Cyclical variations of earnings inequality in Brazil

Variações cíclicas da desigualdade de renda no Brasil

ELIANA CARDOSO*

RESUMO: Este artigo mostra que a distribuição de renda pode mudar drasticamente durante o ciclo de negócios. Essa descoberta contrasta com a crença generalizada de que a distribuição de renda muda lentamente na ausência de guerras e revoluções. A macroeconomia explica em boa medida as variações de curto prazo na distribuição de renda: a desigualdade varia ciclicamente e aumenta com a inflação e o desemprego. Além disso, pelo menos no Brasil, a legislação sobre salário mínimo não contribui para uma melhor distribuição de renda. Há também evidências de que políticas populistas que levam a uma apreciação real não podem ser justificadas como apoio aos pobres. Assim, a melhor maneira de ajudar os pobres é comprovadamente não através da manipulação de preços e salários, mas provavelmente através da estabilidade macro e de um sistema transparente de transferência de impostos.
PALAVRAS-CHAVE: Distribuição de renda; desigualdade; salário-mínimo; ciclos econômicos.

ABSTRACT: This paper shows that income distribution can change dramatically during the business cycle. This finding contrasts with the widespread belief that income distribution changes slowly in the absence of wars and revolutions. Macroeconomics explains in good measure short-run variations in income distribution: inequality varies cyclically, and it increases with inflation and unemployment. Furthermore, at least in Brazil, the minimum wage legislation does not contribute to a better income distribution. There is also evidence that populist policies which lead to real appreciation cannot be justified as supporting the poor. Thus, the best way to help the poor is demonstrably not through the manipulation of prices and wages, but probably through macro stability and a transparent tax-transfer system.
KEYWORDS: Income distribution; inequality; minimum wage; business cycles.
JEL Classification: I32; O15.

I. INTRODUCTION

This paper makes three contributions. First, it shows that income distribution can change dramatically in less than one year. This finding contrasts with the wide-

---

* Tufts University and NBER – National Bureau of Economic Research.

spread belief that income distribution changes slowly in the absence of wars and revolutions. Its second contribution is to show that macroeconomics explains in good measure short-run variations in income distribution. Researchers have traditionally concentrated the analysis of poverty and distribution around microeconomic considerations and the labor market.[1]

This paper documents that inequality varies cyclically, and it increases with inflation and unemployment. Third, at least in Brazil, the minimum wage legislation does not contribute to a better income distribution. Moreover, the paper reports evidence that populist policies which lead to real appreciation cannot be justified as supporting the poor. Thus, the best way to help the poor is demonstrably not through the manipulation of prices and wages, but probably through macro stability and a transparent tax-transfer system.

The next section describes the behavior of unemployment, inflation, the real minimum wage, and the real exchange rate during the 1980s. It also develops the arguments for the regression analysis presented in section 3, which contains the methodology, the evidence, and conclusions. The data comes from *Pesquisa Mensal de Emprego* (PME), a monthly employment survey conducted by the Instituto Brasileiro de Geografia e Estatística. The definition of the inequality measures as well as the description of the universe of analysis and data are in the appendix.

2. MACROECONOMICS AND EARNINGS INEQUALITY

Brazil has one of the most unequal income distributions in the world. In 1990, it had the highest dollar income *per capita* in Latin America but infant mortality was three times that of Chile, the illiteracy ratio was four times that of Argentina, and Brazilians could expect to live four years less than Mexicans.[2]

National averages of economic and social indicators hide extreme regional disparities: the interstate range of income in Brazil is 7 to 1.[3]

The debate on growth versus equality thundered in the 1970s when the census data showed a sharp increase in income distribution inequality. While Fishlow (1972) emphasized the role of government policy in squeezing real wages, Langoni (1973) stressed non-policy forces inherent in a situation of fast growth with a shortage of educated labor. Barros *et al.* (1992) show that two thirds of the increase in

---

[1] Examples of a growing awareness of the importance of macroeconomics for income distribution include Blinder (1980), Blank and Blinder (1985), Nolan (1987), and Blejer and Guerrero (1990).

[2] 2The World Bank, World Development Report 1992, Washington D.C.: World Bank. A summary of the evolution of income distribution in Brazil during the last thirty years is found in Barros et al. (1992). For measures of poverty in Brazil see Hoffmann (1989) and Ravillon and Datt (1991).

[3] By contrast, interstate disparity is 2 to 1 in the United States where Mississippi's per capita income was half that of Connecticut's in 1991 (U.S. Department of Commerce, Survey of Current Business, 72(4), Table A, April 1992).

inequality between 1960 and 1970 can be attributed to education. That leaves ample room for the rise in inflation before 1964 and the mid-l960s recession, which validated the incomes policy of imperfect indexation, to effect distribution. Unfortunately, this hypothesis cannot be tested because of the lack of data for the years between 1960 and 1970. In contrast, data for the 1980s make it possible to examine the importance of macroeconomics to income distribution.

Over the past decade, inequality in Brazil has shown only a minor change in trend but extreme short-run variations (Figure 1).[4]

The contrary belief that it would take a war or a revolution to produce an immediate and significant impact on income distribution derives in part from data availability. The primary sources of information on income distribution are sample surveys which provide data on income and other socio-economic characteristics of the units sampled. Until twenty years ago, data of this type were available for only a few underdeveloped countries and no set of observations covered periods of major macroeconomic instability. By contrast, monthly data for the six largest metropolitan areas of Brazil during the 1980s, a period of extreme economic instability, made this study possible.

FIGURE 1

Gini coefficient — metropolitan areas average
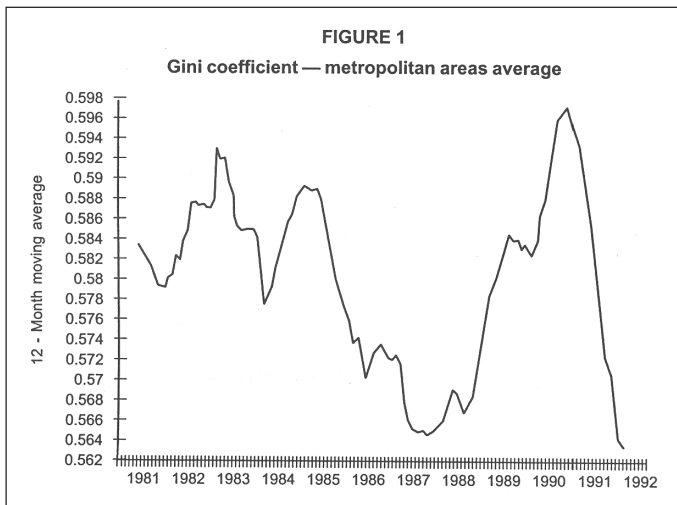
2.1 Inflation

The inflation rates calculated from regional price indices are practically the same in all metropolitan areas. Between 1981 to mid-1983, the inflation rate was relatively stable at approximately 6 percent per month. From mid-1983 to the

---

[4] The year averages for the Gini and Theil indices in table 2 also illustrate this point. For instance, between 1990 and 1991, the Gini index declined from 0.6 to 0.56. By contrast, in the United States during the 1980s, a decade known for increasing earnings inequality, the Gini coefficient increased from 0.41 to 0.42 between 1982 and 1987 (see Levy and Murnane, 1992).

beginning of 1986, inflation doubled, it disappeared in March 1986 with the Cruzado Plan and returned at full speed in 1987 when it accelerated fast reaching 40 percent per month in 1989. Inflation declined in 1990 to 15 percent per month. Figure 2 shows inflation during the 1980s. Repeated and failed stabilization programs increased the plight of the poor who had little room to cope with the radical policy moves which produced sectoral dislocation of resources and employment.

FIGURE 2
**Inflation rate — 5 - month moving average**
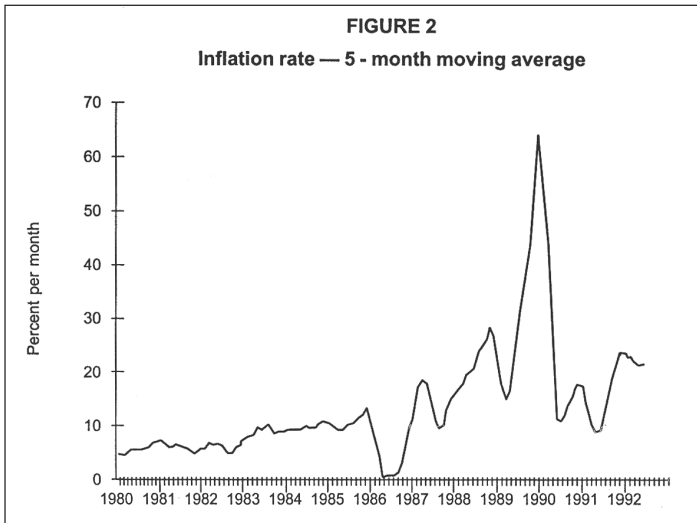
Inflation increased inequality because the wages of middle-income groups benefitted from less perfect indexation relative to wages of high- and low-income groups. Cardoso *et al.* (1992) show that all labor groups suffered real losses from inflation and that the group with five to eight years of education lost more than other groups in the 1980s.[5]

2.2 Unemployment

Figure 3 shows unemployment in the metropolitan areas of Brazil during the 1980s. In all metropolitan areas the unemployment rates declined over the period and the oscillation of unemployment during the period followed a similar pattern in all metropolitan areas. From 1980 to 1985 the unemployment rate went through two small cycles. Finally, from 1987 to the 1991, the unemployment rate showed a slight increasing trend.[6]

──────────

[5] The costs of inflation for wage earners also include oscillations in their real income. For individuals who are liquidity constrained, the significant oscillation in their real wages means that they cannot smooth consumption or that their real disposable income will be eroded if they try to carry cash from one month to the next (see Cardoso, 1992).

[6] Unemployment peaked at approximately 9 percent in the third quarter of 1981, declined to 6 percent

FIGURA 3
**Unemployment rate — metropolitan areas**
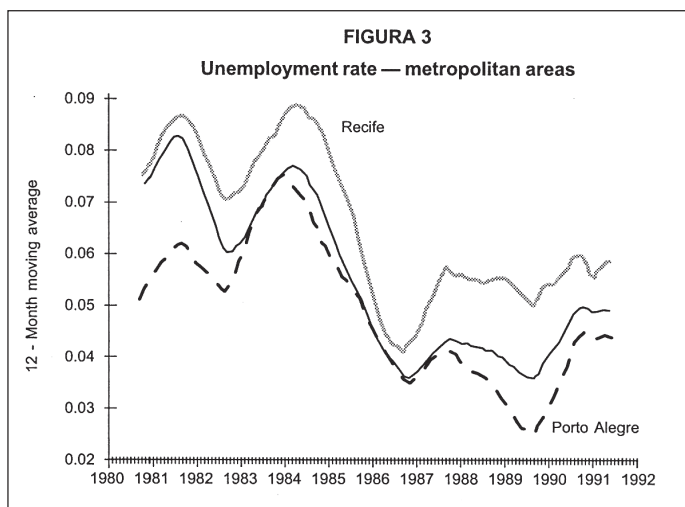
Income distribution responded to the 1982-84 recession. In a recession, unskilled workers are the first to lose their jobs as firms hoard the trained labor force and, in the recovery, unskilled workers get back their jobs and inequality diminishes. The short-run fluctuations in unemployment in the first half of the 1980s and the sharp decline from 1985 to 1987 match quite closely similar variations in inequality. After 1988, the unemployment rate became stable, but the degree of inequality reveals sharp fluctuations matched by fluctuations in the inflation rate. The evidence in section 3 shows that over the period 1980 to 1991 the combined behavior of unemployment and inflation can explain much of the oscillations of the degree of inequality.

2.3 Minimum wages

Figure 4 shows the real minimum wage in Brazil, between 1975 and 1991, and it illustrates the shortcomings of indexation. Until 1979 indexation was annual. It became half-yearly in November of that year. Further inflation acceleration led to quarterly indexation in 1983. ln March 1986 the Cruzado Plan froze prices and wages during ten months and introduced legislation which determined that wages should be increased automatically every time inflation accumulated to more than 20 percent. In June 1987, the Bresser Plan froze prices and wages for three months and introduced monthly wage indexation. In February 1989, fixed indexation rules were abandoned. Since then, the minimum wage has been adjusted at irregular intervals.

---

in the third quarter of 1982, increased to almost 8 percent in mid-1984. From mid-1984 to the end of 1986 there was a sharp decline in unemployment to less than 4 percent.

FIGURE 4

Index of the real minimum wage — 1985 - 100
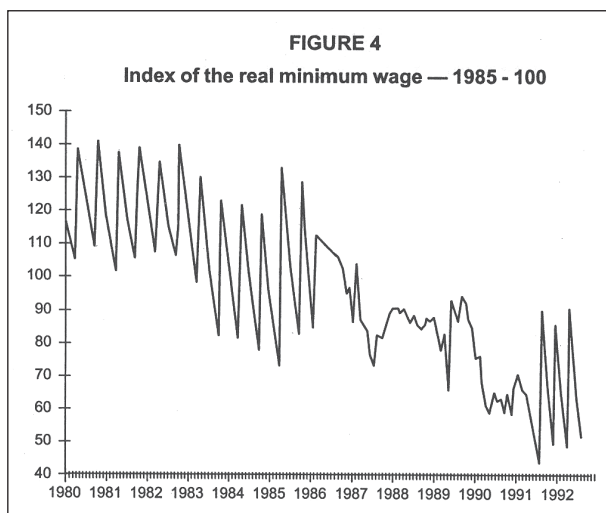
Minimum wage laws aim at altering the distribution of income in favor of low-income households. Unfortunately, governments can establish wage laws, but productivity cannot be directly increased by legislative fiat. Thus, minimum wages can perversely benefit those who gain legislated wage increments at the expense of others who earn the lowest wages.

In Brazil, a legislated wage floor has existed since 1940. Until 1963 coverage was restricted to urban areas and the different floors were established for different regions. The system moved gradually to one single floor in May 1984. Non-compliance is pervasive: approximately 30 percent of workers in the urban areas do not have official work documents *(carteira de trabalho)* filed by their employers.[7] We can take this percentage as an indication of the size of an "informal" labor market, not effectively covered by the minimum wage legislation.

TABLE 1

Workes receiving less than one minimum wage
(Percent of workers in each category)

	Informal workers[a] with less than1 minimum /workers in the region	Formal workers[b] with less than2 minimum /workers in the region
Belém, Fortaleza, Recife and Salvador	71.4	16.4
Belo Horizonte, Rio de Janeiro, Sao Paulo, Curitiba and Porto Alegre	54.3	16.1
Total	57.9	16.1

a Workers without *carteira de trabalho*.
b Workers with *carteira de trabalho*.
Source: José Guilherme Almeida dos Reis (1989), Table 11.3.

---

[7] See Faria (1989).

The case for minimum wage policy in economies with uncovered sectors rests on a set of particular assumptions. Consider for example an economy with a formal sector which complies with the minimum wage and an informal sector where non-compliance is the norm. ln that case, employment effects of wage floors are demand determined only in the formal sector. As wages in that sector are constrained to above equilibrium levels, jobs are rationed and labor supply increases in the informal sector. Employment in the informal sector is then determined jointly by demand and supply. If the formal sector is relatively capital intensive, the minimum wage effects are ambiguous, since production and substitution effects go on opposite directions. If production effects prevail, so that the ratio of capital to labor which moved from the formal sector exceeds the capital/labor ratio in the informal sector, the marginal productivity of labor will rise in both sectors and labor will gain at the expense of capital.

But if labor demand has equal elasticities in both sectors, and labor supply does not decline when the wage falls, those retaining jobs in the covered sector gain and those who move to the informal sector lose as well as the workers in the informal sector whose wages go down. In this case, the minimum wage legislation acts as a tax on the workers in the informal sector to finance a transfer to the workers in the formal sector.[8]

The bottom line is that theory allows for ambiguity and the effect of minimum wages on distribution remains an empirical question.[9]

Section 3 shows that increases in the real minimum wage widens inequality in Brazil. A possible explanation for this result is that an increase in the minimum wage reduces formal employment and increases the number of workers receiving less than the minimum wage.[10]

---

[8] See Welch (1974). Mincer (1976) extends the two-sector model to the case where workers with covered jobs prefer to remain unemployed until covered jobs open up. In equilibrium the flow of labor between the two sectors equates the utility of a relatively certain but lower-wage job in the informal sector with that of a less certain but higher paid job in the formal sector. Low wage earners will be better off depending on the low wage labor demand elasticity and on the probability of a participant in the formal sector having a job in this sector.

[9] In his analysis of the implications of minimum wages in the United States, Gramlich (1976) concludes that "as the minimum wage is increased beyond its historical range of 40 to 50 percent of the median wage, more and more workers confront the grab-bag combination of a higher wage but a reduced probability of having a job", This uncertainty magnifies the undesirable implications of minimum wages: compliance difficulties intensify, more workers lose their jobs or have to take part-time jobs; more of the benefits go to high-income families; and the impact on factor costs and product prices grows.

[10] 1°This paper shows increased inequality of earnings. Inequality among households may also increase. Reis (1989) shows that 35 percent of workers who benefit from minimum wage are among the households in the upper 5 deciles of income. The others are distributed uniformly among the other deciles, with no concentration among the lower deciles. In the United States, Johnson and Browning (1983) argue that minimum wages may not be beneficial in their distributional impact because low-wage workers are frequently members of high-income households, and low-income households receive a relatively small share of their income from low-wage earnings.

TABLE 2

Inequality indices
Brazil, 12-month average for six metropolitan areas
1981-1991

	Theil	Gini
1981	0.68	0.58
1982	0.73	0.59
1983	0.69	0.58
1984	0.69	0.59
1985	0.64	0.58
1986	0.65	0.57
1987	0.63	0.57
1988	0.67	0.57
1989	0.69	0.58
1990	0.73	0.60
1991	0.65	0.56

2.4. Real Exchange rates

Figure 5 shows the index of the real exchange rate defined as the relative price between domestic and international manufactured goods. The real exchange rate appreciated in 1981-82, depreciated in 1983 and started to appreciate again after 1988. There was a sharp real appreciation in 1989, when monetary authorities tried to avoid hyperinflation by slowing down the rate of the crawling peg. After March 1990, the real exchange rate began to depreciate again.

Are real depreciations regressive? Demery and Addison (1987) argue that the impact of real exchange rates movements on income distribution depend on the relative importance of traded and nontraded goods in the production and consumption baskets of different income groups. Moreover, price and wage flexibility, the existence of formal and informal labor markets, factor mobility, and the speed of supply responses to changes in relative prices will all play a role. The evidence in the next section shows that a real appreciation increases inequality in Brazil.

FIGURE 5
Index of the real exchage rate — appreciation up
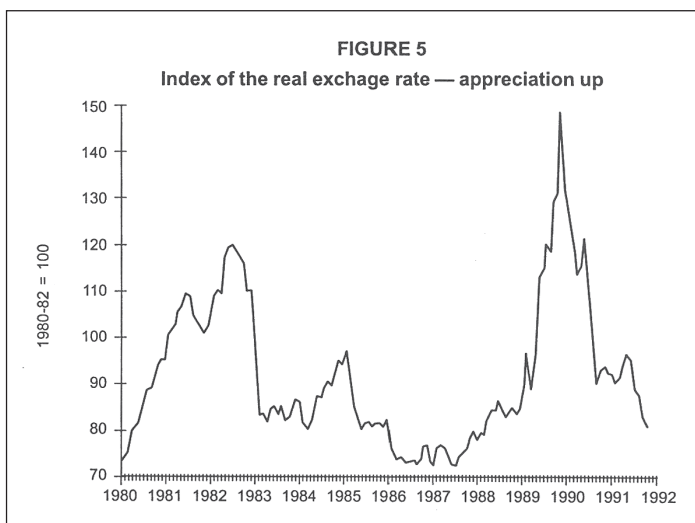
3. THE EVIDENCE

Changes in income inequality are usually described by changes in a scalar measure of inequality such as the Gini or the Theil index. A scalar measure completely ranks a set of income distribution in terms of increasing inequality, but alternative scalar measures do not necessarily rank a set of distributions in the same way. I lessen this problem by the use of three different measures: the Gini index, the Theil index, and the Theil index within groups of workers with the same years of schooling. The indices are defined in the appendix.

Inspection of monthly estimates for the Gini coefficient and the Theil index, from January 1980 to December 1991, indicates the presence of outliers. Outliers, defined as any estimate which diverges from the mean by more than two standard deviations, were discarded. The identification of outliers was done for each metropolitan area separately and the inequality measures for that point in time and metropolitan area were discarded.

Figure 1 shows the twelve-month moving average of the Gini coefficient for the largest metropolitan areas between January 1980 and December 1991.

The degree of inequality is smaller in São Paulo, Rio de Janeiro and Porto Alegre; it is larger and very similar in Belo Horizonte, Salvador and Recife. Despite some regional nuances in the temporal pattern of inequality, all regions followed the same broad pattern which is summarized in Table 2. During the first half of the 1980s, the degree of inequality oscillates around a high level. After 1984, inequality first goes down with a tough around mid-1987. It reaches a peak around mid-1990 (with the Gini coefficient exceeding 0;62 in Belo Horizonte, Recife, Rio de Janeiro. and Salvador). After that it declines: at the end of 1991 the degree of inequality was smaller than the minimal level reached during the 1980s (the average

for the six metropolitan areas was 0.56 in 1991). The temporal pattern for the Theil index (Figure 6) follows a very similar path.

FIGURE 6
Total and Intra-group inequality — metropolitan areas average
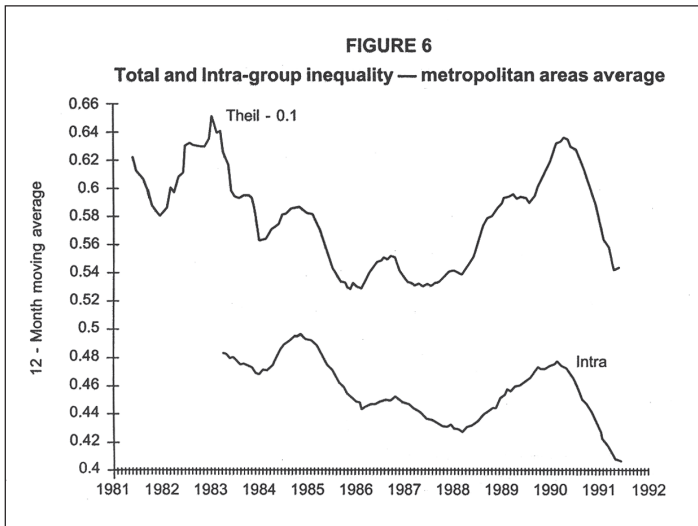
I also use a decomposition of inequality presented in Cardoso *et al.* (1992) and shown in Figure 6. The objective of the decomposition was to isolate the contribution of changes associated to education from ail other sources of change in inequality. The population in each metropolitan region was divided into five subgroups, according to workers' years of schooling: less than one, one to four (elementary school), five to eight, nine to eleven, and twelve or more years. Based on this division, a measure of average inequality within educational groups was calculated. Figure 6 shows that the overall Theil index and the average inequality within educational index followed the same temporal pattern in the 1980s. The variables used in the decomposition analysis spread over the period May 1982 and December 1991, because the surveys do not cover information on the level of education of workers before May 1982. As done for the other inequality measures, outliers were discarded.

For each inequality index, I pool the observations for the six metropolitan areas and estimate the impact on inequality of unemployment, inflation, the real minimum wage, and the real exchange rate (Table 3).

In each regression, the dependent variable is the logarithm of the raw monthly estimates of one of the inequality indices. The independent variables are the logarithm of the level of the unemployment rate, the logarithm of the level of the inflation rate, the logarithm of the real minimum wage, and the logarithm of the real exchange rate. [11]

_____

[11] I use the raw estimate of the unemployment rate (calculated for each metropolitan area using the information for each individual in the sample on whether or not he was actively looking for a job during the week prior to the interview). For the rate of inflation, I use the annual inflation rate in each

Regression analysis
Six metropolitan areas, Brazil

Dependent variable	Coeff. on unemployment	Coeff. on inflation	Coeff. on real min. wage	Coeff. on real exch. rate[b]	R^2	No. of observ.
Gini index	.022 (6.74)	.015 (11.79)	.040 (9.07)		76	761
	.018 (5.13)	.013 (8.86)	.038 (8.28)	.022 (3.06)	.76	761
Theil index	.05 (5.77)	.04 (11.06)	.07 (6.33)		.69	761
	.033 (3.72)	.028 (7.59)	.063 (5.34)	.082 (4.47)	.70	761
Within index[a]	.078 (6.46)	.031 (7.17)	.17 (10.24)		.52	662
	.064 (5.20)	.016 (3.15)	.154 (9.30)	.13 (4.93)	.54	662

[a] Theil index for inequality within groups with the same years of schooling.
[b] The real exchange rate is defined as domestic relative to foreign prices in domestic currency. An increase in the real exchnage rate represents a real appreciation.
All equations include a regional dummy which is equal to one for Belo Horizonte, Recife, and Salvador, and is equal to zero for Porto Alegre, Rio de Janeiro and São Paulo. The dummy is highly significative. All variables in logs; constant not reported; t-statistics in parentheses.
The period is 1981-1991 for the Gini and the Theil. The period is May 1982-Dec.1991 for the Intra-Group Index because the PME does not cover the years of schooling before May 1982. Outliers

All regressions use one regional dummy variable which is zero for the southeast metropolitan regions (Rio de Janeiro, São Paulo and Porto Alegre) and is equal to one for the other regions (Belo Horizonte, Recife and Salvador).

Table 3 shows that variations in unemployment, inflation, the real minimum wage, and in the real exchange rate, and the regional dummy explain three quarters of all variation in the level of overall inequality. The same independent variables explain more than half of the variation of inequality within groups with the same years of schooling.

Table 3 also shows the estimated coefficients on unemployment, inflation, the real minimum wage, and the real exchange rate. All coefficients are positive and have very large t-statistics. Therefore, I cannot reject the hypothesis that unemployment, inflation, minimum wage legislation, and real exchange rate appreciation increased inequality in Brazil during the 1980s.

---

metropolitan area (calculated as the proportional increase in the Consumer Price Index of the current month relative to the Consumer Price Index in the same month in the preceding year). For the real minimum wage. I use the minimum wage deflated by the Consumer Price Index of each metropolitan region. The real exchange rate index is published by Morgan Guaranty.

4.APPENDIX

4.1 Inequality measures

The Lorenz curve, L(p), shows the share of the total income which is appropriated by the poorest p percent of the population. The random variable Z represents labor earnings, re is the mean of Z, and E is the expectation operator. The Gini coefficient is defined as:

(1)
$$Gini \equiv \int_{0}^{1} (1 - 2L(p))\, dp$$

The Theil index, T, defined as:

(2) $Theil \equiv E\,[(Z/\mu)\,\ln(Z/\mu)]$

The average income inequality within groups is defined as:

(5)
$$\text{Within Groups Index} = \sum_{i=1}^{5} \alpha_i\, TW_i$$

where TW; is the inequality within subgroup I as measured by the Theil index; {o.} is a system of weights, $\alpha_j \geq$ and $\Sigma\, \alpha_i = 1$.

The measure of inequality within groups can change either because the inequality within groups, {TWJ, has changed or because the weights, {o.}, have changed. To avoid the effect of changes in the distribution of the population by educational level, the weights of each subgroup i is defined as the average of the 1980-1991 shares in total population in each metropolitan area. Therefore, the weights are constant and only variations in {TWJ can affect the measure of inequality within groups.

4.2 Data sources and description

The Consumer Price Index in each metropolitan area were obtained from the Instituto Brasileiro de Geografia e Estatística (IBGE, the Brazilian Census Bureau). The consumer price indices for São Paulo, Rio de Janeiro and Belo Horizonte are also published in Fundação Getúlio Vargas, *Conjuntura Econômica,* Rio de Janeiro, various issues.

Information on labor income, the unemployment rate, the income differentials by educational level were obtained from the Pesquisa Mensal de Emprego (PME), a monthly employment survey conducted by the Instituto Brasileiro de Geografia e Estatística. The survey exists since 1980 for the six largest Brazilian metropolitan areas. Ordered from South to North they are: Porto Alegre, São Paulo, Rio de Janeiro, Belo Horizonte, Salvador and Recife. In 1982, the PME was evaluated and revised, leading to several improvements, in particular the inclusion of questions on the education level of workers. Each month, approximately 10,000 workers, 10 or more years old, are interviewed in each metropolitan area on 19 questions.

REFERENCES

BARROS, Ricardo et al. (1992). "Welfare, inequality, poverty, and social conditions in Brazil in the last three decades". Paper presented at the Brookings Institution Conference July 15-17, 1992, Washington D.C.

BANK, R. and A. Blinder (1985). "Macroeconomics, income distribution, and poverty". *NBER Working Paper*, nº 1567. Cambridge: NBER.

BLEJER, M. and I. Guerrero (1990). "The impact of macroeconomic policies on income distribution: an empirical study of the Philippines". *The Review of Economics and Statistics,* pp.414-23.

BLINDER, Alan (1980). "The level and distribution of economic well-being". In M. Feldstein, ed. *The American Economy in Transition*. Chicago: University of Chicago Press, pp.415-79.

CARDOSO, Eliana (1992a). "The macroeconomics of poverty in Latin America". Mimeo, forthcoming in Ricardo Haussmann, ed., False Dilemmas. Washington D.C.: Inter-American Development Bank.

CARDOSO, E., R. Paes de Barros, and A. Urani (1992b). "Inflation and unemployment as determinants of income inequality in Brazil: the 1980s". Mimeo, forthcoming in R.Dornbusch and S. Edwards. *Stabilization, Economic Reform, and Growth*. Chicago: University of Chicago Press.

DEMERY, L. and T. Addison (1987). "Stabilization policy and income distribution in developing countries". *World Development*, 15(12), December, pp.1483- 1498.

FARIA, Vilmar (1989). "Changes in the composition of employment and the structure of occupations" In Bacha and Klein, eds. *Social Change in Brazil: The Incomplete Transition*. Albuquerque: University of New Mexico Press.

FISHLOW, Albert (1972). "Brazilian size distribution of income". *American Economic Review*, vol.62, May.

GRAMLICH, Edward (1976). "Impact of minimum wages on other wages, employment, and family incomes". *Brookings Papers on Economic Activity* (2), pp.409-51.

JOHNSON, W. and E. Browning (l983). "The distributional effects of increasing the minimum wage: a simulation". *American Economic Review*, 73(1), pp.204-11.

LANGONI, Carlos (1973). *Distribuição da Renda e Desenvolvimento Econômico do Brasil.* Rio de Janeiro: Expressão e Cultura.

LEVY, F. and R. Murnane (1992). "U.S. earnings levels and earnings inequality: a review of recent trends and proposed explanations". *Journal of Economic Literature*, vol. XXX, September, pp.1333-81.

MINCER, Jacob (1976). "Unemployment effects of minimum wages". *Journal of Political Economy,* nº 84, August, pp. S87-Sl04.

NOLAN, Brian (1987*). Income Distribution and Macroeconomy*. Cambridge: Cambridge University Press.

RAVALLION, M. and G. Datt (1991). "Growth and redistribution components of changes in poverty measures*". LSMS Working Paper*, nº 83, World Bank, Washington D.C.

REIS, José G. A. (1989). "Salário mínimo e distribuição de renda". *Perspectivas da Economia Brasileira* 1989, Rio de Janeiro: IPEA.

WELCH, Finis (1974). "Minimum wage legislation in the United States". *Economic Inquiry*, 12(3) September, pp.285-318.