"The Evolution of Wage Inequality in Brazil, 1976 to 1997"

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The rising trends in inequality in the distribution of earned income continued into the decade of the 1970s. However, a distinction has to be made between the early and late 1970s. While inequality increased during the first half of the decade, it did decline during its second half. In the end, however, the net effect was a rise in inequality, though not as large as that which occurred during the earlier decade. As to the causes of the latter part of the decade's decline in wage concentration, Fishlow et. al. point to a fall in returns to labor that the authors attribute to an upward trend in the business cycle. The theoretical foundation of their argument is that of the practice of labor hoarding, which produces higher skill differentials during recessions and lower differences during periods of growth.

The decade of the 1980s presented a very different macroeconomic picture than that of the earlier ones. Contrary to the earlier 20-year period where all groups enjoyed improvements in mean income levels- albeit significantly greater for the upper income groups-, the decade of the 1980s produced an increase only at the very top of the distribution- and even then a modest one. Inequality, as measured by a variety of indices rose markedly, though again not as strongly as it did during the 1960s. As to the causes of the changes, Fishlow et. al. point to a rise in returns to labor, now associated with a stagnating economy. With a longer time period in which to make inferences and test hypothesis, Bonelli and Ramos conclude that the short term negative relationship between growth and equality for the upturn period 1976-1980 and the downturn period 1981-83 had become blurred by the latter half of the decade whence inflation heated up considerably. After then growth came accompanied by significantly higher inequality. Hoffmann takes up the study of the effect of inflation on equality and finds evidence of a
negative relationship. The study also confirms the rise in dispersion for the decade of
the 1980s and its acceleration during its latter half.

A common thread among studies is the empirically established importance of
education as a major determinant of wage variation. It then seems natural that such a
state of affairs motivated in-depth studies on the relationship between education and
inequality. Fishlow’s and Langoni’s seminal decomposition results associating education
with up to fifty percent of all wage dispersion were largely confirmed in consequent
studies that used human capital models as in Senna, Castello Branco and Velloso. More recent studies such as that of Reis and Barros provide further refinement to the
picture in finding great regional differences in the explanatory power of education as
source of inequality. Such a situation was found to be related not to a difference in
educational levels across regions, but to regional discrepancies in wage-earning profiles.

In terms of the contribution of education to the changes in inequality, Lam and Levison
establish that the rise in earnings concentration occurring during the period 1982-85 had
taken place despite an equalizing distribution of schooling and a decline in returns to
education. The trends were overcome by a rise in other sources of wage variation.

Hence a picture of rising inequality evolves for the decade of the 1960s, 1970s,
and 1980s, with only a brief respite during the latter part of the 1970s. Education seems
to be at the center of the levels but not necessarily the trends in wage dispersion. While
schooling has become more broadly distributed, other factors seem to be playing a larger
role, inflation being a possible one. Therefore, the decade of the 1990s is a specially
interesting period since a stabilization of price levels over its latter half controls for the
effects of inflation on income distribution. In what follows a discussion of the sample to
be used for ascertaining within a consistent methodological framework and sample
definition the determinants of the trends in Brazilian wage variation.

III. Data

The data source for this study is the 1976 through 1997 National Household
Surveys (Pnads) conducted by the Brazilian Institute of Geography and Statistics (Ibge).
Begun in 1976, these have been carried out annually except in 1980 and 1991 when they
were superseded by the decennial census, and in 1994 when the undertaking was
suspended for austerity reasons. In all, there are 19 available data sets. Since the
purpose of this study is that of researching labor market developments, the samples will
be restricted to wage earners, as opposed to the case of all aforementioned studies which
also incorporate employers and the self-employed. Furthermore, in order to make
interpretation of results as straightforward as possible, a reasonably strong labor market
attachment will be included as a sample requirement, notably present only in Fishlow et.
al., Lam and Levison, and Reis and Barros. Therefore, the analysis will be restricted to
prime-age (25-54) male wage earners working at least thirty hours per week and earning
at least one-quarter of the August 1994 monthly minimum wage of R$65. The
agricultural sector is also excluded due to a difficulty in distinguishing consistently in
annual surveys the self-employed from the salaried agricultural worker. Following
Hoffmann, wages will be deflated using the General Price Index for Internal
Consumption (IGP-DI) from 1976 through 1979 and the National Consumer Price Index
(INPC) for the remainder of the time period. Conversions are carried out according to
the month when the particular annual survey took place, with a base month of August 1994.

The effects of the inclusion criteria are the following. As expected, the age, wage and hour restrictions have the overall effect of reducing inequality estimates, but their impact on levels and trends are very small. Similarly, the salaried restriction has little impact on levels and trends in inequality, but only until around 1993. The inequality lowering effects of the inflation reducing policies implemented thereafter are more significant among wage earners than among the entire working population. In turn, wage top coding does not have a significant impact on results. Sample wage trends are almost identical to those where top coded wages are imputed at higher levels or simply eliminated. What does affect results is the presence of 11 unusually high incomes at the very top of the 1976 data. These incomes are up to six times larger than those of the preceding observations and are highly suspect for they accrue to electricians, cooks, stone workers, bus drivers, and mechanics. Their reported monthly salaries are in the order of 160,000 to 638,820 cruzeiros, or some 23,800 to 91,000 US dollars at the August 1994 exchange rate. If removed, inequality is found declining from 1976 to 1981 by 12.7, 3.9, and 7.3 percent according to the Theil, Gini and mld indices, respectively, rather than by a much more considerable 26.5, 6.5, and 13 percent when the incomes are included. Hence, the inequality declining period reported by Fishlow et. al. and Bonelli and Ramos for the latter half of the decade of the 1970s still stands, yet much diminished if the questionable incomes are excluded. Other years are free from such occurrences. Finally, the choice of price index influences real wage trends. When using the combination of IGP-DI and INPC series, the median hourly wage of the 1997 census is
equivalent to 113 percent of the 1976 survey level. The exclusive use of the IGP-DI for
the whole time period places 1997 wages at 72 percent of the 1976 figures. Of course,
price indices have no impact on inequality estimates of measures respecting the scale
irrelevance axiom.

Wages are defined as monthly income over average weekly hours times four.
Potential labor market experience is calculated as age minus education minus seven, age
at which Brazilian formal education begins. The country is subdivided into the standard
five main geographical regions of the north, northeast, south, southeast and central
southwest. Sectoral variables include light and heavy industry, construction, commerce,
transportation and communication, finance, services, the social sector (e.g. teaching,
medical services), and public administration. All statistics are computed using the
weights provided by the surveys to produce representative samples of individuals.

IV. Preliminary analysis

The information on trends in real log wages by decile provided by Figure 1
points to four periods of significant wage shifts. The first begins during the middle of
the 1981-83 recession with an 18.3 percent wage slide at the median in only two years,
perhaps also related to an almost doubling of the inflation rate from a monthly average of
4.7 percent from 1976 through 1982 to nine percent from 1983 to 1984.29 Wages then
pick up from 1984 to 1989 in the context of declining unemployment and accelerating
inflation, which crosses the 50 percent a month threshold in December of 1989.
Furthermore, the aforementioned rise in wages is roughly positively correlated with
increasing position in the wage distribution. A series of short-lived price stabilization
plans implemented from 1989 to 1993 has a negative impact on wages, which only bounce back during the longer lasting low inflation years produced by the 1994 Real Plan. During this period the wages of the first six deciles reach their maximum, while those of the top two deciles stabilize at slightly lower levels than their 1989 highs. Overall, the median wage is 28.9 percent higher in 1997 than in 1993 and 13.5 percent higher in 1997 than in 1976.

[Figure 1: Real wages by decile]

As Figure 2 shows, the largest relative wage changes occur at the extremes of the wage distribution and most notably during three main stages: the high inflation years 1987 through 1989, then during the following attempts at inflation control, and finally after the onset of the post 1994 price stable period. From 1987 to 1989, whence inflation shot up to an average 32 percent monthly rate, the 90/20 and 80/20 wage ratios rise 19.2 and 14 percent, respectively, to go down by 20.6 and 13.5 percent from 1989 to 1993 and then a further 10.7 and 12.1 percent from 1993 to 1997. The 90/10 ratio follows an even sharper trend with the exception that its fall occurs mostly from 1990 to 1992, a change quite likely influenced by the fact that the minimum wage rose by 45.2 percent from 1990 to 1992 to go back down 11.1 percent from 1992 to 1997 (See Section VII, Table 2). Comparatively, changes at the middle of the income distribution are rather limited, and the smaller the closer to the median. The 70/30 and 60/40 ratios go up 12.5 and 2.5 percent from 1987 to 1989, then down 14.3 and 5.6 percent from 1989 to 1993, to go further down by 5.4 and 1.2 percent from 1993 to 1997. In all, during the 21-year time period under consideration the 90/20, 80/20, 70/30 and 60/40 ratios decline by 16.8, 10.1, 6.7, and 4.3 percent. However, despite the long term drop, it must be pointed out
that wage differentials are still a long way away from those prevalent in developed economies. A 1997 90/10 ratio of 9.5 compares very unfavorably with that of 2.4 prevalent in The Netherlands, 2.5 in Germany, 3.1 in the United Kingdom or even the ratio of a high inequality country such as the United States of 5.7. Similarly, a 80/20 ratio of 4.3 is quite higher than that of the 1.4 found in The Netherlands, 1.8 in Germany, 2.1 in the United Kingdom and 3.0 prevalent in the United States.\textsuperscript{30}

[Figure 2: Decile ratios]

The use of better measures of wage dispersion allows for a more precise gauge of income distribution changes (Figure 3). The Gini, Theil and mean logarithmic deviation (mld) indices, measures respecting the axioms of scale and population independence, symmetry and the transfer principle, show a fall in wage concentration of 3.9 to 12.7 percent during the mostly upward cycle 1976 to 1981, an increase of 1.3 to five percent during the 1981-83 recession, a sharper rise of 6.1 to 15 percent during the high inflation years, followed by a long lasting decline starting only around 1994. The post 1994 drop ranges from 6.8 to 21.5 percent and the fact that the downturn is greatest for the Theil measure underscores the fact that relative wage changes were dominated by movements at the top of the income distribution. In all, wage inequality is 6.8 to 16.3 percent lower in 1997 than in 1976. Alternative measures of inequality such as the Atkinson indices (Figure 4), measures which also respect the aforementioned axioms, follow similar patterns with their degree of change depending on how sensitive the index is to inequality among higher incomes. For the post 1994 period, inequality alleviation estimates range from 6.7 percent for the bottom sensitive A(2.5) index to 15 percent for the top sensitive A(0.5) measure. For 1976 through 1997 the reduction estimates vary
from a 3.7 to a 13.4 percent, measurements also underscoring the fact that changes were dominated by movements at the higher end of the income distribution, as evidenced by the larger inequality reduction estimates of the Atkinson indices with lower $\varepsilon$ values.

[Figures 3-4 and Table 1: Mld, Gini and Theil indexes]

Finally, a break up of the wage series into changes in worker characteristics and their prices (Figures 5-6) shows a steady ascent of the college premium from 1977 to 1988 when a maximum is reached. Price stabilization plans have negative effects on the differential, but an upward trend is resumed by 1992. Overall, the college to high school wage premium reaches a considerable 83.9 percent by 1997. However, returns to lower levels of education decline steadily throughout the time period under consideration, a phenomenon perhaps related to the substantial drop in the percentage of workers with no more than primary education, which declined from 60.1 percent in 1976 to 36.9 percent in 1997 (Figure 7). In turn, the price of experience increases rather steadily from 1977 to 1988 to decline thereafter. In all, the premium is not much different in 1997 than in 1976- some six percent per annum. Lastly, residual inequality seems to rise with increasing inflation and decline with price stability (Figure 8). The variance of the error of a regression of the log wage on education, experience, sectoral and regional dummies increases by 11 percent from 1982 to 1987, by 23.5 percent from 1987 to 1989, to decline by 10.6 percent from 1989 to 1993 and then by a further 12.4 percent from 1993 to 1997. 31

[Figures 5-8: Returns to education, experience, residual inequality, education]

It is then the purpose of the rest of the study to isolate the contributions of these changing phenomena to the trends in wage dispersion. Specifically to be learned is to
what extent are the changes in inequality related to a changing educational and demographic profile of the population, to what extent are they due to changes in the prices of these observed characteristics, and to what extent are they due to a changing structure of unobserved characteristics and their prices. Such an exercise will not only allow for an understanding of the direct contributors to the trends in wage distribution, but may provide clues as to possible connections with other less obvious sources.

V. Methodology

Juhn, Murphy and Pierce suggest a simple methodology for decomposing wage distribution trends into contributions related to changes over time in worker characteristics, skill prices, and levels and prices of unobservable traits. The authors assume the usual wage equation with wages a function of observed worker characteristics \( X \), prices \( \beta \), and a term \( u \) representing unobserved characteristics times their prices, alternatively referred to as a residual for the sake of brevity. Central to the method is the latter term's expression as two components, one corresponding to a cumulative distribution function of the residual and the second to an individual's percentile in the residual distribution. That is, if \( F_t^{-1}(\cdot|X) \) is defined as year t's inverse cumulative residual distribution for workers with characteristics \( X \), and \( \theta \) as the percentile of individual i's residual in that distribution, \( F_t^{-1}(\theta_i|X) \) will produce back \( u_i \).

The wage generating equation can hence be expressed in the following manner.

\[
Y_i = X_i \beta + F_t^{-1}(\theta_i|X) = X_i \beta + u_i
\] (1)
The usefulness of such a construction lies in the possibility of estimating wage distributions holding constant skill levels, prices or residual wage dispersion. A change in wage distribution can then be divided into the three sources shown in equation two. The first corresponds to the portion of a distributional change that can be attributed to a varying structure of observed worker characteristics such as education or experience. The second term amounts to the contribution of evolving skill prices such as the education or experience premia. Third, with $F^{-1}(\theta | X_{it})$ standing for the inverse of an average cumulative residual distribution, the last term tallies the contribution to a distributional change attributable to varying residual dispersion.

$$Y_{it} = X_{it} \bar{\beta} + X_{it} (\beta_{it} \bar{\beta}) + F^{-1}(\theta_{it} | X_{it}) + [F^{-1}(\theta_{it} | X_{it}) - F^{-1}(\theta_{it} | X_{it})]$$

(2)

In practice, the contributions of each of the components can be calculated in the following manner. First, wages $Y_{it}$ (equation 3) are computed for the time periods whose distributional change is to be decomposed. To do so, year $t$ characteristics are evaluated not at their corresponding years’ prices, but at a mean price $\bar{\beta}$ calculated as the average price over all time periods. In addition, the residual variance is held constant by calculating an average cumulative residual distribution where, once again, the average is over all time periods. Each person $i$ in year $t$ is then assigned a residual computed from the inverse of the average cumulative residual distribution $F^{-1}(\cdot | X_{it})$, but where
u's percentile corresponds to that in year t's residual distribution \((\theta_\mu)\). Then, as both prices and residuals are held constant in the distributions of \(Y^1_\mu\), the difference in inequality levels in both years can be interpreted as produced by a changing observed worker characteristic structure.

\[
Y^1_\mu = X_\mu \beta + \bar{F}^{-1}(\theta_\mu | X_\mu) \tag{3}
\]

\[
Y^2_\mu = X_\mu \beta + \bar{F}^{-1}(\theta_\mu | X_\mu) \tag{4}
\]

\[
Y^3_\mu = X_\mu \beta + F^{-1}_i(\theta_\mu | X_\mu) = Y^*_\mu = X_\mu \beta + u_\mu \tag{5}
\]

To arrive at the contribution of changing prices, a second wage \(Y^2_\mu\) (equation 4) is constructed using year t characteristics, year t prices, and a residual term computed as in \(Y^1_\mu\). Hence, being that residuals are held constant in the distributions of \(Y^2_\mu\), any additional change in inequality can then be attributed to a changing price structure for observables. Lastly, to calculate the contribution of a changing residual distribution, a third wage \(Y^3_\mu\) (equation 5) is computed using year t characteristics, year t prices and a residual constructed using year t's inverse cumulative residual distribution and year t's residual ranking. That is, \(Y^3_\mu\) distributions coincide with the actual distributions for each
of the years under consideration. Any remaining change in inequality can then be attributed to changing residual variance.

VI. Empirical Analysis

The decomposition methodology is applied to the understanding of the factors behind distributional shifts occurring during critical spells in the time period under consideration. The first of these is encompassed by the years 1976 and 1980, which can perhaps be categorized as ones of strong growth with moderate inflation. Between 1976 and 1980 national product increased at an average 7.2 percent annual growth rate (Table 2) while inflation stood at a annual average of 58.2 percent. The 1981 to 1983 recession defines a second period. The economy contracted by a total of 6.1 percent and unemployment reached 6.7 percent. Inflation picked up in 1983 to an 154.7 yearly rate, though it did not reach much higher levels until 1987. During this third period prices increased by a factor of over 900, reaching annual inflation rates of 323.4 percent in 1987, 819 percent in 1988, and 1349.3 percent in 1989. While 1988 was a recessionary year, product increased by 3.5 and 3.2 percent in 1987 and 1989, respectively, while unemployment decreased from 3.8 to 3.3 percent from 1987 to 1989. Price stabilization plans came and went during the period 1989 to 1993, having temporary effects on inflation and producing ups and downs in product and employment. Long term price stability is reached only after the 1994 Real Plan, whence inflation declined to an
annualized rate of some 12 percent from August 1994 to the end of 1997. Growth stood at an average 4.2 percent per annum. Finally, in providing a context to the changes in wage distribution, it must be pointed out that the value of the minimum wage eroded from 1976 to 1990 when it reached a level equivalent to 56.3 percent of its 1976 value. One then finds a marked 45.2 percent hike from 1990 to 1992, then a moderate slide thereafter.

[Table 2: Macroeconomic indicators]

As touched upon in Section IV, the years 1976-1981 constitute a period where inequality declined 3.9 to 12.7 percent, those between 1981 and 1983 correspond to an increase of 1.3 to five percent, 1987 to 1989 to a rise of 6.1 to 15 percent, and finally 1993 to 1997 to a slide of 6.8 to 21.5 percent. In all, wage concentration declines by 6.8 to 16.3 percent over a 21-year span, with changes dominated by movements at the top of the distribution as in the case of all subperiods. To arrive at an explanation of the factors behind these events, a decomposition of the trends into the often-mentioned components is performed, with results shown in Table 3. In their computation, the distributions of $Y^1_n$, $Y^2_n$ and $Y^3_n$ have been constructed as discussed in Section V. Then, the Theil, Gini, and mld indices have been utilized to estimate the changes in the dispersion of the exponential of wages in each of the distributions, differences from which the decompositions derive.

[Table 3: Decompositions of the trend in wage distribution]

As the numbers show, changes are dominated by the unmeasured price and quantity component. Seventy point four to 97.5 percent of the decline in wage inequality
occurring from 1976 to 1981 can be attributed to this phenomenon. Of the upsurge in inequality occurring during the ensuing years (1981-83), 59.4 to 69.6 percent can be associated with rising residual dispersion, which in turn accounts for a considerable 77.6 to 88.8 percent of the jump occurring between 1987 and 1989. An also substantial 69.5 to 76.8 percent of the fall that took place between 1993 and 1997 can be identified with this phenomenon.

This is not to say that the observable dimension's contribution is negligible. From 1976 to 1981 an educational expansion that takes the form of an increment in the proportion of workers with a high school or college diploma contributes to a rise in inequality equivalent to 19.6 to 60.6 percent of the overall change. The effect is however overwhelmed by a sharper fall in skill prices, where declining college and high school premia play a pivotal role (See Table 4). In net terms, the observed price and quantity change is responsible for 2.5 to 29.6 percent of the reduction in wage dispersion. Observables play a more prominent role during the 1981-83 recession, though skill prices work this time in the opposite direction. Their contribution to higher levels of inequality are equivalent to 26.8 to 35.1 percent of the total increase. Central to the component is the upswing in the college and experience premia which rose markedly in only a two-year span. For the remaining time periods, the influence of changing observables is more subdued. From 1987 to 1989 an increase in skill prices boosted inequality levels by a factor equivalent to 15.4 to 25 percent of the overall change, while during 1993-97 they had almost no perceptible effect.

[Table 4: Skill premia and distribution of education]
Results for the period 1976 to 1989 are consistent with those obtained by Fishlow et. al. and Bonelli and Ramos. In these studies the authors establish that a combination of demographic and between group inequality changes helped bring down earnings dispersion during the latter half of the decade of the 1970s, increase inequality during the recession of the early 1980s, and heighten inequality during the latter half of the decade of the 1980s, though the importance of the factors during this last period is not as great as in the earlier two. What this analysis adds to the discussion are the following contributions to the story. First, changes in the residual distribution seem to be more important in the determination of inequality changes than calculated in the cited articles where less than 50 percent of the changes occurring during 1976-81 and 1981-83 are attributed to this factor. Part of the discrepancy lies in the fact that the studies include in their sample wage earners, employers and the self-employed and it is precisely the variable associated with this distinction that which drives the importance of the between group component, as can be learned from the studies’ tables. Thus, the changing between-group inequality referred to by Fishlow et. al. and Bonelli and Ramos refers more to changing income differentials between the salaried, the self-employed and employers than changing differences between educational and experience groups.

Further details emerge when a variety of indices is used to decompose the trends in inequality. Differing sensitivities to inequality at various segments of the distribution allow one to conclude that observables are more important at the higher than the lower end of the distribution where the unobservable’s contribution predominates. For example, during 1976-81 the upper bound on the observed dimension’s contribution corresponds to Theil’s view of inequality (29.6 percent), while the lower bound
corresponds to the use of the mld index (2.5 percent). During the recession of the early 1980s 40.6 percent of the rise in inequality as measured by the Theil index can be associated with observables, while the corresponding share comes down to 30.4 percent when the mld index is used. The same occurs during the late 1980s when 22.4 percent of the rise can be associated with observables from the point of view of the Theil index, but a smaller 11.1 percent when viewed through the mld measure. For the decade of the 1990s the corresponding figures are 30.5 and 23.2 percent for the Theil and mld indices, respectively.

A third contribution of this study is the extension of the analysis into the decade of the 1990s, where price stabilization plans produced considerable swings in wage dispersion and a general slide in real wage levels. Once prices stabilized, real wages rose by 28.9 percent and dispersion declined by 6.8 to 21.5 percent. The driving force behind the development is a considerable reduction in residual dispersion equivalent to 69.5 to 76.8 percent of the overall change. Demographic shifts are responsible for the balance of the fall. Together, both phenomena produce the largest sustained decline in inequality experienced during the 21-year period under consideration. However, it is important to note that there seem to be limits to the equality enhancing effects of price stability, as can be reasonably expected. An initial drastic reduction in inequality between 1993 and 1995 is followed by a much less pronounced fall between 1995 to 1996, and finally by constant to slightly increasing levels in 1997.

The fourth contribution of this study to the discussion of the factors behind the evolution of inequality in Brazil is the clarification of the role played by education in these changes, which is mentioned as unclear and inconsistent in the aforementioned
studies. The isolation of the effect of changing quantities from changing prices and the extension into the decade of the 1990s allows for the following elements to emerge. As can be ascertained in Table 4 or Figure 7, during the late 1970s the growth in education took the form of a shift from intermediate to higher learning. On the one hand, since the educational expansion occurred from groups with wages closer to the mean to groups with wages farther from the mean, the new distribution of education contributed to higher levels of between group inequality. Yet, on the other hand, the change had an equalizing effect through skill prices, as reflected by the falling college and high school premia. In net terms, the lower price for skill dominated the quantity effect to produce an overall drop in inequality.

Comparatively, worker characteristic changes have much less impact during the decade of the 1980s and are dominated by rising skill prices related first to the 1981-83 recession and then to the close to hyperinflationary context of the latter part of the decade. A clue as to why did the price of skill rise during the recession lies in the fact that all wages declined during this period, yet, those of the college educated and the experienced less so than others.36 Hence, the recession had its expected effect on wages, effect which was greater for the unskilled than the skilled for reasons perhaps having to do with differences in protection against inflation. In just one year the 1983 minimum wage stood at 72 percent of its 1982 value, with its corresponding effect on other low skilled wages which are in many cases set in reference to the mentioned benchmark. On the rise of the price of skill during the high inflationary period of the late 1980s, the macroeconomic context not only seems to affect the variance of the prices of goods and services, but also that of the price for observed skill, and to an even larger extent that of...
the price for unobservables, as manifested by the momentous two-year jump in residual dispersion that took place from 1987 to 1989 (Figure 8). Finally, during the decade of the 1990s observed prices take a back seat to observed quantities, which contrary to the case of the decade of the 1970s, help reduce and not raise inequality. The explanation lies in Table 4. Whereas during the decade of the late 1970s the educational expansion takes the form of a shift from intermediate to higher education, that from 1993 to 1997 takes one from primary to intermediate. Since the price of intermediate education is closer to the mean than that of primary education, the change in characteristic quantities had the effect of decreasing between group inequality. Hence, a consistent role of education emerges in this 21-year analysis of wage inequality in Brazil. Skill prices are affected by demographics and the macroeconomic price context in sensible directions; the effect on inequality of observed quantities depends on where the educational expansion occurs.

[Table 5: Extended decompositions]

Yet another result that emerges from this study is that even over the longer run unobservables still play a considerable role in the determination of changes in inequality, as evidenced in the bottom panel of Table 3. Forty-one point seven to 47.5 percent of the 6.8 to 16.3 percent decline in inequality experienced during the 21-year period under analysis can be pinned to this source, this despite a concurrent and considerable change in the distribution of education. The referred to phenomenon can be associated with the remainder of the change, with the distribution of education having a small but negative effect on inequality that is overwhelmed by a much larger positive trend in observable skill prices. While the college premium is higher in 1997 than in 1976, premia for other
levels of education recede significantly during the same period. Hence, Lam and Levison's optimism on the long lasting effects of a reduction in schooling inequality experienced from 1976 to 1985 has proven to be well founded.37 However, as manifested by the comparatively high levels of inequality still prevalent in Brazil, there remains much room for progress.

Finally, questions may arise as to the long-run effects on distribution of changes in the sectoral composition of the Brazilian economy. To that end, the 1976 to 1997 time period is decomposed using a regression which includes, besides education and experience variables, eight sector dummies. Results shown in Table 5 attest to the fact that the new variables add very little explanatory power to the decomposition. According to the mld and Gini indices, the amount of the variation that is explained by the observable dimension increases from 58.3 and 59.3 percent to 59.2 and 62.0 percent, respectively. Sectoral developments are slightly more important at the higher end of the distribution, as manifested by the fact that the largest increase in explanatory power occurs when the Theil index is used to measure distributional changes. However, even in this case the addition of the binary variables raises the contribution of observables from 52.5 to 57.7 percent. Hence, the sectoral trend from manufacturing to services that occurred in Brazil during the period under study does not seem to be at the center of the tendencies in inequality. Explanations lie elsewhere, including changing skill prices, and more importantly, changing residual dispersion which appears to be particularly susceptible to the macroeconomic price context.

VII. Conclusion
Wage dispersion in Brazil fluctuates considerably during the period under study. An annualized decline of some .8 to 2.4 percent during the late 1970s is followed by an annualized rise of .5 to 2.5 percent during the 1981-83 recession and then by a further three to 7.2 annualized rate during the close to hyperinflationary 1987-89 period. In all, wage inequality grows by up to an impressive 20 percent during the decade of the 1980s. A series of stabilization programs produces wild swings in wage distribution which end only with the 1994 Real Plan. During this period not only does the median wage increase by some 29 percent, but absolute changes favor those at the lower end of the distribution. That is, while wages at the bottom six deciles reach a 21-year maximum, those at the top two drop relative to their peaks in 1989. The result is a significant fall in wage dispersion of some seven to 22 percent. Overall, inequality recedes by seven to 16 percent from 1976 to 1997, change characterized by considerable real wage advances at the lower half of the distribution.

A decomposition analysis performed to ascertain the source of these events places changes in quantities and prices of unobservable skill at the center of the short term trends in inequality. At their maximum degree of influence they are responsible for 78 to 89 percent of the deep hike in inequality occurring during the high inflation period of the latter part of the 1980s. At their minimum they account for 59 to 70 percent of the rise occurring during the early part of the decade. Far behind in importance in the determination of short-run trends are price and quantity changes of observable skill. Prices first seem to react to significant shifts in the educational composition of the population occurring during the late 1970s, but then change in tandem with the
macroeconomic price context—rising with creeping inflation and dropping with price stability. Observed quantities, particularly education, follow a more consistent pattern with their effect on distribution depending on where does the educational expansion occurs—advancements into higher education having negative effects on distribution while advances into intermediate levels having positive consequences. Only over a longer run does the observable dimension play a more significant role in the determination of inequality trends. Fifty-two to 59 percent of the drop in inequality occurring between 1976 to 1997 can be associated with changing quantities and prices of observed skill, particularly education.

However, these hard earned positive steps towards a more equal wage distribution can become overwhelmed in a hurry in an unstable price context. With inflation under some check during the late 1970s, demographic trends were able to have a positive impact on inequality. Rising inflation rates during the early and middle 1980s coincide with a step up of inequality, particularly its residual component. Close to hyperinflationary levels jack up inequality during 1987-89 to extremely high levels while stabilization plans produce wild swings in dispersion during the ensuing years. Inequality finally settles, and on much lower levels, only under the context of price stability. However, while producing a marked decline in dispersion, a low inflationary context seems to have its limits on distribution. The equality enhancing effects of stability brought forth by the Real Plan seem to have run their course after two consecutive years of inequality reduction. Yet, in view of the historic trends in Brazilian distribution, even constant levels of inequality are achievements that cannot be dismissed lightly, particularly when many of the policies implemented during the time were
expected to increase dispersion.

As to other general implications of the results of this study, the high inflation conditions that characterize much of the period under study make it difficult to draw too many comparisons with the case of other countries. While inequality declined during the late 1970s and rose consistently during the decade of the 1980s as in the case of many other economies, the factors related to the latter decade's increased dispersion are quite different from those driving up inequality in most of the developed world. Still, this research does confirm that the college premium did decline in Brazil during the late 1970s and then grew thereafter rather continuously as in the case of many other countries. Also, as concluded in studies investigating the source of distributional trends in developed economies, sectoral shifts do not seem to be at the center of changes in inequality in Brazil. Residual distributional phenomena not only seem to dominate short-run trends but also play a substantial role in longer term ones.

NOTES


3. Albert Fishlow, "Brazilian Size Distribution of Income," *American Economic*


7. Fishlow, "Who Benefits from Economic Development?: Comment" (n. 6 above).


10. Langoni (n. 4 above).
11. Ibid.

12. Fishlow, "Brazilian Size Distribution of Income" (n. 3 above); Rodolfo Hoffmann, "Considerações Sobre a Evolução Recente da Distribuição da Renda no Brasil" (Considerations on the Recent Evolution of Income Distribution in Brazil), Revista de Administração de Empresas, vol. 13, no. 4 (October-December 1973): 7-17.


17. Albert Fishlow, Ariel Fiszbein and Lauro Ramos, "Distribuição de Renda no Brasil e
18. Bonelli and Ramos (n. 16 above).
19. Fishlow, Fiszbein and Ramos (n. 17 above).
20. Bonelli and Ramos (n. 16 above).
21. Rodolfo Hoffmann, "Desigualdade e Pobreza no Brasil no Período 1979-90"
   (Inequality and Poverty in Brazil during the 1979-90 Period), Revista Brasileira de
22. Fishlow, "Brazilian Size Distribution of Income" (n. 3 above); Langoni (n. 4
    above); J. Senna, "Escolaridade, Experiência no Trabalho e Salários no Brasil"
    (Schooling, Work Experience and Wages in Brazil), Revista Brasileira de Economia,
    vol. 30, no. 2 (April-June 1976): 163-93; R. Castello Branco, Crescimento Acelerado
    e Mercado de Trabalho: A Experiência Brasileira (Rapid Growth and the
    Labor Market: the Brazilian Experience) (Rio de Janeiro: Getulio Vargas
    Foundation, 1979); Jacques Velloso, "Educação e Desigualdade da Renda Urbana
    no Brasil: 1960/80" (Education and Income Inequality in Urban Brazil: 1960/80),
    Pesquisa e Planejamento Econômico, vol. 9, no. 3 (December 1979): 661-718.
23. José Reis and Ricardo Barros, "Wage Inequality and the Distribution of Education,"
24. David Lam and Deborah Levison. "Declining Inequality in Schooling in Brazil and
    its Effects on Inequality in Earnings," Journal of Development Economics, vol. 37,
25. Nineteen-eighty six will however be excluded from the study since it was a year of drastic but ephemeral changes produced by the Cruzado Plan. On this see Regis Bonelli and Guilherme Sedlacek, "A Evolução da Distribuição da Renda entre 1983 e 1988" (The Evolution of Income Inequality between 1983 and 1988), Distribuição de Renda no Brasil (Income Distribution in Brazil), ed. J. Camargo and F. Giambiagi (Rio de Janeiro: Paz e Terra, 1991) and Hoffmann, "Desigualdade e Pobreza no Brasil no Período 1979-90" (n. 21 above).

26. Fishlow, Fiszbein and Ramos (n. 17 above); Lam and Levison (n. 24 above); Reis and Barros (n. 23 above).

27. Hoffmann, "Desigualdade e Pobreza no Brasil no Período 1979-90" (n. 21 above).

28. Fishlow, Fiszbein and Ramos (n. 17 above); Bonelli and Ramos (n. 16 above).

29. See Table 2 in Section VI for a macroeconomic context.

30. The developed economies' decile ratios are found in Gottshalk and Smeeding (n. 1 above), Table 1. These are however constructed from earnings, not wages. If the same is done for Brazil, the 1997 90/10 and 80/20 ratios are still a considerable 9.4 and 3.8, respectively. Also, European and American statistics are based on distributions from the mid 1980s to early 1990s.

31. The education and experience premia are derived from the same type of equation. The latter is evaluated at ten years of experience.


33. The upward cycle referred to earlier corresponds to 1976 to 1980. However, since
1980 Pnad data is not available, 1981 will be taken as the ending year reference in the decomposition. Its choice is convenient for comparative purposes since other studies also use it as reference year.

34. Fishlow, Fiszbein and Ramos (n. 17 above); Bonelli and Ramos (n. 16 above).

35. Ibid.

36. From 1981 to 1983 the average wage of the college educated fell by 14 percent while that of the high school graduate tumbled by 20 percent. The wage of the college graduate with 20 years of experience dropped by 13 percent while that of the graduate with five years of experience did so by 22 percent.

37. Lam and Levison (n. 24 above).

Table 1. Wage inequality by index

<table>
<thead>
<tr>
<th>year</th>
<th>Theil</th>
<th>Gini</th>
<th>MLD</th>
<th>A(0.5)</th>
<th>A(1)</th>
<th>A(1.5)</th>
<th>A(2)</th>
<th>A(2.5)</th>
<th>90/10</th>
<th>80/20</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>.574</td>
<td>.539</td>
<td>.497</td>
<td>.236</td>
<td>.392</td>
<td>.495</td>
<td>.567</td>
<td>.621</td>
<td>10.0</td>
<td>4.45</td>
</tr>
<tr>
<td>1978</td>
<td>.564</td>
<td>.537</td>
<td>.494</td>
<td>.234</td>
<td>.390</td>
<td>.493</td>
<td>.565</td>
<td>.620</td>
<td>10.03</td>
<td>4.36</td>
</tr>
<tr>
<td>1983</td>
<td>.526</td>
<td>.525</td>
<td>.472</td>
<td>.222</td>
<td>.376</td>
<td>.483</td>
<td>.559</td>
<td>.615</td>
<td>10.40</td>
<td>4.60</td>
</tr>
<tr>
<td>1984</td>
<td>.515</td>
<td>.524</td>
<td>.470</td>
<td>.220</td>
<td>.375</td>
<td>.482</td>
<td>.557</td>
<td>.613</td>
<td>10.55</td>
<td>4.62</td>
</tr>
<tr>
<td>1985</td>
<td>.530</td>
<td>.530</td>
<td>.484</td>
<td>.226</td>
<td>.383</td>
<td>.492</td>
<td>.568</td>
<td>.626</td>
<td>10.60</td>
<td>4.74</td>
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</tbody>
</table>
Table 2. Macroeconomic indicators and minimum wage, Brazil 1976-97

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflation (%)</th>
<th>Unemployment rate (%)</th>
<th>GDP growth (%)</th>
<th>Minimum wage (R$94)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>3.4</td>
<td>67.7</td>
<td>10.2</td>
<td>110</td>
</tr>
<tr>
<td>1977</td>
<td>2.7</td>
<td>33.8</td>
<td>4.9</td>
<td>115</td>
</tr>
<tr>
<td>1978</td>
<td>2.9</td>
<td>37.2</td>
<td>4.9</td>
<td>114</td>
</tr>
<tr>
<td>1979</td>
<td>4.8</td>
<td>64.7</td>
<td>6.8</td>
<td>103</td>
</tr>
<tr>
<td>1980</td>
<td>5.5</td>
<td>87.4</td>
<td>9.3</td>
<td>98</td>
</tr>
<tr>
<td>1981</td>
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<td>82.3</td>
<td>-4.3</td>
<td>104</td>
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<tr>
<td>1982</td>
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<td>1984</td>
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<td>182.6</td>
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<td>81</td>
</tr>
<tr>
<td>1985</td>
<td>10.2</td>
<td>203.2</td>
<td>7.8</td>
<td>88</td>
</tr>
<tr>
<td>1986</td>
<td>1.4</td>
<td>38.4</td>
<td>7.5</td>
<td>103</td>
</tr>
<tr>
<td>1987</td>
<td>14.2</td>
<td>323.4</td>
<td>3.5</td>
<td>80</td>
</tr>
<tr>
<td>1988</td>
<td>21.5</td>
<td>819</td>
<td>-0.1</td>
<td>83</td>
</tr>
<tr>
<td>1989</td>
<td>31.3</td>
<td>1349.3</td>
<td>3.2</td>
<td>84</td>
</tr>
<tr>
<td>1990</td>
<td>14.5</td>
<td>901.3</td>
<td>-4.3</td>
<td>62</td>
</tr>
<tr>
<td>1991</td>
<td>15.6</td>
<td>375.5</td>
<td>1.0</td>
<td>89</td>
</tr>
<tr>
<td>1992</td>
<td>23.4</td>
<td>891.9</td>
<td>-0.5</td>
<td>90</td>
</tr>
<tr>
<td>1993</td>
<td>30.7</td>
<td>1910.6</td>
<td>4.9</td>
<td>83</td>
</tr>
<tr>
<td>1994</td>
<td>24.2</td>
<td>628.4</td>
<td>5.9</td>
<td>69</td>
</tr>
<tr>
<td>Year</td>
<td>Inflation</td>
<td>GDP Growth</td>
<td>Unemployment</td>
<td>Nominal Min Wage</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>------------</td>
<td>--------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>1995</td>
<td>1.6</td>
<td>20.2</td>
<td>4.6</td>
<td>83</td>
</tr>
<tr>
<td>1996</td>
<td>0.6</td>
<td>7.5</td>
<td>5.4</td>
<td>82</td>
</tr>
<tr>
<td>1997</td>
<td>0.3</td>
<td>3.5</td>
<td>5.7</td>
<td>84</td>
</tr>
</tbody>
</table>

Source: Inflation rates are based from 1976 to 1979 on the IGP-DI found in Conjuntura Econômica of the Fundação Getulio Vargas, and from 1979 to 1997 on the INPC found in the Anuario Estatístico from Instituto Brasileiro de Geografia e Estatística. Utilization and GDP growth rates are found in Conjuntura Econômica. (*) Unemployment rates are drawn from the Monthly Employment Survey carried out since 1982 by the Instituto Brasileiro de Geografia e Estatística. The nominal minimum wage comes from the Folha de São Paulo, as found in Macrometrica time series, and real rates are produced using the aforementioned concatenated price index. Conversions are carried out according to the month when the particular annual survey took place, with a base month of August 1994.
Table 3. Decomposition of the trend in wage inequality

Experience and education variables

<table>
<thead>
<tr>
<th>Index</th>
<th>Quantities</th>
<th>Prices</th>
<th>Residual</th>
<th>Change (percent of total change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mld</td>
<td>.0220</td>
<td>-.0229</td>
<td>-.0354</td>
<td>-.0363 (-100)</td>
</tr>
<tr>
<td></td>
<td>(60.6)</td>
<td>(-63.1)</td>
<td>(-97.5)</td>
<td></td>
</tr>
<tr>
<td>Gini</td>
<td>.0098</td>
<td>-.0130</td>
<td>-.0178</td>
<td>-.0210 (-100)</td>
</tr>
<tr>
<td></td>
<td>(46.7)</td>
<td>(-61.9)</td>
<td>(-84.8)</td>
<td></td>
</tr>
<tr>
<td>Theil</td>
<td>.0143</td>
<td>-.0359</td>
<td>-.0514</td>
<td>-.0730 (-100)</td>
</tr>
<tr>
<td></td>
<td>(19.6)</td>
<td>(-49.2)</td>
<td>(-70.4)</td>
<td></td>
</tr>
</tbody>
</table>

1981-83

| mld   | .0004      | .0030  | .0078    | .0112 (100)                     |
|       | (3.6)      | (26.8) | (69.6)   |                                 |
| Gini  | .0003      | .0022  | .0041    | .0066 (100)                     |
|       | (4.5)      | (33.3) | (62.1)   |                                 |
| Theil | .0014      | .0088  | .0149    | .0251 (100)                     |
|       | (5.6)      | (35.1) | (59.4)   |                                 |

Table 3- Continued
<table>
<thead>
<tr>
<th>Index</th>
<th>Quantities +</th>
<th>Prices +</th>
<th>Residual =</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(percent of total change)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1987-89</td>
<td>1993-97</td>
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<td></td>
</tr>
<tr>
<td>mld</td>
<td>-0.0030</td>
<td>0.0109</td>
<td>0.0629</td>
<td>0.0708</td>
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<tr>
<td></td>
<td>(-4.2)</td>
<td>(15.4)</td>
<td>(88.8)</td>
<td>(100)</td>
</tr>
<tr>
<td>Gini</td>
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<td>0.0058</td>
<td>0.0276</td>
<td>0.0322</td>
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<td>(-3.7)</td>
<td>(18.0)</td>
<td>(85.7)</td>
<td>(100)</td>
</tr>
<tr>
<td>Theil</td>
<td>-0.0020</td>
<td>0.0196</td>
<td>0.0609</td>
<td>0.0785</td>
</tr>
<tr>
<td></td>
<td>(-2.5)</td>
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<td>(77.6)</td>
<td>(100)</td>
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Table 3- Continued

<table>
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<tr>
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<th>Quantities +</th>
<th>Prices +</th>
<th>Residual =</th>
<th>Change (percent of total change)</th>
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</thead>
<tbody>
<tr>
<td>mld</td>
<td>.0142</td>
<td>-.0523</td>
<td>-.0273</td>
<td>-.0654 (21.7) (-80.0) (-41.7) (-100)</td>
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<tr>
<td>Gini</td>
<td>.0038</td>
<td>-.0256</td>
<td>-.0150</td>
<td>-.0368 (10.3) (-69.6) (-40.8) (-100)</td>
</tr>
<tr>
<td>Theil</td>
<td>.0057</td>
<td>-.0547</td>
<td>-.0444</td>
<td>-.0934 (6.1) (-58.6) (-47.5) (-100)</td>
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</table>
Table 4. Skill premia and distribution of education

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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>intermediate to primary</td>
<td>42.0</td>
<td>44.1</td>
<td>47.8</td>
<td>42.4</td>
<td>33.7</td>
<td>32.2</td>
<td></td>
</tr>
<tr>
<td>hs diploma to intermediate</td>
<td>79.6</td>
<td>67.0</td>
<td>66.8</td>
<td>65.8</td>
<td>70.3</td>
<td>62.8</td>
<td>60.9</td>
</tr>
<tr>
<td>college to hs dropout</td>
<td>116.8</td>
<td>111.5</td>
<td>114.3</td>
<td>120.4</td>
<td>124.3</td>
<td>110.6</td>
<td>118.2</td>
</tr>
<tr>
<td>college to hs diploma</td>
<td>78.1</td>
<td>72.7</td>
<td>78.7</td>
<td>84.0</td>
<td>88.1</td>
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<td>83.9</td>
</tr>
<tr>
<td>experience</td>
<td>6.00</td>
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<td>7.57</td>
<td>7.45</td>
<td>6.07</td>
<td>5.83</td>
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</table>

population by

<table>
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<th></th>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>zero</td>
<td>13.5</td>
<td>12.3</td>
<td>10.6</td>
<td>10.1</td>
<td>9.2</td>
<td>7.5</td>
<td>6.7</td>
</tr>
<tr>
<td>primary</td>
<td>46.6</td>
<td>47.8</td>
<td>46.3</td>
<td>42.4</td>
<td>40.0</td>
<td>35.6</td>
<td>30.2</td>
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<tr>
<td>intermediate</td>
<td>21.1</td>
<td>16.8</td>
<td>17.7</td>
<td>19.7</td>
<td>21.7</td>
<td>25.2</td>
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<td>3.0</td>
<td>3.9</td>
<td>4.3</td>
<td>4.7</td>
<td>4.8</td>
</tr>
<tr>
<td>secondary diploma</td>
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<td>9.6</td>
<td>10.9</td>
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<td>9.3</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note. The educational premium is computed through the use of coefficients derived from a regression of the log wage on education, experience, regional and sectoral variables. Educational level figures correspond to the percentage of the sample attaining the referred to educational stage.
Table 5. Decomposition of the trend in wage inequality

Experience, education and sectoral variables

<table>
<thead>
<tr>
<th>Index</th>
<th>Quantities +</th>
<th>Prices +</th>
<th>Residual =</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>mld</td>
<td>.0140</td>
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<td>-.0267</td>
<td>-.0654</td>
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<td>(21.4)</td>
<td>(-80.6)</td>
<td>(-40.8)</td>
<td>(-100)</td>
</tr>
<tr>
<td>Gini</td>
<td>.0038</td>
<td>-.0266</td>
<td>-.0140</td>
<td>-.0368</td>
</tr>
<tr>
<td></td>
<td>(10.3)</td>
<td>(-72.3)</td>
<td>(-38.0)</td>
<td>(-100)</td>
</tr>
<tr>
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<td>-.0572</td>
<td>-.0395</td>
<td>-.0934</td>
</tr>
<tr>
<td></td>
<td>(3.5)</td>
<td>(-61.2)</td>
<td>(-42.3)</td>
<td>(-100)</td>
</tr>
</tbody>
</table>
Figure 1. Real wages by decile
Figure 2. Decile ratios

ratios of corresponding deciles

year

90/10
90/20
80/20
70/30
60/40


41
Figure 3. Wage inequality indexes: MLD, Theil, Gini measure:
Figure 4. Wage inequality indexes: Atkinson measures
Figure 5. Returns to education
Figure 6. Returns to experience
Figure 7. Educational levels
N. Cham. P/EPGE SPE S718e
Autor: Sotomayor. Orlando J.