CEPAL REVIEW 90 • DECEMBER 2006

Earning inequalities in Brazil: quantile regressions and the decomposition approach

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Income distribution in Brazil is highly unequal. There are many factors that influence this distribution and the relative importance of each one has changed significantly in recent years. In this article, the recent evolution of this distribution for employed men and women in urban areas of Brazil was analysed with the use of quantile regressions. We also investigated earning differentials between white people and black people based on the methodology presented in Juhn, Murphy and Pierce (1993). The gap between the richest 10% and the poorest 25% shrank, while there was also a homogenization of the earnings between white and black people, particularly for the first quartile of the distribution. This occurred because changes in the distribution of productive attributes reduced the heterogeneity between groups and, in general, the convergence of factor returns for white and black people benefited the latter (especially black women). However, this convergence was limited by factors related to labour-market discrimination.

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I
Introduction

Income inequality in Brazil, generally considered one of the worst in the world, has been the subject of many studies in recent decades. The availability of microdata from the census and the National Household Survey enables researchers to analyse the distributive problem in Brazil more effectively and to identify factors that differentiate income among different strata of the population and different types of workers. Several studies, such as the one carried out by Langoni (1973), have contributed to the debate among economists and other professionals about the determining factors of inequality. Langoni established that educational heterogeneity was the most important aspect in explaining earnings dispersion. He found that other factors, such as those linked to labour-market characteristics and gender and racial discrimination, were also relevant.

The persistence of high income inequality over decades has generated a context in which negative conditions are transferred between generations for some of the Brazilian population. The income of the individual determines that person's access to different types of resources: the education system, on-the-job training, career advancement and access to capital markets. This access to resources influences workers' capacity to transform personal attributes into income and change the magnitude of marginal returns.

To emphasize this point, some authors include the relative position of workers in the income distribution (using the quantile regression technique) in their analysis of inequality. This type of regression analyses the changes in factor return and in inequality, and identifies reductions in the income gap between individuals in the lowest income stratum of the distribution, even if the inequality indicators remain relatively stable.

A preliminary analysis of the data from the National Household Survey, which includes the different income strata, showed that the poorest groups in the population have increased their share of total income in the last two decades, especially when only employed women are considered.

With this in mind, the main motivation of this study is to analyse a possible improvement in the income distribution in favour of low-income workers, focusing on the reduction in income gaps between racial groups within the poorest 25%. The analysis was carried out with data from the National Household Survey for 1987, 1995 and 2001.

In order to achieve the proposed objectives, the article has been divided into five sections, including the introduction and conclusion. The second section presents a review of the literature on inequality issues in Brazil that considers the relative position of workers in the income distribution. Section III introduces the applied methodologies, which includes the quantile regression technique and a decomposition along the lines of the Juhn, Murphy and Pierce (1993), which analyses temporal changes in income gaps between racial groups. The econometric model, data treatment and empirical results are included in section IV. Section V offers a summary of the main results.

II
Inequality in conditional income distribution in Brazil: a review of the literature

In recent decades, Brazil has figured among worst countries in the world in terms of income distribution. As pointed out by several studies, there are many factors that influence this distribution such as: educational heterogeneity, socioccupational characteristics and discrimination. However, the relative importance of each factor has changed significantly in recent decades, impacting differently on groups of workers that vary in

terms of distribution of productive attributes and also their income strata.

A significant proportion of studies implicitly assume that the market pays the same premium for additional years of schooling, for instance, irrespective of whether the workers are in the upper-income strata. However, in the same way that the endowment of productive characteristics differs between rich and poor, returns on these attributes may also be expected to differ according to the income strata analysed.

In this sense, recent studies have included the idea that a person's relative position in the income distribution might influence the rate of return and, consequently, the level of inequality. Maciel, Campêlo and Raposo (2001), for example, argued that the strong asymmetry observed in the income scale in favour of the rich population in Brazil might be caused by methodological limitations. In order to overcome these difficulties, they applied quantile regressions with the use of microdata from the National Household Survey to analyse the changes in the returns on education for the income of employed women between 1992 and 1999. Using five quantiles (10, 25, 50, 75 and 90) for quantile regressions, it was established that the returns on education (after controlling for job experience) have different magnitudes, depending on the quantile analysed, as the returns increased towards the top end of the distribution.

Menezes Filho, Fernandes and Picchetti (2000) analysed income inequality among employed men with data from the National Household Survey from 1977 to 1996. They argued that the Brazilian economy is characterized by a large variability in wages and income. They estimated a wage equation also based on the same five quantiles for four groups of workers according to schooling. The results showed significant differences in the coefficients not only for the quantiles, but also for the schooling groups. Besides this, they demonstrated that, in recent years, there had been a fall in the returns associated with education, except for tertiary-level schooling, and that the returns on education depend on business cycles.

The returns on education and their relation to income distribution in Brazil was also the subject of Blom, Holm-Nielsen and Verner (2001). They argued that individuals at various points of the income distribution tend to receive different premiums for the endowment of productive characteristics. In order to analyse differences in the returns on education, the study applied quantile regressions to the Monthly Employment Survey data in 1982 and 1998, using quantiles 0.10, 0.25, 0.50, 0.75 and 0.90. The results showed that workers in the upper quantiles received larger premiums for one more year of schooling than other workers.

In research that specifically studied wage differentials, Silveira Neto and Campêlo (2003) examined regional income dispersion in Brazil. In this analysis, they applied quantile regressions based on the quantiles 0.10, 0.25, 0.50, 0.75 and 0.90 with data from the 1999 National Household Survey. The regional income differentials were estimated with the use of Mincer equations. Many independent variables related to individual attributes were used, such as age, education, sex, race and family position, and also some associated with employment conditions in nine metropolitans regions in Brazil. The Metropolitan Region of São Paulo was used as reference. The analysis of the results showed that regional inequality differed according to the income strata considered. The coefficients calculated also depended on the quantile analysed. It was seen that the north and northeast regions presented the worst results for inequality and the larger variability between quantiles, these differentials being more significant among individuals in the lower quantiles.

Oliveira (2002) studied differentials in women's earnings and income inequality trends on the basis of National Household Surveys from 1987 to 1999. The earnings of black women were compared with the relative distribution of white women's earnings. If both distributions were similar, each salary decile for white women would include the same 10% of black women. However, the results for Brazil showed that black women's earnings were concentrated in the lower part of the white women's distribution and that there was a very small proportion of black women at the top of this scale. It was also established that women in the lower-income strata from both racial groups, up to quantile 25, obtained increases in their real earnings that were higher than the ones gained by women in the upper quantiles. It was seen that the real earnings of black women rose by more than the earnings of white women, especially in the lower-income strata. Based on these results, it could be hypothesized that, in the period analysed, there was a reduction in the wage gap between racial groups in the lower quantiles, a non-directional volatility in the intermediate income strata, and an increase in the gap in the upper quantiles. This hypothesis was tested with the decomposition of the wage gap between black and white women in observable and non-observable factors, with the

application of quantile regressions (quantiles 0.10, 0.25, 0.50, 0.75 and 0.90). The estimates showed that the earnings differentials increased in the upper part of the income distribution and confirmed the reduction in the earnings differentials for black and white women in the lower quantiles.

The above-mentioned studies emphasize the importance of analysing the impact of individual and socioоccupational characteristics on the marginal returns on income in different income strata, and also of seeking out factors that might be associated with an improvement in the relative situation of certain population groups.

Taking this into consideration, this paper aims to make a contribution in the area of income inequality by using National Household Survey data to analyse earning distribution trends for employed men and women in 1987, 1995 and 2001. More specifically, this study intends to investigate the evolution of earnings differentials based on the methodology presented in Juhn, Murphy and Pierce (1993) (hereinafter referred to as JMP decomposition).

III

Analysis methodology for income differentials

The objective of this section is to present the methodology that was used to analyse earning differentials in Brazil. It has been divided into two subsections: the first presents the quantile regression model, while the second shows the JMP decomposition method.

1. Quantile regression

Quantile regression was introduced in the econometric analysis carried out by Koenker and Basset (1978 and 1982). It is a method used to measure the effect of explanatory variables on a response variable at different points of a conditional distribution. This method is very effective when the data are known to present heteroscedasticity, as is the case of income distribution.

In comparison with the ordinary least square method (OLS), the estimates obtained with quantile regressions are more effective and give more robust results when the errors do not show a normal distribution behaviour. According to Deaton (1995) and Koenker (2000), the advantages of this method can be summarized as follows: (1) it captures changes in the parameters along many quantiles; (2) it can be evaluated by linear programming; (3) monotonic transformations in the dependent variable can be used and; (4) it presents more robust results in the presence of outliers.

Koenker and Basset (1978) applied the least absolute deviations (LAD) estimator to quantile regressions. As with the OLS model (in which the coefficients vector minimizes the sum of the square of the residues), in the LAD model, given a random variable y and the covariates set x in each quantile q, the sum of the square of the absolute values of the residues is minimized, and the median of the distribution is obtained as the solution of the problem:

$$\min_{\beta} 1/n \left\{ \sum_{i \in \{i: y_i \geq x_i \beta\}} q \mid y_i - x_i' \beta \mid + \sum_{i \in \{i: y_i < x_i \beta\}} (1-q) \mid y_i - x_i' \beta \mid \right\} \quad (1)$$

$$= \min_{\beta} 1/n \sum \rho_q (y_i - x_i' \beta)$$

where $\rho(q)$ is denominated check function.

The median regression is obtained by stipulating q equals ½. By doing this, given the independent variable matrix, it is possible to obtain a family of conditional quantile functions of the dependent variable. In the matrix form, these functions are:

$$Qy(q \mid X) = X\beta(q) + Q_{\varepsilon}(q) \qquad q \in [0.1] \quad (2)$$

where Q_{ε} stands for conditional errors.

According to Buchinsky (1998), the coefficients are interpreted by estimating the marginal effect of each one of the variables in a specific conditional quantile, which is given by the partial derivative of the regression in relation to one of its regressors:

$$\partial Qy(q \mid X) / \partial x_j \quad (3)$$

This derivative must be interpreted as the marginal variation in the conditional quantile *q* due to a marginal change in the *j* element of *X* or a marginal change in the value of a specific covariate.

2. Juhn, Murphy and Pierce decomposition

The temporal variations of the differences between demographic groups exposed to discrimination can be evaluated with the use of the method developed by Juhn, Murphy and Pierce (1993), which takes into account the position of the individual in the residual distribution and also the dispersion of the distribution.

Following Arabsheibani, Carneiro and Henley (2003), for each year *t*, the earning regressions for different groups (white and black people) can be written as:

$$\bar{y}_{jt} = \bar{X}_{jt}\beta_{jt} + \sigma_{jt}\theta_{jt} \qquad j = w,b \tag{4}$$

where $\bar{X}$ is a matrix with the mean values of the productive attributes; σ_{jt} represents the estimate of the standard deviation of the residuals for each group in the year t; and θ_{jt} represents the standardized residuals of the regression, being equal to $\theta_{jt} = \mu_{jt}/\sigma_{jt}$. Consequently, the gap between white and black people becomes:

$$D_t = \bar{y}_{wt} - \bar{y}_{bt} = (\bar{X}_{wt} - \bar{X}_{bt})\beta_{wt} - \overline{\Delta\theta}_t\sigma_{wt} \tag{5}$$

where $\overline{\Delta\theta_t}$ is the mean difference between the standardized residuals for white and black people. The variation in the earning differential between two years is given by:

$$\begin{aligned} D_t - D_{t-1} = {} & \left[(\bar{X}_{wt} - \bar{X}_{wt-1}) - (\bar{X}_{bt} - \bar{X}_{bt-1})\right]\beta_{wt} \\ & + (\bar{X}_{wt-1} - \bar{X}_{bt-1})(\beta_{wt} - \beta_{wt-1}) \\ & + (\overline{\Delta\theta_t} - \overline{\Delta\theta_{t-1}})\sigma_{wt} \\ & + (\overline{\Delta\theta_{t-1}})(\sigma_{wt} - \sigma_{wt-1}) \end{aligned} \tag{6}$$

The first term in the right side of the equation —$[(\bar{X}_{wt} - \bar{X}_{wt\text{-}1}) - (\bar{X}_{bt} - \bar{X}_{bt\text{-}1})]\ \beta_{wt}$— measures the effects that variation in individuals' observable characteristics has on variation in the gap between the groups at two points of time, using the return for white people as a reference. A change in the gap, due to changes in the relative market appreciation of the observable attributes (i.e. the price-effect) is captured by the expression $(\bar{X}_{wt\text{-}1} - \bar{X}_{bt\text{-}1})\ (\beta_{wt} - \beta_{wt\text{-}1})$, which has the value of white people's characteristics as a reference. The third term, $(\overline{\Delta\theta_t} - \overline{\Delta\theta_{t-1}})\sigma_{wt}$, represents the gap-effect that analyses a relative change in black people's position in the white distribution, associated with labour-market discrimination, because it reflects what would happen if the residual inequality of white people holds constant while the percentile ranking of black people changes. Black people should move within the top of the distribution, if they were less exposed to discrimination between two selected periods. The last term —$(\overline{\Delta\theta_{t-1}})(\sigma_{wt} - \sigma_{wt-1})$— represents variations in the non-observable or residual characteristics.

IV
Empirical analyses

The empirical analyses are discussed in three subsections. The first one presents the database and the results for the earning distributions by worker characteristics. The econometric model and data are described in the second subsection. This same subsection also briefly discusses the results of interquantile regressions, that is, the factor returns for individuals of the same racial group that are at different points of the income distribution. The third subsection analyses some of the features of the JMP income decomposition.

1. Database and income distributions by personal and employment characteristics

The database used was the National Household Survey, which is annually researched by the Brazilian Institute

of Statistics and Geography (IBGE), except in National Census years, as in 1991 and in 2000. In 1994, the National Household Survey was not carried out due to technical problems.

In this study, a specific population group was selected from the National Household Survey database of 1987, 1995 and 2001. The data used refers to the economically active population (EAP), i.e. those employed in the reference week of the survey, aged between 18 and 65 years, with a positive income from the main from of employment, a positive number of working hours, and living in an urban area. Using the National Consumer Price Index as the deflator index, all monetary values are expressed as their real values as of September 2001. The data were further divided in two samples, one for men and another for women. These samples were used separately in order to estimate the earning differentials between white and black individuals of each gender (table 1). The white individuals are those who described themselves as such in the National Household Survey, and the individuals who declared themselves as black or mulatto compose the group denominated as black people.

The empirical data presented in this subsection are presented in three tables. Table 2 shows the participation, employment and unemployment rates for both sexes and racial groups. It can be seen that the differences between racial groups are small, but between genders the rates are remarkably dissimilar. For instance, the increase of the unemployment rate for women in the period 1995-2001 was much larger than for men.

We can infer from the data presented above that the differences between racial groups are small and, consequently, the observed earning gaps are not caused primarily by differences in the rates, but are a result of other aspects of the labour force.

The relative distribution of workers in different income strata is presented in table 3. There are two samples that are analysed separately, one for men and another for women. The values in the table indicate the percentage of individuals in each stratum for gender and racial group in three different years. In 2001, for example, 18.01% of white men were in the first quartile of the income distribution, namely, they are among the 25% poorest men, and 21.39% of the white women were in this same category in the female distribution.

In this same year, it can be seen that the black population was over-represented in the poorest stratum, for example, 39.73% of black male workers and 43.69% of black women were in the first quartile of the income distribution. In 2001, at the other extreme of the income distribution, (the richest 10%) there were around 24% of white people (men and women) and only 5% of black people. A similar fact was also noted by Henriques (2001), who established that, in 1999, 85% of the richest 10% of the population was white.

Table 4 presents the amount of income for each income stratum analysed in table 2, with the exception of the richest 10%. First, it shows the distributions of men and women separately with data for whites and blacks grouped together. Then, it also analyses white and the black people's distributions separately.

For the poorest strata of employed men (white and black together), the data show a reasonably stable situation when only the data for the years 1987 and 2001 are analysed. Their share of total income was 6.41% at the beginning of this period and 6.44% at the end, with a small increase of 0.47%. When this same group of workers is analysed separately by racial group, white workers increased their share by 15.9% (from 5.38% to 6.18%), which was a smaller increase than the 23.0% rise (from 7.86% to 9.59%) for black workers.

However, when the analysis is extended to include data for 1995 and is conducted over two different periods, 1987-1995 and 1995-2001, the results are not so stable. In the first case, the relative income share

TABLE 1

Numbers of observations for the samples analysed

	White			Black		
	1987	1995	2001	1987	1995	2001
Men	28 268	32 229	36 155	21 779	26 913	33 987
Women	16 991	22 385	27 232	13 018	17 152	22 076

Source: National Household Survey microdata, 1987, 1995 and 2001.

TABLE 2

Brazil: Labour market statistics by racial group and gender[a]

Group	*Rates*	Men			Women		
		1987	1995	2001	1987	1995	2001
White	Participation	76.2	74.03	71.76	38.65	45.53	48.09
	Employment[b]	73.72	70.2	66.81	37.18	42.12	42.79
	Unemployment	3.26	5.18	6.9	3.79	7.49	11.01
Black	Participation	75.57	73.41	71.14	38.62	44.62	46.04
	Employment	72.56	68.76	64.57	36.72	40.31	38.79
	Unemployment	3.98	6.33	9.23	4.9	9.65	15.74

Source: National Household Survey microdata, 1987, 1995 and 2001.

[a] Men and women are analysed separately.
[b] Employment rate = employed/population between 15 and 65 years old.

TABLE 3

Brazil: Proportion of workers in different income strata separated by racial group and gender[a]
(Percentages)

		Men			Women		
		1987	1995	2001	1987	1995	2001
White	poorest 25%	21.13	16.33	18.01	19.16	21.14	21.39
	2nd quartile	22.54	23.72	23.00	21.85	26.20	18.42
	3rd quartile	24.78	28.55	28.97	28.39	20.26	29.67
	richest 25%	31.55	31.41	30.02	30.60	32.40	30.52
	(richest 10%)	(23.21)	(25.62)	(24.83)	(24.84)	(22.57)	(24.12)
Black	poorest 25%	40.17	37.78	39.73	35.55	42.48	43.69
	2nd quartile	25.00	27.75	26.51	29.39	29.16	21.98
	3rd quartile	21.46	21.81	22.19	22.18	15.20	22.42
	richest 25%	13.37	12.66	11.58	12.88	13.16	11.91
	(richest 10%)	(5.66)	(5.36)	(5.25)	(6.12)	(5.42)	(5.07)

Source: National Household Survey microdata, 1987, 1995 and 2001.

[a] Men and women are analysed separately.

of the poorest stratum fell by 21.6%, from 6.41% to 5.09%. In this period, Brazil suffered the effects of hyperinflation, a recession at the beginning of the 1990s and a stabilization plan in 1994-1995. When men from each racial group are compared separately, it can be seen that black workers lost 15.3% of their relative participation in the income distribution, while white workers lost only 1.30%.

Income redistribution can be observed from the mid-1990s onwards, in the second period analysed, when all the poorest workers increased their share of total income by 26.5%, from 5.09% to 6.44%, while the richest lost 4.21% in the same period. This same tendency was also observed when racial groups were analysed separately.

As can also be seen in table 3, among women (white and black), the poorest workers increased their share by 55.9% between the years of 1987 and 2001, while the richest lost some of their relative income absorption (-1.69%). The poorer group increased its

TABLE 4

Real income share in different quartiles of the total income distribution by racial group and gender
(Percentages)

		Men			Women		
		1987	1995	2001	1987	1995	2001
Total	poorest 25%	6.41	5.09	6.44	5.15	6.96	8.03
	2nd quartile	10.84	10.75	11.26	11.03	13.26	9.43
	3rd quartile	18.84	19.99	20.89	21.17	15.09	20.95
	richest 25%	63.91	64.17	61.41	62.65	64.69	61.59
White	poorest 25%	5.38	5.31	6.18	5.52	5.34	6.73
	2nd quartile	11.01	11.85	11.09	10.88	10.75	11.77
	3rd quartile	20.30	19.75	20.97	20.41	19.63	17.74
	richest 25%	63.31	63.09	61.76	63.19	64.28	63.76
Black	poorest 25%	7.86	6.66	9.59	5.75	15.02	6.98
	2nd quartile	12.07	11.93	10.85	13.26	4.24	15.22
	3rd quartile	21.14	22.48	21.13	20.56	20.58	21.46
	richest 25%	58.93	58.93	58.43	60.43	60.16	56.34

Source: National Household Survey microdata, 1987, 1995 and 2001.

share by 35.2% during the first period analysed (1987-1995), and also increased it by 15.4% in the second period (1995-2001). The richest workers, on the other hand, increased their share in the first period but reduced it during the second.

However, when racial groups are compared separately, the variations are not similar. For the poorest whites, both men and women, their share decreased between 1987 and 1995 and then showed an increase in the second period, which signified an overall rise from 1987 to 2001. For the richest white workers, the evolution was very different. For men, a decline in income share was observed in both periods, and, for women, an increase was recorded in the first period, with a decrease in the second (resulting in a slight increase overall).

For the poorest 25% of black women, there was an increase of over 100% in income share during the first period. This increase can probably be related to the readjustment of the Brazilian national minimum wage. This is the reference wage for paid domestic activities, which employed a great proportion of the poorest women workers in 1994. Even considering the reduction in their share between 1995 and 2001, the poorest black women obtained relative gains that were higher than for the richest women during 1987-2001.

Generally speaking, the poorest individuals (namely those in the first quartile of the income distribution) had the highest rates of increase in the share of total income, particularly those groups that are traditionally discriminated against in the labour market (such as black people and women).

Tables 3 and 4 also showed significant differences in temporal changes when the income distributions were analysed by gender and by racial group. Due to these differences, the statistical analysis shown below was carried out separately for the two gender samples.

2. The econometric model and selected variables

All the results presented in this subsection are based on quantile regressions. These regressions estimate the effects of personal productive attributes, regional dummies and labour-market factors on individual income. As was shown in the methodological subsection that discussed the quantile regressions, the returns were determined by the first partial derivatives of the hourly-income conditional distribution equation, and were analysed with the following conditional regression, which were applied to the quantiles 0.25, 0.50 and 0.90.

$$y(q) = \beta_1 + \beta_2 Head + \beta_3 Age + \beta_4 Age^2 + \beta_5 \sum Education + \beta_6 \sum Region + \beta_8 \sum Position \quad (7)$$

where *y(q)* is the logarithm of hourly income; *Head* is a dummy indicating if the person was the head of household; *Age* is the age of the individual; *Education* is a group of dummies for educational achievement; *Region* is a group of dummies for the regions in Brazil; and *Position* is a group of dummies for the person's position in the labour market.

For each group of individuals (white men, white women, black men and black women), in each year analysed (1987, 1995 and 2001), three quantile regressions were estimated on the basis of the quantiles cited above. The results obtained for the 36 models are shown in annex 1.

The 25th percentile is used as an approximation for the returns of the poorest 25% of workers, while the 90th percentile is an approximation for the richest 10%. The 50th percentile apprehends the effects on the median of the distribution in the hourly income.

The *Head* variable was included in the model to determine the income differentials between the head and other members of the household. The returns obtained for heads of household indicate whether these individuals earn more than others in the labour market. These returns are also related to each household member's ratio of participation in the labour force. Age was used as a proxy for experience. The same term was also included in the model in a squared form in order to analyse the concavity of the income-experience profile.

Schooling data was also included in the model as various dummy variables, depending on the level attained by the person and related to workers' productivity. It must be emphasized that Brazil has large returns on age and for education, but these have been falling over the past twenty years, partly due to the increase in primary school attendance.[1]

Three categories represent the regions in Brazil: south, southeast and other regions. The regional returns are analysed in order to capture some of the spatial differences in the conditional income distribution. Owing to the lower capacity of the poorest workers to transform personal attributes into income generation, regional economic characteristics might be expected to affect this capacity. In regions that are economically more developed, such as the south and southeast regions in Brazil, the factor returns may be substantially larger than in the north, northeast and central-western regions, which were used as reference in the analysis.

Finally, the labour-market positions of occupied workers were aggregated into the following three categories:[2]

Position 1: Workers with employment contracts (*com carteira*), including domestic employees;

Position 2: Workers without employment contracts (*sem carteira*), including domestic employees, public workers, military personnel and employers; and

Position 3: Self-employed workers.

The reference for these dummies was position 1. For instance, a positive sign for the position 2 dummy indicates that workers that do not have an employment contract have a larger income than the reference group.

Following the recommendations of Buchinsky (1998), the variance and covariance matrices were estimated using a Design Matrix Bootstrap Estimator with 20 replications using the Stata 7 statistical package. All the models were significant in the F test at 5% (see annex 2).

3. The decomposition of inequality trends

This section discusses JMP decomposition (Juhn, Murphy and Pierce, 1993). This technique, as already mentioned, was applied in order to isolate the effects of changes in personal attribute endowment and of variations in the returns on these attributes from the effect of discrimination in the period analysed on the earning gaps between white and black people.

The decomposition of the temporal change in the income gap of employed men is presented in table 5. The total earnings differential between white and black men was decomposed into four categories: quantity, price, gap and non-observable characteristics, for two periods 1987-1995 and 1995-2001.

The negative signs in the total column for the 25th quantile in all periods analysed show that there was

[1] See, for example, Menezes Filho, Fernandes and Piccheti (2000).

[2] Due to the fact that the National Household Survey in the 1980s did not analyse public workers and military personnel separately from workers without a formal employment contract from the government, the best option was to aggregate all these workers (although the category is surely a heterogeneous one).

TABLE 5

JMP decomposition of the earning gaps for different racial groups – Men[a]

Quantile	Period	Total	Quantity	Price	Gap	Non Obs.
25	1995-1987	-0.52217	-0.43641	0.01805	-0.10314	-0.00067
	2001-1995	-0.07962	-0.10842	-0.01502	0.05027	-0.00645
	2001-1987	-0.60179	-0.54483	0.00303	-0.05287	-0.00712
50	1995-1987	-0.37679	-0.34319	0.02983	-0.05532	-0.00811
	2001-1995	0.35097	0.33710	-0.01355	0.02357	0.00385
	2001-1987	-0.02582	-0.00609	0.01628	-0.03175	-0.00425
90	1995-1987	-1.07997	-1.05180	0.06331	-0.09134	-0.00013
	2001-1995	0.12137	0.15762	-0.00185	-0.02703	-0.00737
	2001-1987	-0.95860	-0.89418	0.06146	-0.11837	-0.00750

Source: National Household Survey microdata, 1987, 1995 and 2001.

[a] Juhn, Murphy and Pierce decomposition (1993).

a decrease in the earning gap between racial groups for men in this quantile. There was also a decrease in productive attribute distribution, as shown by the negative signs of the quantity column. Besides this, the coefficients in the next column established that variations in the returns on price effects promoted larger income gaps between racial groups between 1987 and 1995, and smaller ones in the second period analysed. This means that these contributions had different impacts in the first period analysed; while they showed a tendency to promote smaller earning gaps between racial groups in the second period. However, labour-market discrimination, reflected in the gap-effect, which showed a positive sign between 1995 and 2001, prevented the contributions originating in these two effects from being even greater during that period. Among men, the gap-effect is negative during all the period analysed only for the 90th quantile of the distribution, although this does not promote similar performance for the total earning gaps, which showed a negative sign only between 1987 and 1995.

The results for women are presented in table 6. It can be seen that the differences in the evolution of the total earning gaps are more outstanding, especially when the results for the 25th and 90th quantiles are compared. For the poorest group, there is a tendency towards reduction in the total earning gaps in all the periods analysed, while the opposite is true for women in the last quantile between the years of 1995-2001, with an increase in the income differentials between white and black women. The data also show that the earning gaps for the first quantile analysed were not only reduced by the quantity effect (which reflects reduced heterogeneity of personal attributes endowment and regional and labour-market characteristics) but also by the price effect, which shows a relative devaluation of the returns of white women when compared to black women in the period analysed. Besides this, the gap-effect also enhanced this homogenization tendency for the first period analysed. As was noticed for men, the employed women in the economically active population in the 25th and 50th quantiles suffered from an increase in discrimination in the final period analysed.

Generally, the results show that the earning gaps between racial groups narrowed for the poorest people, both in terms of men and women. A less unequal distribution of attributes in the period, especially due to education and regional localization, decreased the income differentials between white and black people, allowing for a reduction of the earning gaps related to these endowments. Besides this, a reduction in the factor returns (shown by the quantile regressions, see annex 1), had a greater impact on the white than the black population. This is reflected in the negative signs obtained for the price-effect, especially between 1995 and 2001. However, it was established that the gap-effect has limited these distributive gains in the latter period. As is shown by the non-observable price-effect in the final columns of tables 5 and 6, when the residual earning inequality of whites holds constant, the percentile position of blacks shows greater inequality. This suggests that discrimination exists or that some changes in the attribute endowment were not considered in the analysis.

TABLE 6

JMP decomposition of the earning gaps for different racial groups – Women[a]

Quantile	Period	Total	Quantity	Price	Gap	Non Obs.
25	1995-1987	-0.27716	-0.24239	-0.01685	-0.02970	0.01178
	2001-1995	-0.18002	-0.18261	-0.02146	0.03662	-0.01258
	2001-1987	-0.45718	-0.42500	-0.03831	0.00692	-0.00080
50	1995-1987	-0.32956	-0.31784	0.00757	-0.01386	-0.00543
	2001-1995	0.48240	0.49034	-0.02658	0.01703	0.00161
	2001-1987	0.15284	0.17251	-0.01901	0.00317	-0.00382
90	1995-1987	-0.48321	-0.41128	0.04278	-0.11797	0.00327
	2001-1995	0.88971	0.86194	-0.00044	0.03194	-0.00373
	2001-1987	0.40650	0.45065	0.04234	-0.08604	-0.00046

Source: National Household Survey microdata, 1987, 1995 and 2001.

[a] Juhn, Murphy and Pierce decomposition (1993).

V

Summary of results: reduction of differentials for the poorest 25%

Among other topics, this paper analyses the evolution of the income distribution of the poorest 25% of employed workers in metropolitan areas in Brazil, stressing that the persistence of high income inequality generates a context in which negative conditions are transferred through generations for part of the population. First, it was observed that the relative income share of this group increased over the period analysed. Second, further analyses attempted to determine the extent to which personal attributes, regional inequalities and/or labour-market characteristics impacted on this result. This paper applied quantile regressions in order to capture the effects of the relative position of the individual in a conditional income distribution. Then, the earning gaps between white and black people were analysed using a JMP decomposition. The diverse impact of the heterogeneity of productive attribute endowments, labour-market characteristics and other non-observable factors (including discrimination) were analysed for the periods 1987-1995 and 1995-2001.

When the different quantiles were separately compared, the poorest individuals presented a larger reduction in earnings differentials, with a homogenization of income between white and black people. However, the existence of factors related to labour-market discrimination limited the income convergence in the second period analysed. In spite of this, the reasons that impacted on the reduction of the gap for different racial groups among the poorest workers in the period 1987-2001 (or 1995-2001 for men) can be summarized as follows:

- Changes in the distribution of productive attributes reduced the heterogeneity between white and black people;
- In general, the convergence of the factor returns of white and black people benefited the latter group.

In conclusion then, an improvement in the situation of the poorest workers in the analysed period was observed not only due to the relative increase in share of earnings, but also in terms of a reduction in the differentials by racial group. The results for women were even more positive in terms of these two phenomena.

ANNEX 1

Quantile regressions

	White women (1987)						Black women (1987)					
	Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]		Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]	
	q25 R^2: 0.23						q25 R^2: 0.22					
Head	0.011	0.02	0.62	0.53	-0.02	0.04	Head	0.024	0.02	1.54	0.12	-0.01	0.05
Age	0.081	0.00	20.13	0.00	0.07	0.09	Age	0.074	0.00	14.83	0.00	0.06	0.08
Age2	-0.001	0.00	-15.80	0.00	0.00	0.00	Age2	-0.001	0.00	-12.47	0.00	0.00	0.00
Educ2	0.231	0.04	5.26	0.00	0.14	0.32	Educ2	0.243	0.04	6.89	0.00	0.17	0.31
Educ3	0.492	0.03	14.06	0.00	0.42	0.56	Educ3	0.430	0.03	12.82	0.00	0.36	0.50
Educ4	0.825	0.03	23.99	0.00	0.76	0.89	Educ4	0.713	0.05	14.74	0.00	0.62	0.81
Educ5	1.375	0.04	31.77	0.00	1.29	1.46	Educ5	1.215	0.04	32.06	0.00	1.14	1.29
Educ6	2.119	0.04	49.26	0.00	2.03	2.20	Educ6	2.182	0.07	29.45	0.00	2.04	2.33
Position2	-0.258	0.02	-13.93	0.00	-0.29	-0.22	Position2	-0.448	0.02	-20.94	0.00	-0.49	-0.41
Position3	-0.127	0.02	-5.82	0.00	-0.17	-0.08	Position3	-0.276	0.02	-13.50	0.00	-0.32	-0.24
South	0.200	0.02	9.12	0.00	0.16	0.24	South	0.189	0.03	6.68	0.00	0.13	0.24
South East	0.219	0.02	13.09	0.00	0.19	0.25	South East	0.129	0.01	10.59	0.00	0.10	0.15
Constant	-2.364	0.07	-33.69	0.00	-2.50	-2.23	Constant	-2.185	0.10	-21.56	0.00	-2.38	-1.99
	q50 R^2: 0.2974						q50 R^2: 0.23					
Head	0.010	0.02	0.48	0.63	-0.03	0.05	Head	0.003	0.01	0.32	0.75	-0.02	0.02
Age	0.078	0.00	18.04	0.00	0.07	0.09	Age	0.068	0.00	21.01	0.00	0.06	0.07
Age2	-0.001	0.00	-13.84	0.00	0.00	0.00	Age2	-0.001	0.00	-17.82	0.00	0.00	0.00
Educ2	0.215	0.03	6.54	0.00	0.15	0.28	Educ2	0.205	0.02	10.96	0.00	0.17	0.24
Educ3	0.476	0.03	14.82	0.00	0.41	0.54	Educ3	0.409	0.02	22.71	0.00	0.37	0.44
Educ4	0.881	0.04	24.41	0.00	0.81	0.95	Educ4	0.747	0.03	26.72	0.00	0.69	0.80
Educ5	1.493	0.03	48.16	0.00	1.43	1.55	Educ5	1.372	0.03	48.92	0.00	1.32	1.43
Educ6	2.208	0.03	65.36	0.00	2.14	2.27	Educ6	2.308	0.05	49.80	0.00	2.22	2.40
Position2	-0.179	0.02	-10.34	0.00	-0.21	-0.14	Position2	-0.301	0.02	-18.77	0.00	-0.33	-0.27
Position3	0.051	0.02	2.39	0.02	0.01	0.09	Position3	0.029	0.03	1.05	0.29	-0.03	0.08
South	0.129	0.02	6.20	0.00	0.09	0.17	Age	0.125	0.03	4.95	0.00	0.08	0.17
South East	0.176	0.02	10.14	0.00	0.14	0.21	South East	0.101	0.01	7.65	0.00	0.08	0.13
Constant	-1.952	0.07	-26.19	0.00	-2.10	-1.81	Constant	-1.766	0.07	-26.69	0.00	-1.90	-1.64
	q90 R^2: 0.2893						q90 R^2: 0.28					
Head	0.014	0.03	0.49	0.62	-0.04	0.07	Head	0.002	0.02	0.08	0.94	-0.05	0.05
Age	0.076	0.01	12.35	0.00	0.06	0.09	Age	0.067	0.01	9.77	0.00	0.05	0.08
Age2	-0.001	0.00	-7.84	0.00	0.00	0.00	Age2	-0.001	0.00	-6.99	0.00	0.00	0.00
Educ2	0.216	0.05	4.02	0.00	0.11	0.32	Educ2	0.250	0.03	7.53	0.00	0.19	0.32
Educ3	0.544	0.05	11.20	0.00	0.45	0.64	Educ3	0.485	0.05	10.11	0.00	0.39	0.58
Educ4	1.067	0.05	22.51	0.00	0.97	1.16	Educ4	0.928	0.05	19.85	0.00	0.84	1.02
Educ5	1.623	0.05	32.45	0.00	1.53	1.72	Educ5	1.568	0.05	28.95	0.00	1.46	1.67
Educ6	2.240	0.05	47.30	0.00	2.15	2.33	Educ6	2.380	0.07	32.61	0.00	2.24	2.52
Position2	-0.030	0.03	-0.88	0.38	-0.10	0.04	Position2	-0.157	0.03	-6.06	0.00	-0.21	-0.11
Position3	0.294	0.03	9.49	0.00	0.23	0.35	Position3	0.348	0.04	8.96	0.00	0.27	0.42
South	-0.012	0.03	-0.44	0.66	-0.07	0.04	South	-0.083	0.04	-1.86	0.06	-0.17	0.00
South East	0.071	0.03	2.54	0.01	0.02	0.13	South East	0.010	0.02	0.43	0.67	-0.04	0.06
Constant	-1.275	0.09	-13.95	0.00	-1.45	-1.10	Constant	-1.077	0.11	-9.60	0.00	-1.30	-0.86

[a] SD = Standard deviation.
[b] Confidence interval.

Continuation annex1

	White women (1995)						Black women (1995)					
	Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]		Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]	
	q25 R^2: 0.23						q25 R^2: 0.17					
Head	0.031	0.01	2.55	0.01	0.01	0.05	0.036	0.02	2.17	0.03	0.00	0.07
Age	0.049	0.00	17.34	0.00	0.04	0.05	0.050	0.00	13.19	0.00	0.04	0.06
Age2	0.000	0.00	-13.12	0.00	0.00	0.00	-0.001	0.00	-9.84	0.00	0.00	0.00
Educ2	0.159	0.03	4.60	0.00	0.09	0.23	0.121	0.03	3.99	0.00	0.06	0.18
Educ3	0.340	0.03	11.33	0.00	0.28	0.40	0.303	0.02	14.22	0.00	0.26	0.34
Educ4	0.589	0.03	17.12	0.00	0.52	0.66	0.528	0.03	18.59	0.00	0.47	0.58
Educ5	1.066	0.03	34.93	0.00	1.01	1.13	0.908	0.03	33.68	0.00	0.86	0.96
Educ6	1.883	0.03	54.05	0.00	1.81	1.95	1.862	0.05	38.71	0.00	1.77	1.96
Position2	-0.113	0.01	-13.56	0.00	-0.13	-0.10	-0.139	0.01	-15.77	0.00	-0.16	-0.12
Position3	-0.025	0.01	-1.80	0.07	-0.05	0.00	-0.013	0.02	-0.73	0.47	-0.05	0.02
South	0.261	0.01	19.68	0.00	0.24	0.29	0.306	0.02	13.15	0.00	0.26	0.35
South East	0.244	0.02	15.57	0.00	0.21	0.27	0.215	0.01	15.47	0.00	0.19	0.24
Constant	-1.572	0.05	-31.49	0.00	-1.67	-1.47	-1.640	0.07	-23.39	0.00	-1.78	-1.50
	q50 R^2: 0.26						q50 R^2: 0.20					
Head	0.031	0.01	2.27	0.02	0.00	0.06	0.032	0.02	1.88	0.06	0.00	0.07
Age	0.062	0.00	17.80	0.00	0.05	0.07	0.058	0.00	12.71	0.00	0.05	0.07
Age2	-0.001	0.00	-13.62	0.00	0.00	0.00	-0.001	0.00	-9.65	0.00	0.00	0.00
Educ2	0.173	0.03	6.10	0.00	0.12	0.23	0.164	0.03	6.36	0.00	0.11	0.21
Educ3	0.389	0.02	16.50	0.00	0.34	0.44	0.363	0.02	14.93	0.00	0.32	0.41
Educ4	0.666	0.03	24.78	0.00	0.61	0.72	0.656	0.04	17.83	0.00	0.58	0.73
Educ5	1.243	0.02	60.96	0.00	1.20	1.28	1.127	0.03	44.37	0.00	1.08	1.18
Educ6	2.009	0.02	85.97	0.00	1.96	2.05	2.036	0.03	60.90	0.00	1.97	2.10
Position2	-0.046	0.01	-6.11	0.00	-0.06	-0.03	-0.064	0.01	-5.28	0.00	-0.09	-0.04
Position3	0.163	0.01	12.25	0.00	0.14	0.19	0.167	0.02	10.87	0.00	0.14	0.20
South	0.248	0.01	19.02	0.00	0.22	0.27	0.331	0.03	11.44	0.00	0.27	0.39
South East	0.249	0.01	17.35	0.00	0.22	0.28	0.239	0.02	13.69	0.00	0.20	0.27
Constant	-1.537	0.07	-22.78	0.00	-1.67	-1.40	-1.584	0.08	-19.34	0.00	-1.74	-1.42
	q90 R^2: 0.27						q90 R^2: 0.24					
Head	0.073	0.02	3.39	0.00	0.03	0.12	0.001	0.02	0.03	0.98	-0.04	0.04
Age	0.077	0.01	13.57	0.00	0.07	0.09	0.073	0.00	14.61	0.00	0.06	0.08
Age2	-0.001	0.00	-10.67	0.00	0.00	0.00	-0.001	0.00	-11.44	0.00	0.00	0.00
Educ2	0.151	0.04	3.60	0.00	0.07	0.23	0.169	0.05	3.35	0.00	0.07	0.27
Educ3	0.455	0.04	12.23	0.00	0.38	0.53	0.408	0.04	9.48	0.00	0.32	0.49
Educ4	0.802	0.05	16.08	0.00	0.70	0.90	0.816	0.05	16.21	0.00	0.72	0.91
Educ5	1.462	0.04	37.18	0.00	1.38	1.54	1.358	0.04	30.60	0.00	1.27	1.44
Educ6	2.155	0.05	47.57	0.00	2.07	2.24	2.262	0.05	42.84	0.00	2.16	2.37
Position2	0.170	0.02	7.91	0.00	0.13	0.21	0.128	0.02	6.61	0.00	0.09	0.17
Position3	0.436	0.03	13.13	0.00	0.37	0.50	0.545	0.03	19.07	0.00	0.49	0.60
South	0.121	0.03	3.97	0.00	0.06	0.18	0.307	0.04	8.27	0.00	0.23	0.38
South East	0.163	0.03	6.45	0.00	0.11	0.21	0.294	0.02	12.75	0.00	0.25	0.34
Constant	-1.103	0.12	-9.51	0.00	-1.33	-0.88	-1.278	0.10	-12.28	0.00	-1.48	-1.07

[a] SD = Standard deviation.
[b] Confidence interval.

Continuation annex1

	White women (2001)						Black women (2001)					
	Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]		Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]	
	q25 R^2: 0.22						q25 R^2: 0.17					
Head	-0.003	0.01	-0.20	0.84	-0.03	0.03	0.006	0.01	0.52	0.60	-0.02	0.03
Age	0.054	0.00	16.07	0.00	0.05	0.06	0.054	0.00	21.07	0.00	0.05	0.06
Age2	-0.001	0.00	-12.69	0.00	0.00	0.00	-0.001	0.00	-14.19	0.00	0.00	0.00
Educ2	0.150	0.03	5.78	0.00	0.10	0.20	0.171	0.02	8.25	0.00	0.13	0.21
Educ3	0.304	0.02	13.01	0.00	0.26	0.35	0.310	0.02	15.26	0.00	0.27	0.35
Educ4	0.538	0.03	20.92	0.00	0.49	0.59	0.505	0.02	20.88	0.00	0.46	0.55
Educ5	0.874	0.02	35.93	0.00	0.83	0.92	0.804	0.03	31.93	0.00	0.75	0.85
Educ6	1.794	0.02	80.50	0.00	1.75	1.84	1.789	0.03	61.10	0.00	1.73	1.85
Position2	-0.109	0.01	-12.61	0.00	-0.13	-0.09	-0.177	0.01	-21.80	0.00	-0.19	-0.16
Position3	-0.224	0.02	-9.58	0.00	-0.27	-0.18	-0.419	0.02	-25.09	0.00	-0.45	-0.39
South	0.223	0.01	18.78	0.00	0.20	0.25	0.228	0.02	9.27	0.00	0.18	0.28
South East	0.226	0.01	23.65	0.00	0.21	0.25	0.188	0.01	22.96	0.00	0.17	0.20
Constant	-1.590	0.07	-23.06	0.00	-1.73	-1.46	-1.658	0.05	-32.08	0.00	-1.76	-1.56
	q50 R^2: 0.26						q50 R^2: 0.18					
Head	0.013	0.01	1.93	0.05	0.00	0.03	0.016	0.01	1.73	0.08	0.00	0.03
Age	0.059	0.00	22.69	0.00	0.05	0.06	0.049	0.00	16.30	0.00	0.04	0.05
Age2	-0.001	0.00	-16.64	0.00	0.00	0.00	0.000	0.00	-11.68	0.00	0.00	0.00
Educ2	0.133	0.02	5.91	0.00	0.09	0.18	0.131	0.02	5.65	0.00	0.09	0.18
Educ3	0.314	0.02	14.78	0.00	0.27	0.36	0.278	0.02	13.12	0.00	0.24	0.32
Educ4	0.570	0.02	23.17	0.00	0.52	0.62	0.499	0.02	22.83	0.00	0.46	0.54
Educ5	1.019	0.02	46.07	0.00	0.98	1.06	0.876	0.02	41.72	0.00	0.83	0.92
Educ6	1.913	0.02	79.60	0.00	1.87	1.96	1.878	0.03	69.17	0.00	1.83	1.93
Position2	-0.004	0.01	-0.62	0.53	-0.02	0.01	-0.059	0.01	-7.85	0.00	-0.07	-0.04
Position3	-0.011	0.02	-0.63	0.53	-0.04	0.02	-0.104	0.01	-7.21	0.00	-0.13	-0.08
South	0.179	0.01	17.31	0.00	0.16	0.20	0.205	0.02	9.99	0.00	0.17	0.25
South East	0.206	0.01	16.47	0.00	0.18	0.23	0.190	0.01	24.05	0.00	0.17	0.20
Constant	-1.463	0.05	-28.58	0.00	-1.56	-1.36	-1.307	0.06	-22.45	0.00	-1.42	-1.19
	q90 R^2: 0.29						q90 R^2: 0.23					
Head	0.048	0.02	2.51	0.01	0.01	0.08	0.036	0.02	2.04	0.04	0.00	0.07
Age	0.064	0.00	15.63	0.00	0.06	0.07	0.061	0.01	9.94	0.00	0.05	0.07
Age2	-0.001	0.00	-9.36	0.00	0.00	0.00	-0.001	0.00	-7.39	0.00	0.00	0.00
Educ2	0.217	0.06	3.92	0.00	0.11	0.33	0.122	0.03	3.87	0.00	0.06	0.18
Educ3	0.329	0.04	7.85	0.00	0.25	0.41	0.252	0.02	10.67	0.00	0.21	0.30
Educ4	0.692	0.05	13.85	0.00	0.59	0.79	0.536	0.03	20.84	0.00	0.49	0.59
Educ5	1.284	0.04	31.74	0.00	1.20	1.36	1.053	0.02	44.31	0.00	1.01	1.10
Educ6	2.185	0.04	49.33	0.00	2.10	2.27	2.134	0.03	62.51	0.00	2.07	2.20
Position2	0.187	0.02	10.51	0.00	0.15	0.22	0.179	0.02	9.00	0.00	0.14	0.22
Position3	0.343	0.02	15.72	0.00	0.30	0.39	0.403	0.03	12.65	0.00	0.34	0.47
South	0.042	0.02	1.95	0.05	0.00	0.09	0.194	0.03	6.11	0.00	0.13	0.26
South East	0.122	0.02	6.12	0.00	0.08	0.16	0.192	0.01	15.60	0.00	0.17	0.22
Constant	-0.997	0.08	-12.80	0.00	-1.15	-0.84	-0.988	0.11	-9.14	0.00	-1.20	-0.78

[a] SD = Standard deviation.
[b] Confidence interval.

Continuation annex1

	White men (1987)						Black men (1987)					
	Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]		Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]	
	q25 R^2: 0.24						q25 R^2: 0.16					
Head	0.351	0.01	27.86	0.00	0.33	0.38	0.242	0.02	15.74	0.00	0.21	0.27
Age	0.071	0.00	21.58	0.00	0.06	0.08	0.059	0.00	25.11	0.00	0.05	0.06
Age2	-0.001	0.00	-19.91	0.00	0.00	0.00	-0.001	0.00	-22.31	0.00	0.00	0.00
Educ2	0.318	0.03	10.84	0.00	0.26	0.37	0.256	0.02	12.38	0.00	0.22	0.30
Educ3	0.574	0.02	25.45	0.00	0.53	0.62	0.461	0.02	19.75	0.00	0.42	0.51
Educ4	0.887	0.03	27.77	0.00	0.82	0.95	0.670	0.02	28.77	0.00	0.62	0.72
Educ5	1.377	0.03	50.60	0.00	1.32	1.43	1.140	0.02	54.27	0.00	1.10	1.18
Educ6	2.138	0.03	69.61	0.00	2.08	2.20	2.072	0.05	41.51	0.00	1.97	2.17
Position2	-0.135	0.01	-11.35	0.00	-0.16	-0.11	-0.208	0.01	-15.36	0.00	-0.23	-0.18
Position3	-0.026	0.02	-1.20	0.23	-0.07	0.02	0.030	0.02	1.58	0.11	-0.01	0.07
South	0.142	0.01	11.50	0.00	0.12	0.17	0.035	0.03	1.32	0.19	-0.02	0.09
South East	0.193	0.01	13.66	0.00	0.17	0.22	0.074	0.02	4.79	0.00	0.04	0.10
Constant	-2.006	0.05	-36.54	0.00	-2.11	-1.90	-1.630	0.05	-32.67	0.00	-1.73	-1.53
	q50 R^2: 0.28						q50 R^2: 0.20					
Head	0.327	0.01	26.68	0.00	0.30	0.35	0.264	0.02	15.07	0.00	0.23	0.30
Age	0.083	0.00	29.90	0.00	0.08	0.09	0.073	0.00	21.39	0.00	0.07	0.08
Age2	-0.001	0.00	-26.53	0.00	0.00	0.00	-0.001	0.00	-20.75	0.00	0.00	0.00
Educ2	0.323	0.02	17.40	0.00	0.29	0.36	0.298	0.02	14.76	0.00	0.26	0.34
Educ3	0.636	0.02	37.82	0.00	0.60	0.67	0.533	0.03	19.73	0.00	0.48	0.59
Educ4	0.994	0.03	37.81	0.00	0.94	1.05	0.817	0.03	28.87	0.00	0.76	0.87
Educ5	1.522	0.02	67.75	0.00	1.48	1.57	1.349	0.03	46.81	0.00	1.29	1.41
Educ6	2.239	0.02	99.91	0.00	2.19	2.28	2.246	0.04	51.26	0.00	2.16	2.33
Position2	-0.036	0.01	-2.52	0.01	-0.06	-0.01	-0.145	0.01	-11.87	0.00	-0.17	-0.12
Position3	0.064	0.01	4.38	0.00	0.04	0.09	0.122	0.02	7.84	0.00	0.09	0.15
South	0.086	0.01	6.16	0.00	0.06	0.11	0.026	0.03	0.88	0.38	-0.03	0.08
South East	0.164	0.01	14.62	0.00	0.14	0.19	0.074	0.02	4.90	0.00	0.04	0.10
Constant	-1.906	0.05	-42.00	0.00	-1.99	-1.82	-1.618	0.06	-26.19	0.00	-1.74	-1.50
	q90 R^2: 0.31						q90 R^2: 0.24					
Head	0.309	0.03	12.18	0.00	0.26	0.36	0.291	0.02	12.33	0.00	0.24	0.34
Age	0.085	0.01	16.23	0.00	0.07	0.10	0.080	0.01	14.91	0.00	0.07	0.09
Ead2	-0.001	0.00	-11.83	0.00	0.00	0.00	-0.001	0.00	-11.58	0.00	0.00	0.00
Educ2	0.374	0.04	8.94	0.00	0.29	0.46	0.282	0.02	12.66	0.00	0.24	0.33
Educ3	0.708	0.04	16.02	0.00	0.62	0.79	0.565	0.03	18.58	0.00	0.51	0.63
Educ4	1.134	0.04	25.23	0.00	1.05	1.22	0.912	0.03	26.87	0.00	0.85	0.98
Educ5	1.675	0.03	50.09	0.00	1.61	1.74	1.548	0.04	44.17	0.00	1.48	1.62
Educ6	2.279	0.03	67.02	0.00	2.21	2.35	2.220	0.04	53.48	0.00	2.14	2.30
Position2	0.229	0.03	8.55	0.00	0.18	0.28	0.075	0.01	5.45	0.00	0.05	0.10
Position3	0.225	0.02	10.68	0.00	0.18	0.27	0.245	0.02	11.63	0.00	0.20	0.29
South	-0.059	0.02	-2.89	0.00	-0.10	-0.02	-0.073	0.04	-1.78	0.08	-0.15	0.01
South East	0.030	0.02	1.40	0.16	-0.01	0.07	-0.001	0.02	-0.09	0.93	-0.03	0.03
Constant	-1.263	0.08	-15.70	0.00	-1.42	-1.11	-1.070	0.09	-12.32	0.00	-1.24	-0.90

[a] SD = Standard deviation.
[b] Confidence interval.

Continuation annex1

	White men (1995)						Black men (1995)					
	Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]		Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]	
	q25 R^2: 0.23						q25 R^2: 0.17					
Head	0.289	0.02	17.08	0.00	0.26	0.32	0.204	0.01	15.14	0.00	0.18	0.23
Age	0.058	0.00	17.39	0.00	0.05	0.06	0.056	0.00	19.77	0.00	0.05	0.06
Age2	-0.001	0.00	-15.55	0.00	0.00	0.00	-0.001	0.00	-18.55	0.00	0.00	0.00
Educ2	0.294	0.03	11.29	0.00	0.24	0.35	0.247	0.02	13.02	0.00	0.21	0.28
Educ3	0.554	0.02	26.64	0.00	0.51	0.59	0.443	0.02	23.39	0.00	0.41	0.48
Educ4	0.823	0.02	38.04	0.00	0.78	0.87	0.652	0.02	31.63	0.00	0.61	0.69
Educ5	1.249	0.02	51.33	0.00	1.20	1.30	1.049	0.02	45.58	0.00	1.00	1.09
Educ6	2.139	0.03	83.19	0.00	2.09	2.19	2.036	0.07	30.24	0.00	1.90	2.17
Position2	-0.096	0.01	-7.57	0.00	-0.12	-0.07	-0.136	0.01	-16.27	0.00	-0.15	-0.12
Position3	-0.092	0.01	-6.76	0.00	-0.12	-0.07	-0.071	0.01	-7.90	0.00	-0.09	-0.05
South	0.229	0.02	13.69	0.00	0.20	0.26	0.233	0.02	11.11	0.00	0.19	0.27
South East	0.269	0.01	21.10	0.00	0.24	0.29	0.218	0.01	27.10	0.00	0.20	0.23
Constant	-1.715	0.06	-28.32	0.00	-1.83	-1.60	-1.574	0.05	-29.14	0.00	-1.68	-1.47
	q50 R^2: 0.26						q50 R^2: 0.20					
Head	0.265	0.02	15.75	0.00	0.23	0.30	0.229	0.01	20.95	0.00	0.21	0.25
Age	0.065	0.00	19.90	0.00	0.06	0.07	0.066	0.00	38.19	0.00	0.06	0.07
Age2	-0.001	0.00	-16.98	0.00	0.00	0.00	-0.001	0.00	-35.79	0.00	0.00	0.00
Educ2	0.301	0.02	12.83	0.00	0.26	0.35	0.255	0.02	14.79	0.00	0.22	0.29
Educ3	0.586	0.02	27.56	0.00	0.54	0.63	0.477	0.02	27.08	0.00	0.44	0.51
Educ4	0.904	0.02	39.91	0.00	0.86	0.95	0.745	0.02	45.54	0.00	0.71	0.78
Educ5	1.388	0.02	73.05	0.00	1.35	1.42	1.221	0.02	63.82	0.00	1.18	1.26
Educ6	2.249	0.02	97.39	0.00	2.20	2.29	2.198	0.04	54.75	0.00	2.12	2.28
Position2	0.011	0.01	1.01	0.31	-0.01	0.03	-0.072	0.01	-11.53	0.00	-0.08	-0.06
Position3	0.011	0.01	0.77	0.44	-0.02	0.04	0.065	0.01	6.37	0.00	0.04	0.08
South	0.182	0.01	12.95	0.00	0.15	0.21	0.207	0.02	11.48	0.00	0.17	0.24
South East	0.243	0.01	17.83	0.00	0.22	0.27	0.242	0.01	27.08	0.00	0.22	0.26
Constant	-1.521	0.05	-29.87	0.00	-1.62	-1.42	-1.491	0.04	-36.70	0.00	-1.57	-1.41
	q90 R^2: 0.30						q90 R^2: 0.24					
Head	0.233	0.02	9.95	0.00	0.19	0.28	0.254	0.02	15.09	0.00	0.22	0.29
Age	0.070	0.01	12.86	0.00	0.06	0.08	0.080	0.01	13.26	0.00	0.07	0.09
Age2	-0.001	0.00	-9.20	0.00	0.00	0.00	-0.001	0.00	-9.69	0.00	0.00	0.00
Educ2	0.306	0.05	6.48	0.00	0.21	0.40	0.253	0.02	12.20	0.00	0.21	0.29
Educ3	0.598	0.04	13.64	0.00	0.51	0.68	0.559	0.02	28.36	0.00	0.52	0.60
Educ4	0.989	0.05	20.89	0.00	0.90	1.08	0.901	0.03	26.76	0.00	0.83	0.97
Educ5	1.506	0.04	40.38	0.00	1.43	1.58	1.439	0.03	45.48	0.00	1.38	1.50
Educ6	2.239	0.05	45.47	0.00	2.14	2.34	2.294	0.05	46.09	0.00	2.20	2.39
Position2	0.259	0.02	14.85	0.00	0.23	0.29	0.164	0.02	8.56	0.00	0.13	0.20
Position3	0.238	0.02	10.43	0.00	0.19	0.28	0.228	0.02	13.43	0.00	0.19	0.26
South	0.074	0.02	3.70	0.00	0.03	0.11	0.158	0.02	6.68	0.00	0.11	0.20
South East	0.144	0.02	8.46	0.00	0.11	0.18	0.176	0.02	8.67	0.00	0.14	0.22
Constant	-0.874	0.09	-9.47	0.00	-1.05	-0.69	-1.175	0.10	-12.17	0.00	-1.36	-0.99

[a] SD = Standard deviation.
[b] Confidence interval.

Continuation annex1

	White men (2001)						Black men (2001)					
	Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]		Coeff.	SD[a]	t	P>|t|	95% conf. int.[b]	
	q25 R^2: 0.22						q25 R^2: 0.15					
Head	0.217	0.01	18.07	0.00	0.19	0.24	0.137	0.01	16.05	0.00	0.12	0.15
Age	0.056	0.00	20.98	0.00	0.05	0.06	0.055	0.00	23.66	0.00	0.05	0.06
Age2	-0.001	0.00	-18.19	0.00	0.00	0.00	-0.001	0.00	-20.43	0.00	0.00	0.00
Educ2	0.196	0.03	7.76	0.00	0.15	0.25	0.177	0.02	10.51	0.00	0.14	0.21
Educ3	0.436	0.02	18.78	0.00	0.39	0.48	0.376	0.01	26.32	0.00	0.35	0.40
Educ4	0.662	0.02	33.23	0.00	0.62	0.70	0.567	0.02	32.69	0.00	0.53	0.60
Educ5	1.001	0.02	42.43	0.00	0.95	1.05	0.829	0.02	49.49	0.00	0.80	0.86
Educ6	1.956	0.03	66.71	0.00	1.90	2.01	1.851	0.03	55.08	0.00	1.79	1.92
Position2	-0.100	0.01	-10.45	0.00	-0.12	-0.08	-0.174	0.01	-14.54	0.00	-0.20	-0.15
Position3	-0.191	0.01	-15.92	0.00	-0.21	-0.17	-0.284	0.01	-29.71	0.00	-0.30	-0.27
South	0.231	0.01	19.92	0.00	0.21	0.25	0.192	0.02	12.69	0.00	0.16	0.22
South East	0.251	0.01	18.25	0.00	0.22	0.28	0.173	0.01	20.35	0.00	0.16	0.19
Constant	-1.627	0.05	-30.17	0.00	-1.73	-1.52	-1.486	0.04	-34.41	0.00	-1.57	-1.40
	q50 R^2: 0.26						q50 R^2: 0.18					
Head	0.221	0.01	22.44	0.00	0.20	0.24	0.156	0.01	16.33	0.00	0.14	0.17
Age	0.067	0.00	31.21	0.00	0.06	0.07	0.062	0.00	34.13	0.00	0.06	0.07
Age2	-0.001	0.00	-25.71	0.00	0.00	0.00	-0.001	0.00	-28.22	0.00	0.00	0.00
Educ2	0.218	0.02	8.78	0.00	0.17	0.27	0.196	0.02	10.72	0.00	0.16	0.23
Educ3	0.482	0.02	25.05	0.00	0.44	0.52	0.409	0.01	31.16	0.00	0.38	0.43
Educ4	0.748	0.02	35.17	0.00	0.71	0.79	0.605	0.01	48.90	0.00	0.58	0.63
Educ5	1.177	0.02	53.25	0.00	1.13	1.22	1.005	0.01	85.07	0.00	0.98	1.03
Educ6	2.135	0.02	117.64	0.00	2.10	2.17	2.015	0.04	47.85	0.00	1.93	2.10
Position2	0.017	0.01	2.46	0.01	0.00	0.03	-0.081	0.01	-6.92	0.00	-0.10	-0.06
Position3	-0.049	0.01	-3.89	0.00	-0.07	-0.02	-0.112	0.01	-9.49	0.00	-0.13	-0.09
South	0.167	0.01	14.27	0.00	0.14	0.19	0.192	0.01	14.49	0.00	0.17	0.22
South East	0.224	0.01	19.64	0.00	0.20	0.25	0.179	0.01	19.08	0.00	0.16	0.20
Constant	-1.592	0.05	-33.83	0.00	-1.68	-1.50	-1.432	0.03	-46.78	0.00	-1.49	-1.37
	q90 R^2: 0.31						q90 R^2: 0.24					
Head	0.225	0.02	10.76	0.00	0.18	0.27	0.174	0.01	11.83	0.00	0.15	0.20
Age	0.079	0.00	21.19	0.00	0.07	0.09	0.074	0.00	19.36	0.00	0.07	0.08
Age2	-0.001	0.00	-17.25	0.00	0.00	0.00	-0.001	0.00	-13.00	0.00	0.00	0.00
Educ2	0.178	0.05	3.51	0.00	0.08	0.28	0.212	0.03	7.15	0.00	0.15	0.27
Educ3	0.426	0.04	11.30	0.00	0.35	0.50	0.455	0.03	15.49	0.00	0.40	0.51
Educ4	0.789	0.04	21.72	0.00	0.72	0.86	0.760	0.02	37.53	0.00	0.72	0.80
Educ5	1.324	0.04	32.93	0.00	1.25	1.40	1.304	0.03	52.14	0.00	1.25	1.35
Educ6	2.227	0.04	51.59	0.00	2.14	2.31	2.280	0.03	69.16	0.00	2.22	2.35
Position2	0.237	0.02	13.13	0.00	0.20	0.27	0.145	0.02	8.41	0.00	0.11	0.18
Position3	0.177	0.02	7.81	0.00	0.13	0.22	0.123	0.02	5.76	0.00	0.08	0.16
South	0.010	0.02	0.57	0.57	-0.02	0.04	0.035	0.04	0.83	0.41	-0.05	0.12
South East	0.079	0.02	3.76	0.00	0.04	0.12	0.103	0.01	9.17	0.00	0.08	0.13
Constant	-1.086	0.07	-15.02	0.00	-1.23	-0.94	-1.128	0.06	-17.80	0.00	-1.25	-1.00

[a] SD = Standard deviation.
[b] Confidence interval.

ANNEX 2

F tests of significance

	1987		1995		2001	
			White men			
	F (gl 1, gl2)		**F (gl 1, gl2)**		**F (gl 1, gl2)**	
25º	F (18.28249)	10 342.17	F (18.32326)	13 627.4	F (18.36467)	5 728.31
	Prob > F	0	Prob > F	0	Prob > F	0
50º	F (18.28249)	65 549.1	F (18.32326)	4 708.92	F (18.36467)	13 175.57
	Prob > F	0	Prob > F	0	Prob > F	0
90º	F (18.28249)	34 868.99	F (18.32326)	5 676.31	F (18.36467)	4 464.48
	Prob > F	0	Prob > F	0	Prob > F	0
			Black men			
25º	F (18.22050)	4 185.65	F (18.27241)	3 010.82	F (18.34695)	446 825.4
	Prob > F	0	Prob > F	0	Prob > F	0
50º	F (18.22050)	2 808.88	F (18.27241)	14 715.16	F (18.34695)	28 610.58
	Prob > F	0	Prob > F	0	Prob > F	0
90º	F (18.22050)	6 863.78	F (18.27241)	46 695.01	F (18.34695)	26 216.4
	Prob > F	0	Prob > F	0	Prob > F	0
			White women			
25º	F (18.16972)	7 714.6	F (18.22450)	5 103.57	F (18.27460)	2 255.21
	Prob > F	0	Prob > F	0	Prob > F	0
50º	F (18.16972)	9 222.14	F (18.22450)	9 021.84	F (18.27460)	6 080.06
	Prob > F	0	Prob > F	0	Prob > F	0
90º	F (18.16972)	6 319.44	F (18.22450)	1 436.77	F (18.27460)	5 573.95
	Prob > F	0	Prob > F	0	Prob > F	0
			Black women			
25º	F (18.13162)	1 666.2	F (18.17406)	17 226.23	F (18.22619)	32 471.33
	Prob > F	0	Prob > F	0	Prob > F	0
50º	F (18.13162)	2 200.58	F (18.17406)	12 836.92	F (18.22619)	21 361.02
	Prob > F	0	Prob > F	0	Prob > F	0
90º	F (18.13162)	32 321.38	F (18.17406)	2 000.94	F (18.22619)	666 713.3
	Prob > F	0	Prob > F	0	Prob > F	0

(Original: English)

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