways. One could assume that the choices are sequential, with a participation decision independent from the occupational choice, and the latter conditional on the former. This approach, which would be compatible with a sequential probit estimation, was deemed less satisfactory than one in which individuals face a single three-way choice, between staying out of the labor force, working as employees, or in self-employment. Such a choice can be estimated by a multinomial logit model. According to that specification, the probability of being in state s (= 0, w, se) is given by:

(4) $$P_i^s = \frac{e^{Z_i g_s}}{e^{Z_i g_s} + \sum_{j \neq s} e^{Z_i g_j}}$$ where s, j = (0, w, se)

where the explanatory variables differ for household heads and other household members, by assumption, as follows. For household heads:

$$Z_1^h = \left(\begin{array}{l} \underline{X_1^P}; n_{0-13}, n_{14-65}, n_{>65}, \frac{1}{n_{14-65}} \sum_{-1} D_{14-65} ed, \left[\frac{1}{n_{14-65}} \sum_{-1} D_{14-65} ed \right]^2, \frac{1}{n_{14-65}} \sum_{-1} D_{14-65} age, \\ \left[\frac{1}{n_{14-65}} \sum_{-1} D_{14-65} age \right]^2, \frac{1}{n_{14-65}} \sum_{-1} D_{14-65} Gd, D \end{array} \right)$$

For other members of the household:

$$Z_i^h = \left(\begin{array}{l} \underline{X_i^P}; n_{0-13}, n_{14-65}, n_{>65}, \frac{1}{n_{14-65}} \sum_{-i} D_{14-65} ed, \left[\frac{1}{n_{14-65}} \sum_{-i} D_{14-65} ed \right]^2, \frac{1}{n_{14-65}} \sum_{-i} D_{14-65} age, \\ \left[\frac{1}{n_{14-65}} \sum_{-i} D_{14-65} age \right]^2, \frac{1}{n_{14-65}} \sum_{-i} D_{14-65} Gd, D_1^{se}, L_1^w w_1, D \end{array} \right)$$

Where $n_{k\text{-}m}$ is the number of persons in the households whose age falls between k and m; $D_{14\text{-}65}$ is a dummy that takes the value one for individuals whose age is between 14 and 65; D^{se} is a dummy for a self-employed head, the penultimate term is the earnings of a wage-earning head; and D is a dummy variable that takes the value one if there are no individuals aged 14-65 in the household. The sums defined over {-j} are sums over $\{\forall i \in h / j\}$.

The multinomial logit model in (4) corresponds to the following discrete choice process:

(5) $$s = Arg \max_j \{U_j = Z_i^h g_j + x_j, j = (0, w, se)\}$$

where Z is given above, separately for household heads and other members; the ξ_j are random variables with a double exponential density function and U_j may be interpreted as the utility of alternative j. Once the vector γ_j is estimated by (4), and a random term ξ is drawn, each individual chooses an occupation j so as to maximize the above utility function.

A Decomposition of Changes in the Distribution of Household Income[14]

Once equations 2, 3 and 4 have been estimated, we have two vectors of parameters for each of the four years in our sample ($t \in \{1976, 1981, 1985, 1996\}$): β_t from the earnings equations for both wage earners and the self-employed (including constant terms α_t), and γ_t from the participation equation. In addition, from equation 1, we have Y_{0ht} and Y_{ht} . Let $X_{ht} := \{X_i^P, Z_i^h \mid \forall i \in h\}$ and $\Omega_{ht} := \{\varepsilon^w_i, \varepsilon^{se}_i, \xi^j_i \mid i \in h\}$. We can then write the total income of household h at time t as follows:

(6) $$Y_{ht} = H(X_{ht}, Y_{oht}, \Omega_{ht}; b_t, g_t) \qquad h=1,\ldots,m$$

Based on this representation, the distribution of household incomes:

(7) $$D_t = \{Y_{1t}, Y_{2t}, \ldots, Y_{mt}\}$$

can be rewritten as:

(8) $$D_t = D[\{X_{ht}, Y_{oht}, \Omega_{ht}\}, b_t, g_t]$$

Where *{.}* refers to the joint distribution of the corresponding variables over the whole population.

We are interested in understanding the evolution of D_t over time, or possibly that of a set of alternative summary poverty or inequality measures defined over it.

The decompositions proposed in this project consist of estimating the effects of changing one or more of the arguments of *D[.]* on D_t. The simplest decomposition applies to those arguments which are exogenous to the household: that is, the *bs*, *gs*, and the variance of the various residual terms. Changing the *bs* amounts to assuming a change in the rate of return on human capital variables in equation (2) and (3). We refer to this as a "price effect". In algebraic terms, it can be expressed as:

(9) $$B_{tt'} = D[\{X_{ht}, Y_{oht}, \Omega_{ht}\}, b_{t'}, g_t] - D[\{X_{ht}, Y_{oht}, \Omega_{ht}\}, b_t, g_t]$$

[14] This section draws heavily on Bourguignon et. al. (1998), adapting it to our specifications.

This expression measures the contribution to the overall change in the distribution $D_{t'} - D_t$ of a change in b between t and t', holding all else constant. Likewise, the "labor supply effect" may be defined by:

(10) $$L_{tt'} = D[\{X_{ht}, Y_{oht}, \Omega_{ht}\}, b_t, g_{t'}] - D[\{X_{ht}, Y_{oht}, \Omega_{ht}\}, b_t, g_t]$$

The price effect $B_{tt'}$ is obtained by comparing the distribution at date t with the hypothetical distribution obtained by simulating on the population observed at date t the remuneration structure of period t'. A price effect can be computed individually – that is, for one element of the vector β, or collectively – that is, for all elements of the vector β. Both types of simulations are reported below.

Likewise, the labor supply effect, $L_{tt'}$, is obtained by comparing the initial distribution with the hypothetical distribution obtained by simulating on the population observed at date t the occupational preferences observed at date t'. Again, a labor-supply effect can be computed individually – that is, for one element of the vector γ, or collectively – that is, for all elements of the vector γ. We only report collective labor-supply decompositions in this paper.

Considering only the collective price and labor supply effects, one can then write the change in the distribution of household income as the sum of a price effect, a labor supply effect and a residual:

(11) $$D_t - D_{t'} = B_{tt'} + L_{tt'} + R_{tt'}$$

The residual $R_{tt'}$ measures the contribution to the change in the distribution of income of changes in the distributions of observable and unobservable characteristics, respectively all the X_hs and Y_{0h}s, and all the e_s and h_s.

(11) is a definitionally exact decomposition, but changes in the residual term $R_{tt'}$, which encompass all changes in household physical and human capital endowments, changes in the receipts of non-labour incomes, such as capital income or transfers, and demographic changes, are likely to be important. In order to shed light on some of those effects, one must mind the fact that

of the variables in $\{X_{ht}, Y_{0ht}, \Omega_{ht}\}$, only the residual terms in Ω_{ht} are (by assumption) orthogonal to all other variables. For any other variable, i.e. elements of the X and Y vectors, a change in distribution must be understood conditionally on all other observable characteristics.

Specifically, if we are interested in the effect of a change in the distribution of a single specific variable X_k on the distribution of household incomes between times t and t', it is first necessary to identify the distribution of X_k conditional on other relevant characteristics X_{-k} (and possibly other incomes Y_0). This can be done by regressing X_k on X_{-k} at dates t and t', as follows:

$$X_{kit} = X_{-kit} m_t + u_{kit} \tag{12}$$

where k is the variable, i is the individual, and t is the date. The vector of residuals u_{kit} represents the effects of unobservable characteristics (assumed to be orthogonal to X_{-k}) on X_k. The vector μ_t is a vector of coefficients capturing the dependency of X_k on the true exogenous variables X_{-k}, at time t. For the sake of simplicity, let us assume that the error terms u are normally distributed with mean zero and a common standard deviation σ_t.

The same equation can, of course, be estimated at date t', generating a corresponding vector of coefficients $\mu_{t'}$, and a standard error of the residuals given by $\sigma_{t'}$. We are then ready to simulate the effect of a change in the conditional distribution of X_k from t to t', by replacing the observed values of X_{kit} in the sample observed at time t, with:

$$X^*_{kit} = X_{-kit} m_{t'} + u_{kit} \frac{s_{t'}}{s_t} \tag{13}$$

The contribution of the change in the distribution of the variable X_k to the change in the distribution of incomes between t an t' may now be written as:

$$R^{x^*}_{tt'} = D[\{X_{kit'}^*, X_{-kit}, Y_{oht}, \Omega_{ht}\}, b_t, g_t] - D[\{X_{kit}, X_{-kit}, Y_{oht}, \Omega_{ht}\}, b_t, g_t] \tag{14}$$

In this paper, we perform four regression estimations such as (13), and hence four simulations such as (14). The four variables estimated are $X_k = \{n_{0\text{-}13}, n_{14\text{-}65}, n_{>65}, ed)$. In the case of the education regression, the vector of explanatory variables $X\text{-}_{kit}$ was (1, age, age^2, G_d, regional dummies). In the case of the regressions with the numbers of household members in certain age intervals as dependent variables, the vector $X\text{-}_{kit}$ was (1, age, age^2, ed, ed^2, regional dummies), where age and education are those of the household head. The simulations permitted by these estimations allow us to investigate the effects of the evolution of the distribution of educational attainment and of demographic structure on the distribution of income. We now turn to the results of the estimation stage of the model.

4. Estimating the Model

The results of the OLS estimation of equation (2) for wage earners (formal and informal) are shown in Table 5 below. The static results are not surprising. All variables are significant and have the expected signs. The coefficients on education and its square are positive and significant. The effect of experience (defined as [age – education – 6]), is positive but concave. The gender dummy (female =1) is negative, significant and large.

The dynamics are more interesting. Between 1976 and 1996, the earnings-education profile changed shape. After rising in the late 1970s, the linear component fell substantially from 1981 to 1996. Meanwhile, the coefficient of squared years of schooling fell to 1981 but then more than doubled to 1996, ending the period substantially above its initial 1976 value. Overall, the relationship became more convex, suggesting a steepening of marginal returns to education at high levels. However, plotting the parabola which models the partial earnings-education relationship from equation (2), the lowering of the linear term dominates. The profile shifts up from 1976 to 1981, and again to 1985, before falling precipitously (while convexifying) to 1996. See figure 4. The net effect across the entire period was a fall in the cumulative returns to education (from zero to t years) for the entire range. This co-existed with increasing marginal returns at high levels of education. The implications for poverty and inequality are clear, with the education price effect leading to an increase in the former and a decline in the latter.

Table 5: Equation 2: Wage Earnings Regression for wage-employees				
Year	**1976**	**1981**	**1985**	**1996**
Intercept	4.350 (0.0001)	4.104 (0.0001)	3.877 (0.0001)	4.256 (0.0001)
Education	0.123 (0.0001)	0.136 (0.0001)	0.129 (0.0001)	0.080 (0.0001)
Education^2 (x 100)	0.225 (0.0001)	0.181 (0.0001)	0.283 (0.0001)	0.438 (0.0001)
Experience	0.075 (0.0001)	0.085 (0.0001)	0.087 (0.0001)	0.062 (0.0001)
Experience^2 (x 100)	-0.105 (0.0001)	-0.119 (0.0001)	-0.121 (0.0001)	-0.080 (0.0001)
Gender	-0.638 (0.0001)	-0.590 (0.0001)	-0.635 (0.0001)	-0.493 (0.0001)
R^2	0.525	0.538	0.547	0.474
Source: Authors' calculations based on the "Pesquisa Nacional por Amostra de Domicílios" (PNAD). P-values in parentheses.				

[See Figure 4 in Appendix 4]

Returns to experience also increased from 1976 to 1981, and from 1981 to 1985, with a concave pattern and a maximum at around 35 years of experience. See Figure 5 below. But from 1985 to 1996, there was a substantial decline in cumulative returns to experience, even with respect to 1976, until 50 years of experience. The relationship became less concave, and the maximum returns moved up to around 40 years. Over the entire period, the experience price effect was mildly unequalizing, and seriously poverty increasing.

[See Figure 5 in Appendix 4]

The one piece of good news comes from a reduction in the male-female earnings disparity. While female earnings, controlling for both education and experience, remained substantially lower in all four years, suggesting that some labour market discrimination may be at work, there was nevertheless a decline in the this effect between 1976 and 1996. This effect, as we will see from the simulations reported in Section 5, was both mildly equalizing and poverty reducing.

Let us now turn to Equation (3), which seeks to explain the earnings of the self-employed with the same set of independent variables as Equation (2). The results are reported in Table 6 below. This table reveals that education is also an important determinant of incomes in the self-employment sector. The coefficient on the linear term has a higher value in all years than for wage-earners, but the quadratic term is lower. This implies that, ceteris paribus, the return to low levels of education might be higher in self-employment than in wage work, but would eventually become lower as years of schooling increase. This will clearly have an impact on occupational choice, estimated through equation (4). Dynamically, the same trend was observed as for wage-earners: the coefficient on the linear term fell over time, but the relationship became more convex.[15] The coefficients on experience and experience squared follow a similar pattern to that observed for wage earners, as shown in Figure 5. Once again, the cumulative return to experience fell over the bulk of the range from 1976 to 1996, contributing to the observed increase in poverty. The effect of being female, ceteris paribus, is even more markedly negative in this sector than in the wage sector. It also fell from 1976 to 1996, despite a temporary increase in disparity in the 1980s.

Table 6: Equation 3: Total Earnings Regression for the self employed

Year	**1976**	**1981**	**1985**	**1996**
Intercept	4.319 (0.0001)	4.192 (0.0001)	3.853 (0.0001)	4.250 (0.0001)
Education	0.196 (0.0001)	0.148 (0.0001)	0.165 (0.0001)	0.114 (0.0001)
Education^2 (x 100)	-0.206 (0.0001)	0.021 (0.4892)	0.012 (0.6545)	0.219 (0.0001)
Experience	0.074 (0.0001)	0.079 (0.0001)	0.084 (0.0001)	0.063 (0.0001)
Experience^2 (x 100)	-0.101 (0.0001)	-0.108 (0.0001)	-0.111 (0.0001)	-0.082 (0.0001)
Gender	-1.092 (0.0001)	-1.148 (0.0001)	-1.131 (0.0001)	-0.714 (0.0001)
R^2	0.431	0.434	0.438	0.336

Source: Authors' calculations based on the "Pesquisa Nacional por Amostra de Domicílios" (PNAD).
P-values in parentheses.

[15] In this case, it actually switched from concave to convex.

Let us now turn to the estimation of the multinomial logit in equation (4). This was estimated separately for household heads and for others, since the set of explanatory variables was slightly different in each case (see the description of vectors Z_1 and Z_i in Section 2 above). Table A3.1 in Appendix 3 presents the results for household heads, and Table A3.2 for other household members. In both tables, the results are presented as the effects of other choices versus that of remaining outside the labor force ('unoccupied').

For household heads, education was not significantly related to the likelihood of choosing to work in the wage sector vis-à-vis staying out of the labor force, at any time. In addition, the positive effect of education decreased from 1976 to 1996, to the point where it was no longer statistically significant. The dominant effect on the occupational choices of urban household heads over this period, however, was a substantial decline in the constant term affecting the probability of participating in either productive sector, as opposed to remaining outside the labour force, or in unemployment. Since it is captured by the constant, this effect is not related to the educational or experience characteristics of the head, or to the endowments of his or her household. We interpret it, instead, as the effect of labour market demand side conditions, leading to reduced participation in paid work. This effect will be shown, in the occupational choice simulations reported in the next section, to be both unequalizing and immiserizing .

For other members of the household, education did seem to raise the probability of choosing wage work vis-à-vis staying out of the labour force, with the relationship changing from concave to convex (and weak) over the period. It also enhanced the probability of being in self employment vis-à-vis outside the labor force in both periods, although this relationship remained concave. The number of children in the household significantly discouraged participation in both sectors, although more so in the wage–earning one. The change in the constant term was much smaller than for household heads, suggesting that negative labour market conditions hurt primary earners to a greater extent. Consequently, we will observe the effect of the occupational choices of other household members on poverty and inequality to be much milder than those of the heads. This is in contrast to other countries where similar methodologies have been applied, such as Taiwan,

where changes in spouse (and particularly women) labour force participation rates had important consequences for the distribution of incomes (See Bourguignon et. al., 1997).

Table A3.3 in Appendix 2 reports the results of the estimation of equation (12), with education of individuals ten years old or older as the dependent variable, regressed against the vector (1, age, age^2, G_d, regional dummies). Over time, there is a considerable increase in the value of the intercept, which will yield higher predicted values for educational attainment, controlling for age, gender and regional location. Additionally, the gender dummy went from large and negative to positive and significant, suggesting that women have more than caught up with males in educational attainment in Brazil over the last twenty years. The effect of individual age is stable, and regional disparities, with the South and Southeast ahead of the three central and northern regions, persist.

Tables A3.4 – A3.6 report the results of regressing the number of household members in the age interval 0-13; 14-65; and above 65 (respectively), on the vector (1, ed, ed^2, age, age^2, regional dummies). The main finding here is that the schooling of the head has a large, negative and significant effect on the demand for children, so that as education levels rise, family sizes would tend to fall, ceteris paribus. Additionally, some degree of convergence across regions in family size can be inferred, with the positive 1976 regional dummy coefficients for all regions (with respect to the Southeast) declining over time, and more than halving in value to 1996. This picture suggests a possibly important transformation in Brazil's demographic structure, with potential implications for welfare. As we will see in the next section, the role of observed reductions of family size was indeed crucial.

5. The Simulation Results.

Having estimated earnings equations for both sectors of the model (wage-earners (2) and the self-employed (3)); participation equations for both household heads and non-heads (4); and 'endowment' equations (13) for the exogenous determination of education and family composition we are now in a position to carry out the decompositions described in equations (9),

(10) and (14). These simulations, as discussed above, are carried out for the entire distribution (as in equations 7 and 8). However, the results are summarized below in Table 7, 8 and 9, which report mean household per capita income $\mu(y)$, four inequality indices (the Gini coefficient, the Theil-L index [E(0)], the Theil-T index [E(1)], and E(2)), and the standard three members of the Foster-Greer-Thorbecke class of poverty measures, $P(\alpha)$, $\alpha = 0, 1, 2$, computed with respect to two monthly poverty lines: an indigence line of R$30 and a poverty line of R$60 (both expressed in 1996 RM Sao Paulo prices).

Table 7: Simulated Poverty and Inequality for 1976, Using 1996 coefficients.

	Mean	Inequality				Poverty					
	p/c					Z = R$30 / month			Z = R$ 60 / month		
	Income	Gini	E(0)	E(1)	E(2)	P(0)	P(1)	P(2)	P(0)	P(1)	P(2)
1976 observed	265.101	0.595	0.648	0.760	2.657	0.0681	0.0211	0.0105	0.2209	0.0830	0.0428
1996 observed	276.460	0.591	0.586	0.694	1.523	0.0922	0.0530	0.0434	0.2176	0.1029	0.0703
Price Effects											
α, β for wage earners	218.786	0.598	0.656	0.752	2.161	0.0984	0.0304	0.0141	0.2876	0.1129	0.0596
α, β for self-employed	250.446	0.597	0.658	0.770	2.787	0.0788	0.0250	0.0121	0.2399	0.0932	0.0490
α, β for both	204.071	0.598	0.655	0.754	2.190	0.1114	0.0357	0.0169	0.3084	0.1249	0.0673
α only, for both	233.837	0.601	0.664	0.774	2.691	0.0897	0.0275	0.0129	0.2688	0.1040	0.0545
All β (but no α) for both	216.876	0.593	0.644	0.736	2.055	0.0972	0.0303	0.0143	0.2837	0.1114	0.0590
Education β for both	232.830	0.593	0.639	0.759	2.691	0.0779	0.0234	0.0110	0.2531	0.0953	0.0488
Experience β for both	240.618	0.600	0.664	0.771	2.694	0.0851	0.0265	0.0125	0.2592	0.1000	0.0525
Gender β for both	270.259	0.595	0.649	0.751	2.590	0.0650	0.0191	0.0090	0.2160	0.0797	0.0404
Occupational Choice Effects											
γ for both sectors (and both heads + others)	260.323	0.609	0.650	0.788	2.633	0.0944	0.0451	0.0331	0.2471	0.1082	0.0671
γ for both sectors (only for other members)	265.643	0.598	0.657	0.757	2.482	0.0721	0.0231	0.0119	0.2274	0.0867	0.0454
γ, α, β for both sectors	202.325	0.610	0.649	0.788	2.401	0.1352	0.0597	0.0402	0.3248	0.1466	0.0902
Demographic Patterns											
μd only, for all	277.028	0.574	0.585	0.704	2.432	0.0365	0.0113	0.0063	0.1711	0.0554	0.0264
μd , γ, α, β, for all	210.995	0.587	0.577	0.727	2.177	0.0931	0.0433	0.0321	0.2724	0.1129	0.0677
Education Endowment Effects											
μe only, for all	339.753	0.594	0.650	0.740	2.485	0.0424	0.0136	0.0073	0.1593	0.0567	0.0287
μd, μe for all	353.248	0.571	0.584	0.688	2.320	0.0225	0.0078	0.0049	0.1131	0.0359	0.0173
μe , μd , γ, α, β, for all	263.676	0.594	0.600	0.727	1.896	0.0735	0.0374	0.0296	0.2204	0.0913	0.0561

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of 1976 and 1996.

Table 8: Simulated Poverty and Inequality for 1981, Using 1996 coefficients.

	Mean P/c	Inequality				Poverty					
						Z = R$30 / month			Z = R$ 60 / month		
	Income	Gini	E(0)	E(1)	E(2)	P(0)	P(1)	P(2)	P(0)	P(1)	P(2)
1981 observed	239.075	0.561	0.542	0.610	1.191	0.0710	0.0321	0.0230	0.2133	0.0862	0.0509
1996 observed	276.460	0.591	0.586	0.694	1.523	0.0922	0.0530	0.0434	0.2176	0.1029	0.0703
Income Generation											
α, β for wage earners	203.978	0.563	0.546	0.624	1.288	0.0925	0.0383	0.0258	0.2648	0.1081	0.0628
α, β for self-employed	236.511	0.564	0.554	0.618	1.216	0.0772	0.0342	0.0241	0.2229	0.0915	0.0542
α, β for both	201.262	0.568	0.557	0.636	1.325	0.0987	0.0405	0.0269	0.2750	0.1135	0.0662
α only, for both	226.751	0.560	0.541	0.608	1.203	0.0774	0.0340	0.0240	0.2300	0.0927	0.0545
All β (but no α) for both	184.150	0.574	0.571	0.656	1.411	0.1179	0.0474	0.0302	0.3126	0.1320	0.0772
Education β for both	206.439	0.554	0.523	0.603	1.232	0.0812	0.0351	0.0245	0.2463	0.0984	0.0571
Experience β for both	201.805	0.570	0.566	0.637	1.301	0.1029	0.0427	0.0282	0.2784	0.1169	0.0687
Gender β for both	244.918	0.558	0.538	0.602	1.168	0.0676	0.0310	0.0225	0.2052	0.0829	0.0490
Occupational Choice											
γ for both sectors (and both heads + others)	235.636	0.570	0.548	0.629	1.234	0.0907	0.0479	0.0374	0.2344	0.1044	0.0675
γ for both sectors (only for other members)	240.013	0.564	0.552	0.614	1.195	0.0756	0.0342	0.0244	0.2207	0.0903	0.0537
γ, α, β for both sectors	200.559	0.579	0.566	0.663	1.393	0.1172	0.0562	0.0412	0.2925	0.1307	0.0823
Demographic Patterns											
μ_d only, for all	247.443	0.544	0.496	0.573	1.093	0.0529	0.0275	0.0219	0.1745	0.0688	0.0416
μ_d , γ, α, β, for all	207.243	0.560	0.513	0.617	1.256	0.0874	0.0455	0.0359	0.2486	0.1056	0.0663
Education											
μ_e only, for all	298.677	0.582	0.592	0.663	1.325	0.0610	0.0300	0.0231	0.1779	0.0735	0.0450
μ_d, μ_e for all	310.762	0.569	0.552	0.634	1.248	0.0448	0.0251	0.0208	0.1426	0.0574	0.0361
μ_e , μ_d , γ, α, β, for all	255.032	0.586	0.572	0.681	1.390	0.0775	0.0431	0.0352	0.2155	0.0938	0.0607

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of 1981 and 1996.

Table 9: Simulated Poverty and Inequality for 1985, Using 1996 coefficients.

	Mean	Inequality				Poverty					
	p/c					Z = R$30 / month			Z = R$ 60 / month		
	Income	Gini	E(0)	E(1)	E(2)	P(0)	P(1)	P(2)	P(0)	P(1)	P(2)
1985 observed	243.152	0.575	0.588	0.654	1.432	0.0738	0.0307	0.0205	0.2258	0.0901	0.0514
1996 observed	276.460	0.591	0.586	0.694	1.523	0.0922	0.0530	0.0434	0.2176	0.1029	0.0703
Income Generation											
α, β for wage earners	221.944	0.563	0.557	0.631	1.403	0.0758	0.0306	0.0203	0.2353	0.0929	0.0524
α, β for self-employed	241.405	0.572	0.581	0.647	1.392	0.0725	0.0299	0.0200	0.2236	0.0887	0.0504
α, β for both	220.421	0.560	0.549	0.625	1.380	0.0744	0.0299	0.0198	0.2332	0.0915	0.0514
α only, for both	265.972	0.569	0.575	0.636	1.343	0.0599	0.0262	0.0184	0.1936	0.0758	0.0434
All β (but no α) for both	170.654	0.582	0.597	0.698	1.754	0.1308	0.0494	0.0291	0.3484	0.1467	0.0838
Education β for both	199.652	0.562	0.552	0.637	1.473	0.0864	0.0343	0.0221	0.2659	0.1054	0.0592
Experience β for both	217.070	0.579	0.594	0.666	1.472	0.1049	0.0521	0.0388	0.2651	0.1189	0.0754
Gender β for both	249.474	0.573	0.583	0.647	1.381	0.0698	0.0290	0.0196	0.2160	0.0855	0.0487
Occupational Choice											
γ for both sectors (and both heads + others)	237.069	0.591	0.630	0.690	1.502	0.1048	0.0532	0.0398	0.2577	0.1176	0.0756
γ for both sectors (only for other members)	241.081	0.580	0.603	0.663	1.422	0.0833	0.0344	0.0228	0.2391	0.0982	0.0568
γ, α, β for both sectors	217.070	0.579	0.594	0.666	1.472	0.1049	0.0521	0.0388	0.2651	0.1189	0.0754
Demographic Patterns											
μ_d only, for all	275.264	0.573	0.583	0.702	2.420	0.0368	0.0114	0.0063	0.1724	0.0558	0.0266
μ_d , γ, α, β, for all	210.838	0.599	0.605	0.761	2.335	0.0997	0.0462	0.0339	0.2910	0.1215	0.0726
Education											
μ_e only, for all	281.427	0.587	0.614	0.680	1.451	0.0648	0.0293	0.0209	0.1985	0.0800	0.0469
μ_d, μ_e for all	292.292	0.579	0.588	0.662	1.385	0.0498	0.0246	0.0188	0.1718	0.0659	0.0386
μ_e , μ_d , γ, α, β, for all	254.675	0.580	0.590	0.666	1.410	0.0774	0.0434	0.0348	0.2151	0.0937	0.0606

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of 1985 and 1996.

Tables 7 - 9 contain a great wealth of information about a large number of simulated economic changes, always by bringing combinations of 1996 coefficients to the populations of 1976, 1981 and 1985. In order to address the two puzzles posed in the Introduction – namely the increase in extreme urban poverty between 1976 and 1996 despite (sluggish) growth and (mildly) reducing inequality; and the coexistence of a deteriorating labour market with stable 'headline' poverty – we now focus on a comparison of 1976 and 1996. To do so, we plot differences in the (logarithms) of incomes between the simulated distribution and that observed for 1976, for a number of the simulations in Table 7.[16]

Figure 6 below plots the combined price effects (α and β), separately for wage-earners and the self-employed. As can be seen, these effects were negative (i.e. would have implied lower income in 1976) for all percentiles. The losses were greater for wage earners than for the self-employed and, for the latter, were regressive. These losses are exactly what one would have expected from the downward shifts of the partial earnings-education and earnings-experience profiles, shown in Figures 4 and 5.

[See Figure 6 in Appendix 4]

In Figure 7, we adopt a different tack to the price effects, by plotting the income differences for each individual price effect simulation (for both sectors combined), and then aggregating them. As we would expect from figure 6, the returns to education and experience are both immiserizing. The change in partial returns to education alone is mildly equalizing (as can be seen from table 7). The change in the partial returns to experience are unequalizing, as well as being immiserizing. The change in the intercept, calculated at the mean values of the independent variables, was also negative throughout. This proxies for a 'pure growth' effect, capturing effects on earnings from processes not captured by education, experience, gender, or the unobserved characteristics of individual workers. It is intended to capture the effects of capital accumulation, managerial and technical innovation, macroeconomic policy conditions, and other factors likely to determine

[16] In computing these differences, we compare the percentiles of the two different distributions described above. A different, but equally interesting exercise, is to compare the percentiles of the simulated distribution *ranked as in the observed 1976 distribution*, with that 1976 distribution. These exercises were also performed, but are not reported due to space constraints. In any case, the plots which are presented are those which correspond to the summary statistics presented in tables 7-9.

economic growth, not included explicitly in the Mincerian equation. Its negative effect in this simulation suggests that these factors were immiserizing in urban Brazil, over the period.

[See Figure 7 in Appendix 4]

The one piece of good news, once again, comes from the gender simulation, which reports a poverty-reducing effect, as a result of the decline in male-female earnings differentials captured in Tables 5 and 6. This effect was far, however, from being sufficient to offset the combined negative effects of the other price effects. As the thick line at the bottom of Figure 7 indicates, the combined effect of imposing the 1996 parameters of the two Mincerian equations on the 1976 population was substantially immiserizing. Figure 8 below reiterates this point, separating the 'growth' effect (associated with a simple α simulation), from the combined relative price effects (associated with a joint simulation of the vector β). Note that, when combined in this form, the real price effect is on average incomes (and hence on poverty, but not so much on inequality). An inspection of the rows on table 7 confirms this observation.

[See Figure 8 in Appendix 4]

Figure 9 plots the (logarithm) of the income differences between the distribution which arises from imposing the 1996 occupational choice parameters (the γ vector from the multinomial logit in Equation 4) on the 1976 population, and the observed 1976 distribution. It does so both for all individuals (the lower line), and for non-heads (the upper line). The effect of this simulated change in occupational choice and labour force participation behaviour is both highly immiserizing and unequalizing, as an inspection of the relevant indices in table 7 confirms. It suggest the existence of a group of people who, by voluntarily or involuntarily leaving the labour force, or entering unemployment, or being consigned to very ill-remunerated occupations (likely) in the informal sector, are becoming increasingly impoverished. In the unfavourable conditions of the Brazilian urban labour market of these two decades, which we have just documented above, these are people who appear to be failing to climb the slippery slope, and are becoming trapped in extreme poverty.

[See Figure 9 in Appendix 4]

Combining the negative price and occupational choice effects, one gains a sense of the overall effect of Brazil's urban labour market conditions over this period. This is done graphically in Figure 10, where the lowest curve plots the differences between the incomes from a distribution in which all αs, βs and γs change, and the observed 1976 distribution. It shows the substantially poverty-augmenting (and unequalizing) combined effect of changes in labour market prices and occupational choice parameters on the 1976 distribution.

[See Figure 10 Appendix 4]

At this point, the second puzzle can be stated clearly: given these labour market circumstances what factors can account for the facts that mean incomes rose, headline poverty did not rise, and inequality appears to have fallen slightly? The first part of the answer is shown graphically in Figure 11, where the upper line plots the differences between the (log) incomes from a distribution arising from imposing on the 1976 population the transformation (13) for the demographic structure of the population. The changes in the parameters μ_d (and in the variances of the residuals in the corresponding regression) have a positive effect on incomes for all percentiles, and in an equalizing manner. However, when combined in a simulation in which the values of all αs, βs and γs also change, it can be seen that the positive demographic effect is still overwhelmed. Nevertheless, it is clear that the reduction in dependency ratios, and subsequently in family sizes, in urban Brazil over this period had an important mitigating effect on the distribution of incomes. This can be seen clearly in Figure 12, where the bottom line from Figure 11, which incorporates the demographic effect, is superimposed on the simulations that exclude it, from the changes in labour market parameters only. The line incorporating the demographic effects lies essentially everywhere above the line for all αs, βs and γs only, indicating a smaller loss in incomes everywhere. Note, however, that while this relative gain is particularly pronounced for the 'quasi-poor' (say, from the 5^{th} to the 25^{th} percentile), it is less pronounced below that level, where the new extreme poor are located.

[See Figures 11 and 12 in Appendix 4]

There remains one final piece of the puzzle, necessary to explain why the deterioration in labour market conditions did not have a worse impact on poverty. That, as should be evident from the increase in mean years of effective schooling, registered in Table 1, is the rightward shift in the distribution function of education. This is shown in Figure 13, which reveals that gains in educational attainment were particularly pronounced at lower levels of education, and thus presumably among the poor.

[See Figure 13 in Appendix 4]

A gain in educational endowments across the income distribution, but particularly among the poor, has both direct and indirect effects on incomes. The direct effects are through equations (2) and (3), where earnings are positive functions of schooling. The indirect effects are both through the occupational choices that individuals make, and through the further impact that education has on reducing the demand for children, and hence family size. A simulation of the effect of education is thus quite complex. After it is completed, one observes, in Figure 14, a rather flat improvement in (log) incomes across the distribution (i.e. a scaling effect). However, when this is combined with changes in the parameters of the demographic equations again, the effect gains strength, and becomes not only more poverty-reducing, abut also mildly equalizing. The bottom line in Figure 14, in keeping with the pattern, combines both of these effects with the changing αs, βs and γs. The result is striking: this complex combined simulation suggests that all of these effects, during twenty turbulent years, cancel out almost exactly from the 15^{th} percentile up. Hence the small changes in headline poverty. However, from around the 12^{th} percentile down, the simulation suggests a prevalence of the negative occupational choice (and to a lesser extent, price) effects, with substantial income losses. These account for the rise in indigence captured by the R$30/month poverty line.

[See Figure 14 in Appendix 4]

The bottom line in Figure 14 is, in a sense, the final attempt by this methodology to simulate the various changes that led from the 1976 to 1996 distribution. Figure 15 is a graphical test of the approach. Here, the line denoted "1996-1976" plots the differences in actual (log) incomes between the observed 1996 and the observed 1976 distributions. Along with it, we have also plotted every (cumulative) stage of our simulations. First the immiserizing (but roughly equal) price effects; then these combined with the highly immiserizing occupational choice effects; then the slightly less bleak picture arising from a combination of the latter with the parameters of the family size equations. And finally, the curve plotting the differences between the incomes from the simulation with all parameters changing, and observed 1976. As can be seen, it would not appear that the last line replicates the actual differences badly. Of course, the point of the exercise is not to replicate the actual changes perfectly, but rather to learn the different effects of different parameters, and possibly to infer any policy implications from them. But the success of the last simulation in approximately matching the actual changes does provide some extra confidence in the methodology, and in any lessons we may derive from it.

[See Figure 15 in Appendix 4]

7. Conclusions

In the end, does this exercise help us improve our understanding of the evolution of Brazil's urban income distribution over this turbulent twenty-year period? Whereas many traditional analysts of income distribution dynamics might have inferred, from the small changes in mean income, in various inequality indices, and in poverty incidence[17], that there was little – if anything - to investigate, digging a little deeper has unearthed a wealth of economic factors interacting to determine substantial changes in the environment faced by individuals and families, and in their responses.

In particular, we have found that, despite a small fall in measured inequality (although the Lorenz curves cross as expected, see Figure 2b) and a small increase in mean income, extreme poverty

[17] With respect to the already low R$ 60/month poverty line, by historical standards for Brazil.

has increased, for sufficiently low poverty lines or sufficiently poverty aversion parameters. This seems to have been caused by outcomes related to participation decisions and occupational choices, in combination with declines in the labour market returns to education and experience. These changes are associated with greater unemployment and informality, as one would expect, but more research into them seems necessary. While we seem to have identified the existence a group excluded from both the productive labour markets and any substantive form of safety net, we have not been able to fully interpret the determinants of their occupational choices. Issues of mobility – exacerbated by the current monthly income nature of the welfare indicator – will also require further understanding in this context. Policy implications would seem to lie in the area of self-targeted labour programmes, or other safety nets, but it would be foolhardy to go into greater detail before the profile of the group which seems to have fallen into extreme poverty in 1996 is better understood.

Secondly, we have found that, even above the 15^{th} percentile, where urban Brazilians have essentially 'stayed put', this was the result of some hard climbing along a slippery slope. They had to gain an average of two extra years of schooling (which still leaves them undereducated for the country's per capita income level), and substantially reduce fertility, in order to counteract falling returns in both the formal labour market and in self-employment.

It may well be, as many now claim, that an investigation of non-monetary indicators - such as access to services, or life-expectancy at birth - should lead us to consider the epithet of 'a lost decade' as too harsh for the 1980s. Unfortunately, we find that if one is sufficiently narrow-minded to consider only money-metric welfare, urban Brazil has in fact experienced two, rather than one, lost decades.

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Appendix 1: Data and Methodology

Macroeconomic Data:

All macroeconomic indicators reported in this paper are based on original data from the archives of the Brazilian Statistical Institute (IBGE). GDP and GDP per capita figures reported in Section 1 come from the series shown below in Table A1. This series was constructed from the current GDP series (A), which was revised in 1995 and backdated to 1990; and from the old series (B), from 1976 to its final year: 1995. The series reported below comprises the values of series A from 1990 to 1996, and the values of series B scaled down by a factor of 0.977414 from 1976 to 1989. This factor is the simple average of the ratios A/B over the years from 1990 to 1995. The series is expressed in 1996 Reais, using the IBGE GDP deflator.

Table A1: Real GDP and GDP per capita, Brazil 1976-1996, annual (constant 1996 prices)

Year	GDP (reais)	Population (,000s)	GDP per capita (reais)
1976	434,059,220	107,452	4040
1977	455,477,123	110,117	4136
1978	478,113,823	112,849	4237
1979	510,432,394	115,649	4414
1980	562,395,141	118,563	4743
1981	538,474,976	121,213	4442
1982	542,971,306	123,885	4383
1983	527,054,370	126,573	4164
1984	555,515,747	129,273	4297
1985	599,129,793	131,978	4540
1986	644,002,821	134,653	4783
1987	666,708,887	137,268	4857
1988	666,304,312	139,819	4765
1989	687,391,828	142,307	4830
1990	651,627,236	144,091	4522
1991	658,339,124	146,408	4497
1992	654,759,303	148,684	4404
1993	687,004,026	150,933	4552
1994	727,213,139	153,143	4749
1995	757,918,030	155,319	4880
1996	778,820,353	157,482	4945

The GDP per capita growth rates plotted in Figure 1 are derived from this series. Annual inflation and unemployment rates also come from the relevant IBGE series.

The PNAD data sets

All of the distributional analysis performed in this paper is based on four data sets (1976, 1981, 1985, 1996) of Brazil's National Household Survey (Pesquisa Nacional por Amostra de Domicilios: PNAD), which is fielded annually by the IBGE. For the latter three years, the survey is nationally and regionally representative, except for the rural areas of the North region (minus the state of Tocantins) which are not surveyed. For 1976, rural areas were surveyed neither in the North nor in the Center-West regions. In this paper, we are concerned only with urban areas, which are defined by state-level legislative decrees. The urban proportions of the population in each year are given in Table 1. The PNAD sample sizes, as well as the proportion of missing income values, are given below in Table A2:

Table A2: PNAD Sample Sizes and Missing or Zero Income* Proportions

Year	Number of households	Number of Individuals	Proportion of individuals with RFPC missing	Proportion of individuals with RFPC = zero
1976	84660	385282	0.0052	0.0063
1981	110151	477607	0.0073	0.0141
1985	127128	520069	0.0073	0.0108
1996	91621	329434	0.0291	0.0313

Note: *: Income is Total Household Income per capita (RFPC).

Each PNAD questionnaire contains a range of questions pertaining both to the household and to individuals within the household. Among the former, are questions about regional location, demographic composition, quality of the dwelling, ownership of durables, etc. The latter include age, gender, race, educational attainment, labor force status, sector of occupation and incomes, both in cash and kind, and from various sources. The main variables used in our analysis are the those related to incomes, education, the demographic structure of the household and labor force participation. Tables A6 – A9 summarize the main items in the questionnaire concerning these variables, and the changes from 1976 to 1996.

Most importantly, the distributions analyzed in this paper (except where explicitly otherwise indicated) have as welfare concept total household income per capita (regionally deflated). It is constructed from summing all income sources for each individual within the household, and across all such individuals, except for lodgers or resident domestic servants. The latter two categories constitute separate households. Total nominal incomes are spatially deflated to compensate for differences in average cost-of-living across different areas in the country, according to the spatial price index given in Table A3 below:

Table A3: A Brazilian Spatial Price Index (RM Sao Paulo = 1.0)	
PNAD Region	Spatial Price Deflator
RM Fortaleza	1.014087
RM Recife	1.072469
RM Salvador	1.179934
Northeast (other urban areas)	1.032056
Northeast Rural	0.953879
RM Belo Horizonte	0.958839
RM Rio de Janeiro	1.002163
RM Sao Paulo	1.000000
Southeast (other urban areas)	0.904720
Southeast Rural	0.889700
RM Porto Alegre	0.987001
RM Curitiba	0.987001
South (other urban areas)	0.904720
South Rural	0.889700
RM Belem	1.088830
North (other urban areas)	1.032056
RM Brasilia	1.037915
Center West (other urban areas)	0.968388
Note: This regional price index is based on the consumption patterns and implicit prices from the PPV 1996 survey, for the Northeast and Southeast regions, and extrapolated to the rest of country according to a procedure specified in Ferreira et. al. (1999), where the exact derivation of the index is also discussed in detail.	

We assume, largely due to the lack of earlier comparable regional price information, that the structure of average regional cost-of-living described above remained constant over the period. Temporal deflation was undertaken on the basis of the Brazilian consumer price indices IGP-DI (for 1976), and INPC-R for the three subsequent years. For 1996, the INPC-R was upwardly adjusted by 1.2199, so as to compensate for the actual price increases which took place in the second half of June 1994, and which were not computed into July's index, since the latter was already computed in terms of the URV. This adjustment is becoming the standard deflation procedure at IPEA when comparing incomes across June/July 1994. (See Macrometrica, 1994). In order to center the indices on the first day of the month, which is the reference date for PNAD incomes, the geometric average of the index for a month and for the preceding month was used as that month's deflator. Once again, this is now best practice for price deflation in hyper-inflationary periods. Once the deflators were constructed in this way, the values to convert current incomes into 1996 Reais were as follows:

Table A4: Brazilian Temporal Price Deflators (Selected Years)							
1976	4.115	**1981**	49.512	**1985**	2257.294	**1996**	1.000

A final possible adjustment to the PNAD data concerns deviations between survey-based welfare indicators (such as mean household income per capita) and National Accounts-based prosperity indicators (such as GDP per capita). The international norm is that household survey means are

lower than per capita GNP, both because the latter includes the value of public and publicly provided goods and services, which are generally not imputed into the survey indicators, and because of possible under-reporting by respondents. Given that the *levels* of the two series are not expected to match exactly, analysts are usually concerned by deviant trends, which may indicate a problem with the survey instrument. On the other hand, it may plausibly be argued that National Accounts data have errors of their own, and that many of the 'correction' procedures applied to household data rely on reasonably strong assumptions, such as equiproportional under-reporting by source.

In deciding whether to adjust the PNAD data with reference to the Brazilian National Accounts over this period, we examined the evolution of the ratios of GDP per capita to mean household incomes from the PNAD (for the entire country, and without regional price deflation, for comparability). As Table A5 below shows, these were remarkably stable. In particular, the ratios for the starting and end points of the period covered, which are of particular importance for our analysis, are almost identical. In this light, and since even the disparity with respect to 1981 and 1985 are reasonably small, we judged that the costs of making rough adjustments to the PNAD household incomes on the basis of the National Accounts outweighed the benefits.

Table A5: Ratios of GDP per capita to PNAD mean household incomes, 1976-1996

Year	GDP per capita (A)	Mean PNAD income (B)	(A) / (B)
1976	336.6	190.2	1.770
1981	370.2	187.3	1.976
1985	378.3	188.6	2.005
1996	412.1	233.0	1.769

Tables A6 – A9 summarize the main items in the questionnaire concerning these variables, and the changes from 1976 to 1996.

Table A6: Comparing Income Variables across the 1976 and 1996 PNADs

1976			1996		
Variable	Name	Question	Variable	Name	Question
V2308	Rendimento-Fixo	Quanto ganha ou ganhava mensalmente na ocupação declarada no quesito 4 (ocupação/ profissão que exerce ou exerceu durante mais tempo)?	V9532	Rend/Mensal nesse	Qual era o rendimento mensal que ganhava normalmente, em setembro de 1996, nesse trabalho (principal - em dinheiro)?
V2358	Rendimento-Variável				
V2359	Rendimento Prod/Mercado		V9535	Rend/Mensal nesse	Qual era o rendimento mensal que ganhava normalmente, em setembro de 1996, nesse trabalho (principal - em mercadorias ou valor dos produtos)?
V2362	Outra Renda - Outra Ocupação	Tem renda habitual além da declarada no quesito 8 -V2312 ?	V9982	Rend/Mensal no tra	Qual era o rendimento mensal que ganhava normalmente, em setembro de 1996, nesse trabalho secundário.(em dinheiro) ?
			V9985	Rend/Mensal no tra	Qual era o rendimento mensal que ganhava normalmente, em setembro de 1996, nesse trabalho secundário.(em mercadorias ou valor dos produtos)?
			V1022	Rend Mês 9 Noutros	Qual era o rendimento mensal que ganhava normalmente, em setembro de 1996, nos outros trabalhos que tinha na semana de 22 a 28 de setembro de 1996. (em dinheiro)?
			V1025	Rend Mês 9 Noutros	Qual era o rendimento mensal que ganhava normalmente, em setembro de 1996, nos outros trabalhos que tinha na semana de 22 a 28 de setembro de 1996. (em mercadorias ou valor dos produtos)?
V2365	Outra Renda - Aposentadoria/Pensão	Tem renda habitual além da declarada no quesito 8 -V2312 ?	V1252	Valor 1 Rend após Prev Rec	Qual era o rendimento mensal que recebia normalmente em setembro de 1996, de aposentadoria de instituto de previdência ou do governo federal (em dinheiro)?
			V1255	Valor 1 Rend Pens Prev Req	Qual era o rendimento mensal que recebia normalmente em setembro de 1996, de pensão de instituto de previdência ou do governo federal (em dinheiro)?
			V1258	Valor 1 Rend Outra após Re	Qual era o rendimento mensal que recebia normalmente em setembro de 1996, de outro tipo de aposentadoria (R$)?
			V1261	Valor 1 Rend Outra Pens Re	Qual era o rendimento mensal que recebia normalmente em setembro de 1996, outro tipo de pensão (R$)?
V2363	Outra Renda - Aluguéis	Tem renda habitual além da declarada no quesito 8 -V2312 ?	V1267	Rend Aluguel Rec	Qual era o rendimento mensal que recebia normalmente em setembro de 1996, de aluguel (R$)?
V2364	Outra Renda - Doação/Mesada	Tem renda habitual além da declarada no quesito 8 -V2312 ?	V1270	Rend Doação Rec No	Qual era o rendimento mensal que recebia normalmente em setembro de 1996, de doação recebida de não morador (R$)?
V2366	Outra Renda - Outras	Tem renda habitual além da declarada no quesito 8 -V2312 ?	V1273	Rend Juros Recebid	Qual era o rendimento mensal que recebia normalmente em setembro de 1996, dejuros de caderneta de poupança e de outras aplicações, dividendos e outros recebimentos (R$)?
			V1264	Valor 1 Rend Abono Prem Re	Qual era o rendimento mensal que recebia normalmente em setembro de 1996, de abono de permanência (R$)?
V2956	**Remuneração Todas Ocup.**				
V2957	**Remuneração Outr. Rendi.**				
A Soma dessas duas é igual a soma de todas as outras					

Fonte: Construída com base nos questionários e dicionários da Pesquisa Nacional por Amostra e Domicílios (PNAD) de 1976 e 1996.

Table A7: Comparing Education Variables across the 1976 and 1996 PNADs

1976			1996		
Variable	Name	Categories	Variable	Name	Categories
V2222	Sabe ler e escrever	- menos de 5 anos	V0601	sabe ler e escrever	0- parte ignorada
		1 -Sim			1-sim
		2- Esqueceu			3- não
		3- Não sabe			9- ignorado
		9- Sem declaração			-não informado
V2223	Onde aprendeu a ler e escrever	- menos de 5 anos			
		1- Escola regular			
		2- Outra forma			
		3- Não sabe ler e escrever			
		9- Sem declaração			
V2224	Frequenta escola - série	- Não aplicável	V0602	Frequenta escola ou creche	2- sim
		0 - não há série			4- não
		1 - 1ª série			8- se v0601=1 ou 3 demais variaveis da par
		2- 2ª série			9-ignorado
		3- 3ª série			- não informado
		4- 4ª série	V0605	Qual a série que frequenta	1- primeira
		5- 5ª série			2- segunda
		6- 6ª série			3- terceira
		7- 7ª série			4- quarta
		8- 8ª série			5- quinta
		9 - sem declaração			6- sexta
					7- sétima
					8- oitava
					9- ignorado
					- não informado
V2225	Frequenta escola - grau	- Não aplicável	V0603	Qual o curso que frequenta	0-ignorado
		0- não há série			1-regular de 1º grau
		1- primeiro grau			2- regular de 2º grau
		2- segundo grau			3- supletivo de 1º grau
		3- médio prim. Ciclo			4- supletivo de 2º grau
		4- médio seg. ciclo			5- superior
		5- superior			6- alfabetização de adultos
		6- alfabetização de adultos			7- pré-escolar
		7- admissão			8- pre-vestibular
		8- supletivo			9- mestrado ou doutorado
		9- Art.99 prim. Ciclo			-não informado
		10 - Art99 seg. ciclo			
		11-vestibular			
		99- sem declaração			
			V0604	curso é seriado?	2- sim
					4- não
					9- ignorado
					-não informado

Table A7 (ctd): Comparing Education Variables across the 1976 and 1996 PNADS

V2226	Não frequenta escola - série	- Não aplicável 0 - não há série 1 - 1ª série 2- 2ª série 3- 3ª série 4- 4ª série 5- 5ª série 6- 6ª série 7- 7ª série 8- 8ª série 9 - sem declaração
V2227	Não frequenta escola - grau	- Não aplicável 0- não há série 1- primeiro grau 2- segundo grau 3- médio prim. Ciclo 4- médio seg. ciclo 5- superior 9- sem declaração

V0606	Anteriormente frequentou escola ou creche?	2- sim 4- não
V0607	Qual foi o curso mais elevado que frequentou anteriormente?	0- ignorado 1- elementar(primário) 2- médio primeiro ciclo(ginasial) 3- médio segundo ciclo 4- primeiro grau 5- segundo grau 6- superior 7- mestrado ou doutorado 8- alfabetização de adultos 9- pré-escolar -não informado
V0608	Este curso que frequentou anteriormente era seriado	2- sim 4- não 9- ignorado -não informado
V0609	Foi aprovado pelo menos na primeira série deste curso que frequentou anteriormente	1- sim 3- não 9- ignorado - não informado
V0610	Qual foi a série que concluiu com aprovação neste curso que frequentou anteriormente	1-primeira 2-segunda 3-terceira 4- quarta 5- quinta 6- sexta 7-sétima 8- oitava 9- ignorada -não informada
V0611	Concluiu este curso que frequentou anteriormente	1- sim 3- não 9- ignorado - não informado

Fonte: Construída com base nos questionários e dicionários da Pesquisa Nacional por Amostra e Domicílios (PNAD) de 1976 e 1996.

Table A8: Comparing Labour Market variables across the 1976 and 1996 PNADs

1976			1996		
Variable	Name	Categories	Variable	Name	Categories
V2301	Que fez na semana?	-Menos de 10 anos 0-Sem ocupação 1-Estava trabalhando 2- Tinha trabalho 3-Procur. Trabalho 4-Proc. Trab. 1 vez 5-Afazeres doméstico 6-Frequent. Escola 7-Aposent/Pesion 8-Vive de renda 9-Doente/invalido	V9001	Trabalhou de 22 a 28/9/96?	0-Parte Ignorada 1-Sim 3-Não 9-Ignorado Não informado
			V9002	Trab. Cultivo, Pesca, Criação	2-Sim 4-Não 9-Ignorado Não informado
			V9003	Trab. Construção do próprio uso?	1-Sim 3-Não 9-Ignorado Não informado
			V9004	Afastado temporariamente	2-Sim 4-Não 9-Ignorado Não informado
V2307	Posição na Ocupação	0-Sem declaração 1-Empregado 2-Conta-própria 3-Conta Prop. Não Est. 4-Parceiro Emreg. 5-Parc. Conta Prop. 6-Parc. Empregador 7-Membro da Família 9-Membro de Inst.	V9008	Neste trabalho era?	1-Empregado permanente 2-Empregado permanente agricultura 3-Empregado permanente outra atividade 4-Empregado temporário 5-Conta-própria nos serviços auxiliares 6-Conta-própria na agricultura 7-Conta-própria em outra atividade 8-Empregador nos serviços auxiliares 9-Empregador na agricultura 10-Empregador em outra atividade 11-Trabalhador não remunerado 12-Outro trabalhador não remunerado 13-Trabalhador na produção 88-Tem ativ.agricola e não inform. Pos. ocup. 99-Ignorado Não informado

Table A8 (ctd): Comparing Labour Market Variables across the 1976 and 1996 PNADS

			V9029	No Empr. tinha área p/pr. Partic ?	1-Sim 3-Não 9-Ignorado Não informado
			V9032	Este emprego era no setor?	2-Privado 4-Público 9-Ignorado Não informado
			V9033	Esse emprego era na área?	1-Federal 3-Estadual 5-Municipal 9-Ignorado Não informado
			V9034	Nesse emprego era militar?	2-Sim 4-Não 9-Ignorado Não informado
			V9035	Nesse emprego era Func. Pub. Estat.?	1-Sim 3-Não 9-Ignorado Não informado
			V9042	Nesse Empr. tinha Cart. Trb. Ass. ?	2-Sim 4-Não 9-Ignorado Não informado
V2323	Meio p/ conseguir trabalho	0-Sem declaração 1-Agência Pública 2-Agência Particular 3-Direito Empreg. 4-Amigos/Parentes 5-Colegas Profiss. 6-Anuncios 7-Recebeu proposta 8-Outra 9-Nada Fez	V9115	Providenciou Trab. na Sem. referência?	1-Sim 3-Não 8-Sem resposta nos quesitos de proc. Trab. 9-Ignorado Não informado
			V9116	Providenciou Trab. no mês referência?	2-Sim 4-Não 9-Ignorado Não informado

Fonte: Construída com base nos questionários e dicionários da Pesquisa Nacional por Amostra e Domicílios (PNAD) de 1976 e 1996.

Table A9: Comparing Some Demographic Variables across the 1976 and 1996 PNADs

1976			1996		
Variable	Name	Categories	Variable	Name	Categories
V1004	Situação	1-Urbana 2-Rural	V4728	Situação	1-Urbana-área urbana 2-Urbana-área não urbana 3-Urbana-área isolada 4-Rural-extensão urbana 5-Rural-povoado 6-Rural-núcleo 7-Rural-outros 8-Rural-exclusive -Não informado
V2107	Condição no domicílio	1-Chefe de família 2-Conjuge 3-Filho (a) / enteado 4-Pais ou sogros 5-Outros parentes 6-Agregado 7-Pensionista / Hospede 8-Empregado doméstico 9-Individual dom. col	V0402	Condição na família	1-Pessoa de referência 2-Conjuge 3-Filho 4-Outro parente 5-Agregado 6-Pensionista 7-Empregado doméstico 8-Parente do empregado doméstico não informado
			V0403	Número da família	
V1401	Família	-Não Aplicável 1-Única 2-Individual 3-Principal 4-Primeira secund. 5-Segunda secund.			
V1402	Espécie	-Não Aplicável 1-Particular 2-Coletivo 3-Improvisado	V0201	Espécie de domicílio	1-Particular Permanente 3-Particular Improvisado 5-Coletivo Não informado
V1012	Tipo de área	1-Área metropolitana 2-Auto repreresentativa 3-Não auto representativa	V4727	Tipo de área	1-Região metropolitana 2-Auto repreresentativa-não metropolitana 3-Não auto representativa

Fonte: Construída com base nos questionários e dicionários da Pesquisa Nacional por Amostra e Domicílios (PNAD) de 1976 e 1996.

Nota: A variável Número da Família (V0403) está presente no programa de 1996 e não está presente no programa de 1976, pois esta PNAD só está disponível a nível de domicílio.

Appendix 2: Table A2.1: Evolution of mean income and inequality: a summary of the literature

	Ano														
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Household Income per capita															
Bonelli & Sedlaceck															
Gini Coefficient	0.561			0.550		0.542		0.549							
Gini Coefficient (1)	0.583			0.588		0.584		0.589		0.592					
Hoffman (2)															
Mean (3)				4.7	4.8	4.6	4.7	3.8	4.0	4.5	5.6				
Gini Coefficient				0.588	0.597	0.584	0.587	0.589	0.588	0.592	0.586				
Theil – T				0.523	0.536	0.519	0.520	0.523	0.526	0.529	0.519				
Ferreira e Litchfield															
Mean (4)						143		126	125	150	213	166	166	196	164
Gini Coefficient						0.574		0.584	0.577	0.589	0.581	0.582	0.609	0.618	0.606
Theil – T						0.647		0.676	0.653	0.697	0.694	0.710	0.750	0.796	0.745
Total Individual Income (Active Pop.)															
Bonelli & Sedlaceck (5)															
Mean(6)	2241.8			2081.2	2264.0	2040.6		1835.6		2222.1	3112.8				
Gini Coefficient	0.589			0.574	0.590	0.562		0.582		0.588	0.577				
Hoffman (1) (7)															
Mean (8)				340.2		331.2		297.5	293.6	335.7	426.1				
Gini Coefficient (9)				0.585		0.572		0.591	0.587	0.599	0.589				
Lauro Ramos (10)															
Mean (11)	85.4	87.5	89.7	93.6		93.4	91.9	86.8	89.2	94.6					
Gini Coefficient	0.564	0.543	0.531	0.530		0.514	0.520	0.534	0.536	0.545					
Theil – L	0.556	0.511	0.488	0.486		0.457	0.465	0.496	0.498	0.521					
Theil – T	0.709	0.607	0.571	0.560		0.513	0.527	0.565	0.558	0.584					

Fonte: Hoffman (89) – Pesquisa Nacional por Amostra de Domicílios (PNAD) de 1979, 1981, 1982, 1983, 1994, 1985 e 1986, Censo Demográfico 1980 e Anuário estatístico 1985 para os anos de 1979, 1980, 1981, 1982 e 1983.
Bonelli & Sedlaceck (89) – Pesquisa Nacional por Amostra de Domicílios (PNAD) de 1976, 1979, 1981, 1983, 1985, 1986 e Censo Demográfico de 1980
Lauro Ramos (90)- Pesquisa Nacional por Amostra de Domicílios (PNAD) de 1976, 1977, 1978, 1979, 1981, 1982, 1983, 1984 e 1985.
Ferreira e Litchfield (96) – Pesquisa Nacional por Amostra de Domicílios (PNAD) de 1981, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990.

Nota: (1) – Inclui as famílias sem renda.
(2) – Para 1979: exclusive as populações das zonas rurais da região norte, Matogrosso, Matogrosso do Sul e Goiás e para 1981 a 1986: exclusive a população da zona rural da região norte.
(3) – Valor real, em salários mínimos de agosto de 1980, deflacionado pelo ICV-DIEESE.
(4) – US$ de 1990.
(5) – Exclusive pessoas sem rendimentos ou sem declaração de rendimentos. Somente PEA.
(7) – Somente PEA c/ rendimento positivo
(6) – Deflator:IGP/IBGE. Preços de Cz$ 1000 de set/86; exclusive zona rural da região norte (todos os anos), e zona rural de Matogrosso, Matogrosso do Sul e Goiás (76 e 79).
(8) – Valores em 1000 cruzeiros de set/84. Deflatores: INPC/IBGE, até ago/85; ICV/DIEESE, entre set/85-set/86
(9) – Média ponderada dos valores mínimo e máximo.
(10) – Universo: homens entre 18 e 65 anos, participando da força de trabalho, trabalhando mais de 20 horas por semana e morando em área urbanas; renda total
(11) – Base: 1980=100.

Appendix 3: The Estimation of the Model: Regression Results

Table A 3.1: Dependent variable: participation of the household head

	Year											
	1976			1981			1985			1996		
	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value
Occupied as employee versus unoccupied												
Education	0,008	0,010	0,444	0,025	0,008	0,002	-0,004	0,008	0,598	0,001	0,008	0,881
Education2	0,002	0,001	0,000	0,003	0,001	0,000	0,003	0,000	0,000	0,002	0,000	0,000
Age	0,039	0,007	0,000	0,097	0,005	0,000	0,104	0,005	0,000	0,153	0,005	0,000
Age2	-0,001	0,000	0,000	-0,002	0,000	0,000	-0,002	0,000	0,000	-0,002	0,000	0,000
Gender	-1,833	0,040	0,000	-1,415	0,029	0,000	-1,291	0,027	0,000	-0,922	0,025	0,000
Number of members from 0 to 14*	-0,001	0,009	0,905	0,024	0,007	0,001	0,029	0,008	0,000	-0,015	0,010	0,124
Number of members from 14 to 65*	-0,052	0,011	0,000	-0,050	0,009	0,000	-0,049	0,009	0,000	-0,079	0,012	0,000
Number of members older than 65*	0,076	0,049	0,121	0,000	0,041	0,991	0,001	0,040	0,982	0,006	0,045	0,892
Presence of other members from 14 to 65 (dummy)	-0,008	0,139	0,953	0,659	0,106	0,000	0,922	0,103	0,000	0,494	0,106	0,000
Mean education*	-0,092	0,012	0,000	-0,056	0,011	0,000	-0,083	0,010	0,000	0,009	0,011	0,410
Mean education2*	0,001	0,001	0,286	-0,001	0,001	0,316	-0,001	0,001	0,187	-0,004	0,001	0,000
Mean age*	0,026	0,008	0,001	0,002	0,006	0,711	0,001	0,006	0,806	0,004	0,006	0,510
Mean age2*	0,000	0,000	0,000	0,000	0,000	0,014	0,000	0,000	0,003	0,000	0,000	0,014
Women proportion*	0,012	0,006	0,025	-0,010	0,004	0,018	0,003	0,004	0,508	0,000	0,004	0,940
Constant	2,465	0,167	0,000	0,403	0,107	0,000	0,518	0,103	0,000	-1,052	0,105	0,000
Occupied as self-employed versus unoccupied												
Education	-0,063	0,011	0,000	-0,037	0,009	0,000	-0,061	0,009	0,000	0,009	0,009	0,340
Education2	0,001	0,001	0,233	0,000	0,001	0,518	0,001	0,001	0,115	-0,002	0,001	0,000
Age	0,072	0,008	0,000	0,130	0,006	0,000	0,121	0,005	0,000	0,175	0,006	0,000
Age2	-0,001	0,000	0,000	-0,002	0,000	0,000	-0,002	0,000	0,000	-0,002	0,000	0,000
Gender	-1,719	0,047	0,000	-1,452	0,035	0,000	-1,412	0,032	0,000	-1,479	0,033	0,000
Number of members from 0 to 14*	0,030	0,010	0,002	0,075	0,008	0,000	0,096	0,008	0,000	0,055	0,011	0,000
Number of members from 14 to 65*	-0,055	0,012	0,000	-0,049	0,010	0,000	-0,071	0,010	0,000	-0,090	0,013	0,000
Number of members older than 65*	0,036	0,056	0,522	0,067	0,046	0,145	-0,061	0,046	0,184	-0,081	0,051	0,113
Presence of other members from 14 to 65 (dummy)	-0,015	0,159	0,925	0,689	0,124	0,000	0,909	0,118	0,000	0,469	0,126	0,000
Mean education*	-0,090	0,014	0,000	-0,036	0,013	0,004	-0,055	0,012	0,000	0,039	0,013	0,002
Mean education2*	0,003	0,001	0,004	0,000	0,001	0,674	0,000	0,001	0,638	-0,003	0,001	0,000
Mean age*	0,016	0,009	0,074	-0,016	0,007	0,020	-0,013	0,007	0,040	-0,002	0,007	0,740
Mean age2*	0,000	0,000	0,001	0,000	0,000	0,700	0,000	0,000	0,484	0,000	0,000	0,248
Women proportion*	0,007	0,007	0,287	-0,002	0,005	0,670	0,002	0,005	0,660	-0,014	0,004	0,001
Constant	0,646	0,188	0,001	-1,513	0,129	0,000	-1,152	0,121	0,000	-2,860	0,131	0,000

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of the 1976 and 1996.

Note: * excluding the head.

Table A 3.2: Dependent variable: participation of other members

	Year											
	1976			1981			1985			1996		
	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value
Occupied as employee versus unoccupied												
Education	0,207	0,006	0,000	0,122	0,006	0,000	0,117	0,006	0,000	0,073	0,006	0,000
Education2	-0,006	0,000	0,000	0,003	0,000	0,000	0,002	0,000	0,000	0,003	0,000	0,000
Age	0,333	0,004	0,000	0,314	0,003	0,000	0,315	0,003	0,000	0,303	0,003	0,000
Age2	-0,005	0,000	0,000	-0,005	0,000	0,000	-0,005	0,000	0,000	-0,004	0,000	0,000
Gender	-1,399	0,018	0,000	-1,143	0,015	0,000	-1,152	0,014	0,000	-0,860	0,017	0,000
Number of members from 0 to 14*	-0,105	0,005	0,000	-0,091	0,004	0,000	-0,101	0,004	0,000	-0,123	0,006	0,000
Number of members from 14 to 65*	0,229	0,005	0,000	0,205	0,004	0,000	0,220	0,004	0,000	0,158	0,006	0,000
Number of members older than 65*	0,195	0,021	0,000	0,090	0,018	0,000	0,119	0,018	0,000	-0,068	0,020	0,001
Presence of other members from 14 to 65 (dummy)	-1,111	0,132	0,000	0,072	0,106	0,497	0,276	0,099	0,006	0,294	0,111	0,008
Mean education*	-0,313	0,007	0,000	-0,315	0,007	0,000	-0,328	0,006	0,000	-0,163	0,007	0,000
Mean education2*	0,006	0,000	0,000	0,005	0,000	0,000	0,006	0,000	0,000	-0,003	0,000	0,000
Mean age*	0,043	0,006	0,000	0,003	0,005	0,522	0,001	0,004	0,865	-0,011	0,005	0,029
Mean age2*	0,000	0,000	0,000	0,000	0,000	0,316	0,000	0,000	0,251	0,000	0,000	0,247
Women proportion*	0,109	0,005	0,000	0,095	0,003	0,000	0,092	0,003	0,000	0,091	0,003	0,000
Self-employed head (dummy)	-0,584	0,020	0,000	-0,420	0,016	0,000	-0,351	0,015	0,000	-0,280	0,017	0,000
Labor income of the head (if employee)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Constant	-4,867	0,088	0,000	-5,055	0,070	0,000	-5,034	0,065	0,000	-5,191	0,073	0,000
Occupied as self-employed versus unoccupied												
Education	0,196	0,013	0,000	0,052	0,010	0,000	0,010	0,009	0,267	0,085	0,011	0,000
Education2	-0,011	0,001	0,000	-0,002	0,001	0,001	0,001	0,001	0,136	-0,002	0,001	0,000
Age	0,369	0,007	0,000	0,356	0,005	0,000	0,362	0,004	0,000	0,347	0,005	0,000
Age2	-0,005	0,000	0,000	-0,004	0,000	0,000	-0,004	0,000	0,000	-0,004	0,000	0,000
Gender	-1,815	0,042	0,000	-1,428	0,030	0,000	-1,463	0,027	0,000	-1,343	0,030	0,000
Number of members from 0 to 14*	-0,043	0,009	0,000	-0,010	0,007	0,151	0,002	0,007	0,785	-0,028	0,011	0,010
Number of members from 14 to 65*	0,053	0,012	0,000	0,029	0,008	0,001	0,037	0,008	0,000	0,021	0,011	0,064
Number of members older than 65*	0,224	0,039	0,000	0,025	0,031	0,422	0,083	0,028	0,003	-0,034	0,031	0,287
Presence of other members from 14 to 65 (dummy)	0,199	0,230	0,387	0,943	0,165	0,000	0,769	0,150	0,000	0,898	0,173	0,000
Mean education*	-0,262	0,017	0,000	-0,203	0,012	0,000	-0,215	0,011	0,000	-0,114	0,013	0,000
Mean education2*	0,008	0,001	0,000	0,004	0,001	0,000	0,005	0,001	0,000	0,001	0,001	0,312
Mean age*	0,007	0,011	0,522	-0,021	0,008	0,006	-0,010	0,007	0,144	-0,036	0,008	0,000
Mean age2*	0,000	0,000	0,484	0,000	0,000	0,046	0,000	0,000	0,926	0,000	0,000	0,000
Women proportion*	0,055	0,011	0,000	0,058	0,007	0,000	0,061	0,006	0,000	0,061	0,006	0,000
Self-employed head (dummy)	0,187	0,036	0,000	0,141	0,026	0,000	0,160	0,023	0,000	0,512	0,026	0,000
Labor income of the head (if employee)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Constant	-7,942	0,150	0,000	-7,682	0,113	0,000	-7,389	0,099	0,000	-7,905	0,120	0,000

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of the 1976 and 1996.

Note: * excluding the head.

Table A3.3: Dependent variable: Education*

	Year											
	1976			1981			1985			1996		
	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value
Intercept	-0,675	0,051	0,0001	3,392	0,031	0,0001	3,307	0,031	0,0001	3,239	0,037	0,0001
Age	0,310	0,003	0,0001	0,156	0,002	0,0001	0,185	0,002	0,0001	0,226	0,002	0,0001
Age 2	-0,004	0,000	0,0001	-0,002	0,000	0,0001	-0,003	0,000	0,0001	-0,003	0,000	0,0001
Gender	-0,115	0,024	0,0001	-0,110	0,014	0,0001	-0,043	0,014	0,0024	0,195	0,017	0,0001
North region	-0,826	0,070	0,0001	-0,732	0,040	0,0001	-0,679	0,036	0,0001	-1,092	0,038	0,0001
Northeast region	-1,293	0,030	0,0001	-1,247	0,018	0,0001	-1,339	0,018	0,0001	-1,372	0,021	0,0001
West-center region	-0,822	0,055	0,0001	-0,552	0,030	0,0001	-0,417	0,029	0,0001	-0,569	0,034	0,0001
South region	0,061	0,033	0,0684	-0,107	0,021	0,0001	-0,166	0,021	0,0001	-0,152	0,025	0,0001
R2	0,119			0,085			0,099			0,115		

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of the 1976 and 1996.

Note: * People older than 10 years

Table A3.4: Dependent variable: Total members of households younger than 14 years

	Year											
	1976			1981			1985			1996		
	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value
Intercept	0,231	0,061	0,000	0,659	0,043	0,000	0,832	0,037	0,000	1,580	0,033	0,000
Schooling of the head	-0,085	0,005	0,000	-0,098	0,004	0,000	-0,086	0,003	0,000	-0,041	0,003	0,000
Schooling of the head 2	0,001	0,000	0,000	0,003	0,000	0,000	0,003	0,000	0,000	0,001	0,000	0,000
Age of the head	0,106	0,003	0,000	0,079	0,002	0,000	0,065	0,002	0,000	0,009	0,001	0,000
Age of the head 2	-0,001	0,000	0,000	-0,001	0,000	0,000	-0,001	0,000	0,000	0,000	0,000	0,000
North region	0,715	0,040	0,000	0,691	0,027	0,000	0,595	0,022	0,000	0,368	0,017	0,000
Northeast region	0,501	0,017	0,000	0,483	0,012	0,000	0,392	0,011	0,000	0,230	0,010	0,000
West-center region	0,374	0,032	0,000	0,308	0,020	0,000	0,232	0,017	0,000	0,047	0,015	0,002
South region	0,064	0,019	0,001	0,015	0,014	0,270	-0,026	0,012	0,032	-0,004	0,011	0,677
R2	0,173			0,173			0,000			0,167		

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of the 1976 and 1996.

Table A3.5: Dependent variable: Total members of households with age between 14 to 65 years

	Year											
	1976			1981			1985			1996		
	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value
Intercept	-3,024	0,055	0,000	-2,854	0,041	0,000	-2,630	0,036	0,000	-1,958	0,037	0,000
Schooling of the head	0,024	0,004	0,000	0,027	0,003	0,000	0,013	0,003	0,000	0,005	0,003	0,111
Schooling of the head 2	-0,003	0,000	0,000	-0,003	0,000	0,000	-0,002	0,000	0,000	-0,002	0,000	0,000
Age of the head	0,258	0,002	0,000	0,247	0,002	0,000	0,236	0,002	0,000	0,205	0,001	0,000
Age of the head 2	-0,003	0,000	0,000	-0,003	0,000	0,000	-0,002	0,000	0,000	-0,002	0,000	0,000
North region	0,202	0,036	0,000	0,223	0,026	0,000	0,221	0,021	0,000	0,196	0,019	0,000
Northeast region	0,032	0,015	0,041	0,094	0,012	0,000	0,127	0,011	0,000	0,117	0,011	0,000
West-center region	0,091	0,028	0,001	0,083	0,019	0,000	0,107	0,016	0,000	0,033	0,017	0,051
South region	-0,027	0,017	0,109	-0,020	0,013	0,122	-0,059	0,012	0,000	-0,106	0,012	0,000
R2	0,185			0,199			0,000			0,217		

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of the 1976 and 1996.

Table A3.6: Dependent variable: Total members of households older than 65 years

	Year											
	1976			1981			1985			1996		
	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value	Coefficient	Standard	P-value
Intercept	1,034	0,013	0,000	0,942	0,010	0,000	0,958	0,009	0,000	0,848	0,010	0,000
Schooling of the head	0,006	0,001	0,000	0,005	0,001	0,000	0,004	0,001	0,000	0,005	0,001	0,000
Schooling of the head 2	0,000	0,000	0,001	0,000	0,000	0,001	0,000	0,000	0,335	0,000	0,000	0,033
Age of the head	-0,060	0,001	0,000	-0,056	0,000	0,000	-0,057	0,000	0,000	-0,053	0,000	0,000
Age of the head 2	0,001	0,000	0,000	0,001	0,000	0,000	0,001	0,000	0,000	0,001	0,000	0,000
North region	0,010	0,009	0,263	0,003	0,006	0,597	0,003	0,005	0,554	0,002	0,005	0,776
Northeast region	0,008	0,004	0,025	0,006	0,003	0,050	0,003	0,003	0,199	-0,002	0,003	0,513
West-center region	-0,016	0,007	0,021	-0,006	0,004	0,190	-0,007	0,004	0,097	-0,014	0,005	0,003
South region	-0,009	0,004	0,025	-0,003	0,003	0,362	-0,004	0,003	0,155	-0,004	0,003	0,245
R2	0,510			0,532			0,556			0,578		

Source: Based on "Pesquisa Nacional por Amostra de Domicílios" (PNAD) of the 1976 and 1996.

Appendix 4: Figures

(see figures in zipped file td404.zip)