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How Macroeconomic Factors Affect Income Distribution: The Cross-Country Evidence

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Abstract

This study develops a cross-section empirical framework to examine the relationship between the macroeconomic environment and trends in income distribution. The macroeconomic variables that are found to be associated with an improvement in income distribution are higher growth rate, higher income level, higher investment rate, real depreciation (especially for low-income countries), and improvement in terms of trade. The estimated significant effects of growth, income, and investment provide evidence that policies designed to promote investment and growth are likely also to contribute to an improvement in income distribution.

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SUMMARY

The effects of macroeconomic factors on income distribution are of major concern to economists and have critical policy implications. Surprisingly, despite the fact that income distribution is one of the most investigated issues in economics, very few studies have looked at the direct link between macroeconomic factors and income inequality.

This study examines, in a cross-section empirical framework, the relationship between the macroeconomic environment and trends in income distribution. It aims at identifying the macroeconomic variables that significantly affect trends of income distribution and at estimating the magnitude of these effects. The macroeconomic variables examined include both policy variables (such as public expenditure and inflation) and variables that are considered to be exogenous (such as changes in the terms of trade). In addition, a set of demographic indicators that are likely to affect income distribution is also included in the analysis.

The macroeconomic variables that are found to have a significant negative effect on changes in income inequality (that is, are associated with an improvement in income distribution) are higher growth rate, higher income level, higher investment rate, real depreciation (found to be more important in the case of low-income countries), and improvement in terms of trade. Macroeconomic variables found to have no significant effect on changes in income distribution are inflation (including level, variability, and rate of change), public consumption, external position (both levels and changes), level of the real exchange rate, and the price ratio of investment/consumption goods.

The estimated significant effects of growth, income, and investment provide evidence that policies designed to promote investment and growth are likely also to contribute to an improvement in income distribution. This result is particularly important given the wide-spread perception of a possible trade-off between growth and equity. Not only do we not find evidence of such a trade-off, but our results strongly suggest that the less fortunate segments of the population benefit relatively more from economic growth.

I. INTRODUCTION

The effects of macroeconomic factors on income distribution are of major concern to economists and have critical policy implications. Income distribution is not only a natural policy target by itself, but it can also be viewed as an important factor affecting long-run growth.[2] Both the positive and the normative questions associated with income distribution and its relationship to macroeconomic developments are fascinating. Uncovering this relationship can provide policy makers much needed information for the decision-making process. Furthermore, it can provide better understanding of the political economy forces that shape the debate on macroeconomic policy. Given the importance of these questions, it is surprising that little empirical work has been done on this topic.

Using recently assembled databases that cover a large number of countries, such as the Summers and Heston (1991) database, numerous cross-country studies analyzed the macroeconomic determinants of economic growth.[3] In general, these studies conclude that

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[2]For example, Galor and Zeira (1993) show that in the presence of credit markets' imperfections and indivisibilities in investment in human capital, the initial distribution of wealth affects aggregate output and investment both in the short run and in the long run. Alesina and Rodrik (1994) present a theoretical model which implies that income inequality affects growth negatively, through the following channel: (i) income (and wealth) inequality causes the tax rate to go above its optimal level (because the median voter gains from the redistributive effects of a higher tax rate if the degree of inequality is large); and (ii) a higher-than-optimal tax rate reduces investment and growth. Alesina and Perotti (1996) find empirical evidence that income inequality affects growth negatively, through the following channel: (i) income inequality, by fueling social discontent, increases socio-political instability; and (ii) socio-political instability, by creating uncertainty in the politico-economic environment, reduces investment and growth. Bruno, Ravallion, and Squire (1996) find that initial distribution of assets and income affects subsequent growth; high inequality countries have lower growth and remain inegalitarian, whereas low inequality countries remain egalitarian and achieve rapid poverty reduction from the process of growth. Deininger and Squire (1997) review empirical research done by them using their new data set (described in Deininger and Squire (1996)) and conclude that there is evidence of a negative link between initial income inequality and subsequent growth. Schmidt-Hebbel and Serven (1996), on the other hand, find that cross-country data do not reveal any strong association between income distribution and saving ratios (after controlling for other saving determinants).

[3]Renowned examples of this line of work include Barro (1991) and Fischer (1993); now, this literature is very voluminous.

macroeconomic factors are important determinants of growth.[4] Many other studies looked at the effect of growth on income distribution. Here, the results are more mixed. Earlier studies usually found evidence of a Kuznets curve, in which income inequality first increases and later decreases with the average level of income. However, recent studies concluded that there is no evidence of a strong relationship between income level and income inequality.[5]

Although income distribution is one of the most studied issues in economics, very few studies have examined the direct link between macroeconomic factors and income inequality. Some of them have examined specific macroeconomic factors, such as inflation or terms of trade.[6] Other studies have focused on a small group of countries (or one country only), in the context of time-series or case-study methodology.[7] These two types of studies, in their focus on one issue or one country in relative depth, made an important contribution and their value

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[4]Fischer (1993), for example, shows that growth is negatively associated with inflation, large budget deficits, and distorted foreign exchange markets. He also finds evidence that the causation runs from macroeconomic policy to growth. For example, inflation reduces growth by reducing investment and productivity growth.

[5]Some notable examples are Bruno, Ravallion, and Squire (1996), and Deininger and Squire (1997). Fishlow (1995), however, argues that a complete dismissal of the original Kuznets parabolic relationship between inequality and income may be in error. Milanovik (1994) finds that inequality is lower in richer countries not only because of structural factors (such as employment and rural-urban compositions), but also because the importance of social-choice factors (such as income redistribution and employment policies) increases as the level of income rises.

[6]Typical examples are Bulir and Gulde (1995) and You and Dutt (1996). Bulir and Gulde (1995), using both pooled cross country and single country time series models, find that the level of inflation, inflation variability, and the variability of the nominal exchange rate have a negative impact on overall income equality. You and Dutt (1996) examine the effect of government debt on income distribution in a post-Keynesian framework, and find that it depends on the circumstances under which government debt rises.

[7]Examples of this kind of studies include Blejer and Guerrero (1988), Cole and Towe (1996), and Razin and Sadka (1996). Blejer and Guerrero (1988) looked at the experience of the Philippines in the 1980s and found that underemployment, inflation, and government expenditure are strongly regressive, while a depreciation of the exchange rate tends to reduce inequality. Cole and Towe (1996) examine the factors underlying the rise in U.S. income inequality since the mid-1970s. Their results suggest that the increase in income inequality has not been related to macroeconomic developments, but mainly to developments in labor markets, technology, and demographics. Razin and Sadka (1996) show, in the context of the Israeli experience, that inflation results in a high tax burden on workers and a low tax burden on the business sector (capital owners and self-employed).

in providing real-life examples cannot be disputed. However, the shortcomings of their approaches are apparent. Focusing on one particular issue without properly controlling for other macroeconomic effects—given the complex relationships and high correlations existing between macroeconomic developments—can lead to inaccurate and misguiding results. Also, drawing conclusions and policy implication on the basis of one case study—given that data on income distribution are notoriously infrequent, imprecise and irresolute—is equally troublesome. In particular, the sparse number of observations and their high serial correlation makes a time series analysis in the context of one country extremely difficult, and the small number of degrees of freedom radically limits the number of macroeconomic variables a researcher can include in the analysis.

The purpose of this study is to examine, in a cross-section empirical framework, the relationship between the macroeconomic environment and trends in income distribution. It aims to identify the macroeconomic variables that have significant effects on trends of income distribution, and to estimate the magnitude of these effects. The macroeconomic variables examined in this study include both policy variables (such as public expenditure and inflation) and variables that are considered to be exogenous (such as changes in the terms of trade). A set of demographic indicators (which are likely to affect income distribution) is also included in the analysis.

The framework of analysis used in this study is designed to examine the effects of macroeconomic factors on income inequality, and not the reverse effects of income distribution on macroeconomic variables.[8] This study, by concentrating on cross-country evidence, is necessarily restricted to variables that are widely available and can easily be compared across countries, and the choice of factors to be included in the analysis is largely governed by their availability in an existing well-known database. There are, however, additional factors that can affect trends in income distribution, such as the composition of social expenditure, including expenditure on education, health, and social insurance.[9] The possibility of expanding the empirical framework to include additional variables is discussed again in the concluding section.

Section II examines the current state of knowledge in this area; Section III describes the two data sets used in this study and their integration; Section IV presents the estimation procedure; Section V discusses the main results of the study and their policy implications; and Section VI concludes.

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[8]As discussed, for example, by Alesina and Perotti (1996).

[9]The effects of some of these variables are examined by Clemens (1996), in the context of a case study of Brazil.

II. THE CURRENT STATE OF KNOWLEDGE

The current state of knowledge regarding the relationship between macroeconomic developments and income distribution is poor. As mentioned already, the previous empirical work in this area is limited. In addition, the existing theoretical work—probably reflecting the dominance of models with representative agents, in which income distribution issues are either peripheral or nonexistent—is scant, and usually restricted to only several variables.

To exemplify this point, we conducted a short survey of several highly qualified economists working in an international financial institution. The economists were asked about the probable ceteris paribus effect of several macroeconomic variables on income distribution. Eight economists responded to the survey. The list of variables and the answers of the eight economists is presented in Table 1. The table shows that, with the notable exception of inflation, there is no much agreement between the economists, despite their common academic backgrounds and their similar job experience.

The policy advice offered by most economists usually focuses on the notion that macroeconomic stability, in addition to its valuable effect on growth, may have a beneficial effect on income distribution. The arguments routinely presented are that the less affluent segments of the society are more vulnerable to inflation and macroeconomic instability, because: (i) their income is often defined in nominal terms and they do not have access to financial instruments such as indexation or hedging; (ii) tax systems' brackets typically do not keep up with inflation and become less progressive; and (iii) the inflation tax falls on money holders in a regressive way. These arguments, however, are not fully persuasive.

First, it is easy to raise counter-arguments, such as: (i) the segments of the population that have their income defined in nominal terms are usually more middle class than poor because the poor segments (especially in developing countries) are concentrated in agriculture and receive in-kind income; this "nominal illusion", in addition to reducing real wages, presumably also increases employment, which may benefit income distribution; (ii) the "creeping" of the tax systems' brackets also increases real after-tax wage income and reduces after-tax capital gains and interest income (assuming they are taxed on a nominal basis), which may actually improve income distribution; (iii) there is not much evidence that the elasticity of money holdings with respect to income is significantly below unity; therefore, inflation tax is not necessarily regressive; and there is also a counterpart to the inflation tax, namely increased revenues and increased public expenditure, which usually benefits more the low-income segments of the population.

Second, it is possible to argue that unexpected inflation benefits debtors and penalizes creditors, because most debt contracts are in nominal terms. This will have, of course, an equalizing effect on income distribution and especially on wealth distribution.

Table 1. Results of a Survey of Eight Economists:
Distribution of Answers Regarding Effects on Income Distribution

	Reduces Income Inequality	No Significant Effect	Increases Income Inequality
Growth rate of GDP per person	5	1	2
Improvement in terms of trade	4	2	2
Level of the real exchange rate	3	4	1
Change in the real exchange rate	3	3	2
Pi/Pc	4	1	3
External position	1	4	3
Change in external position	2	4	2
Investment rate	4	1	3
Government expenditure	5	1	2
Level of inflation	0	0	8
Instability of inflation	1	0	7
Change in inflation	1	1	6

Notes: (i) Two control variables that were also mentioned in the survey are the population growth rate and the change in the percent of population under 15; (ii) the level of the real exchange rate is defined as domestic prices relative to foreign prices; (iii) Pi/Pc is the ratio of investment/consumption prices, compared to other countries; (iv) external position is defined as net exports as percent of GDP; (v) investment rate is defined as percent of domestic absorption $(I/(C+I+G))$; (vi) government expenditure is defined as percent of domestic absorption $(G/(C+I+G))$; and (vii) the instability of inflation is defined as the average absolute change from one year to the next.

Third, it is also possible to claim that, in regard to its policy effects on income distribution, the question of maintaining low inflation is of secondary importance compared with the question of implementing inflation stabilization programs. For example, even if higher inflation has a detrimental effect on income distribution in the longer term, it is not clear that reducing inflation from a high to a low level is beneficial (in terms of its net present value), given the fact that the reduction in inflation is usually associated with cuts in fiscal expenditure, including social programs.

A different argument that sometimes is raised by the proponents of low inflation as a tool to improve income distribution is the indirect link through growth. The argument is that

lower inflation will contribute to growth,[10] higher growth rates will increase the per capita income level, and the higher income level will be beneficial for income distribution (because richer countries generally have a more equal distribution of income). This argument, however, can also be assaulted, at least on two counts: (i) the short- vs. long-term argument: a more equal distribution in the long term may be less valuable (in net present value) than immediate spending on social programs, which may have an equalizing effect in the short term; and (ii) assuming the Kuznets' hypothesis is true, growth in poor countries may actually increase income inequality, at least up to a certain income point.[11]

The purpose of the discussion above is to illustrate the great difficulty of drawing clear-cut theoretical conclusions about macroeconomic effects on income distribution. It is important to note that the discussion focused on inflation and its impact on income distribution, a topic on which there is at least some agreement among economists. The effects of other macroeconomic variables, such as real exchange rates or external position, are probably even more difficult to anticipate and their impact on income distribution is even more controversial.

In the absence of a generally accepted theory which incorporates a general equilibrium model with nonrepresentative agents and nominal rigidities, arguments on the effects of macroeconomic policy on income distribution are likely to focus on the relative strengths of several simultaneous impacts. In other words, they are likely to focus on coefficients estimated in empirical studies.

III. THE DATA

This study uses a large cross-country database with two types of data: income distribution variables and macroeconomic and demographic variables. As no such database existed, we had to construct it, using two principal sources. The source for the income distribution data is the Deininger-Squire database, presented by Deininger and Squire (1996). The source for the macroeconomic and demographic variables data is the latest available version (5.6) of the Penn World Tables (PWT), described by Summers and Heston (1991) and updated by the National Bureau of Economic Research. Naturally, many issues arise in the process of assembling large databases from different sources. Therefore, the resulting database is, to a certain degree, dependent on specific assumptions and judgments. The rest of this section describes the blending of the two types of data.

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[10]See, for example, Sarel (1996), which contains further references.

[11]See Kuznets (1955, pp. 7-8).

A. The Income Distribution Data

Deininger and Squire (1996) present a new data set on inequality in the distribution of income. They assembled it starting with the full set of all measurements of income distribution mentioned in the literature (more than 2600), and, after scrutinizing them to filter out the observations that are not "high quality," were left with 682 observations (for 108 countries).[12] The filtering involved identifying the primary source of the data and subjecting the survey's methodology to a strict set of standards:

- Observations had to be based on household surveys (and not, for example, on information inferred from national accounts, using questionable assumptions).

- The surveys had to cover all the population (and not be restricted only to taxpayers or to urban population).

- The measures of inequality had to be based on comprehensive coverage of all income sources (and not exclude nonmonetary income or nonwage earnings).

Each income distribution data point in the sample is summarized by one single number, the Gini coefficient.[13] However, different observations in the sample cannot be easily compared, because the household surveys that generate the data on income distribution did not use a consistent methodology. Fortunately, Deininger and Squire define the major possible sources of differences in the methodologies and identify the specific methodology used for each observation. The two major differences are the recipient unit (household or personal) and the type of income (gross income, net income, or expenditure). The particular methodology used in a survey has, of course, a large impact on the measured Gini coefficient. For example, the Gini coefficients reported by surveys that used net income are likely to be significantly lower than those reported by surveys that used gross income.

The two types of methodological differences (recipient unit and type of income) generate six types of observations: personal/expenditure, personal/net income, personal/gross

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[12]We are grateful to Klaus Deininger for kindly supplying us the full database.

[13]The Gini coefficient, although not a perfect tool, is a relatively good summary indicator of income inequality (for a discussion on the merits and drawbacks of using the Gini indicator, see Deininger and Squire (1996, p. 567)). However, in addition to the issues of choosing the right inequality indicator, there are more fundamental questions regarding the concept of inequality in general. For example, Kusnic and Davanzo (1986) show that measured inequality is overstated, because it includes only market activities. Including nonmarket activities, such as leisure, lowers inequality. Fukushige (1996) discusses the difference between cross-section income inequality and life-time income inequality. These fascinating issues are beyond the scope of the present study.

income, household/expenditure, household/net income, and household/gross income. In general, because it is difficult to obtain an accurate estimate of the systematic differences across the six types of observations, it is best to restrict comparisons across data points to observations that are of the same type.

There are, of course, other methodological differences across surveys, in addition to the two identified by Deininger and Squire. This is especially true for surveys in different countries, but these differences are likely to be less important in surveys conducted across time, in a particular country. Although there is no perfect solution for this problem, using only one type of survey for each country and restricting cross-country comparisons to changes (as opposed to levels) of income distribution, should go a long way toward addressing these problems.[14]

Starting with the 682 observations defined by Deininger and Squire as "high quality" we perform another set of selections. First, we check for inconsistent or insufficient definitions of the categories, and we find one observation defined as "gross" and "expenditure" (probably a mistake) and 20 observations that do not contain precise information on the type of income (gross or net). Our sample is therefore reduced to 661 observations. Second, we filter out the observations for which we do not have sufficient macroeconomic data in the PWT database, and we are left with 594 observations. Third, we take out the countries that contain less than three observations or that span a period of less than a few years.[15] This leaves us with 505 observations. Fourth, in case several types of observations exist for different surveys in the same country, the type with the largest number of observations is retained, and the others are filtered out.[16] This leaves us with 489 observations (for 52 countries). The fifth (and last) step is to filter out the countries which had a socialist economy.[17] There are 7 socialist countries, and we are left with 45 countries spanning 425 observations.

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[14]Comparing changes in Gini coefficients measured by one type of survey for each country is clearly better than the alternatives. However, it still implies some strong assumptions. For example, this comparison assumes that a change of one percentage point in the Gini generated by a "personal/expenditure" type of survey is comparable to an identical change in the Gini generated by a "household/gross income" type of survey.

[15]The particular minimal number of years required can be anywhere between 5 and 9, without affecting the resulting sample.

[16]In case two survey types have the same number of observations, we keep the type that spans a longer period.

[17]In principle, it may be interesting to look also at the socialist countries. However, it is probably not a good idea to pool them together with the other countries. Both during the socialist period and the post-socialist reforms, these countries suffered from very special shocks. Including them in the sample is likely to distort the results.

Because we wish to concentrate on the cross-section dimension, we need to estimate the rate of change in income distribution, in each country, during the sample period (which may differ across countries). To do this, we perform an OLS regression for each of the countries, regressing the Gini coefficient on a constant term and on the year of the observation (as a time variable). We use the estimated year coefficient as the annual rate of change in the Gini coefficient. As a result, we obtain a set of 45 observations on the annual rate of change in the Gini coefficient (52 when including the socialist countries).

The set of observations on annual rates of change in income inequality is described in the last column of Table 2, with a negative number representing a decrease in the Gini coefficient (an improvement in the distribution of income over the period). The table also reports the period, the number of observations, the average Gini coefficient during the period, and the "adjusted" Gini. The "adjusted" Gini is obtained according to a procedure described in the Appendix, and its purpose is to create a measure of income inequality that is roughly consistent across the 6 types of observations and across socialist and nonsocialist countries. The adjustment creates a measure that is equivalent to observations based on personal/expenditure surveys in a nonsocialist country.[18]

B.   The Macroeconomic and Demographic Data

The PWT database is used to assemble a large set of macroeconomic and demographic variables, to match the income distribution data presented in Table 2. For each country, we calculate its matching set of variables during the specific sample period for which income distribution data are available. This set includes the following macroeconomic and demographic variables:

Macroeconomic variables

- *ly*, the logarithmic average of income per person during the sample period, in 1985 international dollars (adjusted for purchasing power parity).

- *growth*, the average growth rate of real income per person during the period, in percent per annum.

- *eff_tot*, the net effect of changes in terms of trade during the period on the growth rate of real income per person during the period, in percent per annum; it is calculated using the PWT data on real income per person and on real income per person adjusted for changes in terms of trade.

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[18]Interpreting the adjusted Gini from Table 2 for a socialist country is a little intricate. The variable measures the amount of inequality that we would expect in such a country, if it was not a socialist country. The actual (unconditional) inequality can be derived by subtracting 17.8 points from the adjusted Gini.

Table 2. The Data Set of Changes in Income Distribution

Country	Soc	Start	End	Obs	Gini Avg	Inc Net	Inc Grs	HH	Gini Adj	Chg Gini
Australia	0	1969	1990	9	37.88	0	1	1	30.04	0.3467
Bahamas	0	1977	1986	3	47.16	0	1	1	39.32	0.0048
Bangladesh	0	1963	1986	8	36.00	0	1	1	28.16	0.0453
Belgium	0	1979	1992	4	27.01	1	0	1	24.27	-0.1022
Brazil	0	1960	1987	8	56.21	0	1	1	48.37	0.0281
Bulgaria	1	1980	1992	12	23.90	0	1	0	34.08	0.1102
Canada	0	1951	1991	23	31.27	0	1	1	23.43	-0.0567
China	1	1980	1992	12	32.68	0	1	0	42.86	0.7958
Colombia	0	1970	1988	5	52.65	0	1	1	44.81	-0.0463
Costa Rica	0	1961	1983	5	47.28	0	1	1	39.44	-0.1109
Czechoslovakia	1	1965	1988	9	21.19	1	0	0	44.95	-0.0920
Denmark	0	1981	1992	3	32.45	0	1	1	24.61	0.2063
Dominican Republic	0	1976	1992	3	45.76	0	1	0	38.15	0.2500
Egypt	0	1959	1975	3	40.00	0	0	1	41.88	-0.2449
Finland	0	1977	1991	10	30.04	1	0	1	27.31	-0.3762
France	0	1956	1984	7	43.11	0	1	1	35.27	-0.5771
Germany	0	1973	1984	5	31.37	0	1	1	23.53	0.0811
Greece	0	1974	1988	3	34.53	0	0	1	36.41	0.0057
Hong Kong	0	1971	1991	7	41.58	0	1	1	33.74	0.2144
Hungary	1	1972	1991	6	24.17	1	0	0	47.93	0.3413
India	0	1951	1992	31	32.55	0	0	0	32.55	-0.0993
Indonesia	0	1964	1990	10	33.67	0	0	0	33.67	0.0187
Iran	0	1969	1984	5	43.23	0	0	0	43.23	-0.0314
Ireland	0	1973	1987	3	36.31	1	0	1	33.58	-0.2921
Italy	0	1974	1991	15	34.93	1	0	1	32.20	-0.3724
Japan	0	1962	1990	23	34.82	0	1	1	26.98	-0.0232
Korea, Republic of	0	1965	1988	11	34.52	0	1	1	26.68	0.1295
Malaysia	0	1970	1984	5	50.76	0	1	1	42.92	-0.1700
Mexico	0	1950	1977	6	54.80	0	1	1	46.96	0.0207
Netherlands	0	1975	1991	12	28.59	1	0	1	25.86	0.1097
New Zealand	0	1973	1990	12	34.36	0	1	1	26.52	0.4917
Norway	0	1962	1991	9	34.21	1	0	1	31.48	-0.2218
Pakistan	0	1969	1988	8	31.55	0	0	1	33.43	0.0814
Panama	0	1979	1989	3	50.90	0	1	0	43.28	0.8616
Philippines	0	1957	1985	5	48.53	0	1	1	40.69	-0.0617

Table 2. The Data Set of Changes in Income Distribution (concluded)

Country	Soc	Start	End	Obs	Gini Avg	Inc Net	Inc Grs	HH	Gini Adj	Chg Gini
Poland	1	1978	1991	13	24.77	0	1	0	34.95	0.1777
Portugal	0	1973	1990	3	38.05	1	0	1	35.31	-0.2096
Puerto Rico	0	1969	1989	3	51.11	0	1	1	43.27	-0.0730
Singapore	0	1973	1989	6	40.12	0	1	1	32.27	0.0146
Soviet Union	1	1980	1989	4	26.04	0	1	0	36.22	0.3027
Spain	0	1980	1989	6	28.84	0	0	1	30.73	-0.6456
Sri Lanka	0	1953	1987	8	42.50	0	1	1	34.66	0.1378
Sweden	0	1967	1992	15	31.63	1	0	1	28.90	0.0113
Taiwan	0	1964	1990	23	29.48	1	0	0	35.45	-0.0664
Thailand	0	1962	1992	8	45.48	0	1	1	37.64	0.3140
Trinidad	0	1958	1981	4	46.21	0	1	1	38.37	-0.1468
Tunisia	0	1965	1990	5	42.51	0	0	0	42.51	-0.0664
Turkey	0	1968	1987	3	50.36	0	1	1	42.52	-0.5980
United Kingdom	0	1961	1991	31	25.98	1	0	0	31.95	0.1844
United States	0	1950	1991	42	35.31	0	1	1	27.46	0.0721
Venezuela	0	1971	1989	4	44.93	0	1	0	37.31	-0.1661
Yugoslavia	1	1978	1990	8	32.88	0	1	0	43.06	-0.1585

Notes: *Soc* - gets value 1 if the country had a socialist experience; *Start* - the year of the first observation; *End* - the year of the last observation; *Obs* - the total number of observations during the period; *Gini avg* - the average Gini across all the observations during the period; *Inc net* - gets value 1 if the surveys for this specific country measured inequality in net income; *Inc grs* - gets value 1 if the surveys for this specific country measured inequality in gross income; *HH* - gets value 1 if the recipient unit in the surveys for this specific country was the household; *Gini adj* - the value of the Gini coefficient adjusted for differences across survey types and between socialist and nonsocialist economies, according to the procedure described in the Appendix; *Chg Gini* - the rate of change in the Gini coefficient (in percentage points per annum), estimated by an OLS regression.

- *avg_rer*, the average real exchange rate during the period, expressed as the logarithmic percentage points of deviation of local GDP prices, expressed in U.S. dollars, from U.S. prices.

- *chg_rer*, the average rate of change of the real exchange rate during the period, in percent per annum.

- *p_ratio*, the average ratio between investment prices and consumption prices, expressed as the logarithmic percentage points of deviation of the local price ratio from the world's price ratio.

- *avg_infl*, the average annual inflation during the period, expressed as logarithmic percentage change of GDP deflators; the change of GDP deflators is inferred from data on the GDP deflator in the U.S. and PWT data on exchange rates and the relative price of GDP compared to the U.S. GDP; although there might be small discrepancies between this measure and official data on GDP deflators, the two measures are close and our method is consistent with obtaining all macroeconomic data from one source (with the necessary exception of the GDP deflator series for the United States).

- *var_infl*, the variability of inflation, defined as the period average of the absolute change in inflation rates from one year to the next.

- *chg_infl*, the annual rate of change in inflation during the period; the rate is estimated by an OLS regression, in a similar way to the estimation of the change in Gini coefficients described above.

- *inv*, the average investment rate as percent of total domestic absorption (private consumption, investment, and public consumption), at 1985 international prices.

- *gov*, the average rate of public consumption as percent of total consumption (public and private), at 1985 international prices.

- *avg_ext*, the average external position, defined as (GDP - domestic absorption) / GDP, at 1985 international prices, in percent.

- *chg_ext*, the average change in the external position during the period, in percentage points per annum.

Demographic variables

- *n*, the average population growth rate during the period, in percent per annum.

- *avg_15*, the average percent of population below 15 years of age during the period; this variable is inferred from the "adult-equivalent" measure in PWT. Because the PWT database does not report this variable after 1990 (and, for a few countries, after the mid-1980s), the percent of population below 15 was extrapolated, when necessary, using the most recent 5-year period average rate of change.

- *chg_15*, the annual average change in the percent of population under 15 years of age during the period, in percentage points.

- *avg_lab*, the average percent of the population counted in the labor force; because the PWT database does not report this variable after 1990 (and, for a few countries, after

the mid-1980s), it was extrapolated, when necessary, using the most recent 5-year period average rate of change.

- *chg_lab*, the annual average change in the percent of the population counted in the labor force, in percentage points.

IV. THE ESTIMATION

The estimation procedure is a simple cross-country OLS regression. This choice is determined by the relatively large number of countries for which data is available, and the fact that for most of these countries the data covers only a small number of observations, usually during different periods.

The dependent variable is the rate of change in the Gini coefficient, reported earlier in Table 2. There are at least four reasons to choose the rate of change of income inequality as the dependent variable, rather than its level. First, the rate of change captures better the effects of contemporaneous macroeconomic variables on income inequality. Second, it significantly reduces the potential problem of reversed causality (i.e., income inequality affecting macroeconomic indicators). Third, because we estimate the rate of change by an OLS regression using all available data points (and not simply by using the first and last observations), it also reduces the effects of measurement errors in individual observations. Fourth, the observations are based on different types of surveys (e.g., some surveys are based on net income and others on gross income), and it is not possible to fully correct for these differences; although not a perfect solution, using changes instead of levels goes a long way in addressing this problem.

The right-hand side variables are the macroeconomic and demographic variables described in the previous section, and two additional control variables:

- *year*, the average year of the sample, is included in order to control for possible general time effects in the dynamics of income distribution, given that the sample period differs across countries.[19]

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[19]For example, there is a perception that technological factors caused a general increase in inequality during the 1980s and 1990s. For some countries the samples cover a later period and they would capture this effect, while for other countries the samples cover an earlier period and they would fail to capture it. Including the average year of the sample controls for this effect, assuming it is linear in time.

- *gini_adj*, the average Gini during the sample period, adjusted according to the procedure described in the Appendix, is included in order to control for possible convergence in inequality across countries.[20]

Having 45 observations, we first included all possible variables in the regression, and then started dropping the variables with the lowest statistical significance, one at a time. After eliminating all nonsignificant variables, we started adding them back to the regression, one at a time, to check robustness of the results (but none of the eliminated variables was found to be significant and all retained variables remained significant in this second round). We then started to add an additional set of variables to the regression, one at a time. The new set was constructed by multiplying the previous set of variables by the vector *ly*, the average logarithm of income during the sample period. These variables were included in the regression in order to capture a possible income effect on the impact of the right-hand side variables on income distribution.[21] The only variable in this new group that was found to be significant was the product of the change in the real exchange rate (*chg_rer*) with *ly*, and all other previously selected variables remained significant when each of the variables in the new group was included. The regression's results are described in Table 3.

V. The Results and Their Policy Implications

The macroeconomic variables that were found to have a significant negative effect on changes in income inequality (were associated with an improvement in income distribution) are:

- Higher growth rate

- Higher income level

- Higher investment rate (compared with private and public consumption)

- Real depreciation (found to be more important in the case of low-income countries)

- Improvement in terms of trade

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[20]We could, in principle, choose to use the Gini at the beginning of the period. However, given that (i) the cross-country differences in income inequality are in general much larger than the time-series differences, and (ii) the individual income inequality data points are not very precise, we feel that using the average for the sample period is more appropriate in this case.

[21]Assuming the income effect is linear, we estimate the following functional form: $y = a_0 + a_1 x_1 + a_2 x_1 ly + ...$, where ly is defined as deviation from mean log income. If the estimated a_2 coefficient is significant, then the total effect of x_1 on y will be $a_1 + a_2 ly$. If the estimated a_2 is not different than zero, then the effect of x_1 on y is simply a_1, for every level of income.

Table 3. The Results: Macroeconomic Determinants of Income Distribution

	Estimated Coefficient	(*t*-statistic)
constant	2.58	(4.83)
ly	-0.322	(-4.65)
growth	-0.134	(-5.77)
eff_tot	-0.285	(-3.34)
chg_rer	0.0674	(3.60)
inv	-0.0195	(-3.02)
avg_lab	0.0184	(3.48)
chg_lab	1.27	(5.98)
chg_rer ly	-0.0680	(-2.72)

Notes: (i) The dependent variable is the annual rate of change in the Gini coefficient; (ii) the method of estimation is OLS; (iii) the number of observations is 45; and (iv) the adjusted R^2 is 0.505.

Macroeconomic variables that were found to have no significant effect on changes in income distribution:

- Inflation (including level, variability, and rate of change)

- Public consumption (compared with private consumption)

- External position (both levels and changes)

- Level of the real exchange rate (prices relative to United States)

- Price ratio of investment/consumption goods (relative to the rest of the world)

The effects of existing inequality and of time were found to be nonsignificant. Regarding demographic variables, a smaller labor force (as percent of total population), in both levels and changes, was found to decrease inequality.[22]

The results are very interesting in their policy implications:

- The estimated significant effects of growth, income and investment provide evidence that policies aimed to promote investment and growth are also likely to contribute to an improvement in income distribution. This result is particularly important given the wide-spread perception regarding a possible trade-off between growth and equity. Not only that we do not find evidence of such a trade-off, but our results strongly suggest that the less fortunate segments of the population benefit relatively more from economic growth.

- The failure to find significant effects on income inequality of inflation, public consumption and external position may appear disappointing. However, the message conveyed by this lack of significance is actually very positive, and it reinforces the message of the other findings. It implies that policies that create a stable macroeconomic environment to promote investment and growth have a net positive effect on income distribution, because additional effects do not offset the positive effect operating through the growth channel. It also demonstrates that adjustment policies (such as reducing public consumption and stabilizing inflation) does not necessarily have a negative impact on income distribution, as feared by many.

- The significant effects found for terms of trade shocks and changes in the real exchange rate demonstrate the existence of a strong link between a country's external environment and its income distribution. We found that the adverse effects of negative terms of trade shocks and real exchange rate overvaluation have a relatively stronger impact on the low-income segments of the population, especially in poorer countries. Although policies can rarely affect directly the terms of trade dynamics, they should take them into account and be prepared to promptly react, for example by increasing targeted assistance to the poor at times of serious deterioration in the terms of trade. Regarding the real exchange rate, policies should try at least not to contribute to such overvaluation and to be prepared to take corrective measures when such overvaluation occurs.

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[22]This finding is difficult to interpret, but it probably should be viewed as a proxy for demographic dynamics. When these two variables were omitted, the other demographic variables (population growth rate and the percent of population below 15 years of age) became significant.

VI. CONCLUSIONS

This study used a simple empirical framework to identify the macroeconomic factors that influence income distribution and to estimate their particular effects, relying on two large cross-country databases (the Deininger-Squire and the Penn World Tables). It created a new database, documenting changes in income distribution in a set of countries over country-specific periods, and computing a large group of matching macroeconomic and demographic indicators during these periods.

The main findings of the study are that higher growth, income, and investment rates reduce income inequality (when controlling for other variables). Similarly, improvements in the terms of trade and real depreciation (especially in low-income countries) have an equalizing effect. Effects of other macroeconomic factors, such as inflation, public consumption, and external position, were found to be insignificant (again, controlling for other relevant variables).

The policy implications of these results are very positive. The results present evidence that policies aimed to promote investment and growth are likely also to contribute to an improvement in income distribution.

One possible direction for future studies is to expand the database constructed by this study, by adding additional groups of variables related to public policies. Some obvious candidates are fiscal variables (including expenditure composition and tax incidence), indicators of human capital (including education and health), and industrial policies (for example, effective rates of protection of agriculture and manufacturing). Another possible direction is to expand the framework of the empirical analysis from a cross-section to a panel. Both directions, however, are likely to need significant amounts of additional raw data, which currently are not easily available.

The Adjusted Gini and the Kuznets Curve

This Appendix calculates a measure of "adjusted Gini" (to be consistent across different survey types) and investigates the existence of a Kuznets curve (an inverse-U shape of the function that relates income inequality to income levels).

Given that there are six major types of income distribution surveys (described in a previous section), a method is needed to make possible comparisons between data points reported by surveys that are not of the same type. The procedure describes here adjusts the Gini coefficients reported by five of the survey types to be consistent with the sixth type.

We assume that the only additional factors that affect the Gini coefficient in a systematic way (besides the survey type) are the income level (perhaps in a nonlinear fashion), the socialist/nonsocialist experience of the country, and a time effect. We chose the type of survey "expenditure-personal" to be the reference type. We then construct five dummy variables, for each of the other five types. It is important to note that, using this method, we do not need to assume that the two possible effects, the "expenditure/net income/gross income" and the "personal/household", are independent and additive. However, we need to assume that the differences across survey types affect the Gini in an additive fashion (in other words, we assume that these differences add a constant term to the Gini coefficients and not, for example, multiply them by a constant factor).

In order to estimate the five dummy coefficients, we run a regression of the form
$$Gini = a_0 + a_1 d_1 + a_2 d_2 + a_3 d_3 + a_4 d_4 + a_5 d_5 + a_6 y + a_7 1/y + a_8 \, soc + a_9 \, year.$$

The nonlinear effect of income is intended to capture the Kuznets hypothesis. Anand and Kanbur (1993) present a formalization of the Kuznets process and derive the functional forms of the inequality-development relationship for several commonly used indices of inequality. They find that the most suitable specification is the one in which the Gini is regressed on the mean income and the reciprocal of the mean.[23] The use of the socialist dummy is intended to capture systematic differences between countries with and without socialist experience. The year variable is included to capture a possible general trend in inequality (in all countries) over time.

Table 4 presents the estimated results. Most dummy coefficients are significant. In particular, the dummies for survey types that measure inequality in gross income have very strong and significant estimated coefficients. The socialist effect also was estimated to be very strong and significant. The estimated year effect is positive and significant, but its value is not very strong (it implies a general annual rate of increase in the Gini coefficients of about one-tenth of a point).

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[23]We also tried other specifications, such as $a_6 \, log \, y + a_7 \, (log \, y)^2$, and the estimated coefficients a_1-a_5 were not significantly affected.

Table 4. Estimation Results on Effects of Survey Types
on Measured Gini Coefficients

|	Estimated Coefficient	(*t*-statistic)
constant	46.4	(33.7)
dummy 1 (personal, net income)	-5.97	(-3.90)
dummy 2 (personal, gross income)	7.62	(6.21)
dummy 3 (household, expenditure)	-1.88	(-1.29)
dummy 4 (household, net income)	2.73	(2.14)
dummy 5 (household, gross income)	7.84	(7.35)
y	-0.00145	(-12.6)
1/y	-1940	(-1.99)
soc	-17.8	(-14.6)
year	0.107	(2.69)

Notes: (i) Dependent variable is the measured Gini coefficient; (ii) the method of estimation is weighted OLS, with weights calculated to ensure equal total weight across countries; (iii) the total number of observations is 594; and (iv) the adjusted R^2 is 0.521.

The results are also interesting in their Kuznets-curve implications. The nonlinear shape implied by the income coefficients indeed has an inverse-U profile, as predicted by Kuznets, and the maximum inequality occurs at a level of income of around $1,150 (1985 PPP-adjusted dollars). However, the coefficient of the term $1/y$ is only marginally significant at a 5-percent confidence level. The resulting fitted line, together with the one-standard-error deviations, is described in Figure 1. As the figure shows the relatively large standard error of the regression makes it difficult to draw definite conclusions regarding the inverse-U shape.

Using the estimated coefficients for the dummy variables, it is straightforward to adjust the measured Gini coefficients. For example, Gini coefficients reported by surveys based on household gross income should be reduced by 7.84 points to be comparable with surveys based on personal expenditure.

Figure 1
Effect of Income Level on Income Distribution

Income Distribution (adjusted Gini coefficient)

Income Level (in 1985 PPP dollars)

Fitted line   -1 s.e.   +1 s.e.
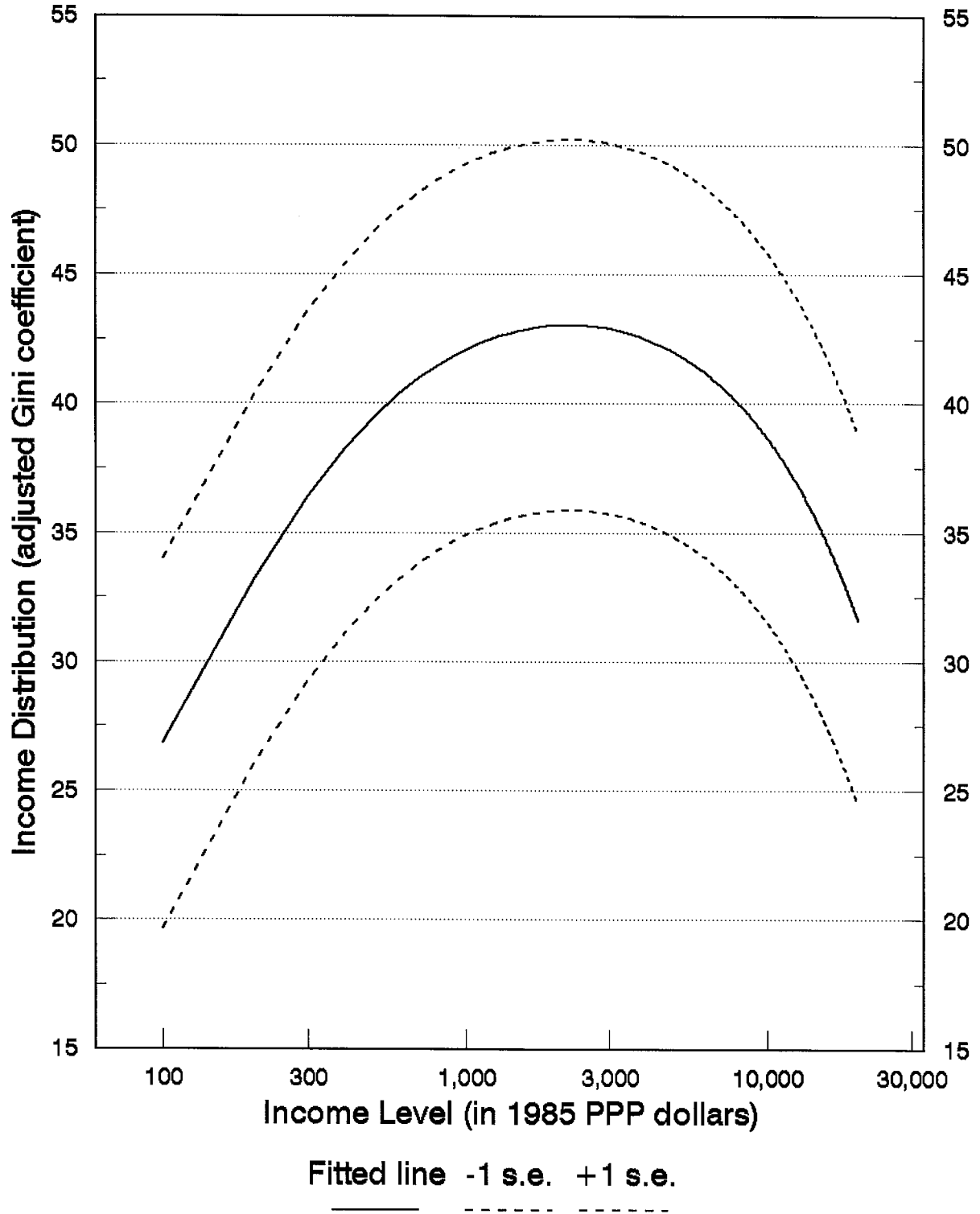
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