March 2002

Evaluating the Poverty Impact of Economic Policies : Some Analytical Challenges

by

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Abstract

Where redistribution and anti-poverty policies consist of cash transfers allocated according to some pre-specified rules, evaluating their impact on the distribution of living standards and poverty might seem straightforward. It seems sufficient to apply the transfer rules to some representative sample of households. This is the essence of 'incidence analysis' and micro-simulation techniques used in many countries. In practice, however, things are not so easy. There are various reasons for this: a) cash transfers are likely to modify behavior, which in turn can generate economy-wide changes through general equilibrium effects; b) in most developing countries, transfers are made only indirectly, through public spending or indirect taxation, with allocation rules which are often far from transparent and may themselves depend on behavior; and c) implementation may be partial or distorted. More fundamentally, poverty reduction policies often go through both macro-economic and structural instruments aimed at enhancing economic activity and growth The actual change in individuals' standard of living generated by these instruments is not easy to work out because of the fundamental difficulty of establishing satisfactory linkages between micro and macro analysis, whether the latter refers to aggregate demand, medium-run growth or general equilibrium in a somewhat disaggregated framework.

This paper reviews the various tools presently available to evaluate the impact of economic policies in general on poverty reduction, or on the distribution of living standards, and explores directions for improvement. It is organized around the common thread of 'incidence analysis'. But this basic micro-economic evaluation tool is used in different contexts and in different ways so as to accommodate a wide range of policies with some potential impact on poverty. In particular, the paper covers indirect taxation and subsidies, public spending programs, at the national and local levels and from an ex-ante and an ex-post point of view, and macro-economic policies, in situations of either steady growth or crisis periods. By suggesting that incidence analysis could also be applied using samples of firms, it also touches upon the role of institutions and more generally policies aimed at improving the investment climate.

Keywords: Evaluation, Poverty, Distribution, Incidence, Micro simulation, Macroeconomic model

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Introduction and Motivation

Accounting for the effects of economic policy on the distribution of welfare among individuals and households has long been on the agenda of economists. Doing it satisfactorily has proved difficult, however. Progress in economic analysis and the increasing availability of micro-economic household data eased things a little. At the same time, the growing intensity of the debate on distribution, poverty and the social effects of globalization has made the issue a practical operational objective for national governments, multilateral agencies and other aid agencies.

Poverty reduction and pro-poor growth strategies demand that all economic policy choices be evaluated *ex ante* and monitored *ex post* for their impact on poverty and distribution[2]. This paper reviews available methods and makes suggestions for improving them or developing new tools. The discussion occasionally refers to on-going case studies where these new tools are being tested. In fact, the present paper can be considered as the methodological introduction of a forthcoming 'toolkit' for evaluating the distributional and poverty impact of economic policies.

An internal survey conducted at the World Bank on Poverty Reduction Strategy Papers (PRSPs)[3], highlighted the main policy issues that need to be evaluated --in their poverty and distribution dimensions:

1. What is the poverty-impact of specific changes in public spending? How can changes in the delivery of public services, especially for health and education affect the poor? Same question for improving public expenditure targeting? How can public expenditure and revenue be better monitored and improved?
2. What is the poverty-impact of specific changes in taxation? How can the financial and administrative burden of taxation on poor people be reduced?

[2] By *ex ante* evaluation we mean quantitative techniques --that can be both micro and macro-- to "predict" the likely impact on poverty of a change in policy (e.g., tax, subsidy, trade policy reform, exchange rate regime, etc.) prior to their implementation. But it is also crucial to evaluate *ex post* the actual impact l impact of policies, the distance from what had been predicted with ex ante techniques, and the way to improve their performances – on this see Ravallion [2001]

[3] The sample consisted of 4 full PRSPs (100% of actual, Uganda, Burkina Faso, Tanzania, and Mauritania) and 13 Interim or I-PRSPs (40% of actual, Yemen, Chad, Ghana, Cameroon, Kenya, Zambia, Rwanda, Cambodia, Vietnam, Bolivia, Honduras, Albania, and Georgia). The objective of the exercise was to identify in the sample what were the most common policies and instruments used for poverty reduction. Macroeconomic policies included monetary, fiscal, and exchange rate policies. Structural reform measures encompassed institutional changes (including anti-corruption, decentralization, tax administration, and budgetary reform), sectoral reform policies such as privatization, changes in tax rates, and expenditure increases/decreases in specific sectors.

3. What is the poverty impact of structural reforms such as trade policy, privatization, agricultural liberalization and price decontrol? How policy could sequence these reforms?
4. What is the poverty impact of changes in the macro framework such as the fiscal, inflation and exchange rate targets? How can policy make the best use between the trade-offs between several objectives?
5. What is the poverty impact of exogenous shocks such as trade shocks, capital flows volatility, changes in foreign aid and foreign payment crises? How can policy mitigate these effects?
6. What is the poverty impact of the quality of governance in its relation to investment and to growth (through the effect on the perceptions by private investors of the stability of the business environment in which they will operate, i.e. the "investment climate"). What measures, policies can improve governance and productivity?

These various questions refer to different perspectives on poverty reduction. The first two questions are of a microeconomic nature and call directly for standard incidence analysis of public spending and taxation. The following four questions refer more to three kinds of macro policies. The first macro policy is concerned with policy-induced changes in the structure of the economy, either in terms of sectoral activity as with trade or price policies or in terms of firms' ownership (private vs public). The second macro policy has to do with the management of aggregate demand and macro-economic balances. It includes target setting for the main macro instruments as well as the analysis of various types of shocks and the best way to cope with them. The third macro policy is more dynamic and essentially refers to policies aimed at enhancing private investment and growth.

We are not well equipped to deal with the distributional and poverty consequences of these various types of macro policies. Moreover, the tools to be used are very likely to depend on the kind of policy being analyzed. A contribution of the present paper is to propose various generalizations of micro-based standard incidence analysis of public spending and taxation that should permit covering the preceding macro policy issues.

In effect, this paper proposes a three layer methodology for evaluating the poverty effect of economic policies. The bottom layer consists of a micro-simulation module based on household micro data that permits analyzing the distributional incidence of public spending and taxation as well as the income generation behavior of households. The top layer includes aggregate macro modeling tools that permit evaluating the impact of exogenous shocks and policies on aggregates like GDP, its components, the general price level, the exchange rate, the rate of interest and the like, either in the short-run or in a growth perspective. The intermediate layer consists of tools that permit disaggregating the predictions obtained with the top layer into various sectors of activity and various factors of production.

Ideally, these three layers should communicate with each other in some consistent way. For instance, studying some change in public spending in education at the bottom level should modify the rate of growth of the economy in the top layer as well as the structure of activity and of factor remunerations in the intermediate layer. In turn those latter changes should affect the household income generation model in the bottom layer. Unfortunately, available analytical equipment for such a full integration of these three analytical layers is far from complete. In what follows, only some very simple, mostly sequential top-down integration methods are investigated.

The paper opens (section I) with a short summary of the role played by poverty and distribution issues in the history of thought in development economics. Then the paper is organized according to the policy issues. The first part (section II) is micro oriented and is devoted to methods for analyzing the incidence of public expenditures, taxation and redistribution policies and, more importantly, changes in these policies. The second part (sections III and IV) focuses on the links that may be established between macro modeling and the distribution of economic welfare, and on the three layer structure just described. The unifying link between the two parts is the idea of handling poverty and distribution effects of economic policies within the framework of the 'micro-simulation' of real household incomes; that is as an extension of standard partial equilibrium distributional incidence analysis. Both parts first review existing methods and, when appropriate, suggest improvements or new developments based on a few selected recent or ongoing case studies.

I. The poverty reduction focus in development economics

Evaluating the effects of economic policy on the distribution of welfare among individuals and households did not start as an issue of development economics. It was rather a typical “Welfare Economics” issue in developed economies, closely linked to the evaluation of the re-distributive capacity of tax systems. The issue penetrated development economics in several waves

The 1950s and the 1960s, or the era of “High Development Theory”, are characterized by the dominance of an aggregate growth point of view with almost no micro and no distributional concern. The social impact of macro policies – i.e. on poverty and distribution - was analyzed as a by-product of GDP growth with little or no effect of growth itself on the income distribution across individuals of a population. GDP growth meant an increase in the mean income of the population. With poverty defined by some fixed level of real income, growth would eventually reduce poverty "mechanically", so to speak –i.e., through a “trickle down” effect.

Concerns with distributional issues (indirect taxation, structure of demand by income level, effect of public expenditures) appeared by the end of the 60s early 70s but somehow separately from the aggregate growth point of view. Distributional concerns weakened again with the debt 'crisis' in the early 1980s. The interim period exhibited a **dichotomy** between micro (distribution) and macro (growth). The cross-country Kuznets curve literature (see section III.1 below), which started in 1973 and remained very dynamic until the early 1980s, is a typical illustration of that dichotomy and the permanence of 'growth' objectives coming from the previous period. Indeed, according to this insight, per capita growth could first translate into higher inequality but it would later result in more equality. The implicit policy recommendation consistent with this view was thus "Do not worry about redistribution, since we know that distribution will equalize at the end! And keep the eye on growth." The volume "Growth with redistribution" by Chenery and al. [1974] expressed a more progressive view but not that different, something like "Do not perturb growth but try to improve the distribution if you can". The first studies of incidence analysis of public expenditures were launched in the late 70s (Meerman [1979] on Malaysia, Selowski [1979] on Colombia). The same is true of studies of taxation incidence, although they were published later –(Ahmad and Stern [1983]) . Computable General Equilibrium (CGE) models *cum* distribution also appeared in the late 70s (Adelman and Robinson, 1978). But they were essentially static and thus divorced from growth and macro analysis of growth (see below in section III.2)

Most of the 80s are crisis years. Largely due to the debt crisis, the emphasis in development economics shifted to macroeconomic adjustment– both macro stabilization and structural adjustment. The focus of the work of policy-makers, academics and practionners shifted to short-run aggregate macroeconomics

and how to restore external balances in developing countries through changes in relative prices, e.g., 'getting the prices right'. Distribution became a secondary issue because of the crisis, at least until the second half of the 80s when the literature started investigating the social cost of adjustment. (See UNICEF's "Adjustment with a human face" (Cornia, Jolly and Stewart, 1987), OECD's project on "adjustment and distribution" (Bourguignon, de Melo and Morrisson, 1991), or the chapter on this topic in the World Bank's 1990 World Development Report.)

A renewal of interest in the relationship between growth theory and distributional effects occurred with the return of growth in developed countries and in some parts of the world at the end of the 1980s. Distribution then "comes back from the cold" as elegantly put by Atkinson (1997). What is new is an effort to associate distribution explicitly with growth mechanisms both in theory and in the empirics of growth (see the general survey by Aghion, Caroli and Garcia-Penalosa ,1999). The dichotomy at last seemed to be broken. But, at the same time, it became clear that relatively little was known regarding growth as a process of distributional dynamics.

It was not until the mid-1990s that one would see the culmination or the *'aboutissement'* of the preceding process of "convergence" of growth and distribution. The reactivation of "growth with equity" and poverty reduction as an issue for policy-makers and academics came with the 'poverty reduction' strategies pushed by the International Financial Institutions or IFIs. This new beginning for an "old" topic motivates the present reflection on the links between distribution, redistribution and other economic mechanisms as well as all types of economic policies. Where do we stand?

Hopefully, we are now in a context where there is more awareness of the complexity posed by the interaction between growth (the macro dimension) and poverty and inequality (the micro dimension). But the bad news is that it remains difficult to bring about the more thorough methodological change that is needed in the design of models and tools to evaluate policies.

The next sections of this paper review progress in addressing this issue. They provide a summary of the strengths and weaknesses of "old" and "new" approaches and how they can provide answers –in their area of competency—to the policy questions raised initially.

Table 1: Emphasis on Poverty and Distribution in Development Economics
(adapted from G. Meier [2001])

	1950s	1960s	1970s	1980s	1990s
DEVELOPMENT GOALS	Growth of Gross Domestic Product (GDP)	Growth of Per Capita Gross Domestic Product (GDP)	Growth of Per Capita GDP and Poverty Alleviation	Rise of Non Monetary indicators (Human Development Index) and Protect the Environment	"Freedom" indicators and Sustainable Development
MACROECONOMIC GROWTH THEORY	Fixed coefficient ICOR Dual Economy Models Stages of Development Physical Capital accumulation (Big-Push, Infrastructructure)	Neo-Classical Growth model Growth Accounting Human Capital (Education, Health)	Growth Accounting Empirical work and puzzles	New Growth Theory Knowledge capital (Technology, Education))	Role of Institutions, of externalities Social Capital (Networks, Institutions)
FUNCTIONNING OF MARKETS	Market Failures Government intervention needed	Public sector guidance to markets	Government Failures, Get Prices Right	Coordination and Information problems	Asymmetries, Multiple Equilibria and Development Traps
INEQUALITY & POVERTY		Analysis at aggregate level	Cross-country analysis Representative Agents	Poverty Mapping Benefice and Tax Incidence Analysis, Public Expenditure Reviews	Modeling Household Behavior (Micro Simulations)
MODELS & TOOLS	Financial Programming	Gap Models	Macroeconometric and CGE Models	Augmented CGE Models w/ Representative Agents	New generation of micro-macro linkage models
POLICY CONTEXT	Socialist Experiments (Central Planning, Price Controls, etc.)	Liberation Movements Decolonization (Industrial Policies, Public sector Investment)	Liberal Agenda (Trade & Price Liberalization)	Washington Consensus Agenda (Macro stability, Privatization, External Sector)	Post Washington Consensus Agenda
		Planning, Programming	Minimalist Government	Complementarity between Government and Markets	Political economy Institutional Transition investment climate

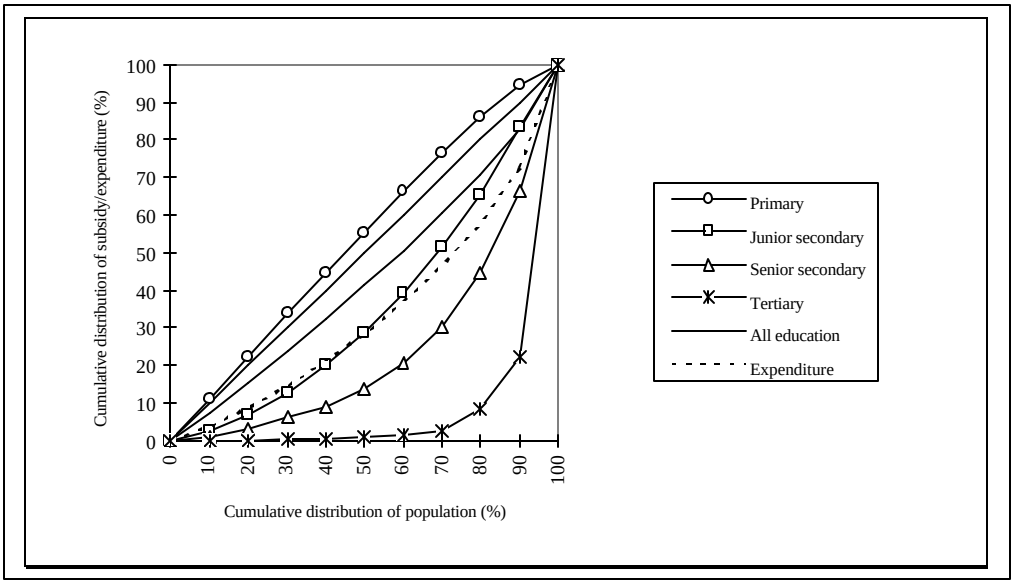
II. Evaluation of micro-oriented policies: Incidence analysis of public spending and taxation

II.1 "Standard" micro-economic incidence analysis

To answer the first question in our list ("What is the poverty-impact of specific changes in the delivery of public services, especially for health and education"), a first step has been to use micro-economic incidence analysis. One practical application here is "Benefit Incidence Analysis" (BIA). Pioneering work in developing countries goes back to Meerman [1979] on Malaysia and Selowski [1979] on Colombia. Modern versions of such models include some chapters in van de Walle and Nead [1995], Sahn and Younger [1999] on Africa, Demery [2000], OECD [2002] . The basic idea is to impute to individual households, or possibly household groups, the cost of the public provision of services on the basis of their consumption or access to those services, as they are observed in conventional or specifically designed household surveys (see Box 2).

This type of analysis involves three steps. First, estimates are obtained of the unit cost of providing a particular service (e.g., education or health). This is usually based on officially reported public spending and the number of users of the service in question. Second, this unit cost is 'imputed' as a subsidy to households or individuals which are identified as users of the service, for instance households with children in school, or households whose members visit a health facility, or have access at a reasonably low cost to facilities such as clinics, family planning, or subsidized piped water. Individuals who use all these subsidized public services in effect benefit from an in-kind transfer, even though the actual value they give to this transfer – or their 'willingness to pay' for it - may differ among them and may differ from the unit cost faced by service providers. Benefit incidence analysis measures the distribution of this transfer across the population. The third step involves comparing this gain with other dimensions of individual or household welfare, so as to evaluate the redistributive role of the public expenditure under analysis – irrespectively of the way it is financed. The most common practice consists of ranking individuals or households by income or expenditure per capita and to examine the share of public expenditures accruing to households below some rank. An example of the resulting 'concentration curve' of public education in Indonesia is given in Figure 1. Other breakdowns than income are of course worth analyzing. Examining the share of public expenditures or the proportion of people accessing a given service by region or ethnic groups informs on other dimensions of the redistribution taking place through that particular expenditure or service.

Figure 1: Indonesia, Benefit Incidence of Education Spending, 1989 (from World Bank (1993) *Indonesia: Public Expenditures, Prices and the Poor*. Country Department III, East Asia and Pacific Region, Report No. 11293-IND, Washington D.C. (August 31).], (From Demery [2000]).



Benefit incidence results can readily be portrayed in graphic form (Figure.1) . Tracking the cumulative distribution of total household expenditures against the cumulative population ranked by per capita expenditures gives the expenditure *Lorenz curve*. Such a curve for Indonesia is shown as a dotted line in Figure 1. This provides a point of comparison with which to judge the distribution of education spending in Indonesia. The concentration of educational spending by income level is shown in the other curves of Figure 1. These graphics convey some important messages. First, compare the concentration curves with the 45^o diagonal. If the curve lies above the diagonal, it means that the poorest (say) quintile gains more than 20 percent of the total subsidy (and the richest quintile, less than 20 percent). Such a redistribution is clearly progressive. Second, comparisons may be made with the Lorenz curve. Concentration curves lying above the Lorenz curve (and below the 45^o diagonal) are progressive relative to income (or expenditure in this case). If beneficiaries were given monetary transfers instead of the in-kind transfer, the distribution of money income would become more equitable. Concentration curves lying below the Lorenz distribution indicate regressive transfers. From Figure 1 it is clear that the primary school subsidy was progressive in absolute terms, the concentration curve lying above the diagonal. The senior secondary and tertiary subsidies were regressive (below the Lorenz curve). The overall education subsidy was relatively progressive (lying between the diagonal and the Lorenz curve).

In principle, the same kind of imputation methodology at the household level could be used to answer the second question in our list ("How can the financial and administrative burden of taxation on poor people be reduced?"). Knowing how much income a household earns from various sources, or how much it spends on different goods, it would seem easy a priori to compute how much income tax is due – for the richest households, of course - or how much indirect taxes is paid through observed expenditures. In many developed countries, so-called 'tax-benefit models' are actually doing precisely this. They simply apply the official rules for calculating income related taxes and cash transfers to each household or individuals in a micro data base, thus allowing the evaluation of the 'direct' redistributive impact of the tax-

benefit system. Such tax-benefit models would probably be useful too in some developing countries where income related taxes and cash transfers have some importance.[4] In many other countries, however, this represents only a tiny part of the redistribution system, the bulk of taxation being essentially indirect.

In presence of indirect taxation and tariffs, the simple calculation referred to above requires first to figure out the way in which these instruments will modify the prices of the goods consumed by households. Then, observing sufficiently disaggregated budget shares in household budget surveys, it becomes possible to evaluate the distributive impact of indirect taxation. Ahmad and Stern have been among the first to run this type of calculation in the case of developing countries and to analyze indirect tax reforms that would contribute to increasing social welfare (see Box 1) For a synthesis of their work on India, see Ahmad and Stern [1991].

A difficulty that arises when dealing with the incidence of indirect taxation, including tariffs and possibly non-tariff barriers to trade, is how to identify the effect of changing indirect tax rates on the prices faced by households, when they are considered as pure consumers. The calculation is not too difficult in an economy where it can be safely assumed that all firms producing the same good are subject to the same tax rate and that perfect competition applies. Input-output techniques are available to do this [5]. Things are much less easy when different producers do not face the same rate – as is the case when comparing formal and informal production units – or when the geographical origin of the goods matter – as with import tariffs. In those cases, complete multi-sector models of the economy must be designed, at a disaggregated macro level, to represent the way in which changes in the indirect tax and tariff system will ultimately result in changes in the consumer prices faced by households. In other words, a 'macro' incidence analysis has to be performed prior to the arithmetic standard incidence analysis based on micro household data. This is particularly true when analyzing the impact of comprehensive tax reforms rather than concentrating on the static incidence of changes in tax rates within a given tax system.

[4] The development of anti-poverty cash-transfer programs like Progresa in Mexico, Bolsa Escola in Brazil, etc.. makes these tax-benefit models very attractive analytical instruments for policy making. On the general issue of the applicability of these models to developing countries, see Atkinson and Bourguignon (1991)

[5] See for instance, Newbery and Stern [1987], chapter 11.

Box 1 : Indirect Tax Incidence Analysis (see Ahmad and Stern [1987], in Newberry and Stern [1987]

In many developing countries, Government have sought to reform their tax system to increase its yield and minimizes distortions for producers and consumers. One common move is to shift from direct taxation of imports using tariffs to indirect taxation. Another type of reform consists in replacing a multitude of direct and indirect taxes on consumption by a simple proportional value-added tax. What would be the effect of these tax reforms on the poor? Ahmad and Stern [1987] use Indian data for the year 1979-80, to analyze the effect of replacing all taxes and subsidies with a proportional value-added tax. If total indirect taxes represent 8.3% of total consumer expenditure, the proportional value-added tax rate would be 8.3% of the tax-inclusive price of all goods. Such a non-marginal reform in prices, however, can be expected to trigger changes –through demand responses—in commodities consumed. But a proportional tax allows one to estimate revenue from total expenditure –assumed unchanged—without any specific assumption on commodities consumed and raises exactly the required revenue. Ahmad and Stern estimate then the welfare equivalent variation of expenditures –for each per capita expenditure group, rural and urban. They find (see Table below) that switching to a VAT would be equivalent to reduce the real expenditures of the poorest rural households by as much as 6.8% and increasing those of the richest rural households by more than 3%. For urban groups, the poorest are also most affected. There are a number of refinements to the analysis. For example, the treatment of cash-and-kind consumption would lead to a lower estimate of losses for poor rural households, but overall, there would still be losses.

Box 1Table: Equivalent Variations of Expenditures by Population group for Proportional Value-Added

Group	Percent of the population	Per Capita Expend. Rupees/ Month (1)	Equivalent Variation of Expend. (2)	Percent (2)/(1)
Rural				
1	0.28	17.09	-1.142	-0.067
2	0.3	22.63	-1.531	-0.068
3	0.92	27.19	-1.851	-0.068
4	1.68	31.81	-1.674	-0.053
5	2.42	35.14	-1.843	-0.052
6	4.63	42.1	-2.196	-0.052
7	9.34	49.94	-1.002	-0.020
8	15.07	62.07	-1.85	-0.030
9	15.84	78.53	-0.393	-0.005
10	14.6	102.84	-0.247	-0.002
11	7.01	137.93	3.166	0.023
12	3.68	192.92	5.249	0.027
13	0.71	274.69	8.348	0.030
14	0.43	460.15	15.932	0.035
Urban				
1	0.01	13.7	-0.663	-0.048
2	0.03	22.25	-1.094	-0.049
3	0.07	27.51	-0.945	-0.034
4	0.12	31.63	-1.071	-0.034
5	0.3	36.82	-1.229	-0.033
6	0.69	42.36	-0.645	-0.015
7	1.64	50.43	-0.708	-0.014
8	3.45	62.28	-0.8	-0.013
9	4.46	79.08	0.819	0.010
10	5.23	103.5	1.318	0.013
11	3.34	138.84	4.621	0.033
12	2.32	195.1	7.167	0.037
13	0.76	277.15	10.879	0.039
14	0.57	464	19.334	0.042

Source : Ahmand and Stern [1987]

BOX 2: Standard Benefice Incidence Analysis (BIA) (Demery [2000])

Consider the benefit incidence of public spending on a particular government service—say education. The total incidence of public spending on one group (the poorest income group, the urban population or the female population) depends on two factors: the use of publicly-funded services by that group, and the distribution of government spending among various services —benefit incidence will be greater as the government spends more on the services used relatively more by the group. To show this result formally, consider the group-specific benefit incidence of government spending on education:

$$X_j \equiv \sum_{i=1}^{3} E_{ij} \frac{S_i}{E_i} \equiv \sum_{i=1}^{3} \frac{E_{ij}}{E_i} S_i \qquad (1)$$

X_j is the value of the total education subsidy imputed to group j. E_{ij} represents the number of school enrollments of group j at education level i, and E_i the total number of enrollments (across all groups) at that level. S_i is government *net* spending on education level i (with fees and other cost recovery netted out), and i (=1,..,3) denotes the level of education (primary, secondary and tertiary). Note that S_i/E_i is the unit subsidy of providing a school place at level i. Equation (1) assumes that this subsidy only varies by level of schooling and not across groups. Commonly, government subsidies for services vary significantly by region. Services typically attract higher subsidies in urban than in rural areas. And services are often better financed in the capital city than in other urban areas. These variations in unit subsidies lead to inequalities in the distribution of benefits which should be captured in the analysis. If data permit, benefit incidence involves the estimation of:

$$X_j \equiv \sum_{k=1}^{n} \sum_{i=1}^{3} \frac{E_{ijk}}{E_i} S_{ik} \qquad (1a)$$

where the k subscript denotes the region specified in the unit cost estimate, there being n regions distinguished. The *share* of the total education subsidy (S) accruing to the group is given by:

$$x_j \equiv \sum_{k=1}^{n} \sum_{i=1}^{3} \frac{E_{ijk}}{E_i} \left(\frac{S_{ik}}{S} \right) \equiv \sum_{k=1}^{n} \sum_{i=1}^{3} e_{ijk} s_{ik} \qquad (2)$$

Clearly, this share (and indeed overall inequality in benefit incidence) is determined by two factors: the share of the group in total enrollments at each level of education and in each region (e_{ijk}), and the share of each level of education and region in total education spending (s_{ik}). The *e*'s reflect household enrollment decisions, whereas the *s*'s reflect government spending allocations across regions and levels of schooling. The *e* and *s* variables can be defined also for other sectors, so that for health, e_{ij} would represent the share of group j in the total visits to health facility i. And s_i would be the share of total government net spending on health facility i (for example primary health clinics).

It is now common to have incidence analysis being conducted at the individual level on the basis of the information available in household surveys. In that case, x_j above would represent the share of individual j in total spending. The concentration curve shown in figure 1 plots the cumulative of x_j against j when all households are ranked by increasing welfare – e.g. income per capita. The concentration curve for total spending I- i.e. all educational levels in the example above- is the sum of the concentration curves for the various individual services – primary, secondary, university.

II.2 Limitations of the "standard" incidence analysis

The preceding argument suggests that standard incidence analysis cannot really be conducted in isolation from a macroeconomic framework when applied to taxation, which somehow seemed to constitute its strength (e.g., as a “stand-alone” analysis). Yet, it has other weaknesses which are not always related to the lack of a macroeconomic framework. They are listed below, before ways to overcome them are considered.

A first shortcoming of benefit incidence analysis (BIA) applied to public expenditures is that it focuses on the “average” (ex-post) incidence of all expenditures at a point of time rather than the 'marginal (ex-ante) incidence' of a policy that would consist in increasing expenditures on a service and/or the coverage of that service. In effect, the latter may be of more relevance for policy makers and requires other types of instruments. Either ex-ante instruments predicting who will be benefiting from some planned expansion of expenditures on a given service , or ex-post instruments showing who actually benefited from the expansion that took place. Younger [2001] is right in noting that the 'standard' incidence analysis gives information on the marginal incidence only in the case where the expansion of expenditures consists of improving the quality of the service uniformly for all initial users, with absolutely no change in the identity of users. This is, however, a restrictive assumption.

A second serious drawback is that the standard analysis, or even marginal incidence analysis that would simply simulate the change in the identity of users, assumes no behavioral response from recipients of subsidies. This critique may also apply to taxation incidence analysis and is not totally independent of the average versus marginal incidence issue. Two examples will show the nature of the problem. First, say that the government spends more on primary schooling. The standard incidence analysis will say that all users will get more than before. If behavioral response is taken into account, however, one may expect that a better quality will attract new users, so that the increase in quality will not be as big as if the number of users had remained the same. Behavioral response to changes in the quality and availability of public services is clearly crucial. Second, in the case of a reform of indirect taxation that is reasonably small, it is well known that the change in the welfare of a household may be approximated by the change in the cost of its initial consumption basket arising from induced changes in consumer prices [6]. Actually, households will react to these price changes by moving away from the goods which became relatively more expensive. Knowing this reaction is not necessary for evaluating the welfare gain of the reform, but it is indeed needed to evaluate the change in the public budget or to design reforms which are budget neutral. In those two cases, simply imputing a change of prices to the users of a public service or to the

[6] This is a straight application of the envelope theorem, as illustrated for instance, in Stern [1987] in Newberry and Stern [1987], Chapter 3.

consumers of particular goods is not enough. It is also necessary to know how this change will modify the consumption made of the service or the goods.

Other difficulties in standard incidence analysis, that often combine with the previous ones, must be stressed. For instance, inter-generational aspects of public expenditures aimed at building up human capital are important. In the presence of liquidity constraints and imperfect capital markets, improving the human capital of children through improved schooling or health services cannot be considered as a gain for the parents. Incidence must be evaluated separately for the generation of parents and that of children. In other words, (marginal) incidence analysis needs to be dynamic rather than static. Another (possibly related) difficulty is that traditional incidence analysis uses a single welfare index that is commensurate to income – so that income and the unit cost of schooling, health services, or infra-structure may be conveniently added together and lumped into income redistribution analysis. Instead of this, one might also consider that welfare and poverty are multi-dimensional concepts, so that education, health, or a better quality of life might be valued per se, independently of their monetary value[7].

Some of the last difficulties have to do again with the lack of reference to a macro-economic framework. First, it may often be irrelevant to consider public spending and funding – i.e. taxation – independently of each other. For the reason alluded to above in the case of taxation incidence, this may require referring to some kind of macro framework to understand how tax reforms may translate themselves in changes in consumer prices. But things go much further than this. A tax or a tariff reform is likely to change not only consumer but also producer prices, wages and profit rates – unless some specific neutrality conditions are met. Therefore, the redistribution that goes through a reform of tariffs and indirect taxation is, under rather general conditions, most likely to go as much through changing the structure of household incomes as through changing the prices they face as consumers. If this is the case, then, clearly redistribution incidence analysis requires a full macro-economic framework that will help figuring out the way in which the structural changes in the economy brought about by a indirect tax or import tariff reform will map into the household incomes and their distribution. Somehow, standard average or marginal incidence analysis of public expenditures are based on the assumption that the funding comes from a fully neutral proportional tax on all income sources - or on all uses of income[8] - or from reducing public spending, under the assumption that this too is without any effect on the economy. This may not always

[7] A logically prior problem is how to value the benefit to recipients. Standard analysis usually impute cost. But since the amount consumed is not decided by the agent (but by the provider), she is not equating marginal utility to a price, and the value may differ substantially from cost.

[8] Like a value-added tax at a constant rate on all goods and services, including those produced by the informal sector. This tax system is often recommended precisely for its assumed neutrality property .

be satisfactory, unless it is known that taken altogether, the tax system and some components of public spending are not far from this neutrality property.[9]

But of course, sizable macroeconomic consequences are to be expected not only from tax reforms but also from some public spending programs. Large public programs in education, health or infra-structure may affect the equilibrium and the structure of the economy at the time they are undertaken – through increased demand on specific factors or types of labor, but also in the future by changing the relative factor endowments of the economy and therefore the distribution of income and poverty. For instance, it seems relevant to ask oneself whether an ambitious schooling program undertaken today might lead after some years to a change in the structure of earnings –unless this program is accompanied by or generates itself changes in labor demand that will preserve the existing earning structure. This kind of concern should in theory be included in incidence analysis, but this requires an interaction with macro-economic modeling. As another example, the incidence of a decision to raise the minimum wage motivated by "redistributive" considerations will have not only affect the labor market but may lead to non-neutral fiscal effects through the civil service pension fund.

II.3 Recent developments and directions for improvement

As seen above, the most obvious drawbacks of average incidence analysis of public expenditures, and to a lesser extent taxation, are well understood. Policy-makers are aware of the necessity of adopting a marginal incidence view, that is to concentrate on the effects of additional expenditures or taxation, and at the same time to take into account behavioral responses to the price or the availability of services and to taxation.

Both approaches –i.e. marginal incidence and behavioral response - are necessarily linked to each other when an ex ante perspective is adopted. They have some autonomy when the analysis is conducted ex post. In the first case, marginal incidence is to be figured out by projecting which households will have access to new facilities or how they will react to changes in the accessibility of services, their quality, or their prices. In the second case, marginal incidence is to be ascertained by observing how changes in the previous parameters were associated with actual changes in the consumption of certain services by households.

[9] Hence the considerable importance of models of the CGE type used to simulate the effects of tax systems. For an example of such an analysis of the distributional properties of the tax system in a developing countries, see Devarajan and Hossain [1998]

On both fronts, developments are for the moment limited, but progress is being made. Some pioneering work has been done, or is still under way, which we summarize below. Probably the next step is to generalize existing applications of these techniques, so as to develop instruments with broader usability. We review these developments in turn.

a) Ex ante evaluation of changes in the accessibility of public services and the need for geographical mapping techniques

Following the simplest approach alluded to above that consists of measuring the incidence of public services by their accessibility in the population, a simple tool would be to combine information in household surveys about actual access to these services and their planned geographic expansion. Ideally, it would then be possible to see how the concentration curve of the access to some specific service could be modified by the geographical expansion of that service, and therefore the pro-poor bias of such a policy.

In practice, this is a difficult task if one has to rely exclusively on household surveys, the geographical coverage of which is limited because of sample size and clustering techniques. In other words, using the tax-benefit models arithmetical framework mentioned above to simulate the marginal impact of such policies is likely not to be feasible. Alternatives must be found.

A convincing alternative would consist of extending the techniques of “poverty mapping” - i.e. “census/survey matching” - that permit estimating the mean and the distribution of household characteristics usually not observed in censuses at the level of local communities, provided of course they comprise enough population. In other words, the distribution of income and poverty may not be observed in municipalities and rural districts in the census, but they may be inferred from "matching" the census' information with that in a household survey where income data are observed. Once this is done, it is sufficient to have at one's disposal the map of the accessibility of public services in the country and the way this map is to be modified by policy reform to perform both standard and marginal incidence analysis at the level of the whole country. [10] To some extent this is equivalent to superimposing poverty maps and maps describing the access to education, health facilities, or some specific infrastructure.

Experiences with this type of methodology suggest that rather precise maps describing poverty and other socio-economic attributes of the population may be drawn. These maps may be of considerable value to governments, non-governmental organizations and multilateral institutions interested in strengthening the

[10] Assuming of course, that the geographical expansion of a given service does not modify the distribution of the population through migration.

poverty alleviation impact of their spending, as long of course as the same degree of detail may be used in evaluating or designing reforms in the geographical allocation of public spending..

The design of country-wide – or possibly city-wide- poverty maps is now well established. See Box 3 for a summary of the methodology and the paper by Elbers, Lanjouw and Lanjouw [2001] . Superimposing poverty maps and public spending maps – on average or marginal terms – is currently underway. But very much remains to be done to broaden the use of these techniques and to have them applied to all dimensions of public spending - education at various levels, different types of health services, infra-structure, etc. In this respect, it is worth noting that the constraints in building these superimposed maps may not be so much a question of matching censuses with surveys but to have all the necessary detail on the effective geographical allocation of spending – taking into account possible discrepancies between centrally planned and locally effective spending.

BOX 3: Building Poverty Maps – Hentschel J., Lanjouw J.O., Lanjouw P. and Poggi J. [1998]

It is possible to construct reliable poverty maps combining sample survey data with census data to yield predicted poverty rates for all households covered by the census. There are two steps involved.

1) Estimating Models of Consumption :To impute expenditures using the census, the first step is to estimate a model of consumption or standard of living using household survey data. Of course, the only variables which can be used to predict consumption are variables which are available both in the census and in the survey.

2) Predicting Poverty. The parameter estimates from the regressions (using the full household sample) are used to predict consumption or standard of living in the census data. For each household in the census, the parameter estimates from the applicable regression (conditional on geographical location) are combined with the household's characteristics in order to obtain an imputed value for per capita consumption expenditure. The distribution of living standards, and therefore the prevalence of poverty, may then be estimated with census data with the caveat that the imputation method comes with some uncertainty . Other dimensions of household welfare and its distribution in a given geographical area may be recovered in the same way

More formally in the case of poverty, the log per capita expenditures for household i, lny_i, is first modeled as a function of a vector of explanatory variables, X_i, common to the survey and the census, and a random disturbance term, e_i. The estimation is made on survey data and yields : $Ln\, y_i^S = X_i^S \hat{b} + \hat{e}_i^S$ **(1)** where the superscript S refers to the household survey, $\hat{b}$ is a vector of estimators obtained for instance through OLS and $\hat{e}_i^S$ the corresponding residual. Given a poverty line, *z*, the indicator of poverty P_i for each household *i* is :

$$P_i = \mathbf{1}\ if\ \ lny_i < lnz;\ P_i = 0\ otherwise. \qquad \textbf{(2)}$$

The matching operation consists of imputing to census data X_i^C a per capita expenditure $\hat{y}_i^C$ consistent with (1). This is done through computing :

$$Ln\, \hat{y}_i^C = X_i^C \hat{b} + \hat{e}_i^C$$

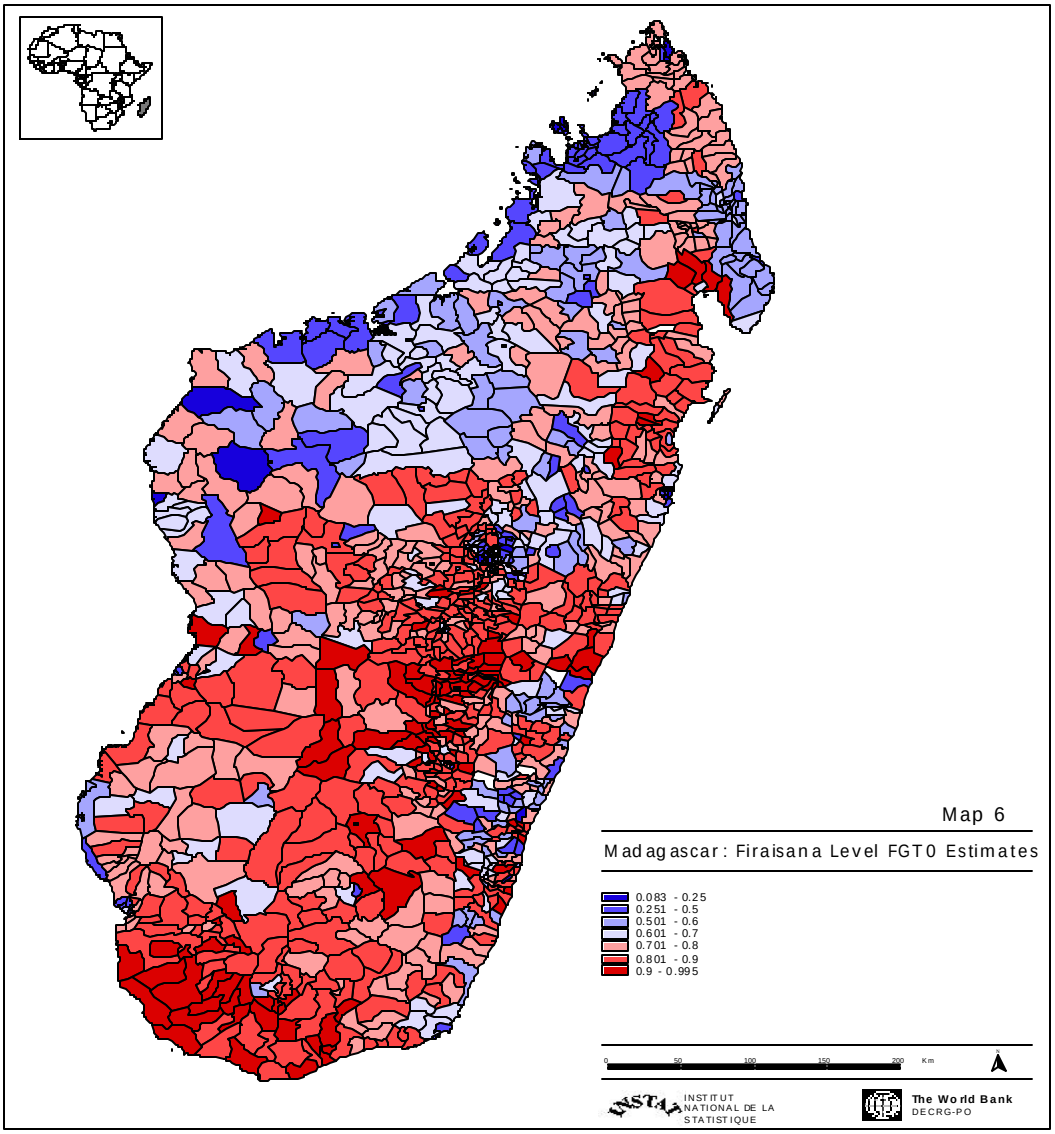
where the $\hat{e}_i^C$ are drawn randomly in the law generated by the $\hat{e}_i^S$ conditionally on the X_i^S

Then poverty may be recovered for any census community by averaging the index function (2), defined on $Ln\, \hat{y}_i^C$ on all households in that community. If the community is sufficiently large, then the way in which the $\hat{e}_i^C$ were drawn is without importance. The same kind of technique may be used for any characteristic of the distribution of consumption expenditures – and as a matter of fact for the whole distribution if this were necessary.

Figure 2: Poverty Map (from Gabriel Demombynes, Chris Elbers, Jenny Lanjouw, Peter Lanjouw, Johan Mistiaen and Berk Özler [2001])

Three data sources were used to produce local-level poverty estimates for Madagascar. First, the 1993 unit-record population census data were collected by the Direction de la Démographie et Statistique Social (DDSS) of the Institut National de la Statistique (INSTAT). Second, a household survey, the Enquête Permanente Auprès des Ménages (EPM) was fielded to over 4,508 households between May 1993 and April 1994, by the Direction des Statistique des Ménages (DSM) of INSTAT. Third, we made use of a variety of spatial and environmental outcomes at the Fivondrona level (e.g. representing a collection of Firaisanas or "communes"). These data were specifically provided to this project by CARE. The household-level welfare indicator underpinning the Madagascar poverty map includes components such as an imputed stream of consumption from the ownership of consumer durables, so as to be as comprehensive as possible. The resulting poverty map below displays the geographic poverty profile for over 1300 firaisanas in Madagascar.

Firaisana Level FGT(0) Estimates



b) Ex-ante marginal incidence analysis and micro-simulation techniques

That households have access to a particular service does not guarantee that they are using it. The geographical incidence approach described above must thus be complemented by some kind of modeling aimed to predict the users of a particular service. In addition, it must be taken into account that changes in public services as well as taxation modify the behavior of households and therefore their income. Marginal incidence analysis must account for these indirect (behavioral) effects on household welfare. Moreover, there may be important cross-effects between taxation and the use of public services. For instance, an increase in the price of cash crops –due to a subsidy or a change in a tariff-- may raise the demand for schooling within households in the concerned area. In turn, this modifies the incidence of public spending in schooling. Hence, marginal incidence analysis of public spending and/or taxation may require modeling household income generation behavior, including the choice of activity by household members – for example, schooling vs another occupation. .

The "household income micro-simulation" (HIMS) approach is based on observed household survey data and estimated or calibrated models of behavioral response (labor supply and occupational choices, production, consumption, schooling demand, etc.). HIMS models consist essentially of an integrated, econometric model of occupational choice – including schooling as in Gertler and Glewwe [1990] - of income generation for the various individuals belonging to a household, and of taxation incidence à la Ahmad and Stern ([1987]. The income generation model is based on earning and self-employment income regressions for the whole population with residuals being interpreted as individual fixed effects. The other component is a polytomic occupational allocation model where individuals are allocated to, or choose from inactivity or unemployment, wage work, and self-employment. Schooling may also be part of these choices. In that case too, fixed effects are estimated for all individuals in the sample. A general model of income generation at the household level that may be used as a basis for micro-simulation and marginal incidence analysis has been proposed by Bourguignon, Ferreira and Lustig [1998] for analyzing marginal changes in income distribution. [11]

Initially, the HIMS approach started in developed countries with Orcutt [1957] to address issues related to the distributive impact of welfare programs, and changes in tax policies, fiscal reforms and health care financing. But this first attempt did not include behavioral responses of households. The approach considered here combines this analysis with standard econometric modeling of households' behavior, while ignoring the possible feedback effects of behavioral response (partial equilibrium framework).

[11] For a rigorous statement of the methodology see Bourguignon, Fournier and Gurgand [2001] and Bourguignon, Ferreira and Leite [2002].

The HIMS framework should preferably be used for marginal incidence analysis whenever one assumes that public spending or taxation – or price subsidies – modifies significantly the price system faced by households. For instance, a change in the price of the agricultural crops modifies self-employment income and possibly the activity choice of several household members. Better access to schools modifies schooling demand and the total income of the household. Improving local infrastructure may increase the productivity of self-employment, or that of domestic activity thus raising participation in market activities. Changes in the relative prices of consumer and producer goods via taxation or subsidies directly affect the real income of the household but also activity choices, if they are strongly income elastic.

But in addition, other simulations are possible. For instance, one may simulate the effect of changing the structure of earnings on the overall distribution of income, or the effect of changing the price of the crops produced by farmers in the rural sector, or the effect of rationing the access to formal wage work. The important point is that, because of the heterogeneity of the members of a household, all these changes will produce variations in household income that will be in different proportions across households. We shall see below how these features provide useful links with macro models.

The micro-simulation approach bypasses many of the problems of the benefit incidence analysis and in particular the lack of behavioral response and the evaluation of policy choices based on averages calculated for large groups of the population. Nevertheless, several question still arise. How far this approach may go and how comprehensive models may be without becoming unreliable or black boxes? What are the data limitations (e.g. in low income countries) given the requirements of this approach? What trade-offs are there between simplicity and a fully specified structural model of behavioral response? Are simple scenarios with no behavioral response of any relevance?

An indirect way to deal with marginal ex-ante incidence of public spending has been proposed by Lanjouw and Ravallion (2000). It consists of relating the benefits that an income group in a province or a district may derive from a given public spending program with the total size of this program in the province or the district. Geographical variability of the size of the program and its distributional effects is used as an identification device. The relationship between group benefits and the total size of the program is estimated on the basis of observed incidence in various areas at a point of time. Marginal incidence is then projected by simulating the effect of expanding the size of the program in an area. Of course, this method relies implicitly on the assumption that the expansion of a given public spending program covers different income groups in a pattern that cannot be modified. For instance, the program is captured first by the rich, then by the middle class and reaching the poor only once it is at maximum size. This process is supposed to repeat itself identically for all provinces or districts. Policy is therefore only present, in this

BOX 4: The various levels of Household Income Micro-Simulation (HIMS): a simple example, (from Robilliard A.S., Bourguignon F., and Robinson S. [2001])

As a starting point consider the elementary income model for a household j given in eq. (1):

$$(1) \qquad y_j = \left[\sum_i w_{ij} L_{ij} + E_j + R(w_i L_i + E_j ; \sum_i S_{i,j} ; A_j) \right] / P(C_j ; p)$$

where real income y_j is the sum of wage income by household members i supplying L_{iij} unit of labor –which may be zero- at the wage rate w_{iij}, of non-labor income E_j and transfer income R( ). The latter depends on gross income, the number of household members attending school $\sum_i S_{i,j}$ and some socio-demographic attributes A_j. Finally P( ) is an household specific consumer price index that depends on the observed budget shares of the household, C_j, and the price vector, p.

1st level micro-simulation : pure accounting

At this level, one computes arithmetically how changes in ΔR( ) and Δp – for instance through taxation - affect real income. The change Δ can be interpreted as a change between two intervals of time or a counterfactual. Applications of this first level concern all types of redistribution analysis with no behavioral response at the agent's level. This is the original framework proposed by Orcutt (1957) and used since then in tax-benefit models in developed countries. The schooling argument in R allows analyzing the incidence of public spending in education.

2nd level micro-simulation : reduced form behavior

$$(2) \quad Log\, w_{ij} = B_{ij}.b + s_{\,u}.u_{ij}$$

$$(3) \quad L_{ij} = f(D_{ij}.g\,; s_{\,v}.v_{ij})$$

$$(4) \quad S_{ij} = g(D_{ij}.l\,; m_{ij})$$

where u_{ij}, v_{ij} and μ_{ij} are assumed to have unit variance.
At this level, the potential wage rates of the various household members and their labor supply are explained by a set of individual and household socio-demographic characteristics B and D in a reduced form model. Estimates of the β, σ_u, γ, λ, σ_v, u_{ij}, v_{ij} and μ_{ij} are obtained on the sample of observations for a base year. Possible simulations now include, on top of the instruments at the 1st level, changes Δβ, $\Delta\sigma_u$, Δγ, $\Delta\sigma_v$, Δλ ; where again, Δ can be interpreted as a change between two intervals of time (i.e. two household surveys) or possibly a counterfactual (e.g., the effects on wages and occupational choice of changes in tax or public spending policy as given by some counterfactual macro model).

3rd level micro-simulation : Structural model of labor supply and partial equilibrium

$$(5) \quad L_{ij} = F(w_{ij}, E_j, P(C_j, p), G_i ; R(); d ; w_{ij})$$

$$(6) \quad S_{ij} = K(y_j, G_i ; R(); f ; q_{ij})$$

Labor supply now appears as an explicit function of the wage rate, non-labor income, the household specific CPI, individual and household socio-demographic characteristics, G, and the redistribution system (R( ). δ is a set of coefficients to be estimated whereas ω_{ij} is again a residual that stands for an individual fixed effect. Schooling is a function of household income y, individual and household socio-demographic characteristics – including school accessibility - G, the redistribution system (R( ). ϕ is a set of coefficients to be estimated whereas θ_{ij} are residuals.

With this formulation, it it becomes possible to simulate directly the impact of taxation or access to school on household welfare, that goes through labor-supply behavioral response and schooling demand, rather than importing these effects from elsewhere.

framework at the inter-province or inter-district level, through the allocation of spending. Intra-province or intra-district allocation of public spending is endogenized, and to some extent, taken as a given.

BOX 5: Marginal Incidence – from Ravallion and Lanjouw [2000]

Let us suppose that we want to expand a program of subsidies aiming at increasing enrollment rates in primary schools. We know that the benefits of the program, on average, are not "pro-poor" (i.e. "middle-class" groups are benefiting more than low-income groups). Among possible reasons for this are: (a) Government programs lend themselves to "capture" by different income groups over time; (b) the poor may be concentrated in more remote or inaccessible regions, that are less well-served by current programs; (c) scaling up may reduce targeting effectiveness. Nevertheless, the "pro-middle-class" current distribution of benefits of spending may not be the same as what would happen with an expansion of the program. In other words, the distribution of marginal benefits might show that it is worth expanding it. In order to evaluate such a decision, one has to calculate by quintile the specific participation (enrolment) rates. The approach is to compare average with marginal odds:

- Calculate the average odds ratio (defined as the quintile average enrolment rate divided by population average enrolment rate)
- Calculate average participation rate for the whole population
- Estimate the marginal odds ratio (defined as the marginal increase in quintile specific enrolment rate associated with an aggregate change in overall enrolment)

In other words, one has to estimate separately, for each quintile (where E is enrolment rate and A is adult literacy -a control-) the following:

$$E_{district,province}^{quintile} = a^{quintile} + b^{quintile} E_{district,province} + d^{quintile} A_{district,province}$$

If we change the subsidy rate for primary schools across zones (districts or provinces), we can measure, through the estimated β coefficients, how increased public spending in the zone (district or province) will affect each quintile of that zone (district or province).

c) Ex-post evaluation of marginal incidence and public programs

The marginal incidence of public spending may also be evaluated ex-post, essentially by observing who are the users of the newly installed services, the actual beneficiaries of a given program, and figuring out the overall effect of these programs.

Identifying marginal users may be done over time and on a cross-sectional basis, provided that the marginal services may indeed be identified. As an example of the first situation, consider for instance the households with kids going to school in year 1 and households with kids going to secondary school in year 2, as observed for instance in two cross-sectional surveys taken in these two years. The marginal incidence of that part of public spending which permitted this change in secondary enrollment may be represented by

$$N_{2q} / N_2 - N_{1q}/N_1 \qquad q = 1, 2, \ldots.$$

where N_{tq} is the number of households in income fractile q with kids in school and N_t total school enrollment in year t. Alternatively N_{tq}/ N_t may be interpreted as the share of the total schooling cost that is expanded through enrollment on fractile q. In any case, this expression representsthe shift in the concentration curves shown in figure 1 above. It is also possible to define marginal incidence as the share of a given fractile in the total increase in enrollment :

$$(N_{2q} - N_{1q}) / (N_2 - N_1)$$

Such a formula is used by Van de Walle and Neade [1995].[12] What is crucial is that there may be a big difference between average incidence at a point of time - i.e. N_{1q}/N_1 or N_{2q} /N_2 – and the marginal incidence defined by the preceding formulae.

The preceding formulae allow one to evaluate the marginal distributional incidence of programs at the national level under the (implicit) simplifying assumption that welfare gains are essentially proportional to the unit cost of the public service that is evaluated. One may also want to evaluate the marginal incidence of programs with only local coverage, and, more importantly, to judge their effectiveness in both reaching the right people and affecting their behavior and welfare in the appropriate way. If the formulae above permit handling the targeting part of the evaluation, this is not true of induced changes in the behavior and welfare of program participants. In particular, the assumption of individual welfare gains all equal to the average cost of the program seems much too extreme. Other methods must then be used

To evaluate the welfare gain due to the program, it would seem natural to simply compare the participant's welfare level with the program and that without the program. This is not an easy task, though. The difficulty comes from the fact that while a post-intervention welfare indicator is available, no such an indicator is available for the situation without the program. Indeed, by definition, participants are observed only when they benefit from the program but, in general, no data on the counter-factual of what would have happened to them in the absence of the program.

Naïve comparisons are still common even though they may be misleading. It is tempting to proxy the "true" effect of the program by contrasting participants versus non-participants or simply by using reflexive comparisons, that is the same people before and after the program. However, such methods can be very deceptive because of serious 'selection' problems. The population of participants is generally not drawn randomly from the whole population, so that one does not know whether the program being

[12] See also Younger (2001).

evaluated is effective on its own or because it was applied to participants especially receptive to it. Various methods have been designed over the recent years to remedy this problem (see Box 6).

The inherent difficulty in finding an adequate, non-biased "counterfactual" -e.g., the baseline effect for participants to a program in the absence of the program that one wants to evaluate - and the difficulties in getting adequate data and survey design for measuring impact are serious obstacles to ex-post evaluation. Nevertheless, it is of the utmost importance to conduct rigorous, or the best possible, ex-post evaluation in order to know how the welfare impact of the actual projects behind public spending actually compares with what is usually assumed in ex-ante marginal incidence analysis. Ideally, there should be a constant interactionbetween ex-ante and ex-post analysis which is presently very far from sight because of the small number of both ex-post and ex-ante evaluations being undertaken[13].

BOX 6: Techniques for Ex-Post Evaluation of programs– Ravallion M. [2001a]

In the absence of the proper data, some procedures and tools may be used fill in the missing observation.

- *Randomization:* Only a random sample is allowed to participate to the program. "Randomized out" group is the counterfactual. Hard to do in practice because of social justice comparisons. Delayed participation of part of the population may be used to reach the same objective.
- *Matching*: Match participants to non-participants from a larger survey. Matches are chosen on the basis of similarities in observed characteristics. The most common method is to match people on the basis of their ex-ante probability to participate to the program, these probabilities depending on their characteristics as well as those of the communities they live in – i.e. " Propensity-score matching."
- *Double difference*: The simplest version of that method consists of collecting baseline data on non-participants and (probable) participants before the program. Compare with data on the same individuals after the program. Subtract the two differences.
- *Instrumental variables:* Use variables that influence participation -- but do not affect outcomes given participation -- to identify the exogenous variation in outcomes due to the program. The counter-factual is then identified.

Yet, it is not always possible to implement these methods. Recurrent problems are:

- Programs have to be put in place quickly. As a consequence, neither randomization or baseline surveys are feasible.
- Allowing for unobservables. Finding valid instrumental variable or exclusion restrictions is not always easy. Dubious practices abound in applied work
- Project monitoring often has little or no evaluative content. There is plenty of data on inputs but little on performance, and still less relative to a relevant counter-factual.

[13] For example, it is conceivable that for important programs such as Progresa, one compares the expected results of an ex-ante evaluation done using the techniques above mentioned with the data that were available at the time the program was designed and available ex-post evaluation.

d) Other issues in evaluating the distributional effect of public spending

Another combination of an ex-ante with an ex-post approaches can be found in the recent practices that are tracing public expenditures flows through proper surveys. Judging whether budgeted public spending actually reaches local targets seems a crucial first step before assessing whether the "poor" are actually reached. In other words, the practice of imputing unit cost of schooling or health services to beneficiaries may be quite misleading if part of these "costs" actually remunerate 'intermediaries' between the ministry of finance and community schools or dispensaries.

There is recognition that institutions and governance problems can "filter" policy intentions and reduce considerably the effectiveness of pro-poor spending. There is now a new quantitative approach to evaluating the delivery of public services in that light – see Box 7.

BOX 7: Transparency & Accountability-Public Expenditure Tracking Surveys - Dehn, Reinnika and Svensson [2001]

The need for special Public Expenditure Tracking Survey comes primarily from the increasing evidence that budget allocation to social services (the basis for traditional "benefice incidence analysis") is not consistent with the casual observation of what is really happening in the ground. However, there are many other reasons why a more accurate, ex-post, tool for assessing the targeting power of public spending is needed:

- Government failure has become more of an issue
- Budget allocations poor predictors of services beneficiaries receive when governance is poor
- Little known about transformation of budgets into services
- Household surveys show that quality of service important determinant of demand

There are now techniques to conduct incidence analysis of public expenditure using budget allocations, household surveys, and several other sources of information:

- Participatory poverty assessments
- Service delivery surveys of households
- Public officials surveys

This combination of approaches allows both a diagnosis of problems in service delivery and their statistical analysis. It can be expanded so as to become a research tool per se – i.e. the Quantitative Service Delivery Surveys (QSDS).

Dehn, Reinnika and Svensson [2001] demonstrate that budget allocations alone can be misleading in explaining outcomes and making policy decisions, when institutions are weak. They diagnose the problem, using empirical evidence from primary education and health care in Uganda, but arguing that a similar problem exists in many countries. Adequate public accounts are not available so they carried out a field survey of schools and clinics to collect data on spending. Problems with the flow of public funds have to do largely with governance and a lack of accountability. On these two accounts, they identify the following problems. Primary enrollments increased 60 percent in 1991-95, but official figures indicate enrollments were stagnant. Such a stunning discrepancy indicates that official data cannot always be trusted. The government's share of funding increased over time, but public primary education was still funded largely by parents, who contributed, on average, more than 70 percent of total spending on schools in 1991 and 60 percent in 1995. Parents' contribution continued to increase despite higher public spending. Less than 30 percent of funding intended for non-salary public spending actually reached the schools in 1991-95; district authorities kept and used most of the capitation grant meant for schools. (An increase in enrollments which was not taken into account when the total amount of the grant was calculated is responsible for the remaining discrepancy). Similarly, at best, schools were allowed to keep only a third of mandatory tuition fees from parents; the rest went to district education offices. By and large, salary payments did reach the schools, so at least the wage part of the increase in budget allocations filtered down through the system. The only systematic way of misappropriating salary funds were "ghosts" on the payroll. Close to 20 percent of all teachers on the payroll were removed as ghosts in 1993.

III. Analyzing the distributional and poverty effects of macro policies

The previous sections reviewed a set of policies that could be analyzed using micro-economic techniques. These policies affect poverty essentially through redistribution. By contrast, this section considers policies that affect poverty through growth and changes in the macroeconomic structure. In particular, it addresses the policy questions No. 3-5 in the introduction: "What is the poverty impact of structural reforms and changes in the macroeconomic framework or at the macroeconomic level?". This section also addresses the need, stressed above, for micro incidence analysis that sometimes relies on a macroeconomic framework, as with indirect taxation issues or when the program the incidence of which is analyzed is likely to have sizable macroeconomic effect. We start with the current practice in analyzing the relationship between growth and poverty in aggregate models. Then we move to disaggregated models of various types and the reliance on the so-called "representative households". Next, we point out to some limitations to this approach. Finally we show how these limitations could be overcome by extending the micro-simulation techniques of the type just reviewed in the previous section to deal with the incidence of policies that essentially operate at the most aggregate macro level or at the intermediate sectoral disaggregation level.

III.1 The relationship between growth and poverty in aggregate models

a) Is there any systematic relationship between growth and distribution ?

The main question in studying the effect of growth on poverty is whether growth has any systematic effect on the distribution of economic welfare in the population. If so, the effect of growth on poverty should be the compound effect of increasing all incomes in the economy and changing their relative levels at the same time. If not, then the effect of growth on poverty should be fairly simple to figure out.

An important source of debate has been the insight that came with Kuznets [1955] seminal paper arguing that the relation between income inequality and economic growth follows a general pattern of an inverted-"U-curve", as could be expected in a Lewis-type of "dual" economy. Although empirical evidence seemed initially in favor of that hypothesis – see for instance Ahluwalia and Chenery [1976] – it is now admitted that no such strong and systematic relationship seems to exist.[14]

More fundamentally, the recent study by Dollar and Kraay [2000] suggests that, on average across countries, no simple variable seems able to explain observed changes in the distribution of income over time and during the process of economic development. They regress the mean income of the poorest 20 per cent of the population over the mean income of the population and a host of variables assumed to

[14] See for instance Deininger and Squire (1998)

account for the rhythm and the economic structure of growth – i.e. openness, public spending. They find the coefficient of the former variable not to be significantly different from one and all the other variables essentially insignificant. They thus conclude that income inequality – as measured by the ratio of the income of the poorest 20% to the mean income - does not show any tendency to be modified with the process of development and the development policy, so that the income of the poor grows like that of the mean individual in the population. Of course, it may also be the case that this analysis simply misses important distribution determinants, which cannot be observed on a cross-sectional basis and introduce some bias in the results [15] (See in particular Anand and Kanbur [1993] and Deininger and Squire [1998].) The recent literature has also gone in the opposite direction, namely searching for the empirical evidence in favor of the hypothesis suggested by several theoretical models that inequality in the distribution of economic resources should have a negative impact on growth. Despite initial hopes, evidence appeared weak and little significant. See, for instance, Benabou [1996] for a review of the early literature on this issue.

b) Empirical analysis of the relation between growth and poverty

Several recent papers focused on the statistical relationship between economic growth and poverty reduction across countries and time periods. Many of them - Ravallion and Chen [1997], de Janvry and Sadoulet [1998], Agenor [2002] - are based on linear regressions where the evolution of some poverty measure between two points of time in a country is explained by the growth of income or GDP per capita and a host of other variables-- the main issue being the importance of GDP in determining poverty reduction[16].

The lessons from this cross-sectional aggregate approach are deceptively simple. Of course, GDP growth tends to reduce poverty – with an average elasticity around 2 when poverty is measured by the headcount. However, the very nature of the cross-sectional exercise makes it very hard to draw any conclusion that would be "country-specific". By adopting a cross-sectional regression framework, or by investing too little in functional specification testing, these papers overlook the point that there is a identity – that can be calculated from the initial distribution of income-- relating mean income growth, distributional changes and changes in poverty.

[15] On this see Bourguignon (2002).

[16] We do not include Dollar and Kraay [2001] here despite obvious analogies with these papers. By focusing on the relative mean income of the bottom quintile of the distribution, their paper –despite the title-- actually deals with distributional issues or "relative" poverty rather than absolute poverty defined by the number of individuals whose standard of living falls below an arbitrary line.

Ex-post, it is always possible to decompose the change in poverty that is due to the uniform growth of income and the change that is due to changes in relative incomes – i.e. changes in the distribution. If a household survey is available in the country under analysis, a simple identity relates these various concepts – see Datt and Ravallion [1993]. A spreadsheet software has recently been made available to exploit that identity – see SimSIP-Poverty, Wodon (2002). If no household survey is available or if its use is found to be cumbersome, then Bourguignon [2002] proposes an approximation of that identity that seems satisfactory. Ex-ante, predicting the consequences of a growth policy on poverty can be done with the same technique, at least under the assumption that the policy under scrutiny will be distribution neutral – see Box 8.

In the next section, we show how to depart from the aggregate approach.

Box 8: The arithmetics of growth, distribution and poverty, Bourguignon [2002]

Ex-post the contribution of growth and distributional change to change in poverty between period t and t' may be expressed in the following way - Ravallion and Huppi (1991), Datt and Ravallion (1993), Kakwani (1993) –

$$\Delta H = H_{t'} - H_t = \tilde{F}_{t'}(\frac{z}{\overline{y}_{t'}}) - \tilde{F}_t(\frac{z}{\overline{y}_t}) = \left[\tilde{F}_t(\frac{z}{\overline{y}_{t'}}) - \tilde{F}_t(\frac{z}{\overline{y}_t}) \right] + \left[\tilde{F}_{t'}(\frac{z}{\overline{y}_{t'}}) - \tilde{F}_t(\frac{z}{\overline{y}_{t'}}) \right] \quad (1)$$

where $\tilde{F}()$ is the distribution of 'relative income', $z / \overline{y}$ is the 'relative' poverty line that is the poverty line normalized by the mean income and H is the poverty headcount ratio. This simple *identity* consists of adding and subtracting the same term $\tilde{F}_t(\frac{z}{\overline{y}_{t'}})$ in the original definition of the change in poverty. The first expression in square bracket in the RHS of (1) corresponds to the growth effect at 'constant 'relative income distribution', $\tilde{F}_t(X)$, whereas the second square bracket formalizes the distribution effect, that is the change in the relative income distribution, $\tilde{F}_{t'}(X) - \tilde{F}_t(X)$, at the new level of the 'relative' poverty line. Ex-post, observing $\tilde{F}_t(X)$ and $\tilde{F}_{t'}(X)$ is sufficient to perform that decomposition. Ex-ante, some assumption must be made on $\tilde{F}_{t'}(X)$, the simplest one being that it is identical to $\tilde{F}_t(X)$ - i.e. no change in the distribution.

A very simple approximation of (1) may be obtained in the case where the distribution may be assumed to be Log-normal, probably the most common approximation of empirical distributions in the applied literature. It can be shown in that case that the elasticity ? of the poverty headcount (H) with respect to the mean income $\overline{y}$ is given by :

$$e = -\frac{\Delta H}{\Delta Log(\overline{y}) H_t} = \frac{1}{s} l\left[\frac{Log(z / \overline{y}_t)}{s} + \frac{1}{2} s \right]. \quad (2)$$

where $l[\ ]$ is the ratio of the density to the cumulative of a standard normal and s is the standard deviation of the logarithm of income, a measure of income inequality that may be related to more usual indices.

III.2 The Computable General Equilibrium – Representative Household (CGE/RH) approach

The preceding method for evaluating the incidence of growth on poverty could conceptually be generalized to disaggregate representations of growth by sector or social groups. It would only be necessary either to observe the growth of specific sectors or to be able to predict them with the appropriate modeling tools. Then, knowing the distribution *within* these sectors or groups, the same identity relationships as above could be used - as in the Poverty Analysis Macro Simulator model built by Pereira da Silva, Essama-Nssah and Samake [2002]).

Unfortunately, things are not that simple. In particular, the identity described earlier would work as long as there is no movement between the groups or sectors being considered in the analysis, or if those movements were in some sense distribution neutral. This is unlikely, though. For instance, people moving between the formal and informal sectors are not drawn randomly from their sector of origin nor distributed randomly in their sector of destination. In addition, analyzing growth in a disaggregated way may require more sophisticated modeling tools.

Much energy over the last 20 years or so has been dedicated to developing disaggregated models that would permit analyzing simultaneously changes both in the structure of the economy due to some specific growth-enhancing policy and in the distribution of income within the population.

a) Early 'real' models combining sectoral disaggregation and representative household groups (RH)

Computable General Equilibrium models (or CGEs) probably remain today the first step of any analysis seeking to integrate distribution considerations and economic policy at both the micro and the macro level. Since the pioneer work by Adelman and Robinson [1978] for South Korea and Lysy and Taylor [1980] for Brazil, many CGEs for developing countries combine a highly disaggregated representation of the economy within a consistent macroeconomic framework and a description of the distribution of income through a small number of “representative households” (RH) meant to represent the main sources of heterogeneity in the whole population with respect to the phenomena or the policies being studied. Models were initially static and rigorously Walrasian. They now often are dynamic – in the sense of a sequence of temporary equilibrium linked by asset accumulation – and often depart from Walrasian assumptions so as to incorporate various macro-economic features or 'closures' as well as imperfect competition.

Several “representative households” (RH) are necessary to account for heterogeneity among the main sources of household income – or among the changes in income–due to the phenomena or the policies being studied. Despite the need for variety, the number of RH is generally small, however-- usually less

than 10. The RHs are essentially defined by the combination of the productive factors they own – farmers, rural wage workers, skilled urban workers, unskilled urban workers in the formal sector, etc. Although simple, this disaggregation methodology proved to be very useful and gave many insights into a variety of issuesoccasions. With time, this approach led to an increasing degree of disaggregation of the production and the demand sides of the economy, in the degree of heterogeneity among agents – by explicitly considering that households within a RH group were heterogeneous but in a 'constant' way - in the specification of government transfers and other types of expenditure, and on the structure and the functioning of factor and good markets.

CGEs probably remain today the first step of any analysis seeking to integrate distribution considerations and economic policy at both the micro and the macro level within a consistent framework. Recent examples of such disaggregated models with a strong focus on income distribution involve Devarajan and Lewis [1991] on Indonesia, Decaluwe [1998] on Morocco, etc. It should also be noted that many CGEs are actually used to conduct taxation incidence analysis of the type mentioned above.[17] The same models could be extended to provide inputs –i.e., the precise consumer price vector—to conduct incidence analysis of taxation at the household level, as seen in the previous section, rather than with RH groups.

Finally, it should be noted that a large number of applications of CGE/RH modeling analyze the distribution effect of trade liberalization – for a recent example see fro instance Yao and Liu [2000]. It is not the purpose of this paper to summarize this large body of literature.

b) 'Macro Augmented' CGE models with representative household (RH) groups

Most of the CGEs just referred to are 'real' and rely on very simple macro-economic closure rules like saving determined investment expenditures. Whether static or dynamic, they seem to be more appropriate to address medium-run issues where most markets may be assumed to be in equilibrium and growth is in some sense 'balanced'. It was soon felt that some extensions were necessary to cover a wider range of policy issues, in particular issues related to the short-run management of the economy. To do so, CGEs have been extended to include money and other financial assets. The "Maquette" designed by Bourguignon, Branson, de Melo [1989] for the OECD was the first CGE modeling framework incorporating multi-sectoral disaggregation, income distribution through RHs – and constant heterogeneity within them – macro-economic mechanisms and policy instruments linked to money and various types of financial assets. These developments were particularly interesting to analyze both the macro and the distributional effects of large financial crises and adjustment of stabilization policies.

[17] In effect, this may have been one of the first uses of CGEs but this tended to concentrate on developed countries – see for instance Shoven and Whalley (1984). For an excellent application of this framework to developing countries see the model of Devarajan and Hossain (1998) for Philippines.

Since then, improved macro-augmented distributional CGEs have been proposed by a variety of authors in a variety of countries - see for instance Dorosh and Sahn [2000] for applications to African countries. More recently, the "Integrated Model for Macroeconomic Poverty Analysis", or IMMPA, built by P.R. Agenor, A. Izquierdo and H. Fofack [2000] at the World Bank, tries to provide a unifying framework to integrate a financial sector and a broad range of macro-economic closure rules as well as long-run endogenous growth mechanisms within the CGE/RH approach.

Truly dynamic CGEs with inter-temporally optimizing agents endowed with perfect or near-perfect foresight were also developed. They permit a better analysis of transition paths between long-run growth regimes and the effects of policy instruments affecting them. But they were more adapted to intergenerational than more common infra-generational distribution issues. Moreover, only a few applications were made to developing countries.[18]

III.3 The approach using disaggregated IS-LM macro-econometric models

While the macro-augmented CGEs examined above were capable of analyzing some distributional issues they were unable to account properly for several macro specific phenomena in particular those related to crisis situation where the role of expectations had to be modeled in a more sophisticated way. Another shortcoming of CGEs is that they generally are 'calibrated' models relying on a small number of key behavioral parameters the value of which is arbitrarily set – or imported from another country where it has been properly estimated. Other data are simply identified by the assumption that the economy is initially in a state of equilibrium. Progresses in macro-econometric modeling and estimation techniques allow to address many of these macro issues in a more satisfactory way. Unfortunately, these models are not designed specifically to tackle distributional problems. Also, their authors were not concerned primarily by these problems. But the lack of a tradition does not imply that macro-econometric models are incapable per se of dealing with distributional problems. There are various ways in which this may be pursued.

The first technique, similar to the CGEs/RH, consisted in a first stage of disaggregating production into various sectors rather than to stay at a fully aggregate level. This approach –which was essentially following the IS-LM tradition-- produced a multiplication of increasingly larger sectorally disaggregated macro models in most developed economies. Indeed, many large-scale macro-econometric quarterly

[18] This literature has its origin in the book by Auerbach and Kotlikoff [1987] For applications to developing countries, see Mercenier and de Souza [1994]. A related literature (Auerbach, Kotlikoff and Leibfritz [1999]) has focused on "inter-generational accounting" and distribution.

models with more than 1,000 equations and a dozen sectors were operating in the 1980s, for instance the Wharton Econometric Forecasting model by L. Klein for the US, or the "Dynamique Multi Sectoriel" model, DMS, or METRIC for France. Despite their sectoral disaggregation, however, these macro models stayed short of the RH approach. They barely touched on distribution issues beyond a breakdown between wages for different labor categories and various types of non-wage income. It would probably have been possible to do better. However, the late 1970s shocks (jumps in oil prices, interest rates, exchange rate volatility between developed countries) seriously weakened the forecasting and analytical power of these models Their prediction errors undermined their prestige. The Lucas critique sealed their fate.

Since then, the preference is for smaller and more aggregate models -- the logical structure of which may be made much more flexible. This suggests a second solution relying on a two layer approach for taking distributional issues on board. The first layer is a compact, possibly flexible, econometric modeling of all relevant aggregate macro variables (GDP, prices, interest and exchange rates). The second layer consists of disaggregating employment, production, etc. into a multi-sector/RH type of framework. The difficulty, of course is to have this second layer made fully consistent with the first one.

One may think of macro-augmented CGE models where some components of the 'macro' part would result from econometric estimation. But more integrated approaches are also possible. Early examples of this approach can be found for instance, in a typical IS-LM model for South Africa that was built with the specific purpose to test the effect of macro-policies (e.g., the end of Apartheid, growth-enhancing policies, stabilization, etc.) on three specific and distinct groups of the South African population (skilled labor, semi-skilled labor and unskilled labor). An explicit two-level CES production function was estimated allowing for substitution between these labor categories and capital. The novelty there consisted in relying on the econometric estimation of the behavior of a disaggregated labor market for the three levels of skills in the economy. This was possible ironically because of the data availability in Apartheid South Africa, which used to classified labor according to racial characteristics (see P. Fallon and L. Pereira da Silva [1994]).

Aggregate macro relationships implicit in the preceding approach are of a short-run nature. But they may also want to take into account long-run growth determinants rather than short-run aggregate demand phenomena. The same two-layer approach can be used in this case, too. A recent example of such a structure can be found with the combination of VAR techniques to project growth with a CGE/RH providing some breakdown of various sources of household income. Recent extensions of the 123 CGE model developed by S. Devarajan and alii. [2000]) are in this spirit.

III.4 Limitations of the RH approach

Although the disaggregation of macro models is an attractive and probably the most obvious way of integrating macro-economic and distributional issues, the RH approach outlined above suffers from various limitations.

If mean income differences across a few RH groups explain a substantial part of overall inequality at a point of time, this may not be true at the margin between two points of time, or between a benchmark and a counterfactual simulation. Most decomposition studies of 'change' in inequality suggest that changes in the distribution are due to a large extent to changes in the distribution *within* RH groups. See for instance the pioneer study by Mookherjee and Shorrocks [1983] for the UK. This is because of the pronounced heterogeneity of several economic phenomena like income shocks among individuals and households belonging to the same RH group, , occupational changes or the fact that two members of a given household may actually belong to groups that are very differently affected by a macro-economic shock or policy. This decomposition of changes in inequality has also been applied to developing countries. Ahuja, V. et. al. [1997] apply this for Thailand while Ferreira and Litchfield [2001] do it for Brazil. Results are analogous. It follows that the RH approach based on the assumption that relative incomes are constant within household groups may be misleading in several circumstances.

This is specially true when studying poverty. It may be the case that the change – say a drop - in the mean income of a RH, as simulated by the kind of model reviewed in the preceding sections, is relatively limited. Yet, if income is averaged over households among which the macro-economic shock under scrutiny had very heterogeneous effects, then poverty might be increasing by much more than suggested by the drop in mean income. For instance, some individuals may have lost their job in some households, or some households may have more difficulty to diversify their activity, or their consuption, than others. For these individuals, the relative fall in real income is necessarily larger than for the whole group. If their initial income was low, then poverty may increase by much more than expected under the assumption of distribution neutral shocks – that is applying the methodology reviewed above in section III.1. By averaging the analysis for all households belonging to the same group, the RH approach may thus be driving analysts and policy-makers to wrong conclusions.

In this sense, the appropriate usage of the RH assumption depends on the sources of income of households within each RH group. If there is a great variety of sources of income for the same household, then it is likely that policies that are simulated with the underlying view that they will produce homogeneous results for a group, will lead to weak results.

When using RHs in disaggregated macro models, the challenge is to design a specific breakdown of the household population that guarantees a maximum coverage of possible distribution effects of policy and shocks. However, this objective is likely to lead to a number of RH groups that is much too large for practical purposes. On the other hand, one may also want to follow the fate of individuals rather than households, as it would be the case if the emphasis were put on the effects of macro shocks and policies on women empowerment or any other more specific category of the population. Again this is something that is not possible with the RH approach.

III.5 Combining macro modeling and micro-simulation models

It should be clear from the preceding analysis that the most promising direction consists in seeking a true integration between macro models and the observed heterogeneity of households as observed in a household survey. The problem is how to do it. In what follows we explore two possibilities but also stress some difficulties.

a) The difficulty of full integration

The first possibility consists in moving from representative to 'real' households within the CGE approach. It is theoretically possible. After all, it suffices to replace a small number of RHs by the full sample in the household survey. This, however, requires having at one's disposal the same models at the individual or household level as in CGE/RH models at the representative household group level. This could be done by estimating the structural form of micro models of occupational choices, labor supply and consumption behavior while allowing for appropriate individual fixed effects. This would also generally require assuming that all individuals operate in perfect markets and are unconstrained in their choices. It is likely that advances in computational capability will make it easier to build and estimate this type of model in the future. As of today, most of the work to achieve full integration in these models still needs to be done. [19]

b) Exploration of the sequential approach (top-down)

This second possibility generalizes the household income micro-simulation approach (HIMS) described for the ex-ante marginal incidence analysis of taxation and public spending. But now, the *incidence analysis* is made on the basis of changes in consumer/producer prices, wages, and sectoral employment levels as predicted by some (disaggregated) macroeconomic model. The idea is to use the 2nd level

[19] Of course, there may be intermediate solutions between working with a few representative household groups and with several thousands of 'real' households. For instance, one might be satisfied expanding the original RH approach to several hundreds of households defined for instance on the basis of the 'clusters' typically found in household survey samples.

analysis (i.e., reduced form income generation model in Box 4 above) and to have the changes in prices and in the coefficients of earning, self-employment income, and occupational choice functions and in prices provided by some macro model. The basic difficulty is to ensure consistency between the micro and macro levels of analysis. Implementing price and wage changes obtained with a macro model at the micro level is not difficult and essentially mirrors the standard incidence analysis. Implementing changes in occupation – due for instance to the contraction of the formal sector and employment substitution in the informal sector - is more difficult. A method for doing so has been developed by Robilliard, Bourguignon and Robinson [2000] in a model that simulated the effects of the 1997 crisis in Indonesia (see Box 9). Other applications are presently under way.

The top-down route may be easily combined with standard marginal incidence analysis of changes in public expenditures, taxation and safety nets that could accompany the macro shocks and policies being studied. Note, however, that it does not permit identifying the feedback effect of these accompanying measures (e.g., safety nets) at the macro level.

Interestingly, this approach can work with very different types of macro frameworks. The choice will depend on the specific issue being studied and the availability of modeling tools. CGE models will of course typically be used to study the effect of 'structural reforms' like trade policies or indirect taxation, whereas disaggregated macro-econometric models might be preferred when dealing with aggregate demand issues, as with financial or exchange rate crises. However, it is shown below that other tools might be necessary when dealing with long-run growth issues.

It is interesting that the case made above for a two layer framework - a flexible aggregate macro model plus a consistent disaggregation into sectors and RHs – to study the distributional impact of macro policies becomes now a *three layer structure*. On top, we find a model providing predictions or counterfactuals on standard macro-economic aggregates – GDP, price level, exchange rate, rate of interest. In the middle, lies now a disaggregated multi-sectoral CGE-type of model, whose closures should be consistent with the macro results in the upper layer. And at the bottom, we find the HIMS framework with rules that make it consistent with the predictions or counterfactuals provided by the intermediate layer.

This three-layer structure results rather directly from the logics of the phenomenon being studied. In one way or another, the analysis of distributional issues must rely on some kind of HIMS framework. A particular case of that framework being the RH approach, but it was seen that such an approach could hide important changes in the distribution of living standards or in poverty. Changes in household (real) income are derived, by definition, from changes in relative prices – both on the consumption and the production sides - the structure of wages, and occupational shifts. They may also be due to changes in

idiosyncratic income determinants. But it is the first set of changes that a micro-macro bridge must explain. Clearly this requires some disaggregated macro representation of the economy and the labor markets, a role played by the intermediate layer. For several policy issues, and in particular those concerned with structural reforms, this intermediate layer might be sufficient. Other macro-economic issues may require the top layer that deals with aggregate demand, the credit market, foreign balance and the price of domestic and foreign assets.

Box 9. Linking HIMS and macro-modeling : the sequential approach (Robilliard, Bourguignon, Robinson, [2002]).

a) the HIMS framework

This is a generalization to the household of the 2nd level individual income model in Box 4. The household (real) income generation model consist of a set of equations that describe the earnings and the occupational status of its members according to the segment of the labor market where they are operating.

- Earnings equations by labor market segment
- Self-employment income function at the household level by type of business

(M) - Functions that represent the occupational choice (inactive, wage worker, self-employed) of household members by labor market segment (defined by gender, skill, area).

- Idiosyncratic consumer price index

These equations are estimated econometrically on a sample of observations for some base year. There are all idiosyncratic in the sense that they incorporate fixed individual effects identified by standard regression residuals. A micro-simulation then consists of modifying all or part of these equations. For instance, one may want to analyze the effect on poverty of changing the price of farm products – i.e. modifying the corresponding self-employment income function in the appropriate proportion – or wages in a particular labor market segment, or modifying occupational choice behavior in favor of some specific occupation – e.g. wage work.

b) Linkage with macro-models

Suppose that a macro-model (CGE, econometric, pure forecasts..) may give counterfactual information on the variables that enter the household income model, but at the aggregate level. In other words, the macro model yields information on 'linkage variables' like the aggregate level of wages by labor segment, the price of the output of the self-employment sectors, the aggregate level of employment by type of occupation, the structure of consumer prices. *The idea is to modify some parameters in the equations of model (M) so as to make the aggregate results of the micro-simulation consistent with the linkage variables.*

This operation is easy for variables like wage or self-employment income. It is sufficient to multiply the equations by some parameter until the mean wage or self-employment income in the HIMS framework coincides with the value of the linkage variables provided by the macro-model. Things are more complicated with occupational choices because the corresponding functions are not linear. Yet, tâtonnement on specific parameters of these functions may be undertaken so as to ensure that the aggregate employment structure resulting from the micro-simulation is consistent with the information provided by the macro-model through the linkage variables. No feed-back is actually necessary for the idiosyncratic consumer price index.

c) Analogy with grossing-up techniques

All these modifications are equivalent to the familiar operation of 'grossing up' a household survey so as to make it consistent with data coming from National Accounts on the income side and an Employment survey on the occupational side. The only difference is that the latter operation differs from straight re-weighting and is highly (income) selective thanks to the initial econometric modeling of occupational choices.

IV. Further directions for investigating micro-macro linkages

IV.1 Dynamics and Long Run Growth

a) Introducing dynamics

Much of what precedes about the possible linkage between micro and macro phenomena refers to a static framework. At least, this seems true of the two bottom layers of the three-layer structure just described. Both the intermediate disaggregated multi-sector CGE-like model and the HIMS framework are likely to rely on some kind of medium-run equilibrium assumptions. This is certainly true for the allocation of flexible factors of production across sectors in the intermediate model. But this is also true for occupational choices and earning equations in the HIMS. Even though the usual residuals of econometric estimation might reflect adjustment mechanisms, they are interpreted in the HIMS framework as individual fixed effects and are thus transformed into a permanent component.

Such a static framework may be inappropriate in situations where the upper layer of the structure is meant to describe phenomena where dynamics is important, as for instance in cases of macroeconomic crises. If the upper layer describes the dynamic adjustment of the economy to a new equilibrium, it might be necessary to have this adjustment path reflected both in the intermediate and the micro part of the model. But this is something we are not well equipped to deal with. Augmented CGE models, meant to handle this kind of situation, are most often based on ad-hoc assumptions, which may not always be consistent with the modeling choices made in the upper layer. Inter-temporal CGE models might be a better tool but they rely on assumptions about expectation formation which are unrealistic and make them better fit for the analysis of very long-run phenomena. Finally, it is possible to make the micro-simulation of household decisions truly dynamic by representing saving behavior or changes in family composition[20]. But then some particular phenomena remain difficult to model given the data that is available. How to estimate consumption smoothing or migration behavior without panel data for instance? On the other hand, reconciling this dynamic micro-simulation with the dynamics of both the intermediate CGE-like and the upper layer of the three layer-structure is likely to be difficult.

In view of the difficulty of maintaining the three-layer structure in a truly dynamic framework, it might be held that poverty analysis should rely predominantly on the lower layer of this structure after making it properly dynamic. An approach of this type that has being followed by Townsend (Townsend and Ueda [2001]) by simulating the dynamics of income, consumption and labor supply of cohorts of households facing uncertainty and an imperfect credit market. Several policies of interest may be simulated in such a framework, but they are for the moment limited in scope. Here again, more work is needed to see how far it is possible to go in that direction.

[20] On dynamic micro-simulation of household behavior, see Harding [1993]

b) Introducing long-run growth

It should be possible to analyze medium-run growth and the effects of both its pace and its structure on poverty and the distribution of living standards using the three-layer structure discussed in the previous section. However, things are likely to be more difficult when a longer perspective is needed as it would be the case with investments of a long maturity.

Education and human capital policies in general provide good examples of that difficulty. The main effect of increasing public spending in these areas today-- both in terms of the rate of growth of total income and its distribution-- is due to appear in the distant future – say, at least 10 to 15 years. Therefore, a complete analysis of these policies requires a truly dynamic framework where it should be possible to evaluate the effects of that policy on the distribution today – in particular the negative effect of financing this policy on current income and poverty – as well as on the distribution 10 or 15 years from now. In turn the latter requires projecting how the economy and the whole household population will look like by then, depending on some assumptions about the structure of both economic and demographic growth. Here again, such an analysis may rely on dynamic micro-simulation analysis, although with a longer horizon than in the case considered above. Such micro-simulation techniques are available for a constant economic environment. However, linking them satisfactorily with the evolution of the economy and the structure of economic growth requires much effort.

IV.2 Firms, Institutions and Investment climate

As pointed out earlier, all the progress made, or envisaged, so far with the three layer framework outlined above has consisted of ensuring that adequate, issue-specific, macro economic frameworks could be adapted to provide a guide for micro simulations while fully utilizing the heterogeneity found in household surveys. While allowing for a much more detailed representation of occupational choices, income generation, etc., the HIMS (the third layer of our three layer framework) remains circumscribed to the activity, income and/or expenditure of households in the economy. In other words, it ultimately deals with private consumption, the labor market and, in some cases, wealth accumulation.

Similarly, one may think of applying to a population of firms-- for example, using industrial survey data instead of household surveys.

a) Extending incidence analysis and micro-simulation to a sample of firms

The first level of incidence analysis for a sample of firms would simply consist of measuring the subsidies and taxes on their income (profit) and investment. With simple assumptions about average tax rates, the average incidence analysis conducted for households could be replicated. By how much is the tax system modifying the structure of prices, and possibly the investment and production decision of firms? In addition –but quite distinctly—an analysis of the direct effect of the cost of "corruption" (or 'quasi-tax') could be done, when the appropriate data is available, as for instance in the recent micro-economic 'investment climate' studies undertaken in the World Bank (see Dollar [2002]).

The next level would also replicate the path followed for households. Firms' output and demand for inputs (capital and labor) could be modeled as depending upon the levels of subsidies, taxes and the cost of corruption. In particular, a relationship between firms' output and investment levels could be feeding back into the economy's price levels and hence into the type of analysis conducted with households.

Naturally, the major caveat to extending the methodologies described above in this direction is that the demographics of firms creation and destruction are more complex than that of a population of households.

b) Firms heterogeneity, Institutions and Investment Climate

The third level of the approach would consist in extending to firms the type of interaction with macro models seen for households. It could be of significant importance to be able to disaggregate the productive sectors that are in the second layer of models by the size of the firm. In particular, accounting for different investment, borrowing, or hiring behavior by size of firms within the same sector could permit understanding the interaction between SMEs and larger firms. This could have implications both at the macroeconomic level and for distribution (e.g., wage differentiation, profit distribution, exit and entry of firms).

While it could be cumbersome to try to exactly match –for firms-- the approach followed for households, one could envisage using the information on firm heterogeneity in the second layer of our framework. There, one would find that –for example—large and small firms in the same sector would react differently to macro policies and shocks.

This type of analysis could also enable one to evaluate more precisely the effect of policies that change the institutional environment firms face. Based on the incidence analysis of "investment climate" variables on firms' investment, pricing and hiring behavior that were identified above , one could measure first, the different types of effects of the "investment climate" on the level and structure of economic activity and then, descending to our third layer, the effect of these changes on households.

V. Conclusions

This paper surveys techniques that are available or under development and aiming at evaluating the poverty impact of economic policies. However, the preceding review covers more than what is actually current practice in evaluating the impact on poverty of economic policies. From the many caveats and limitations that were mentioned one should not get the impression of a lost cause. There has been progress and there will be progress in determining "what policies are pro-poor?". There are some established consensus on certain aspects of the issue, although there are also counter-intuitive findings. We will conclude by suggesting a few directions for practical implementation. These directions are influenced by two "methodological inclinations" that appear very clearly throughout the paper.

The first is the need to shift from average and indirect incidence analysis to marginal incidence analysis in relation to both micro or macro-oriented policies. However, even simple things like marginal incidence analysis for micro-oriented policies, or the growth-poverty calculation are still not systematically in use. A first priority then is to make sure that all available tools are properly and systematically used.

The second is the three layer structure (i.e., macro, meso-disaggregated, micro) upon which one should build the evaluation of the distributional effects of any kind of macro-oriented policy. Yet, this recommendation for using such a structure is fully compatible for methodological flexibility at each level of this structure. The possibility to choose various classes of models within each layer was stressed throughout the paper. In particular, the paper insisted very much on the possibility of adopting several combinations of models - e.g., CGEs and RHs; macro-econometric and micro; CGE and micro - depending on the country, the policy being investigated, and the situation at hand. One interesting related possibility that emerges from this flexibility –inter alia for the multilateral institutions-- is that a three layer approach could perhaps allow models built by different institutions, --or inside an institution, different departments or divisions-- to be hooked together. This option would only require that any model builder use its comparative advantage in one of the layers while ensuring that models are built with the ability to receive inputs from one layer and transmit other outputs to another layer. For example, the linkage variables should be commonly defined.

The paper also shows areas where useful tools could be developed and used at a relatively low cost. Pilot studies exist or are about to be completed. It is only a matter of organizing their diffusion. There are promising cases where we have seen the contribution to policy making of geographical mapping, micro-simulation of consumption of public services, indirect taxation/tariffs incidence analysis, etc. . We are also making progress in specifying the role of the investment climate using firm surveys. Finally, we are now testing several combinations for our suggested three layer approach with a top-bottom micro-macro

integration that combines the two main classes of models (CGEs and macro-econometric) with the two main “micro” approaches (HIMS and RH).

However, as one should expected in such a comprehensive review, the paper also reveals several missing tools. We pointed out that the most noticeable hole is the analysis of all issues that are related to dynamics either in the very short-run (for example the impact of macro-economic crises and their management) or the long-run (for instance, the effect of educational expansion). It is necessary to invest in moreresearch in these areas.

Finally, the quality of tools depends quite understandably on the intensity with which they are used and vice-versa. This is a demand-supply problem. Presently, we probably are far from an efficient equilibrium. While the effort to improve existing tools, develop others and create the culture of a three layer approach is considerable, we believe that there is a promising new area of collaboration between different modelers and the ultimate users of these tools.

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