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THE DISTRIBUTIONAL EFFECTS OF GROWTH: MICRO VS. MACRO APPROACHES

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The distributional effects of growth : micro vs. macro approaches [1]

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With the turn of the century, distributional issues in the development field seem to have gained an importance they may never had before, even in the 1970s when so much attention focused on the so-called Kuznets curve. Distribution is not only 'back from the cold', as Atkinson noted a few years ago.[2] In the new century, it has clearly become a 'hot' issue. Raul Prebisch would certainly not have been against this state of affair, as equity, both between and within nations, always ranked very high in the list of his concerns about development.

The recent resurgence of interest for distribution came with a considerable broadening of the questions being debated. The increasing awareness towards the end of the 1960s that growth was not necessarily distribution neutral[3] explained the emphasis that was then put on understanding the effects of economic growth on distribution. The world macroeconomic disruption that followed the oil crisis of the mid-70s practically dwarfed distribution issues for the next 15 years, as research priority in development shifted from growth and equalizing the gains from growth to achieving macro-economic stabilization and 'structurally adjusting' inefficient economies. When growth and distribution issues came back to the forefront during the 1990s, more importance was given than before to the effects that the initial distribution of resources may have on economic growth. In particular, the question of whether disparities in inequality could explain the observed

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[1] Paper prepared for the Raul Prebisch seminar, "La teoria del desarollo en los albores del siglo XXI" ECLAC, Santiago de Chile, August 2001. Sections 1 and 2 borrow partly from a recent paper by Bourguignon, Ferreira and Lustig (2001) presented at the Latin American Meeting of the Econometric Society, Buenos Aires, July 2001. The opinions expressed here are the author's and do not necessarily reflect those of the World Bank, its Executive Directors or the countries they represent.

[2] Atkinson (1997).

[3] Of course, that economic development could not be defined as the increase of GDP per capita and therefore involved a distributional dimension had been pointed out by several early thinkers on development like Prebisch – see in particular Prebisch (1963) – Singer or Perroux.

heterogeneity in growth performances, and especially the fact that many countries failed to grow significantly faster despite the structural adjustments that had been achieved, attracted very much interest. More fundamentally, the objective of halving world poverty that international development agencies and the leaders of the richest countries have set for the first 15 years of the new century, clearly calls today for a fuller understanding of the multi-causal relationship between growth, inequality and redistribution. Indeed, achieving this crucial goal requires either to accelerate growth in developing countries, provided the way this is done does not benefit only the rich by increasing inequality, or to redistribute, provided that the instruments being used to do so effectively do not slow down growth at the same time.

Results obtained by economic research on these various fronts during the last decades are mixed. On the theoretical side many channels through which economic growth and the distribution of income and/or economic resources may interact have been explored. Progresses in the understanding of that interaction have been considerable, a disproportionate part of them having taken place in the last 10 years or so.[4] Unfortunately, the situation looks less favorable from an empirical point of view. Theory is often inconclusive in the sense that it identifies alternative channels through which growth and inequality may interact in opposite ways, thus leading to opposite policy recommendations – i.e. redistribute more in one case, redistribute less in the other. Eliminating that ambiguity must ultimately rely on empirical analysis. But empirical results have so far been disappointing. On the one hand, cross-country aggregate analysis could not detect any strong relationship between growth, inequality and policy instruments likely to affect one or the other. On the other hand, empirical micro-economics did not contribute much evidence. In effect, it was not seen until now as an adequate tool for analyzing a relationship that involves a macro-economic concept like growth.

The preceding statement on the inconclusiveness of cross-section empirical studies of the relationship between growth and inequality might be found too strong. After all, finding no statistical significant relationship between some variables may itself be an important result. In the field of growth and inequality, this may mean that the rate of growth of an economy has no impact on the distribution per se, in which case 'growth is good for the poor' as recently concluded by Dollar and Kraay (2000). In a different perspective, it might also be interpreted as implying that redistribution has no effect on growth. Both interpretations of the absence of a significant relationship between growth and inequality hide two fundamental weaknesses, however. First, cross-country comparisons may reveal relationships, or the absence of a relationship, that are valid only 'on average' across countries, but may not be valid for particular sets of countries.[5] Second, it is often difficult to control for the effect of omitted variables and misspecification, which, as will be seen below is likely to be quite strong in several instances.

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[4] For a review of this literature see the introduction and various chapters in Atkinson and Bourguignon (2000).

[5] This argument is still valid when 'panel' data are used, that is when several observations of the same country at different time periods are available, if there is too much time persistence of shocks in the relationship being studied.

If this skepticism about the possibilities of macro-econometric analysis is justified, then what should be done? The main point made in this paper is that efforts must bear more on the micro-economic side. A good reason for focusing on aggregate data in the past was that more detailed data, which would have permitted more powerful hypothesis testing, were not available, or not available on a regular and fully comparable basis. Today, this situation is radically changing. Reliable household surveys are available in numerous developing countries on an annual basis. They permit following the evolution of the distribution of income, or of other welfare concepts, over time with considerable detail. In Latin America, for instance, there are at least 10 countries where this kind of information has been available annually for more than 20 years. Analyses of the relationship between the process of economic growth and distribution relying on the structure of growth, rather than the overall growth rate, and on the full distribution of household or individual welfare, rather than the Gini coefficient, should thus be possible within an increasing number of countries The challenge of the years to come seems precisely to design methods that will permit to exploit the opportunities linked to the increasing availability of detailed household and individual data as well as the exploding computing facilities offered by modern technology.

This presentation draws some lessons from recent work made in that direction. It relies very much on the results obtained in the MIDD (Microeconomics of Income Distribution Dynamics) project undertaken under the auspices of the World Bank and the Interamerican Development Bank [6] and, to a lesser extent, on recent extensions of the methodology in that project towards applied general equilibrium modeling – Ganuza et al. (2001), Robillard, Bourguignon, Robinson (2001). The ambition of the MIDD project was to explain the evolution of the distribution of income – both at the household and the individual earner level - as a function of several basic parameters in a few Asian and Latin American countries. This project is now near completion and several extensions are in progress. This seemed to be a good opportunity to reflect on what was learned in terms of methodology for the analysis of the relationship between growth and distribution and the directions that should be followed in the future.

The paper is organized as follows. Sections 1 and 2 present succinctly the methodology of the MIDD project and the main results obtained in the case of four countries : Brazil and Mexico on the Latin American side, and Indonesia and Taiwan on the Asian side. Then, section 3 discusses what the implications of these results may be for the relationship between growth and distribution in general, and for cross-country macro analyses of that relationship in particular. Section 4 presents some extensions under way that should permit to go deeper into the analysis by bringing elements of macro modeling in the original methodology. Section 5 summarizes and concludes.

1. Micro-simulation analysis of changes in household income distribution

Standard methods for analyzing changes in the distribution of income or consumption expenditures among individuals or households are based on the decomposition of

[6] See Bourguignon, Ferreira, Lustig (2001).

changes in some poverty and inequality measures by population subgroups. With this approach, the change in some scalar measure of inequality or poverty is decomposed into what is due to changes in the relative mean income of various predetermined groups of individuals or households, what is due to changes in their population weights and, residually, what is due to changes in the inequality within those groups. When groups are defined by some attribute of the individuals or households, such as location, age or schooling, this method identifies the contribution of changes in the distribution of these characteristics and economic returns associated to them to changes in summary poverty or inequality measures.[7]

There are two main limitations to this approach. First, the analysis relies on summary measures of inequality and poverty rather than the full distribution. Second, the decomposition of changes in inequality or poverty measures often leaves an unexplained residual of a nontrivial magnitude.

An analogous decomposition methodology, inspired by Shorrocks (1982), is based on single-equation regressions on income run at various points in time. Income or earnings are expressed as the sum of various characteristics - age, schooling, etc. - weighed by regression coefficients. Income inequality may then be expressed as the sum of the inequality of these characteristics in the population weighted by the regression coefficients, which are conveniently interpreted as economic returns on these characteristics. Changes in total inequality may then be expressed as a combination of changes in those returns and changes in the distribution of characteristics within the population. However, the same kind of problem arises with this approach as with the group-decomposition analysis. [8]

Another way of using the income or earning regression to analyze distributional changes relies on micro-simulation techniques. Based on the regression and the micro data behind it, it is a simple matter to simulate what would be the distribution of individual earnings or household incomes if one ore several coefficients of the equation were modified, or if the joint distribution of the explanatory variables within the population would be different. Juhn, Murphy and Pierce (1993) use a technique of this type to study the determinants of the increase of wage inequality in the US during the 1970s and the 1980s.[9] In particular, they are able to identify how much of this change is explained by an increase in the rate of return to schooling, a fall in the gender wage differential and a change in the rate of return or the distribution of unobserved talents. A side benefit of this

[7] The decomposition of changes in the mean log deviation of earnings in UK by Mokherjee and Shorrocks (1982) is the best illustration of this method. The comparison over time of poverty profiles (Huppi and Ravallion (1996)) or of poverty probit analysis (Psacharopoulos *et. al.*, 1993) belong to the same tradition. A related approach decomposes changes in scalar poverty measures into a component due to growth in the mean and one due to redistribution (Datt and Ravallion, 1992)

[8] See Fields and Leary (1997). This problem is discussed in some detail in Bourguignon, Ferreira and Lustig (2001).

[9] An application of that method to household income in Mexico is provided by Bouillon, Legovini and Lustig (1999).

method is also that it permits handling the whole distribution of earnings rather than specific summary measures of inequality or poverty. [10]

The preceding method may be generalized to household income distribution by broadening the income model. A household income generation model is estimated that comprises a system of equations rather than a single equation describing individual earning determinants. This system involves earning equations for all household members at working age, potential household self-employment income equations and occupational choice models describing how individuals at working age allocate their time between wage work, self-employment and non-market time. This multiplicity of equations, the non-linearity implied by modeling both potential earning or self-employment income and occupational choices, as well as the obvious simultaneity of the occupational decisions of the various members of a household make the analysis of changes in the distribution more complex than the single-equation exercises described above.

Micro-simulation methods proved to be extremely powerful instruments for identifying the sources of changes in the distribution of incomes, or individual earnings, in a given country. In the MIDD project and several other studies based on the same methodology,[11] the observed change in distribution between two given years, say year 1 and 2, were decomposed as follows.

- 'price' effects show how the distribution would change if the coefficients of the earning equations in year 1, assimilated to the 'price' of or return to individual characteristics present in the equation, were replaced by the coefficients of the earnings equations of year 2, or vice-versa. By rescaling all earnings so that means are kept unchanged, this type of micro-simulation actually shows the effect on the whole distribution of changing the 'structure' of earnings as defined by the usual socio-demographic characteristics of earners : gender, age, schooling, area of residence,... The simulation also covers self-employment income functions, which comprise additional income determinants (number of household members involved in household business, land and other assets available, ...). The simulation can bear on all coefficients at the same time, or only on some aspects of the structure of earnings, like schooling, gender differentials or returns to land. Note also that the analysis is 'partial' in the sense tnat it is made for given occupational choices by all individuals in the household. Changing the structure of earnings may have some effect on individual labor supply or occupation decisions, however.

- 'occupational choice' effects are obtained by applying to year 1 the coefficients of the models that describe the labor supply and occupation decisions of household members in year 2, and vice versa. All individual characteristics remain constant. Earnings remain the same for individuals whose occupational status is not modified, but do change in the opposite case. In particular, individuals who are simulated to take a job must be given earnings that correspond to their characteristics. The original earning – or self-

[10] A non-parametric version of that method is provided by diNardo, Fortin and Lemieux (1996).
[11] See in particular Altimir, Beccaria and Gonzalez Rosada (1999), Gasparini, Marchionni and Sosa Escudero (2000), Grimm (2001).

employment income - regression – is used to draw randomly these potential earnings.[12] Note that, again, the analysis is partial but, this time, in a double sense. On the one hand, the general equilibrium effect on earnings of changes in occupational choices are ignored. On the other hand, the occupational choice models are 'reduced form' models where earning rate do not appear explicitly. It follows that coefficient changes observed between years 1 and 2 are associated with changes in occupational choice behavior, whereas they could partly reflect changes in the returns to wage or self-employed labor.

- the 'population' effect may be defined as all the observed change in distribution that is not explained by the two preceding effects. It corresponds to the effect of the change in the joint distribution of all individual and household characteristics that are considered as given in the household income generation model, that is in the individual earnings and occupational choice equation, or in the household self-employment income function. Obtaining more detail requires some additional modeling. For instance, a natural way of modifying the distribution of schooling in the population is to perform a rank preserving switch of distributions conditionally on age, gender, and possibly area or geographical region. For instance, the highest educated women aged 25-30 in year 1 are given the schooling level of the highest educated women aged 25-30 in year 2, with random matching in case of equal ranks. The same is done for the next schooling level, and so on. An analogous procedure may be used for family size, or for the matching of educational levels across household members. For other socio-demographic characteristics, changing the distribution can be done by reweighing the sample available in year 1 using weights observed in year 2, conditionally on the characteristics under analysis, like age or region. The results of the micro-simulations performed in these ways must be taken with care, though. Indeed, they rely on the strong implicit assumption that all unobserved determinants of household income – that is unobserved determinants of individual earnings, self-employment income and occupational choices – are independent from the socio-demographic characteristics being modified. In some cases, this assumption is quite restrictive. For instance modifying the regional distribution of the population in the way just described is equivalent with assuming that migrations are neutral with respect to unobserved income determinants.

As with the price and the occupational choice effects, the analysis of population effects with the preceding simulation rules is incomplete. To be sure, changes in the distribution of schooling or migration flows might very well have modified the equilibrium of the labor market and generated changes in the structure of earnings, which in turn could have triggered changes in occupational choices. That the decomposition just described offers no direct way for taking this kind of general equilibrium effects into account might be held against it.

More fundamentally, it must be stressed that the micro-simulation methodology just described is essentially descriptive. It permits to identify major changes behind distribution data at two points of time, something that the mere inspection of the data, and simple decomposition of some summary inequality measure might miss. Assuming that

[12] This means that the results of a micro-simulation is random. In the UNDP (2001) project, several authors do Monte-Carlo analysis and report the means and standard deviation of micro-simulation results.

major changes have indeed been identified, it will then be time to ask whether they may be related to each other by some common economic phenomenon or whether they are independent. The former step is necessary for an analysis of the true economic causes for changes – or no change – in the distribution of income to be possible, though. The examples shown in the next section suggest that this first step is generally extremely instructive.

2. Comparative facts about development and distribution : four country stories

This section summarizes the results obtained with the preceding decomposition method in four countries : Brazil (1976-1996, urban sector only, by Ferreira and Paes de Barros, 2000), Indonesia (1980-1996, by Alatas and Bourguignon, 2000), Mexico (1984-1994, by Legovini, Bouillon and Lustig, 2001) and Taiwan, China (1979-1994, by Bourguignon, Fournier and Gurgand, 2000). The discussion is essentially limited to the decomposition of distributional changes into the price, occupation and population effects defined above. Results are first commented on a comparative basis. Then, the 'story' suggested for each country by the whole decomposition exercise is succinctly summarized.[13] For future reference, table 1 shows some general characteristics of the evolution of the socio-economic structure in the four countries.

< Table 1 around here >

Table 2 reports the decomposition of the change in the Gini coefficient between the initial and terminal years of the periods under analysis. Using this summary inequality measure is restrictive here because the interest of the methodology being used is precisely to permit considering the whole distribution. This makes the discussion simpler, though. The decomposition is made into two steps. Bold entries in the table refers to the general effects identified above : price, occupational choice and population. The latter effect has been decomposed itself into two effects, however. The first corresponds to changes in the distribution of unobservables in the earning and self-employment income functions, as summarized by the usual residual term in earning and self-employment income regressions in the household income generation model. The second is due to the change in the distribution of individual and household characteristics used explicitly in the respective models. Other (normal) entries in that table correspond to some further sub-decomposition of the preceding effects.

The first stage decomposition (bold entries) in table 2 suggests that, in all countries, there are numerous powerful individual forces for change in the distributions, even though they sometimes tend to offset each other. The absolute value of the effects identified by the decomposition methodology, in the body of the table, is indeed frequently larger than the absolute value of the actual change in the top row. For instance, inequality, as measured by the Gini coefficient, hardly changed in Brazil. Yet, it could have fallen by 2.6 percentage points because of the population effect. In the opposite direction, the reason why inequality increased so much in Mexico is precisely because the

[13] For more detail, interested readers are sent back to the original studies. They may be downloaded from www.iadb.org/sds/pov/publication.

occupation effect was not strong enough to compensate for the two strongly unequalizing population and price effects.

A second noticeable feature of table 2 is that there is little uniformity across countries. Looking at the first stage decomposition (bold entries), there is no row where effects are uniformly positive or negative, or uniformly large or small (in absolute value). This suggests that there is very much national specificity in the way the income distribution behaves over time and in the forces responsible for its evolution. The population effect would seem to be pretty big in absolute value, when considering Brazil, Indonesia and Mexico. But it is small, almost negligible overall, in Taiwan. Likewise, the price effect is moderate in Brazil, a little bigger and negative in Indonesia, and very strongly positive in Mexico and Taiwan.

A third feature of table 2 is the potentially important role of unobservables. The change in the variance of the residuals of the regressions on earnings and self-employment income are responsible for a 2 percentage point fall in inequality in Taiwan and a 2 point increase in Indonesia. In comparison, this effect is negligible in Brazil and Mexico. By definition, there is some ambiguity about the interpretation to be given to this term. It may correspond to a change in the distribution of unobserved income determinants in the population, or to a change in their remuneration.[14] But it may be given other interpretations too. For instance they may correspond to transitory income components or even measurement errors. This latter case is particularly interesting because it gives more weight to the other components of the decomposition. If indeed, the change in the residuals' variance corresponds to changes in the size of measurement errors or transitory income components then it should simply be ignored. In such a scenario, the actual change in permanent income inequality would be a 3.9 point increase in Taiwan and a .4 drop in Indonesia.

<Table 2 around here >

Instead of getting into the more detailed effects shown in table 2, it seems more efficient to jump immediately to the kind of story that this decomposition suggests for the evolution of the distribution of income in the four countries.

- *Brazil*

Neither mean income – or GDP per capita – nor inequality changed much in Brazil between 1976 and 1996. The moderate change in the Gini coefficient corresponds in effect to a sizable worsening of the situation of the poorest (bottom 15 per cent). This increase in both absolute and relative poverty was related to changes in participation decisions and occupational choices, in combination with declines in the labor market returns to education and experience. These changes were associated with greater unemployment and informality, as one would expect, and it is difficult not to relate them

[14] In the case of individual earnings in the US, Juhn, Murphy and Pierce (1993) interpret the observed increase in the variance of the residuals as the sign that unobserved 'talents' are paid a higher price. But there is no solid justification for that interpretation.

to the sluggish growth performance of Brazil during the two decades under analysis. While the existence of a group excluded from both the productive labor markets and any substantive form of safety net seems to have been identified, it was not possible to interpret clearly the phenomena behind the change in the determinants of their occupational choices, and in particular the role of demand. Issues of mobility require further understanding in this context. For it is possible that the preceding changes reflect transition strategies rather than changes in permanent incomes.

Even above the 15th percentile, where urban Brazilians have essentially 'stayed put', this was the result of some hard climbing along a slippery slope. They had to gain an average of two extra years of schooling (which still leaves them undereducated for the country's per capita income level), and substantially reduce fertility, in order to counteract falling absolute and relative returns in both the formal labour market and in self-employment. As shown at the bottom of table 2, both phenomena would have produced a clear improvement in equity in the absence of adverse conditions in the labor market, themselves most likely the outcome of poor growth performances.

- *Indonesia*

With an annual rate of income per capita above 5 per cent, growth performances in Indonesia during the period under analysis (1980-1996) were impressive. Yet, overall inequality did not change much. The small increase in the Gini coefficient is seen to be the result of various phenomena that pushed the distribution of income in various directions and finally produced several switches in the relative position of specific groups of households without any dramatic change in the overall distribution. This conclusion holds when considering changes in the structure of prices and earnings as well as when taking into account other effects.

The most noticeable phenomena behind the changes in the structure of prices and earnings are the following : increase in the return to schooling in rural areas – except in farming - and fall in urban areas, equalization of earnings and income across Indonesian islands, and in particular falling gap against Java, improvement in the terms of trade of farmers and increase in the returns to land for small holdings. Taken together, these various phenomena, which are all clearly related to both the rate of growth and the structural changes it caused, contributed to a small equalizing of the overall distribution but numerous switches in the relative ranking of households within the distribution. In other words, the stability of the overall distribution may have hidden some mobility along the income scale, at least on the account of the price effect.

Another important phenomenon was the vigorous rural-urban migration movement, itself the result of booming non-agricultural activities throughout the period, particularly in Jakarta. This may only be inferred from the data because the migration status of people is imperfectly observed in the Indonesian household survey. But this phenomenon is most likely behind both the strongly unequalizing effect of occupational choices in table 2 and the strongly equalizing population effect. Both are linked t each other and reflect above all the selectivity of migration, which affected primarily rural wage workers, or more

generally people in rural areas with little other employment opportunities than wage work.[15] As not all migrants could find a job as a wage worker in cities, they contributed to increasing the proportion of urban self-employed. Overall, this process produced an increase in urban inequality, whereas income became more equally distributed on the rural side. For the whole population, however, the effect of the migration process, fueled by exceptional growth performances outside the rural sector, was probably limited.

Even though it has likely been a dominant factor, not all the occupational and population effects can be explained by migration. Table 2 shows in particular that the change in schooling levels has contributed to an increase in inequality. Given the logic of the decomposition method used in this project, this means that other population or occupational effects – possibly migration - must have compensated for that increase.

Overall, it turns out that, in net terms, the factor responsible for the slight increase in inequality is the increase in the variance of 'unobservables', that is the residuals of the earning equations and self-employment functions. To the extent that this terms may actually correspond to measurement errors or possibly a larger volatility of incomes, it cannot be discarded that Indonesian remarkable growth between 1980 and 1996 took place without any noticeable change in the distribution of household income, but nevertheless with some reshuffling of relative positions. But it cannot be discarded either that this increase in inequality reflects a higher remuneration of unobserved talents which would itself be the result of growth.

- *Mexico*

Dominant factors in explaining the very substantial increase in income inequality between 1984 and 1994 have to do with changes in the structure of earnings by educational levels and by area of residence. The average rate of return to the number of years of schooling did not change much during the period under analysis, but the whole return schedule became more convex. Marginal returns increased for highest educational levels and decreased for low levels. Economic phenomena behind that evolution may have to do with skill-biased technological progress or the transition towards a more open economy. In any case, such an evolution contributed to a substantial increase in the inequality of both individual earnings and household incomes. It was complemented by a change in agricultural terms of trade which contributed to widening the income gap between the urban and the rural sector. Altogether these changes in the structure of earnings and self-employment income were responsible for an increase of the Gini coefficient equal to 3.6 percentage points in the case of individual earnings and 2.2 for equivalized household income.

Part of the increased disparity in labor incomes among households was offset by a change in the participation behavior of women, which itself may be related to the observed

[15] Because determinants of non-wage work in rural areas, especially the availability of non-land assets that may be used in non-farm self-employment, are imperfectly observed, this selectivity was interpreted as an 'occupational choice' effect in the decomposition methodology, that was partly compensated by a 'population' effect.

change in the structure of earnings. Two phenomena were revealed by the decomposition methodology. On the one hand, lower earnings of household heads at the bottom of the distribution may have caused a compensating increase in women participation, an evolution that was possibly reinforced by a strengthening of the income effect in female participation behavior. On the other hand, higher earnings at higher educational levels may have contributed to increasing the participation of women in the corresponding income range. The former effect proved to be stronger than the latter. If the preceding analysis relating the two phenomena is right, behavioral responses to unequalizing changes in the structure of earnings have thus partly mitigated the effect of the latter upon distribution.

Education played an unequalizing role too. Somewhat paradoxically, the general increase in the level of schooling observed in the working age population may have contributed to more, rather than less inequality. The explanation for this result is to be found in the convexity of the returns to schooling. Larger marginal returns at the top than at the bottom of the schooling range implies that a uniform increase in schooling would benefit more the rich than the poor households. This effect might have had a contribution as high a one percentage point increase in the Gini coefficient.

The last explanatory factor responsible for the increase in inequality is linked with non-labor incomes which became much more unequal in 1994 and at the same time more strongly correlated with household labor income. If this income component could be thought to give an accurate representation of capital income, it would be tempting to conclude that higher and more unequal capital incomes contributed to the deterioration of the distribution of household income during the period under analysis. Unfortunately, it is well known that capital income is generally grossly under-estimated in household surveys, and it is quite possible that the evolution observed between 1984 and 1994 simply corresponds to a change in the coverage of that particular income source by the household income survey. For the time being, the status of that component in the decomposition analysis for Mexico is comparable to that of the variance of residuals in other countries. In other words, it might well be purely spurious, in which case the observed increase in Mexican inequality might be overestimated.

- *Taiwan*

As in Mexico, the leading factor in explaining the evolution of the distribution of income in Taiwan between 1980 and 1994 is the increase observed in the rate of return to schooling among both wage earners and self-employed. This increase amounted to 2 percentage points for men and almost 4 for women and may have been responsible for an increase in the Gini coefficient of the distribution of household income equal to 2 percentage points – and obviously more for the distribution of individual earnings. One possible explanation for that rise in the price of educated labor may be the dramatically high rate of growth of Taiwan's economy throughout the period (6 per cent). However, it must also be noticed (table 1) that the supply of educated labor seems to have increased approximately in the same proportion as labor demand – at least under the assumption of no change in the skill structure of the latter. Both increased by 60 to 70 per cent. A

competitive explanation of the increase in the rate of return to schooling and to increasing inequality in Taiwan would thus have to be sought in the evolution of the structure of the economy, that was heavily biased towards skilled labor – away from light manufacturing to heavier manufacturing, services to firms, and financial services – as well as possibly in skill-biased technological change.

The increase in women participation was less pronounced than in other countries, but participation behavior became more concentrated on wage work, and schooling became a stronger determinant of participation – perhaps as a reflection of higher returns to educated labor. Also women work became more autonomous with respect to household heads' income. All this may explain why women wage work became more frequent in well to do households and contributed to an increase in inequality.[16]

Altogether, it would thus seem that the exceptional growth performances of Taiwan would have contributed to increasing quite substantially the inequality of the distribution of household income, if it had not been for a drop in the variance of the residuals of earning equations. It is also to be noted that the substantial changes in the socio-demographic structure of the population did not do very much to counteract that evolution. Mildly equalizing effects of the general increase in schooling and the drop in fertility were offset by other changes in the distribution of socio-economic characteristics which remain unidentified.

3. Aggregate relationships between growth and distribution in the light of the four country stories

The four preceding stories are based on a thorough micro-economic analysis of the evolution of the distribution of income in selected countries. The question addressed in this section is whether they fit well the framework that is generally used to study the relationship between growth and inequality at the macro-economic level. In other words, is it possible to go more or less directly from a decomposition analysis of the type shown above to the specification used in regression analysis at the macro-level, most often run on cross-country data? If it is the case, then what does explain that the results obtained in cross country regressions with distribution on the left hand side are so disappointing? In the opposite case, is there a way to improve the initial specification, or is the cross-country aggregate approach essentially flawed?

The stories above are about the consequences of growth – in a broad sense - for the distribution of income. In the growth-inequality literature, the part that is relevant is therefore the one that relates directly or indirectly to the Kuznets curve, that is where the distribution, or changes in it are explained by the level of income and a host of other variables. It has now be proven that the Kuznets curve which had been so popular in the 1970s was probably the result of particular features in the data of that period. It essentially vanishes when more recent cross-sections or panel data are used. As a matter

[16] Paradoxically, the same phenomenon contributed to a drop in individual earnings inequality because women entering wage work were situated in a (upper) middle position among men and women wage earners.

of fact, recent attempts at explaining variations of inequality across countries using better data and controlling for fixed effects have identified only a limited set of statistically significant variables, not necessarily related to economic development or economic growth. Thus, land inequality, schooling level or schooling inequality, and economic dualism are among the very few variables the significance of which proved to be robust. In most cases, however, significance is achieved by mixing regressions in levels across countries and time variations within countries. Unfortunately, few significant results are preserved – or may even be identified – when the analysis is restricted to the latter. [17]

Recent attempts at explaining changes in the distribution by the same variables as those used in explaining differences in growth rates across countries have been disappointing too – see in particular Lundberg and Squire (1998) and Dollar and Kraay (2000). The latter go as far as concluding that 'growth is good for the poor' because the growth rate itself or its major policy determinants are apparently without significant effect on the distribution. As mentioned in the introduction, this conclusion may be much too quick, though. There are many reasons why variables on the right-hand side in a regression may turn out being unsignificant. Measurement error is a first possibility and may be difficult to correct for because of too few instruments being available. The specification being chosen may also be inappropriate. In particular, too many other crucial variables may be absent from the regression because they are not available on a regular basis. The country stories in the preceding section certainly suggest that all these sources of bias of cross-sectional analysis are very real, and may actually contribute to hiding what is being looked for.

Growth is without any doubt part of the four stories told above and it could hardly be held that the evolution of the distribution in these four countries was independent from growth. It is far from being the only determinant factor, though. It may also have contradictory distributional effects. Finally, the way it affects distribution may depend on several other characteristics of the country, and possibly on the policies being followed. The next paragraphs illustrate those points.

It makes little doubt that stagnation in Brazil is responsible for more inequality because the economy did not provide enough employment opportunities at the bottom of the distribution. At the same time, stagnation may have been responsible for more equality because it possibly contributed to a drop in the rate of return to schooling. At the opposite end of the scale, growth has also been responsible for more inequality in Taiwan because it was extremely fast and may have put pressure on the market for skilled labor. By pushing up the rate of return to schooling and creating employment opportunities in priority for educated women, it was seen above that this process led to a more unequal distribution. Likewise, in Indonesia, growth is undoubtedly responsible for changes in inter-regional earning differentials, an improvement in the terms of trade of farmers, and rural-urban migrations, with neutral effects on the distribution but substantial reshuffling of relative income positions. In practically all countries, growth was then found to be responsible for significant changes in the distribution, or at least potentially so.

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[17] On all this see the survey by Kanbur (2000). See also Deininger and Squire (1996), and Li, Squire and Zou (1998).

This does not imply that the relationship between growth and distribution is a simple one. An important point that comes out of the comparative analysis above is that the various changes that have been identified resulted in several cases from the interaction between growth and some other policy variable or some specificity of the economy. Also, in several cases, those changes may have tended to cancel each other in terms of overall inequality. As an illustration of the former remark, it may be noticed that what seems to matter for the effect of growth on the structure of earnings is the underlying evolution of the supply of skilled labor. If supply, as determined by both the average level of schooling of the population at working age and occupational choices of the more educated, lags behind growth, then the rate of return to skill is bound to increase with unequalizing effects. This may have been the trend in Taiwan, the opposite being true in Brazil. Thus, it is not so much growth that matters as the gap between the demand and supply of skilled labor. Note also that demand is affected not only by the rate of growth but also by its structure, which may itself result from policy. For instance, the reason why demand for skilled labor grew so much in Taiwan may have to do with the openness of the economy and the strong changes it caused in the structure of production toward sectors more intensive in both physical and human capital. The same may be true in Mexico if the increase in the rate of return to schooling is indeed to be related to the opening that took place since the mid-1980s in that country.

One would probably be embarrassed if being asked to translate the growth-related part of the stories told above into a simple linear relationship between inequality, growth and other variables. From what precedes, it would seem impossible not to have among explanatory variables the growth rate of GDP per capita, some indicator of exogenous changes in participation, preferably differentiated by skill level, the evolution of mean schooling, and policy variables like openness or change in openness. Without all these variables, it would not be possible to describe the contrasted experiences of countries like Brazil, Taiwan or Mexico during period extending 10 years and over. Practically, however, cross-country linear regressions rely on much cruder variables, simpler specifications and shorter spells. Some variables in the preceding argument are often missing – typically, exogenous changes in participation are ignored – whereas others are ill specified. For example, Dollar and Kraay (2000) use school enrollment as an independent regressor whereas it would probably be better to use the potential increase in the skilled labor force, which might be summarized, as a first approximation, by a combination of the mean schooling and some participation index.[18] There is also the issue of the time period over which growth and distributional change are observed. The argument in the preceding section refers to the medium or even the long-run, whereas data samples found in the cross-country literature often include much shorter spells, which are likely to be contaminated by short-run phenomena.

Another lesson to be drawn from the country stories above for aggregate cross-country analysis is the importance of several socio-demographic variables only loosely related to current economic growth and policy. Two such variables appearing in table 2 are the

[18] This distinction may look very much like the controversy on education and growth, see for instance Pritchett (2001). The argument may be stronger

distribution of schooling within the population at working age – different from mean schooling, which is supposed to influence distribution only indirectly through the rate of return to schooling - and fertility, or more exactly the distribution of family size within the population. There probably are others, for instance the changing matching of individual characteristics within households. Doubtlessly, these variables are related to policy and possibly to growth but this relationship is of a very long-run nature, the result of decisions and economic events which took place a long time ago. Yet, they are still important to explain the evolution of the distribution. Failure to take them into account in the case of Brazil would lead one to conclude that zero economic growth had no effect on the distribution or would lead one to greatly overestimate the role of current policy in Mexico.

Taking the effects of these long-run socio-demographic trends properly into account is not an easy thing. The example of education is quite illustrative of that difficulty. As can be seen in table 1, schooling made important progresses in the population at working age in practically all the four countries, although less rapidly in Brazil and Mexico. Yet, it may be seen in table 2 that the effect of schooling expansion on the distribution of income is very different from a country to the next. For instance, schooling expansion increased inequality in Mexico, as seen above, and also in Indonesia but reduced it in Taiwan and Brazil. The reason for this difference is mostly that earning profiles with respect to education are less convex in Taiwan and Brazil than in Mexico and the expansion of education in the latter countries may have been stronger, in absolute value, at the bottom than at the top of the schooling range. Under these conditions, the sign of the effect of a variable like schooling expansion on inequality is likely to be highly country specific. Not controlling for that specificity in a cross-country regression would likely lead to the conclusion that schooling expansion has little impact or no impact on the evolution of the distribution, and therefore that educational policies have no significant influence on distribution in the long-run. The four country stories suggest that this would indeed be wrong.

In sum, in-depth micro-economic analysis of distributional changes in the four countries considered in this paper reveal serious weaknesses in the macro-econometric cross-country analysis of the effect of growth and policy on distribution. On the one hand, it is not clear that the specification being used in those regressions is adequate in view of the mechanisms revealed by micro-economic analysis. The relationship between growth, development policy and distribution is more complex – and country specific- than a standard regression model would allow for. On the other hand, some variables are omitted despite the importance they seem to have in micro analysis. Of course, this would not be a problem if they could be considered as independent from the actual regressors, but this is hardly the case. For instance, change in mean schooling clearly has implications for the change in the distribution of schooling in the population. Under these conditions, concluding from international aggregate data comparisons that there is no significant effect of growth or growth policy on distribution may be misleading. This may be the result of the specification and the variables being used. The problem is that alternative specifications allowing for the proper interactions that would permit representing country specificity might be difficult to implement because of limited

degrees of freedom and often because the required information is not available in a large enough sample of countries – e.g. where will one find cross-country data on the convexity of the schooling/earning profile? All this invites to considerable care in interpreting the results of this type of aggregate analysis.

4. From descriptive to modeling micro-analysis of distributional changes

As mentioned several times, the country stories brought forward by the decomposition methodology explained above are essentially partial in the sense that they do not take into account general equilibrium links between the various elements of the decomposition. The way growth and policy parameters was introduced in these stories was thus mostly intuitive. It indeed seemed 'natural' to relate changes in employment behavior, or the employability of Brazilian households at the bottom of the distribution to the overall stagnation of the economy during the period under analysis. Likewise, it was tempting to relate the increase in the rate of return to schooling and its unequalizing effect to the fast growth of the economy in Taiwan and to openness in Mexico. But, these are hypotheses that should be confirmed either by some kind of direct evidence or by some counterfactual device. Without such a confirmation, the tentative critique made to the aggregate approach to the distributional consequences of economic growth would not be fully justified. Macro-analysis may be inconclusive because of inadequate specification, itself the consequence of a lack of both appropriate data and degrees of freedom. But the decomposition methodology behind the stories told above might not be more conclusive because of the lack of explicit link among the elements of that decomposition and between those elements on the one hand, and growth as well as policies affecting both growth and distribution on the other.

The solution to that problem would consist of going one step further in the decomposition methodology and to relate explicitly some of the causes that have been identified for distributional changes to macro-economic shocks, policies or the process of growth in general. Such a step has been taken in some recent work undertaken under the auspices of UNDP – Ganuza et al. (2001) - and of the World Bank – Robillard, Bourguignon and Robinson (2001). Both stand closer to counterfactual modeling than to the gathering of direct evidence. But these attempts are interesting because they show promising directions for future micro-based research on growth, policy and inequality. The next paragraphs describe informally the features of these two sets of studies.

Going back to the decomposition methodology, assume that one is given aggregate information on the way growth has proceeded during a given time interval possibly as a result of some given policy. As a bridge with the decomposition methodology, imagine that this information concerns the rate of growth of labor incomes, that of capital incomes, the evolution of the skill gap, possibly that of the agricultural terms of trade, and finally employment levels by types of employment – say formal/informal or wage vs. self-employment – and gender. Such information could come from any type of macro-economic model, with a minimum level of disaggregation in terms of sector and factors of production. Applied general equilibrium models would certainly be very helpful at this respect. But macro-econometric models could be used too, and could in effect provide

more solid evidence altogether. In any case, with such macro counterfactuals at hand, it is conceptually not too difficult to generate changes in the coefficients of the household income generation model in the decomposition methodology above that will fit the macro counterfactual, rather than the actual evolution of the economy. Based on this new set of coefficients, it is then possible to gauge more directly the effects of some aspects of growth or of a specific policy on distribution.[19]

This mapping of a small number of macro aggregates into the distribution of income through the household income generation model developed for the decomposition methodology is best seen as an extension of standard 'grossing-up' methods on household survey data. First, starting from the original distribution, the various household income sources are rescaled in a proportion that varies across income sources and possibly labor-market segments, so as to fit the overall rates of growth provided by the macro counterfactual for each type of income. Because households may derive income from many different sources, however, this operation is much more complex and has more subtle effects on the overall distribution than simply multiplying the total income of households belonging to different groups – defined for instance by household heads' occupation - of the head by different proportionality factors, as is often done.

Second, it is necessary to modify employment levels in the same labor-market segments as for income rescaling so as to be in conformity with the macro counterfactual. This is done by reweighing households in the original survey conditionally on the occupation of their members, and practically by modifying the coefficients of the occupational choice models in the decomposition methodology. But this procedure that makes occupational choices consistent with the counterfactual's aggregate employment predictions is fundamentally different from reweighing households on the basis of a simple criterion like the occupation of the household head, his/her education or area of residence. There are two reasons for this. First, reweighing takes place on individuals rather than households so that the composition of households and the occupation of their members are really what matters. Second, the reweighing depends on a complex set of individual characteristics and may be highly *selective*. For instance, if the macro counterfactual points to many individuals moving from self-employment and inactivity to wage work, individuals whose occupational status will change at the micro-simulation stage are not drawn randomly from the initial population of individuals in the formal sector. On the contrary, they are drawn in a very selective way, essentially based on cross-sectional estimates of the probability they had to be a formal wage worker or a self-employed in the first place. For instance, those with the lowest earnings or the youngest will actually move. This has a direct effect on the distribution of income or earnings *within* conventional groups of individuals or households, and introduce a new dimension to the original macro counterfactual.

This line of modeling was followed in a UNDP multi-country project trying to estimate the impact of the opening of Latin American economies since the 1980s on the distribution of individual income among active people. Macro counterfactuals were

[19] For a formal exposition of this bridge between macro analysis and micro-simulation see Robillard, Bourguignon and Robinson (2001).

generally based on AGE models with varying degrees of integration. Results of these various studies are presently being synthesized – see Ganuza et al. (2001). Another example of this approach to the distributional evaluation of macro policy or macro phenomena is the analysis of the distributional effects of the Indonesian crisis by Robillard, Bourguignon and Robinson (2001). Again, the underlying macro counterfactual comes from a real AGE model coupled with a few nominal macro relationships. The mapping into distribution is a little more complex than in the preceding case because a larger number of labor market-segments and income sources are considered and the analysis focuses on households rather than individuals.

These are only first attempts in a direction that looks quite promising. Future work should try to strengthen and broaden the methodology developed so far. It should also move closer to direct econometric evidence in the elaboration of macro counterfactuals. For instance, one may feel more secure relying on regression estimates of the elasticity of the skill wage gap with respect to labor demand, or of the output elasticity of employment than imposing some kind of equilibrium conditions within a AGE framework. Finally, it also seems necessary to introduce some kind of dynamics in the representation of individual behavior. Income smoothing in situations of crises or long-run migration behavior are likely to be very income selective and may be an important reason why growth or economic fluctuations are not distribution neutral.

Conclusion

Very much emphasis has been put in all the literature about the distributional consequences of growth on the results of cross-country regressions run on a few aggregate variables. Ideally, such an emphasis seems fully justified. If some theoretical model is available and can be tested at the country level, the same can certainly be done on a cross-sectional basis. It may even be more efficient to do so because more data are available, especially when working with cross-sections of time series, and also because of the diversity of national experiences. Country specificity seems to require more detailed data than the aggregate variables generally available on a cross-country basis as well as particular specifications, however. The big problem is then that degrees of freedom are likely to be insufficient to do serious estimation and serious testing. This is especially problematic when focusing on the long-run consequences of growth because one cannot rely on multiple growth spells for each country in the sample.

Summarizing the results obtained in several recent country studies, the present paper has shown that very much insight about the distributional consequences of growth could be obtained from the comparative analysis of micro household data over time. Beyond observing changes in the distribution, a simple decomposition methodology based on micro-simulation facilitates the identification of the sources of changes in the distribution of income, and with some stretch of imagination permits to build economic stories that could explain these changes or the way in which various forces for change may in some cases have offset each other. The stories summarized in this paper permitted to identify various ways by which growth and policy significantly affected the evolution of the

distribution in single countries. This is in contrast with what may be gathered from the recent literature based on cross-country aggregate analysis, which suggests that growth and distribution policies are, on average across growth spells, distribution neutral. The reason for that apparent discrepancy seems to lie mostly in a high country specificity of the relationship between growth and distribution, which can hardly be taken into account properly in cross-country aggregate analysis.

The main message of this paper thus is that micro analysis of distributional changes is the direction which must now be given priority. An obvious distinctive feature of the 21st century will be the increasing availability of detailed micro data on individuals and households, as well as rapidly growing treatment capacity. It thus seems natural to invest in the type of methodology summarized in this paper. This may be made in several directions. a) Multiplying country studies based on statistical decomposition techniques that may reveal the sources of change in the distribution. b) Improving on these techniques by linking them with counterfactual modeling either though calibrated models like AGE or through macro-econometric models. c) Expanding the modeling of micro-economic behavior, in particular by getting into dynamics and maybe making the models more structural. Following these various research directions should be useful from a double perspective. On the one hand, they will enrich micro-based stories and will permit to accumulate stylized facts on the effects of growth and policy on distribution, something that is crucially missing for the moment. On the other hand, this line of research will progressively make available the detailed data necessary for good macro analysis across countries and more rigorous hypothesis testing.

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Table 1. Selected indicators of long-run structural evolution

Country	Brazil	Indonesia	Mexico	Taiwan
Period being analyzed	1976-1996	1980- 1996	1984-1994	1979-1994
GDP pc in 1980 (ppp US $)	4499	1430	5758	3786
Annual growth rate of GDP pc (1980-1996, %)	1	5.7	2.4	6
Growth rate of mean household per capita income[b] (%)	0.2	5.1	1.1	5.7
Average years of schooling : initial year	3.2	3.8	5.6	6
: terminal year	5.3	6	6.9	9.5
Urbanization rate (%) : initial year	68	23		70
: terminal year	77	35		84
Women participation (%) : initial year	28		33	46
: terminal year	42		41	50
Family size : initial year	4.6	5	5.3	4.9
: terminal year	3.6	4.4	4.9	4.2
Gini coefficient (household income per capita, size weighted households) : initial year	0.595[a]	0.384	0.491	0.271
nal year	0.591[a]	0.402	0.549	0.29

[a] Urban sector only

[b] As given by household surveys in initial and terminal years

Table 2. Decomposition of the evolution of the inequality of household income per capita

(Absolute change in Gini coefficient, percentage points)

	Brazil (urban)	**Indonesia**	**Mexico**	**Taiwan**
	1976-1996	1980- 1996	1984-1994	1979-1994
Observed change	**-0.4**	**1.6**	**5.8**	**1.9**
Overall Price Effect	**0.3**	**-0.9**	**1.9**	**2.4**
- Education	-0.2	0.1	1.1	(2.1) [b]
-Wage gaps[a]	0.6	0.3	1.1	
Overall Occupation Effect	**1.5**	**4.7**	**-0.5**	**1.3**
Distribution of residuals in earning and self-employment income functions	-	**2**	**0.1**	**-2**
Overall Population Effect	**-2.6**	**-4.3**	**4.6**	**0.2**
- Education Effect	-0.3	1.3	1	-0.2
-Number of children	-2			-0.8

Source : MIDD project, various studies

[a] Between gender, urban/rural, wage/self-employed ..., depending on the country
[b] Indirectly inferred from various pieces of information in the Taiwan study, as this figure is not directly available there.