EUI WORKING PAPERS IN ECONOMICS

EUI Working Paper ECO No. 94/40

Inequality, Economic Growth and the Debt Crisis

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Printed in Italy in October 1994
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Badia Fiesolana
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September 22 1994

Abstract: High initial income inequality is correlated with slow per capita GNP growth in a cross section of countries. There are many theoretical explanations of this pattern each of which suggests that the correlation should be eliminated when additional explanatory variables are added to the regression. This paper reports only weak evidence for each of the theories considered. On the other hand it is noted that the correlation of income inequality with slow growth in the 1980s is much more negative that the correlation with growth in the 1960s and 1970s and that this correlation is strikingly reduced when an indicator variable for rescheduling of debt repayment is included in the regression. This paper suggests that unequal income distribution is correlated with slow growth because it is correlated with difficulties in debt repayment in the 1980s. This suggests a causal connection which has received relatively little emphasis in the theoretical literature.

I would like to thank Lucrezia Reichlin, Christian Morisson and other participants at the European Workshop on Recent Developments in Econometrics and Economic Theory : Growth and Income Distribution for helpful suggestions.

I Introduction

This paper explores the association between income inequality and per capita GDP growth from 1960 to 1985 in a cross section of 54 countries. As is now well known (Persson and Tabellini 1991 and Alesina and Rodrik 1991) an unequal income distribution is associated with slow economic growth. There are a large number of different theoretical explanations for this association. Some theories assert that the association is due to a true causal relation as inequality causes some proximate cause of slow growth such as low investment in physical or human capital. Other theories assert that the relationship is spurious as some third factor, the true cause of slow growth also causes unequal income distribution. The implications of the two types of theories are, of course very different. However the same extremely simple technique can be used to evaluate competing theories. Each theory suggests that the addition of a new explanatory variable will eliminate the partial correlation between income inequality and slow growth. This paper uses the rich data set accumulated by Barro and Wolf (1989) and the World Bank's Social Indicators of Development (1992) as sources for additional explanatory variables.

The results of this simple empirical investigation are not especially decisive. Each of the many additional variables explains a small fraction of the association between income distribution and growth, but the effects are small and statistically insignificant. The conclusion is that there might be something to each or to every theory, but that the data do not firmly suggest which. This is not really surprising given the small sample, the poor data quality, the many omitted variables, and the fact that the available data correspond only loosely to the variables associated with inequality and growth according to the various theories.

There is, however, an extremely striking feature of the data which has not, to my knowledge, been noted, and which is firmly implied by only a small subset of the theories. A disproportionate fraction of the apparent effect of unequal

income distribution on economic growth is caused by the extremely low growth in the 1980s of countries with unequal income distribution (measured in the late 50s or early 60s) . Depending on which additional variables are included in the regression, one half to two thirds of the apparent effect of inequality on growth is due to growth in 5 of 25 years. If growth from 1960 to 1980 is considered, the apparent negative effect of income inequality is small, statistically insignificant and driven to zero by a wide variety of proposed additional explanatory variables. The data tell two different stories one for the 60s and 70s and the other for the early 80s.

What was different about the 80s ? Two possibilities spring to mind. First the price of oil rose in the 70s and fell in the 80s so the relative performance of OPEC countries declined sharply. This explanation of the change from the 60s and 70s to the 80s clearly has some empirical importance, however the difference in the apparent effect of income inequality on economic growth in the 80s and before remains statistically and economically significant when a dummy variable for OPEC member is included. Second real interest rates rose and many debtor countries experienced extreme economic difficulties. As noted by Berg and Sachs (1988), countries with unequal income distributions had higher debt export ratios in 1981 and were more likely to reschedule debt repayment. The importance of this root from inequality to slow growth is demonstrated by the striking decrease in the coefficient of per capita GDP growth on a measure of inequality when the debt burden in 1981 or a dummy variable for rescheduled debt payments is included in the regression.

The patterns noted above indicate the importance of the connection between inequality and foreign indebtedness predicted by Alesina and Tabellini (1988) and noted by Berg and Sachs (1988) and Ozler and Tabellini (1991). This does not cast much doubt on the many other theories of why inequality is bad for growth. Each of them can be modified with the additional argument that many developing countries borrowed heavily in the 70s and only those which developed successfully were able to repay their debts. One interpretation of the results reported

in this paper is that international lending enabled countries with unequal income distribution and unhealthy economies to obscure the second of these problems until the debt crisis occurred.

This analysis suggests that theories which connect income inequality to heavy foreign borrowing and to difficulties with repayment are empirically important. It casts relatively little light on the wide variety of other theories which attempt to explain why inequality is associated with slow growth.

This paper is divided into six sections the first of which is this introduction. The second sketches several theoretical explanations of the association between inequality and slow growth. The third describes the data used. The fourth describes the specification and some test statistics. The fifth describes the empirical results. The sixth draws conclusions.

II Review of Theories and Their Empirical Implications

In this section I will briefly discuss eight different explanations for the negative association of inequality and growth. I will suggest empirical implications of each explanation. For convenience I will give each explanation a brief title indicated in CAPITAL letters.

Among the leading theories seeking to explain why inequality is bad for growth are two closely related theories which suggest that the true culprit is efforts to reduce income inequality by redistributing income. Persson and Tabellini and Alesina and Rodrik each note that less equal income distribution implies that the median household receives larger benefits from simple re-distributive policies. They appeal to a median voter model to predict that re-distributive taxes and transfers will be greater if income is distributed less equally. Then they note that in an economy characterized by endogenous growth this will slow economic growth if the taxes reduce incentives to accumulate the engine of growth -- respectively human and physical capital. The reader is referred to Persson and Tabellini (1991) and to Alesina and Rodrik (1991) for a presentation of the models. Each draws

and tests the same implication of the model. Since the theories rely on a model of voting it applies to democracies and not to dictatorships. In fact each finds a larger effect of inequality on growth in democracies than in dictatorships. However neither paper presents data which can reject the hypothesis that the effects of inequality on growth rates are equal in the two sub-samples. Indeed Persson and Tabellini express confidence in the basic relationship between income inequality and growth and much less confidence in their particular theory.

Each theory suggests other predictions which are in principal testable. First each predicts that the negative effect of inequality on growth can be explained with direct measurement of investment in the engine of growth. In the ALESINA AND RODRIK model this is simply investment, for the PERSSON AND TABELLINI model this is investment in human capital which can be measured, albeit very poorly, by formal schooling. In each case a striking effect of including the additional variable on the association between income inequality and growth has an ambiguous interpretation. Rapid growth can increase investment in physical human capital by increasing the returns on human and physical capital. Also each model, taken literally, suggests that the association between inequality and slow growth would be eliminated if re-distributive policies were measured directly and included as explanatory variables.

A slightly less rigorous interpretation of the theories leads to different predictions. Taxes and transfers are only one effect of a struggle over income distribution and arguably are the least damaging for growth. A casual reinterpretation of each model suggests that inequality leads to slow growth by increasing the intensity of distributional struggle. This might occur in dictatorships as well as in democracies and might not lead to victory for the poor or egalitarian. This informal POLITICAL CONFLICT argument suggests that the association between income inequality and slow growth might be explained by inclusion of indicators of "distributional conflict" such as the number of strikes, riots, revolutions and coups per year as additional explanatory variables.

A story with empirical implications very similar to Persson and Tabellini's model, but with rather different policy implications is as follows. First education is the engine of growth as is suggested by the work of Barro (1991). However, investment in formal education is the result of public policy as well as individual choice, since formal education is heavily subsidized. The PUBLIC EDUCATION argument follows. Assume governments in different countries subsidize education to different degrees. High subsidies to education cause high enrollment. This increases economic growth. high enrollment also drives down the return to education and reduces income inequality. This final step seems bold but it is supported by the evidence that returns to schooling different countries are highly correlated with income inequality and that they explain (in a purely statistical sense) a large fraction of differences in inequality (Tilak 1989). Furthermore, swings in income inequality in Columbia are largely explained by swings in returns to formal education, which are, in turn, explained by a sharp increase in public spending on education in the early 50s (Londono 1990).

In this PUBLIC EDUCATION story the income distribution does not result from exogenous differences in native ability as it does in the Persson and Tabellini model. In contrast the level of education is determined by exogenous (or not modelled) public choices. If true it suggests that slow growth and inequality are caused by the absence of a particular kind of re-distributive policy. The implications of Persson and Tabellini's model and the sketch of a model described above are very similar, but no connection between democracy and the effect of inequality on growth is implied by the second.

There are also DEMAND SIDE explanations of the effect of inequality on growth. Murphy, Shleifer and Vishny (1989), Baldwin (1956), Harbison (1970), North (1959) and Rosenberg (1972) argue that the rich demand services, hand made luxuries and imports, while the non-rich demand domestically produced manufactured goods. If manufacturing is characterized by aggregate increasing returns to scale this implies a negative

association between income inequality and economic growth. This suggests that the share of industry in GDP or in labour demand might explain the association of inequality and slow growth.

A modified version of the theory has a clearer implication if one considers the sort of services the rich might demand. In particular concentration of wealth increase incomes to lawyers, flatterers, courtiers and rent seekers generally compared to the incomes of those with skills in producing wealth e.g. engineers. Murphy, Shleifer and Vishny (1991) assert that a high ratio of engineers to lawyers is correlated with rapid growth. This TALENT ALLOCATION model suggests that the inclusion of the fraction of tertiary degrees in engineering and natural science should help to explain the correlation of inequality and slow growth. It is worth noting (especially before an audience of social scientists) that the alternative may not be self interested rent seeking and that e.g. intense political struggle might also attract educated people away from engineering.

Rent seeking (and political conflict) models suggest that abundant UNPRODUCED WEALTH (e.g. land, oil, minerals) is a mixed blessing. Struggles over the control of such wealth might distract effort from wealth creation and reduce growth. If the control of unproduced wealth is typically less equally distributed than other sources of income such as labour or human capital, this could explain the correlation of inequality and slow growth. One does not have to appeal to rent seeking or distributional conflict to explain such a result however. If e.g. land contributes to national income, but contributes less than e.g. knowledge to economic growth, nations with abundant unproduced wealth might have slow economic growth. This argument involves no theory at all and follows if wealth from land adds an equal amount to the numerator and denominator of e.g. per capita GDP in 1985 divided by per capita GDP in 1960. If ownership of unproduced wealth is less equally distributed than human capital, the amount of unproduced wealth should explain the correlation of inequality and slow growth.

A similarly uninteresting explanation is DEMOGRAPHIC. Across countries an unequal income distribution is correlated with high fertility (Heerink 1991). Rapid population growth is correlated with slow growth of per capita GDP. Therefore inequality is correlated with slow growth. Unlike the theories above this argument is strictly empirical, and indeed known to be true. The only question is how much of the empirical pattern is explained in this way.

Finally each of the models which predict slow growth suggest that countries with unequal income distributions might experience difficulty repaying foreign debts. In addition, as explained by Alesina and Tabellini (1988) and Ozler and Tabellini (1991) political instability and sharp differences in priorities of competing parties may increase external indebtedness. An informal version of their argument is that if there is a high chance of a new government with very different aims taking power, the current government will benefit from reducing the new government's ability to spend by borrowing up to the liquidity constraint. If income inequality is associated with political instability and sharp ideological conflict, it should be correlated with external indebtedness and poor growth performance in the 80s. Finally as argued informally by Berg and Sachs, the rich a relatively able to avoid capital controls and taxes by sending their money abroad. Capital flight is known or at least universally believed to have contributed to the debt crisis. According to the DEBT CRISIS explanation, the negative effects of inequality on growth should be concentrated in the 1980s and explained by debt export ratios and an indicator variable indicating that the country in question rescheduled debt repayment.

The models, explanations, and informal arguments above are listed below with empirical implications. When additional explanatory variables are listed without explanation, the implication is that inclusion of such variables in a regression explaining per capita GDP growth will drive the coefficient on an index of inequality toward zero

Persson and Tabellini	education, government taxes and transfers. Effect should be seen only in democracies.
Alesina and Rodrik	Investment/GDP, government taxes and transfers. Effect should be seen only in democracies.
Political Conflict	Strikes, Riots, Revolutions and Coups
Public Education	Education. Effect should be seen in dictatorships.
Demand Side	percent employment in Industry
Talent Allocation	Fraction of tertiary students in science and engineering. Unproduced Wealth
Unproduced Wealth	Population per square Kilometer of agricultural land.
Demographic	Growth of population over same years as growth of GDP.
Debt Crisis	Reschedule, Debt Export ratio in 1981. The effect should be concentrated in the 1980s.

III Data

Data on income distribution are available for many fewer countries than data on economic growth or the other covariates. Furthermore income distribution data for different countries are often not comparable even when assembled by the same organization such as the World Bank of U.N.. In this paper I use data on the distribution of income in 54 countries collected by Felix Paukert

(1973). This data set has some key advantages. First the data are old reducing problems with simultaneity. For 43 of 54 countries the data were collected before 1965. Second all refer to pre-tax income. Since endogenous tax rates are the key feature of the Persson-Tabellini and Alesina-Rodrik theories this is crucial. Finally while Paukert asserts no more than that the distribution data refer "mostly" to the distribution of income across households, experts in the field consider his data set less contaminated than other sources of old income distribution data by incomparable data on e.g. the distribution of income across income recipients or the distribution of wages (Robert Summers personal communication). A weak point of his data set is that data are collected at different times for different countries. For 41 of the 54 between 1955 and 1965 and for 39 between 1956 and 1964. I have explored the possible biases this introduces in the results by including the year the data were collected as an additional explanatory variable without noticeable effect on the results (results not shown). An expert on income distribution data informed me that the income distribution reported by Paukert for Germany and Morocco are inaccurate (C. Morisson personal communication) these data points are excluded from all calculations including summary statistics. If Germany and Morocco are included the apparent effect of inequality on growth is slightly higher and more difficult to explain.

Since different measures of inequality are highly correlated, finding which measure is most (negatively) correlated with growth is not a fruitful approach to choosing among the theories. I have focused on the share of income of the richest 5% of households. To reduce the risk that the results are driven by outliers I use the log of the income share of the richest 5% (logrich). Some exploration of different measures is presented below. Table 1 presents the share of the riches 5% and the year in which the data were collected for the sample of 54 countries.

Data on per capita real GDP at international prices are obtained from Heston and Summers (1988). Data on debt export ratios in 1981 and on whether the country in question rescheduled

debt repayment were obtained from Berg and Sachs (1988). All other data were obtained either from Social Indicators of Development (IBRD 1992) or from the data appendix assembled by Barro and Wolf (1989) as used and described in Barro (1991). Definitions and original sources are described in a data appendix (itself a modified version of Barro and Wolf's data appendix). Summary statistics for all variables are presented in table II.

IV Specification and Statistical Tests

The approach used in this paper is very simple. Most results are reported for OLS estimated across countries as in equation 1)

1) $gr6085 = c + ß\,logrich + \alpha\,\underline{Z} + \varepsilon$

where gr6085 is the rate of growth of real per capital GNP from 1960 to 1985, c is a constant, logrich is the log of the income share of the richest 5% of households, and $\underline{Z}$ is a vector of additional variables as suggested by different theories. Each theory predicts that the addition of some Z variables will drive ß towards zero.

I use three statistical techniques to evaluate whether the addition of a variable drives ß towards zero. First, under the assumption that the additional variable is exogenous, I can test the hypothesis that ß is zero with a standard t-test. This tests the theory which suggests addition of Z and thus the hypothesis that the proposed causal connection is the only true causal connection. In each case it the null hypothesis is implausible. First it is likely that several of the proposed causal paths contribute to the raw correlation, and second because the Z variables are often crude proxies for the variables of interest. Nonetheless, The null hypothesis is almost never rejected using per capita GDP growth from 1960 to 1985 as the dependent variable. Given the small sample and resulting low power of the tests this is not interesting. It is more interesting to test whether the point estimate of ß is reduced

significantly, that is to test the null that the expected value of estimates of ß estimated with different specifications are the same.

To do this I use a Wald statistic which is asymptotically distributed N(0,1) and is described by equation 2

$$2)\ \text{statistic} = (ß_1 - ß_2)/\sqrt{(\text{var}ß_1 + \text{var}ß_2 + 2\text{cov}(ß_1, ß_2))}$$

Where $ß_1$ and $ß_2$ are estimates of ß using different specifications.

This tests the hypothesis that the proposed causal connection does not exist at all. Again the null hypothesis is rarely rejected.

Since diametrically opposite null-hypotheses are generally not rejected one could conclude that the whole exercise is futile. One might also interpret the point estimates with caution recognizing the large standard errors. In addition to the point estimate itself, it is useful to compare the success of additional variables in explaining per capita GDP growth and in explaining ß that is driving ß towards zero. In particular this is useful if Z variables e.g. enrollment rates capture only part of differences in the variable of interest e.g. human capital accumulation. If Z is a poor measure of the variable of interest it will have a small effect on ß and a small effect on the R^2 of the regression. These effects are compared by reporting the ratio of the coefficient to the standard error of the regression S. This statistic is generally constant with two exceptions. It is easy to interpret this. If e.g. the correlation of logrich with measured and unmeasured human capital accumulation are equal a constant ß/S implies that human capital accumulation explains all of the correlation of inequality and growth if it explains all of differences in growth rates across countries. Since it is generally agreed that none of the variables considered is the sole source of growth, I consider a constant ratio ß/S to suggest that the theory in question is incomplete. This is not a test of a hypothesis but rather a statistic and, as noted above, the data generally do not reject the hypothesis that ß and therefore ß/S are zero.

Results

First the raw correlation between logrich and gr6085 is negative and significant with correlation coefficient of 0.34 and a t-statistic of -2.57 as reported in column 1 of table III. The regression coefficient is -1.75 which suggests that at the sample arithmetic mean of the income share of the rich 26.6 an additional 1% of income going to the rich would reduce per capita GDP growth by 0.066 % each year which would imply real GDP 1.64 % lower in 1985. A one standard error increase in logrich is correlated with real gdp growth lower by 0.63 % per year. This is similar to the results of Persson and Tabellini and of Alesina and Rodrik and suggests that the differences in income distribution data and specification are not crucial.

Column two of table III reports the very small effect of adding the log of per capita real GDP in 1960. This is included to control for possible convergence. There is no evidence of convergence in this regression without additional explanatory variables. The coefficient on the log of per capita real GDP in 1960 is extremely sensitive to further addition of explanatory variables.

Column three of table III includes the annual population growth rate from 1960 to 1985. The point estimate of -0.82 suggests that additional people add almost nothing to production. Again this coefficient is strongly affected by additional explanatory variables. More importantly, the inclusion of the population growth rate has a noticeable effect on the coefficient on logrich which falls by approximately two thirds of a standard error. The t-statistic on logrich falls to 1.55, it is not possible to reject the hypothesis that inequality is correlated with slow per capita GDP growth only because it is correlated with rapid population growth. However it is also not possible to reject the hypothesis that the true coefficients with and without the population growth rate are the same. These results lend some support to the demographic explanation, and casts doubt on empirical work which excludes population growth.

Finally the basic specification is completed in column four

by the addition of the percent of workers employed in industry in 1965.

3) $gr6085 = c + ß\,logrich + \alpha_1 lgdp60 + \alpha_2 gpop6085 + \alpha_3 Slind65 + \varepsilon$

where lgdp60 is the log of per real per capita GDp in 1960. gpop6085 is the growth rate of population from 1960 to 1985 and Slind65 is the percent of workers employed in industry in 1965. The coefficient on Slind65 is expected to be positive as output of industry has grown more quickly than output of agriculture or services. In fact the coefficient is significant and positive. The inclusion of the percent of workers employed in industry has almost no effect on the coefficient on logrich casting some doubt on the demand side explanation. However percent of workers employed in industry is strongly negatively correlated with population growth and it is difficult to disentangle the two effects. The coefficient on logrich is similar if the percent of workers employed in industry is included and the population growth rate is excluded (results not shown).

The public education argument and the Persson and Tabellini model suggest that the negative correlation of inequality on growth can be explained if human capital investment is included as an explanatory variable. Column 5 of table III reports the effect of including the primary school enrollment rate in 1970 and the secondary school enrollment rate in 1970. The two variables are of course collinear, but the primary school enrollment rate is still strongly statistically significant. The R^2 jumps from 0.29 to 0.61 implying an F(2,47) statistic of 17.78 . Nonetheless the coefficient on logrich is -0.88 so it is reduced by only about one third of a standard error. This reflects the surprising fact that, once per capita GDP and the population growth rate are included, income inequality is not associated with low primary school enrollment. The ratio of the coefficient to the standard error of the regression rises slightly. If the point estimate is taken literally and it is assumed that the correlation of logrich with measured and unmeasured human capital accumulation are equal this implies that

for differences in human capital accumulation to explain the association of inequality with slow growth, differences in human capital accumulation would have to explain all of the variance in per capita GDP growth rates. It is quite difficult to reconcile this result with the public education explanation. Since school enrollment is perhaps a poor measure of human capital accumulation, the result could be reconciled with the Persson and Tabellini model. However it is difficult to explain why primary school enrollment should be such an excellent explanatory variable if it is poorly correlated with true human capital accumulation.

Column six of table III reports the virtually identical results obtained when enrollment in 1960 is used instead of enrollment in 1970. A Similar effect on the coefficient on logrich occurs when the student teacher ratio in primary and in secondary school are added to the regressions (results not shown). Similarly little effect occurs when the ratio of nominal government spending on education to nominal GDP averaged over 1970 to 1985 was used as an indicator of investment in human capital (results not shown)

In order to get some indication of the importance of political conflict in economic growth, the number of politically motivated strikes per year, riots per year and revolutions plus coups per year were included as additional explanatory variables. Only revolutions plus coups per year had a significantly negatively coefficient. The additional explanatory variables had almost no effect on the coefficient on logrich. This casts some doubt on the importance of the political conflict explanation. Of course the variables used are a poor measures of political conflict.

Finally the real investment in real GDP averaged over 1960 to 1985 was included as an additional explanatory variable. As expected it is positively associated with real per capita GDP growth. Again the effect on the coefficient on logrich is fairly small. The coefficient changes from -0.96 to -0.67 about one half of a standard error.

Since rapid growth may cause high investment these OLS

results may be partially caused by simultaneous equations bias. Any multiplier effects and/or capital mobility imply that positive shocks to growth cause high investment. This biases the coefficient on investment up and, given the negative partial correlation between inequality and investment, biases the coefficient on logrich up towards zero. In order to evaluate the importance of this problem I used the ratio of real investment to real GDP in 1960 which should not be (as strongly) affected by shocks to economic growth from 1960 to 1985. As expected the explanatory power of investment in 1960 is less than that of investment averaged over 1960 to 1985. The inclusion of the ratio of investment to GDP in 1960 actually increases the magnitude of the coefficient on logrich to -1.14.

Many of the OLS regressions reported in this paper are potentially effected by simultaneous equations bias. In each case this bias would lead to increased apparent success in explaining the association of income inequality and growth.

These results provide almost no evidence for the Alesina and Rodrik model and suggest that their explanation is not very important.

In order to test the allocation of talent model the percent of tertiary students concentrating in natural sciences and engineering in 1970 (sci70) and in 1980 (sci80) were included in separate regressions along with the other variables which were found above to be statistically significant. Since these data are available for only 43 and 37 of the 54 countries respectively additional regressions with the reduced sample but not including sci70 or sci80 were estimated. Oddly, with the small sample for which both allocation of talent and income distribution data were available, the coefficients on sci70 and on sci80 were negative (for the whole sample for which data were available the coefficients were positive but not statistically significant). The coefficients on logrich actually increased marginally when sci70 or sci80 were added to the regression (results not shown). There is no evidence in this data set that the negative association between inequality and growth is caused by the effect of inequality on the allocation of talent.

In a relatively direct approach to testing the Alesina and Rodrik and Persson and Tabellini theories, I attempt to include direct measures of the extent of government redistributive policies; the share of nominal government social insurance and welfare payments to nominal GDP (SOCSEC) Socsec is available for only 40 countries so a regression with the basic specification and the reduced sample are reported for comparison. The coefficient on logrich is actually increased slightly. Socsec is not significantly negatively associated with growth. Results are reported in table IV. The effort to find direct evidence that inequality is associated with slow growth because it is positively associated with government redistributive policies is completely unsuccessful. In order to test the unproduced wealth explanation the basic specification -- equation 3 -- was re-estimated with the percent of workers in industry in 1965 replaced by the percent of workers in agriculture in 1965. This caused a small reduction in the coefficient on logrich as reported in column two of table IV (results from a regression excluding the percent of workers in agriculture are reported in column one of table IV for comparison since the sample size is reduced by one). Finally, the log of the ratio of population to arable land in 1965 was added. The additional variable has large but imprecisely estimated positive coefficient. Inclusion reduces the coefficient on logrich to -0.21 with a t-statistic of -0.29 as is reported in column two of table IV. The negative association between income inequality and per capita GDP growth from 1960 to 1985 is essentially completely explained by the positive correlation of inequality and rapid population growth and a large role of agriculture in GDP in 1960. The null hypothesis that the expected values of the coefficients on logrich from this regression and from the simple regression with the same sample are the same is rejected by the data -- the difference is 2.63 times its standard error.

The striking effect of including the log of the ratio of population to agricultural land suggests that unproduced wealth is a mixed blessing as it diverts energies from productive activities to rent seeking. It is also possible that it merely

reflects the fact that land was a more important source of national income in 1960 than in 1985.

In any case it is disturbing that this variable is rarely used in the large comparative growth literature. It seems possible that, like the association of inequality and slow growth, many patterns in the data are the result of omitting this variable. It is also disturbing that the effect of Ladens65 on the coefficient on logrich is very small when Germany and Morocco are included in the regression (results not shown). This simply shows that with a small sample apparently statistically robust results can be created, or in this case eliminated, by one or two outliers.

In summary with one to three exceptions the additional explanatory variables which the various theories surveyed suggest should explain the association of income inequality and slow growth had only a small to tiny effect on the coefficient of interest. The exceptions are the rate of growth of population, the percent of workers employed in agriculture and especially the log of the ratio of population to agricultural land. This lends some support to the demographic explanation and to the unproduced wealth explanation.

The results of this exercise are difficult to interpret for at least three reasons. First the explanatory variables are often extremely poor measures of the phenomenon of interest e.g. political conflict. Second it is always impossible to reject the alternative hypothesis. The fact that the data do not demonstrate that the coefficient on the share of the rich are different when e.g. investment is or is not included in the regression does not mean that they are the same. Third the association to be explained is to weak to be convincingly reduced. In none of the regressions which include the population growth rate, is the coefficient on logrich statistically significant. This makes it difficult for any variable to cause a striking reduction in the magnitude of the coefficient. Given the large point estimate of the effect of inequality on growth this quite probably reflects the small sample size and poor data quality, although it is possible that the true association is too

small to be worth explaining. In any case little evidence for any of the theories but the demographic theory and the unproduced wealth theory is present in this data set.

The additional variables generally reduce the coefficient on Logrich approximately as predicted. This can be interpreted as implying that there each is true and each theory explains part of the association of inequality with slow growth. However this reduction is principally achieved by the inclusion of variables which have received little attention from theorists -- the growth rate of population and the ratio of population to agricultural land. The theoretically motivated addition of other variables reduces the coefficient on Logrich by at most 0.29 or less than one half of its standard error.

The results reported in tables III and IV suggest that the association between inequality and growth is due to the correlation of inequality and rapid population growth and large amounts of agricultural land per capita. This impression is shown to be false when economic growth from 1960 to 1980 is separated from economic growth from 1980 to 1985. Column one of Table V reports the coefficient on Logrich from the simple regression of the annual rate of growth of per capita GDP from 1980 to 1985 (gr8085) on logrich. The Correlation coefficient is 0.26 and the regression coefficient is -4.48, two and one half times as large as the coefficient estimated with growth from 1960 to 1985. This means that half of the apparent effect of inequality on growth from 1960 to 1985 is achieved in the 1980s. This striking fact is easily explained by the debt crisis theory, but not by any of the other theories. The change in the coefficient on logrich is statistically significant at the 5% level as is demonstrated by a regression of the difference of the two growth rates on logrich which gives a t-statistic of -3.31. Table V reports the coefficients of the growth rate of real per capita GDP from 1980 to 1985 and from 1960 to 1980 and of the difference of the two growth rates. In column one the coefficients from simple regressions are reported.

Column two of table V reports the fact that the addition of the log of per capita GDP in 1960, the growth rate of population

from 1960 to 1985, and the percent of workers employed in industry has almost no effect on the difference in the coefficients or the t-statistic of the difference. The difference in the two periods becomes much more striking as the ratio of the coefficients on Logrich estimated with the two different periods increases to 12.69. If taken literally this would imply that three fourths of the effect of inequality on growth over the whole period occurred from 1980 to 1985.

One obvious and uninteresting explanation of the change is that oil exporters have unequal income distributions and experienced high growth in the 70s and low growth in the 80s. As is reported in column 3 of table V the inclusion of an indicator variable for members of OPEC in addition to the variables used in the regression reported in column 2 does reduce the difference between the coefficients and the t-statistic. The test statistics remain significant at the 5% level however.

In contrast when additional indicator variables for Latin America and for Africa reduces the coefficient of gr8085 on logrich in half (or roughly two standard errors). The t-statistic becomes statistically insignificant. Indeed when only the indicator variables are included in the regression the coefficient of gr8085 on logrich is small and not statistically significantly greater than the coefficient of gr6080 on logrich.

The most striking feature of this data set is that Latin American countries, African countries and OPEC members have unequal income distributions and experienced slow economic growth from 1980 to 1985. The poor growth of OPEC countries in the early 80s has an obvious explanation. The poor growth of Latin American and African countries in the early 80s suggests that differences in experience of the debt crisis by countries with equal and unequal income distributions is an important part of the association of inequality and slow growth.

In the results reported above I used data from the whole sample or from 1960 to explain growth from 1980 to 1985 or to explain growth from 1960 to 1980. This made it easier to compare the two periods. Table VI reports the small effect of additional explanatory variables measured more recently on per capita GDP

growth from 1980 to 1985. The effects on the coefficient on logrich of adding explanatory variables analogous to those used regressions reported in table III and IV are small. This is problematic for theories other than the debt crisis theory.

A more direct test of the importance of the debt crisis in contributing to the association between inequality and slow growth is provided by including debt related variables in regressions explaining growth in the 80s. Berg and Sachs use a small cross sectional data base to demonstrate the strong association between income inequality and the debt export ratio in 1981 and between inequality and the rescheduling debt repayments (Berg and Sachs). Since a heavy debt burden and rescheduling debts are correlated with slow growth in the early 80s, the association between inequality and debt or rescheduled payments must help explain the association between inequality and slow growth. Columns 5 and 6 of table VII demonstrate the striking reduction of the coefficient on logrich caused by the inclusion of an indicator variable for rescheduled debt repayment. The coefficient fall roughly by half that is by approximately 1.4 standard errors. The null hypothesis that the expected values of the coefficients are equal is rejected against the one sided alternative that including the indicator variable reduces the coefficient since the test statistic is 2.02. Note that information on rescheduling (obtained from Berg and Sachs) was available along with income distribution data for only 18 countries. Column 4 reports the simple regression of gr8085 on logrich estimated with the reduced sample for comparison. Column 6 of table VII reports the similarly striking effect of including the debt export ratio in 1981. Table VII demonstrates the empirical importance of difficulties with debt in accounting for the association between inequality and slow growth.

V Conclusions

This paper has discussed a large variety of potential explanations for the fact that countries with unequal income distributions have achieved lower per capita GDP growth. Each

of the explanations suggests that the addition of explanatory variables measuring the proximate or root cause of slow economic growth would drive the apparent effect of inequality to zero. An extensive investigation along these lines finds modest to nonexistent evidence for all of the theories discussed with three striking exceptions.

An unequal distribution of income is correlated with rapid population growth which is correlated with slow per capita GDP growth. Each of these fact has been widely noted in the literature, and the result was known in advance. This paper simply provides an additional warning that population growth rates should not be ignored when attempting to explain differences in economic growth.

A low ratio of population to agricultural land is correlated with slow economic growth and with an unequal income distribution. These correlations are strong enough to eliminate the negative partial correlation of inequality and per capita GDP growth from 1960 to 1985. Again no interesting theory is needed to explain this stylized fact. The negative correlation land per capita and economic growth can be explained if land contributes a relatively constant amount to GDP and therefore proportionally more to per capita GDP in 1960 than in 1985. The positive correlation of land per capita and inequality can be explained if ownership of land is less equally distributed than ownership of other factors of production. While this explanation is not especially interesting, its apparent empirical significance means that it can not be ignored.

The strong association between inequality and difficulty with debt repayment in the early 1980s and the strong association between such difficulty and slow growth provides an explanation for the association between inequality and growth in at least an accounting sense. One can interpret this as simply implying that countries with unequal income distributions chose to postpone inevitable economic costs by borrowing. If one does so the lack of success in explaining the association between inequality and slow growth over the entire period remains problematic. The small effect of each additional explanatory variable accumulate

until the overall results are consistent with the view that each theory is true and the overall pattern is the result of the combination of many different effects. However the striking pattern of a weak association in the 60s and 70s and a strong association in the 80s largely accounted for by difficulties with debt repayment suggests that more attention should be focused on theories which predict specifically that countries with unequal income distribution accumulate heavy foreign debts and have difficulty repaying those debts.

Such theories emphasize the advantage of borrowing up to the maximum allowed by creditors if governments with sharply different aims alternate in power (Alesina and Tabellini 1988, Ozler and Tabellini 1991) or emphasize the opportunity and strong incentives which enable the rich to transfer their wealth abroad (Berg and Sachs 1988). The results of this paper suggest that such phenomena deserve more attention from economists attempting to understand the connection between inequality and economic growth and indeed from economists attempting to understand economic growth in general.

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Table I

Income Distribution Data for 54 Countries

	% income share of top 5%	year of survey		% income share of top 5%	year of survey
BENIN	32	59	FRANCE	25	62
CHAD	23	58	GERMANY*	33.7	64
GABON	47	60	GREECE	23	57
IVORY COAST	29	59	ITALY	24.1	48
MADAGASCAR	37	60	NETHERLANDS	23.6	62
MOROCCO*	20.6	65	NORWAY	15.4	63
NIGER	23	60	SWEDEN	17.6	63
NIGERIA	38.4	59	UNITED KINGDOM	19	64
SENEGAL	36	60	BARBADOS	22.3	51
SIERRA LEONE	33.8	68	COSTA RICA	35	69
SOUTH AFRICA	39.4	65	EL SALVADOR	33	65
SUDAN	17.1	69	JAMAICA	30.2	58
TANZANIA	42.9	64	MEXICO	28.8	63
TUNESIA	22.4	71	PANAMA	34.5	69
ZAMBIA	37.5	59	TRINIDAD AND TOBAGO	22.5	57
BURMA	28.2	58	UNITED STATES	14.8	69
INDIA	20	56	ARGENTINA	29.3	61
IRAQ	34	56	BOLIVIA	35.7	68
ISRAEL	11.2	57	BRAZIL	38.4	60
JAPAN	14.8	62	CHILE	22.6	68
KOREA	12.5	66	COLOMBIA	40.4	64
MALAYSIA	17.8	57	ECUDAOR	24.6	68
PAKISTAN	20	63	PERU	48.3	61
PHILLIPINES	27.5	61	SURINAM	15.4	62
SRI LANKA	18.4	63	VENEZUELA	23.2	62
DENMARK	16.9	63	AUSTRALIA	14.4	66
FINLAND	21	62	FIJI	21.4	68

Source Paukert (1973)
* Data from Germany and Morocco were not used as they are alleged to be inaccurate

Table II

Summary Statistics

	Mean	Standard Dev.	Max.	Min.	# obs.
rich	26.60	9.28	48.3	11.2	52
Logrich	3.22	0.36	3.88	2.42	52
gr6085	1.99	1.84	5.95	-2.83	52
gr8085	-0.68	3.16	5.09	-8.98	52
gr6080	2.65	1.85	6.54	-1.89	52
lgdp60	0.37	0.91	2.00	-1.57	52
lgdp80	0.90	1.03	2.43	-1.04	52
gpop6085	2.02	0.95	4.29	0.29	52
gpop8085	2.05	1.53	9.85	-0.03	52
gpop6080	2.01	1.02	4.39	-0.42	52
slind65	21.21	12.27	46.48	0.98	52
slind80	22.87	10.53	40.46	1.63	52
slagr65	47.48	26.36	95.24	3.40	52
slagr80	37.93	26.51	91.08	2.60	52
prim60	0.79	0.31	1.44	0.05	52
prim70	0.88	0.29	1.64	0.14	52
sec60	0.25	0.22	0.86	0.003	52
sec70	0.38	0.27	1.00	0.01	52
geetot	0.045	0.015	0.077	0.014	49
sengsci65	21.84	14.76	100.00	0.00	40
sengsci80	25.32	9.00	46.52	10.01	35
inv	19.60	7.55	36.91	7.00	52
inv60	18.89	9.52	45.70	1.43	52
inv80	20.60	9.24	50.06	1.71	52
socsec	5.61	5.60	19.14	0.03	38
revcoup	0.22	0.28	1.15	0.00	52
riot	1.03	1.77	9.46	0.00	52
strike	0.19	0.33	1.54	0.00	52
ladens65	4.54	1.46	7.41	0.88	51
ladens80	4.80	1.39	7.67	1.11	52
resc	0.56	0.51	1	0	18
detex	1.44	0.88	2.73	0.19	18

Source: see data appendix for definitions and sources.

Table III : Per-Capita GDP Growth 1960-85 and Income Inequality

	1	2	3	4	5	6	7	8
# obs	52	52	52	52	52	52	52	52
R-Squared	0.12	0.12	0.24	0.32	0.61	0.60	0.42	0.36
Constant	7.64	7.29	7.37	4.06	-0.76	-0.58	3.63	3.67
	(2.21)	(2.46)	(2.31)	(2.66)	(2.56)	(2.53)	(2.83)	(2.60)
logrich	-1.75	-1.66	-1.12	-0.96	-0.88	-0.75	-0.84	-1.11
	(0.68)	(0.75)	(0.73)	(0.70)	(0.59)	(0.61)	(0.72)	(0.69)
log(gdp60)		0.10	-0.28	-1.34	-2.27	-2.45	-1.64	-1.50
		(0.30)	(0.31)	(0.56)	(0.48)	(0.48)	(0.56)	(0.55)
Population			-0.82	-0.41	0.03	-0.09	-0.26	-0.33
Growth rate			(0.30)	(0.34)	(0.32)	(0.30)	(0.33)	(0.33)
% Employment in Industry '				0.11	0.10	0.08	0.13	0.10
				(0.05)	(0.04)	(0.04)	(0.05)	(0.05)
Primary School Enrollment '60						5.01		
						(0.93)		
Secondary School enrollment '60						1.48		
						(1.74)		
Primary School Enrollment '70					3.83			
					(0.78)			
Secondary School enrollment '70					2.58			
					(1.52)			
Investment % of GDP in 1960								0.05
								(0.03)
Revolutions and coups							-2.01	
							(0.94)	
Riots							-0.05	
							(0.14)	
Strikes							-0.37	
							(0.94)	
beta/S	-1.01	-0.94	-0.68	-0.60	-0.72	-0.60	-0.55	-0.72
test 1		0.35	1.58	1.84	1.46	1.65	1.70	1.41
test 2	-1.84	-1.64	-0.65		0.15	0.40	0.34	-0.87

Standard errors in parentheses. S is the standard error of the regression. Description of Test statistics in text. For definitions of variables and sources see data appendix.

Table IV : Per-Capita GDP Growth 1960-85 and Income Inequality

	1	2	3	4	5
# observations	51	51	51	38	38
R-Squared	0.24	0.34	0.39	0.57	0.58
Constant	7.35	8.76	5.06	3.70	3.84
	(2.34)	(2.26)	(3.02)	(3.51)	(3.55)
logrich	-1.12	-0.59	-0.21	-1.39	-1.42
	(0.73)	(0.72)	(0.73)	(0.74)	(0.75)
log(gdp60)	-0.26	-1.83	-1.42	-2.09	-2.05
	(0.32)	(0.65)	(0.68)	(0.58)	(0.59)
Population Growth rate	-0.82	-0.51	-0.46	-0.38	-0.45
	(0.30)	(0.31)	(0.30)	(0.36)	(0.39)
% Employment in industry '65				0.05	0.06
				(0.05)	(0.05)
Primary School Enrollment '60				3.87	4.00
				(1.20)	(1.23)
Secondary School enrollment '60				1.49	1.16
				(2.03)	(2.14)
log of population per square Km '65			0.33		
			(0.18)		
% Employment in agriculture '65		-0.06	-0.05		
		(0.02)	(0.03)		
Social insurance & welfare % of GDP					-0.03
					(0.06)
Beta/S	-0.67	-0.37	-0.14	-1.21	-1.22
Test 1		2.36	2.97		
Test 2		1.63	2.45		

Standard errors in parentheses. Dependent variable is average percent growth rate of per capita real GDP from 1960 to 1985. Beta is the coefficient on Logrich. S is the standard error of the regression. Test 1 compares this coefficient with the coefficent of the simple regression. Test 2 compares this coefficient with the coefficient in column 1. For definitions of variables and sources see data appendix.

Table V

Comparison of the Association between Inequality and

GDP growth from 1960 to 1980 and from 1980 to 1985

Dependent Variable	1	2	3	4	5
1960/1980	-1.07	-0.26	-0.48	-0.22	-0.01
	(0.71)	(0.75)	(0.77)	(0.89)	(0.91)
1980/1985	-4.48	-3.71	-3.37	-1.83	-1.69
	(1.07)	(1.11)	(1.12)	(1.28)	(1.30)
1985/1980-1980/1960	-3.41	-3.45	-2.89	-1.60	-1.71
	(1.03)	(1.14)	(1.12)	(1.30)	(1.25)
	[-3.31]	[-3.02]	[-2.58]	[-1.23]	[-1.36]

Standard errors in parentheses. t-statistics in square brackets. Coefficients of real per-capita GDP growth on the log of the income share of the richest 5% are reported. 1985/1980-1980/1960 is the the growth rate of per capita GDP from 1980 to 1985 minus the growth rate from 1960 to 1980. Other definitions and data sources are described in the data appendix.

1. the regressions also include a constant
2. the regressions also include a constant the log of real per capita GDP in 1960, the percent of workers employed in industry in 1965, and the growth rate of population from 1960 to 1985.
3. the regressions also include a constant the log of real per capita GDP in 1960, the percent of workers employed in industry in 1965, the growth rate of population from 1960 to 1985, and an indicator variable for member of OPEC.
4. the regressions also include a constant the log of real per capita GDP in 1960, the percent of workers employed in industry in 1965, the growth rate of population from 1960 to 1985, an indicator variable for member of OPEC, an indicator for African, and an indicator for Latin American.
5. the regressions also include a constant an indicator variable for member of OPEC, an indicator for African, and an indicator for Latin American.

Table VI

Per-Capita GDP Growth 1980-85 and Income Inequality

	1	2	3	4	5	6	7	8
# obs	52	52	52	52	52	52	52	51
R-Squared	0.26	0.26	0.27	0.28	0.46	0.29	0.55	0.41
Constant	13.76	12.95	12.36	11.78	3.91	11.15	12.73	0.95
	(3.47)	(4.01)	(4.10)	(4.28)	(4.45)	(4.34)	(3.82)	(5.30)
logrich	-4.48	-4.28	-3.91	-3.95	-3.30	-3.98	-3.84	-3.12
	(1.07)	(1.19)	(1.28)	(1.30)	(1.19)	(1.30)	(1.14)	(1.23)
log(gdp80)		0.17	0.05	-0.28	-2.81	-0.65	-0.90	2.23
		(0.41)	(0.44)	(0.78)	(0.95)	(0.87)	(0.67)	(1.17)
Population Growth rate			-0.24	-0.18	0.11	-0.26	-0.65	-0.38
			(0.31)	(0.33)	(0.38)	(0.34)	(0.28)	(0.36)
% Employment Industry '80				0.04	0.08	0.03	0.05	
				(0.08)	(0.07)	(0.08)	(0.07)	
Primary School Enrollment '70					4.21			
					(1.92)			
Secondary School enrollment '70					7.59			
					(3.01)			
Investment % of GDP 1980						0.05		
						(0.05)		
Revolutions & coups							-6.46	
							(1.42)	
Riots							0.15	
							(0.22)	
Strikes							0.71	
							(1.35)	
Employment in Agriculture '80								0.10
								(0.05)
Log Pop per sq km '80								0.72
								(0.31)
Beta/S	-1.63	-1.55	-1.41	-1.41	-1.34	-1.42	-1.68	-1.16

Standard errors in parentheses. S is the standard error of the regression. For definitions of variables and sources see data appendix.

Table VII

Per-Capita GDP Growth 1980-85 and Income Inequality

	1	2	3	4	5	6
# observations	52	52	52	18	18	18
R-Squared	0.26	0.28	0.45	0.26	0.54	0.57
Constant	13.76	11.78	5.72	12.71	7.13	10.17
	(3.47)	(4.28)	(4.15)	(5.72)	(5.01)	(4.59)
logrich	-4.48	-3.95	-1.81	-4.14	-1.79	-2.43
	(1.07)	(1.30)	(1.34)	(1.76)	(1.63)	(1.48)
log(gdp80)		-0.28	0.34			
		(0.78)	(0.49)			
Population Growth rate		-0.18	0.52			
		(0.33)	(0.38)			
% Employment in Industry '80		0.04				
		(0.08)				
OPEC member			-5.17			
			(1.77)			
Latin America			-2.72			
			(0.98)			
Africa			-2.70			
			(1.32)			
Rescheduled debts					-3.65	
					(1.21)	
Debt export ratio 1981						-2.09
						(0.64)
Beta/S	-1.63	-1.41	-0.72	-1.51	-0.80	-1.12
Test					1.83	1.42

Standard errors in parentheses. Beta is the coefficient on Logrich. S is the standard error of the regression. Test compares this coefficent to the coefficient in the simple regression. Dependent variable is average percent growth rate of per capita real GDP from 1980 to 1985. For definitions of variables and sources see data appendix.

Appendix

Data Sources and Definitions

"Income Distribution and Economics Growth In a Cross Section of Countries," Waldmann, Robert J (1992)

This appendix is an edited version of Barro and Wolf (1989) which describes the data set used in Barro (1991).

The data are listed alphabetically.

B&W is the Data Appendix For Economic Growth In a Cross Section Of Countries, Barro, Robert J and Wolf Holger C (1989) . Used in Barro (1991) "Economic Growth in a Cross Section of Countries," Quarterly Journal of Economics vol CVI (May 1991).

HS88 is Heston A. and Summers R. (1988) "A New Set of International Comparisions of Real Product and Price Levels: Estimates for 130 Countries" ; The Review of Income and Wealth, 34, March 1988 , 1-25 (Dataset on Floppies) <Includes Corrections for Brazil and Indonesia>

HS91 is Heston A. and Summers R. (1991) "The Penn World Table (Mark V) An Expanded Set of International Comparisons, 1950-1985." data on diskette as described in the Quarterly Journal of Economics vol 106 pp 327-368.

SID is Social Indicators of Development data on diskette published by the World Bank.

B&S is Berg Andrew and Sachs Jeffrey (1988) "The Debt Crisis: Structural Explanations of Country Performance," Journal of Development Economics vol 29 pp 271-306.

Paukert Paukert, F (1973) "Income Distribution at Different Levels of Development," International Labour Review August September.

AFR is a dummy for Sub-Sahara Africa. The source is B&W

DETEX is the debt export ratio in 1981. The source is B & S

GEETOT is the average from 1970 to 1985 of the ratio of nominal government expenditure on education to nominal GDP. The source is B&W

GPOPxxyy is the growth rate of population from 19xx to 19yy. The source is HS88 via B&W

GRxxyy is the growth rate of per capita GDP from 19xx to 19yy. The source is HS88 via B&W

INV is the average from 1960 to 1985 of the ratio of real domestic investment (private plus public) to real GDP in percent. The source is HS88 via B&W

INVxx is the ratio of real domestic investment (private pus public) to real GDP in percent. The Source is HS91.

LA is a dummy variable for Latin America. The source is B&W

LADENS is the natural logarithm of population per square kilometer of arable land. The source is SID

LGDPxx is the natural Logarithm of GDP per capita in real terms in 19xx. The source is HS88 via B&W

LOGRICH is the natural Logarithm of income share of richest 5%. The source is Paukert (1973).

OIL is a dummy for OPEC member. The source is B&W

POLRIGH is an index of political rights.(1=highest, 7=lowest). The source is B&W

PRIMxx is the ratio of total students enrolled in primary education to estimated number of individuals in the age bracket 6-11 years in 19xx. The source is B&W

RESC is a dummy variable indicating country rescheduled debt repayment during the period 1982-87. The source is B&S

REVCOUP is the number of revolutions and coups per year (1960-85).The source is B&W

RIOT is the number of Riots per year (1960 to 1985). The source is B&W

SECxx is the enrollment ratio for secondary education in 19xx . Constructed as ratio of total students enrolled in secondary education to estimated number of individuals in the age bracket 12-17 years. The source is B&W

SLINDxx is the percent of employment in industry in 19xx. The source is SID.

SLAGRxx is the percent of employment in Agriculture in 19xx. The source is SID.

SOCSEC is the ratio of nominal social insurance and welfare payments to nominal GDP in percent. Average 1970 to 1985. The source is B&W.

STRATPR is the student teacher ratio in primary schools in 1960. The source is B&W

STRATSEC is the student teacher ratio in secondary schools in 1960. The source is B&W

STRIKE is the number of policially motivated strikes per year.(1960 to 1985)The source is B&W.'

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