THE MACROECONOMICS OF POVERTY REDUCTION

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This paper puts in perspective recent research on the macroeconomics of poverty reduction. It begins by arguing that research on poverty was, and continues to be, distorted by an excessive focus on micro and measurement issues. The debate on 'pro-poor growth' is used to illustrate the extent of this bias. Next, it provides a review of the transmission channels of macroeconomic policies to the poor, with particular emphasis on the role of the labor market. It then presents a new class of theoretical and applied macroeconomic models for poverty analysis. It concludes by identifying directions for future research.

No Society can surely be flourishing and happy, of which the far greater part of the members are poor and miserable. (Adam Smith, *The Wealth of Nations*, Book 1, Ch. 8)

1 INTRODUCTION

Poverty remains a widespread phenomenon in the developing world, despite significant progress in raising living standards in many countries in recent years. According to World Bank estimates, the headcount ratio (which measures the incidence of poverty, i.e. the proportion of individuals or households earning less than a given level of income), based on an international poverty line of $1.08 per day, dropped from 40.4 per cent in 1981 to 21.1 per cent in 2001 when China is included.[1] But the drop is only from 31.7 per cent to 22.5 per cent without China, where poverty dropped from 63.8 per cent to 16.6 per cent during the same period. In sub-Saharan Africa alone, the incidence of poverty increased from 41.6 per cent in 1981 to 46.4 per cent in 2001 with a $1.08 per day poverty line, and from 73.3 per cent to 76.6 per cent with a $2.15 per day poverty line. Moreover, as a result of sustained population growth, the absolute number of poor doubled during the period, from 164 million in 1981 to 313 million in 2001 with a $1.08 per day poverty line, and from 288 million to 516 million with a $2.15 per day poverty line. As a result, the share of the world's poor living in sub-Saharan Africa rose from 11 per

[1] See Chen and Ravallion (2004). The poverty line is measured at 1993 purchasing power parity exchange rates.

cent in 1981 to 29 per cent in 2001. The depth of poverty, as measured by the poverty gap (defined as the average shortfall of the income of the poor with respect to the poverty line, multiplied by the headcount ratio) remains also the highest in sub-Saharan Africa, having increased from 17 per cent in 1981 to 21 per cent in 2001.

'Getting the facts right' on world poverty has proved to be difficult and remains a matter of controversy between the World Bank and some academic researchers.[2] Nevertheless, most observers would agree that millions of individuals around the world continue to endure lives of deprivation, and that prospects for reducing poverty remain bleak in some regions. Based on current trends, sub-Saharan Africa as a whole will not be able to reduce poverty by half between 1990 and 2015, as called for under the Millennium Development Goals proclaimed in 1999 by the United Nations.

Bringing relief to the world's poorest remains therefore one of the central policy issues of the new millennium. In that context, much effort has been devoted in recent years to understanding how macroeconomic policy affects poverty (through its impact on cyclical output, growth and distribution) and how aggregate shocks (whether policy-induced or otherwise) are transmitted to the poor. A key reason for this has been the growing recognition that economic crises hurt the poor the most, because they often lack the means to protect themselves from adverse income and employment shocks. The poor lack assets, such as land and bank deposits, and often have no direct access to credit markets (or face prohibitive borrowing costs when they do), to smooth the impact of these shocks. For the very poor, unfavorable shocks may be large enough to result in actual declines in consumption, with adverse effects on their longer-term nutrition and health prospects. Moreover, due to the lack of education and marketable skills, the poor tend to be less mobile than workers with better education. Another reason has been the need to develop quantitative macroeconomic models to help countries conduct systematic policy analysis and examine the trade-offs that are inherent to the formulation of medium- and long-term poverty reduction strategies.

The purpose of this paper is to provide an overview of some of the recent research on the macroeconomics of poverty reduction, as well as my own perspective on what may constitute fruitful research directions. In doing this, I will focus on income poverty. It is now well recognized that poverty is a multidimensional phenomenon, which is not only evident in low levels of income, but also in poor people's vulnerability to ill health, personal violence and natural disasters. The focus on income, however, is justified to some extent because the impact of macroeconomic policy on the poor operates essentially through changes in earnings, and because changes in income tend to be highly

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correlated in the medium and long term with other social and demographic indicators, such as life expectancy, infant mortality, fertility and the literacy rate (the direction of causality remaining, of course, a matter of debate).

Section 2 discusses some of the reasons why research on the macroeconomic aspects of poverty may have been 'distorted' by either a relative neglect of the issue by macroeconomists or an excessive focus on micro/measurement aspects. The lack of a macro perspective is well illustrated by the recent debate on 'pro-poor growth', which is also discussed in that section. Section 3 provides a brief analytical review of the transmission channels of macroeconomic policies to the poor, with a particular focus on the role of the labor market. Section 4 illustrates how the type of labor market distortions that are typically observed in developing countries can be integrated in a two-household theoretical macro model to analyze the poverty effects of macroeconomic policies—in particular, the impact of a cut in government spending on the urban poor. Section 5 discusses a particular class of applied macroeconomic models designed for quantifying the impact of adjustment policies on poverty and unemployment. Section 6 identifies various directions for future research, including the sources of, and evidence on, poverty traps; the causes of asymmetric effects of output shocks on the poor; alternative approaches to linking macro models and household surveys; potential trade-offs between unemployment reduction and poverty alleviation; the allocation of public investment and its implications for long-run growth; and channels through which redistribution can actually hurt the poor. The final section offers some concluding remarks.

2   A DISTORTED AGENDA

My initial contention is that macroeconomists have for a long time ignored the issue of poverty and how macroeconomic policy shocks are transmitted to the poor. This has been the case both in academic circles and in international development institutions (IDIs). These institutions have a special mandate for conducting policy-oriented research on low-income countries; but their agenda, for most of the past decades, has been largely biased—in some cases because of the failure to consider poverty reduction in itself as a legitimate target for macroeconomic policy, and in others because of an excessive focus on microeconomic and measurement issues. I illustrate the implications of these distortions by reviewing the rather confusing state of the debate on 'pro-poor growth'.

2.1   *A Neglected Topic by Macroeconomists*

The collapse of the Keynesian-neoclassical 'synthesis' and the subsequent shift in paradigm in macroeconomics toward the homogeneous, representative agent framework led macroeconomists away from consideration of dis-

tributional issues. This shift, which occurred despite well-known conceptual obstacles (such as the aggregation problems discussed by Kirman (1992)) also led, in my view, away from the consideration of poverty issues. The state of the literature on this subject is very telling in that regard: until recently, papers focusing on the macro aspects of poverty were relatively rare, regardless of whether one is focusing on developing or industrial countries.[3] Moreover, many of the papers that attempted to focus on the transmission mechanism of macro shocks to the poor in developing countries were deficient in several dimensions—most notably, as discussed later, in their failure to capture the complex nature of the labor market in these countries.

Of course, since early contributions by Nurkse (1953) and others, growth theorists have spent considerable time and effort formulating and analyzing models of underdevelopment traps; much of this literature is aptly surveyed by Azariadis (2001). However, too often the focus in this literature has been on the 'intrinsic' properties of these models, and less on their policy implications. As it turns out, in some cases these implications either are far from obvious or lack operational content. For instance, in some of these models, the role of government policy is to coordinate expectations into self-fulfilling growth beliefs, so as to move the economy from a 'bad' equilibrium (a low-growth poverty trap) to a 'good' (high-growth) equilibrium. Put differently, public policy acts as a 'selection device' among different convergent paths. But how, in practical terms, public policy must be implemented to achieve such a shift in expectations is not specified. As another example, Boldrin (1992), in an important contribution, showed how accounting for human capital accumulation can lead in an endogenous growth framework to multiple equilibria—one of which is a low-income (locally stable) stationary state.[4] He went on to show that a nonlinear tax scheme may eliminate the multiplicity of equilibria. In practice, however, such schemes are notoriously difficult to implement—even more so in the context of low-income countries with limited administrative capacity. Moreover, as discussed subsequently, a number of important issues have not yet been addressed in the analytical literature on poverty traps.

One would have hoped that international institutions like the International Monetary Fund (IMF), whose job it is to provide advice on macroeconomic policy to poor countries, would have developed a strong research agenda in this area. But until very recently (or so I would like to believe), the issue was essentially swept under the rug. Part of the reason was surely the Fund's relatively narrow mandate (or, more accurately perhaps, the narrow interpretation of it), which appeared to exclude direct consideration of

[3]For industrial countries, two of the few papers that I am aware of are Romer (2000) and DeFina (2004). For developing countries, a recent example is Akinbobola and Saibu (2004).
[4]Put differently, in this type of models the set of initial conditions for which positive growth is an equilibrium is not disjoint from the set of initial conditions for which permanent stagnation is also an equilibrium.

poverty reduction as a legitimate policy goal in its programs. Instead, poverty was viewed as something to be 'left to the World Bank'. The lack of direct interest on poverty, and the focus on price stability, was occasionally justified by IMF economists by what still remains one of the Fund's favorite dictums: 'inflation is a tax on the poor' (just as it is, of course, on everybody else with non-indexed income or nominally fixed assets). But as discussed later, inflation can affect the poor in many ways, and understanding (and quantifying) these different channels is critical for good policy advice. Another common belief among IMF economists is that growth will, in a sense, 'take care' of the poverty problem. Again, this may well be true in many cases, but it may turn out to be wrong in many others also. The danger is that, without careful analysis, strong priors can lead to erroneous (and socially costly) policy recommendations. Moreover, these priors may have encouraged a 'benign neglect' attitude at the IMF regarding the need to study carefully and thoroughly the transmission process of macro shocks to the poor. Some analytical research on the macro implications of labor market distortions in low-income countries (an important first step in poverty analysis, as I argue later) was indeed initiated in the mid-1990s; however, by the IMF's own account, little has happened since then (see International Monetary Fund, 2003). Sporadic contributions do not, in any case, amount to a coherent research agenda.

At a more policy-oriented level, recent attempts to bring poverty issues to the forefront of IMF programs have not been met with much greater success. There are a number of reasons why this has happened, and going through them at any length is beyond the scope of this paper. However, I suspect that high on the list would be the lack of a clear conceptual macro framework with an explicit account of (i) the transmission channels of macro shocks to the poor, (ii) the interactions between poverty, growth and inequality and (iii) the role of public investment and public capital in fostering growth.

In a sense, the relative lack of interest for the issue by mainstream macroeconomists and institutions like the IMF involved in research and policy advice on macroeconomic management in low-income countries opened the way for a control (I am refraining from saying 'hijacking') of the research agenda on poverty by economists primarily concerned with purely microeconomic aspects and measurement issues.

Let me be clear. By calling for greater attention to the macroeconomic dimension of poverty reduction strategies, I do not mean to revive sterile controversies between micro and macro approaches to economic analysis, or draw too sharp a divide between the practical importance of micro and macro factors in affecting poverty. Countless examples of failed attempts at structural adjustment in the past decades have taught us a lot (unfortunately the hard way) about how microeconomic rigidities and institutional constraints can condition the outcome of macroeconomic policies and their impact on

poverty. Policy economists understand well now that a currency devaluation aimed at improving external accounts may have a limited impact on the trade balance if farmers in rural areas cannot respond to improved price incentives because of a lack of access at the micro level to credit to finance production inputs. And if urban and rural households suffer from the rise in the domestic currency price of imported goods, overall poverty rates may well increase. Likewise, policies aimed at promoting human capital accumulation and growth may have little effect on the aggregate stock of skilled labor if individual choices are distorted by labor market regulations—despite a strong signaling effect provided by large skilled–unskilled wage differentials. And it is certainly true to argue that more needs to be learned about the macro implications of micro and institutional factors, particularly with respect to risk-coping strategies, the gender dimension of vulnerability, the decentralization of public services and the relationship between crime and poverty (see Dercon, 2002; Huang *et al.*, 2004; Sahn and Younger, 2004).

My argument, rather, is that there are still important gaps in our understanding of issues that are fundamentally 'macro' in nature, and that investigators (or the institutions sponsoring them) should strike a better balance between research on the role of micro and macro factors in poverty analysis. At the same time, it is also important to recognize and account for the complementarity or interaction between these factors—what one may call 'micro–macro' linkages—in determining poverty outcomes.

2.2   An Excessive Focus on Micro Aspects and Measurement Issues

As noted earlier, poverty is a complex and multidimensional phenomenon, and there is considerable controversy in the literature about how it should be defined and measured. Indeed, there are many alternative (and perhaps equally legitimate) approaches to the measurement of poverty.[5]

Measurement is obviously important, given the need for an *ex ante* analysis of the quantitative impact of policies (both macroeconomic and structural) on poverty. Through the development of comprehensive household and income surveys, we have learned a great deal on household behavior and the characteristics of poverty. However, in my view, there has been too much focus on measurement, particularly in IDIs like the World Bank, and not enough on the substantive macro issues. In part, this has been the result of a relative lack of interest on the part of macroeconomists, as noted earlier. But at another level, this has been also the result of undue influence exerted by economists preoccupied with little else than measurement aspects.

Let me illustrate my argument with a more precise example. As I argue later, understanding the nature of poverty and low-growth traps and how to escape from them, as well as the interaction between micro decisions and

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[5]See Duclos (2002) for an overview of the theory of poverty measurement.

macro outcomes, is crucial for the design of poverty reduction strategies in low-income countries. This also involves developing new empirical methods to determine whether such traps are present or not. However, IDIs have conducted surprisingly little research in these areas, despite being in a unique position to do so. A recent search of the IMF's 'Publications' website for the word 'poverty trap' yielded no result. The term is mentioned once in the IMF's own review of its research on macroeconomic issues in low-income countries (International Monetary Fund, 2003), in connection with the conceptual contribution of Masson (2001). Thus, the IMF, in part because of its narrow focus on the financial aspects of macroeconomic adjustment, and in part because of insufficient work on the functioning of labor markets in developing countries, has made limited contributions to the topic. A search of the World Bank's site yielded two publications with a deliberate analytical focus, Hoff (2001) and Jalan and Ravallion (2002). The first paper, however, focuses mainly on coordination failures as a source of multiple equilibria and underdevelopment traps, whereas the second is an empirical exercise (on China) whose broader implications are far from clear.

A search of the United Nations Development Program (UNDP) website yielded more results, with one of the most important documents being the 2002 report on poverty traps (United Nations, 2002). However, the report contains too many assertions, with little attempt to discriminate rigorously among alternative potential causes of these traps. A search of the African and Asian Development Banks for the same term yielded no result. On both the UNDP and World Bank websites, the search produced also several country reports (for instance, on Haiti and Madagascar) where the word 'poverty trap' is mentioned; but in most of these publications, the existence of a trap was postulated, not demonstrated with rigorous empirical analysis. As discussed later, establishing empirically the existence of poverty traps is a crucial step for sensible policy design, given the multiplicity of potential causes.

Of course, looking for publications on 'poverty traps' is by no means a scientific test. It reveals, nevertheless, a lack of systematic discussion of an issue of crucial importance for low-income countries. Referring to the term 'poverty trap' in a policy paper without systematic and rigorous analysis is problematic, because the term is often used as a substitute for 'constraints', and because we know so little about how to test for poverty traps. And this is not an isolated problem; many aspects of the transmission of macro shocks to the poor have also been neglected, and the lack of a macro perspective has led to much confusion about the extent to which growth affects the poor.

2.3 The Confusion over 'Pro-poor Growth'

Indeed, a good illustration of what is wrong with an excessive 'micro' perspective on poverty issues (and also perhaps with fads and fashion with

catchy terms) is provided by the debate on 'pro-poor growth'. The term is now widely used in both academic and international policy circles, but a perusal of the literature reveals that it means very different things for different people.[6]

A common view is that growth is pro-poor if it reduces poverty 'significantly'. The issue then boils down to how 'significant' the reduction in poverty must be for growth to be deemed pro-poor. A first definition then is that growth is pro-poor if the poor benefit equally (i.e. relative to other groups) from income growth. Thus, growth is pro-poor if it has a one-to-one (inverse) relationship with poverty. A second definition is that growth is pro-poor if the poor benefit more than proportionately from income growth— or, equivalently, if the poor benefit more than the non-poor. This requires that the income growth rate of the poor be larger than the income growth rate of the non-poor. The pro-poor growth index of Kakwani and Pernia (2000), defined as the ratio between total poverty reduction and poverty reduction in the case of distribution-neutral growth, is consistent with this definition. So is Bhalla's (2004) definition, which considers growth to be pro-poor if the growth rate of consumption of the poor is (on average) higher than the growth rate of consumption of the non-poor. Thus, according to this definition, a one-to-one relationship between growth and poverty (as in the first definition) would imply that growth, on average, is not pro-poor, because it is not associated with a reduction in inequality between the two groups. A third and broader definition is to define growth as pro-poor as long as poverty falls as a result of growth. From that perspective, then, the Kakwani–Pernia index and Bhalla's definition are too restrictive, because they imply that even if growth reduces poverty (as measured by either higher income or consumption) it is not pro-poor as long as the poor do not gain relatively more than the non-poor. A final definition, which is quite orthogonal to the previous ones, is that growth is pro-poor if it is labor intensive— the reason being that labor is the production factor that the poor possess in greater quantity.

There are several problems with all these definitions, at both the conceptual and empirical levels. Let me start with the last definition (growth is pro-poor if it is labor intensive), because it is easy to dismiss. The fact that the poor generate most of their earned income from the sale of labor by no means implies that pro-poor growth should be understood as (unskilled) labor-intensive growth. The reason is clear enough—high levels of employment may not reduce poverty if the increase in jobs is brought about through a reduction in real wages. Instead, the consequence may be an increase in the so-called 'working poor' and potential trade-offs between unemployment reduction and poverty alleviation, as discussed later.

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[6]Ravallion's (2004) 'primer' on the issue does little, in my view, to clear up the confusion.

The other definitions are also problematic. First, changes in mean income are not what most macroeconomists would consider to be 'growth'. What matters from a growth perspective is long-run changes in standards of living. However, many of the studies on growth and poverty are based on changes in mean income derived from relatively small samples of household surveys, conducted at different times across countries and irregular intervals within countries—with adjacent observations in some cases, but sometimes gaps of several years in others. Several studies, for instance, have used the survey data compiled by the World Bank, which cover mostly the 1990s and (for some countries) the 1980s.[7] Gaps between consecutive surveys vary considerably over time and across countries, exceeding 10 years in several cases. Most importantly, changes in observed mean income should not be confused with growth effects; business cycle effects are likely to dominate income fluctuations, particularly in surveys that are conducted frequently. These changes are therefore poor proxies for capturing the long-run changes in income that are due to growth effects. The implication is that it should not be at all surprising to find, as Kraay (2004) does, that growth in average household survey incomes is poorly correlated with some of the most common determinants of long-run growth identified in cross-country regressions, such as trade openness and quality of institutions. This may have nothing to do with limited coverage or measurement errors (which led the author to arbitrarily remove from his final sample of poverty spells what he considered 'implausibly large' changes) with the household survey data, as Kraay asserts, but rather is concerned with the failure to identify short- and long-run components of income changes.[8] Indeed, this failure, coupled with the use of different samples, may be one reason why results on the growth–poverty link differ so much across studies.

Making a proper distinction between short-run fluctuations in income and longer-run changes due to 'fundamental' forces related to growth is obviously hampered by the lack of sufficiently long time series (i.e. sequences of surveys) in many countries. Time intervals used to measure poverty changes from household surveys are determined by the availability of these surveys, which (as noted earlier) varies significantly across countries. Some of these intervals are short, so changes in poverty are likely to reflect short-term fluctuations in consumption and income, rather than longer-run trends. But the problem does not only arise with high-frequency data: regardless of the frequency of the surveys, it is always possible for changes in income to reflect cyclical factors. What this implies, first, is that it is incorrect, in most of this literature, to talk about the effect of 'growth' on poverty; 'changes in income' is more appropriate. But there is more than just semantics at stake here; it

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[7]These data are available at http://www.worldbank.org/research/povmonitor/
[8]Kraay's regressions also fail to account for possible nonlinearities—a common problem in this literature, as discussed later.

also means that one cannot tell whether an increase, say, in mean income is due to 'luck' (in the sense of positive, but temporary, shocks) or changes in fundamentals (related to idiosyncratic changes in private behavior, or induced by deep policy reforms). Such a distinction is of course crucial from a policy perspective.

Second, studies based on mean incomes of the poor are often subject to large reporting errors. The use, by some researchers, of the average income of the bottom quintile to analyze the 'growth' effect of poverty may thus provide unreliable results. In addition, it is also an arbitrary indicator. Foster and Székely (2001) proposed instead to use changes in the generalized mean, instead of setting arbitrarily (as in some studies) the poverty threshold at 20 per cent to define who is poor.[9] The advantage of doing so is that it gives elasticities of poverty with respect to income changes that capture features of the distributional process. They found that when the change in income is weighted for all individuals similarly, the elasticity is close to one. But as more weight is given to the income of the poorest, the elasticity declines substantially.

Third, studies based on an *ex post*, additive decomposition of poverty between 'growth' and inequality components (such as Kakwani and Pernia, 2000), which are often used to determine if a particular episode was characterized by pro-poor growth, essentially treat growth and inequality as independent. However, inequality, poverty and growth are interrelated, and causality can run in different directions. For instance, in the 'circular relationship' emphasized by Nurkse (1953), while growth may be necessary to reduce poverty, high poverty can also be an impediment to growth: in a subsistence economy, saving and investment (in both physical and human capital) may be insufficient to promote growth, because income is used solely to acquire basic necessities and avoid starvation. High poverty rates may also depress private capital formation and impose constraints on the ability of the government to raise resources to finance lumpy investment in infrastructure, thereby inhibiting growth. From a macroeconomic perspective, all three variables are endogenously determined, and respond to *policies*.[10] By implication, it is meaningless to talk about 'growth' being pro-poor or not: policies are pro-poor, not growth *per se*.

[9]The generalized mean can be defined as $\bar{y}_\alpha = (\Sigma_{i=1}^{n} y_i^\alpha/n)^{1/\alpha}$, for $\alpha \neq 0$, and $\bar{y}_\alpha = (\Pi_{i=1}^{n} y_i)^{1/n}$, when $\alpha = 0$. The parameter α defines the weighting of income y_i of individual i. When $\alpha = 1$, the generalized mean is the standard arithmetic average. When $\alpha = 0$, $\bar{y}_\alpha$ is the geometric mean. When $\alpha < 0$, the income weighting is inverse to income ($\alpha = -1$ gives the harmonic mean); put differently, individuals with lower incomes receive greater weights in the calculation of the generalized mean.

[10]This endogeneity explains in part why the empirical evidence on the relationship between growth and inequality is, by and large, ambiguous. See Banerjee and Duflo (2003) for a recent survey; in their study changes in inequality (in any direction) have an adverse effect on growth. See also Barro (2000) and the discussion below.

The thrust of the foregoing discussion is thus that *ex post* decompositions, of the type described by Kakwani and Pernia (2000), are essentially useless for *ex ante* policy analysis. The elasticities that are derived from them do not differentiate between policies and shocks. They say nothing about the interactions, and transmission channels, between growth and inequality. In addition, their additive nature means that they cannot account for the fact that the elasticity of poverty with respect to the change in mean income depends also on income inequality. Suppose, for instance, that the distribution of income is lognormal. If the poverty line is located to the right of mean income, a 1 per cent increase in that income will have an impact on poverty that is proportionally smaller than if the poverty line is located to the left. For *ex ante* policy assessment, growth and distribution need to be considered jointly, in the context of a fully specified macroeconomic framework.

Indeed, once one realizes that it is policies that must be defined as pro-poor or not, not growth itself, the nature of the 'measurement problem' changes radically. To determine whether a policy is pro-poor requires the use of a structural macro model (which may of course vary in size), in which growth, inequality and poverty are all determined endogenously. The outcome of numerical simulations can then be used to derive an *ex ante* measure of the 'pro-poorness' of these policies. What matters, therefore, is the net effect of a given policy on poverty, not its decomposition between 'growth' and 'redistribution' components, which is shock dependent. This is important because some policies may entail a trade-off between these components, whereas others may not; focusing only on (aggregate) *ex post* decompositions cannot tell us anything about these trade-offs at the level of individual policies.

To illustrate the measurement issue in this context, let μ_P (μ_R) denote mean consumption of the poor (non-poor) in real terms, and let x denote a policy instrument (say, government spending); a pro-poor policy index can be defined as

$$I_x = \frac{d\mu_P/dx}{d\mu_R/dx} - 1 \tag{1}$$

where $d\mu_h/dx$ measures the numerical (or multiplier) effect of a change in x on μ_h, with $h = P, R$. Assuming that these effects are positive, the index I_x is negative (positive) if the impact of x on mean consumption of the poor is lower (higher) than on mean consumption of the non-poor. It is zero if the impact of x on mean consumption of the poor and non-poor is the same. More generally, the following definition holds.

Definition 1: Let $d\mu_h/dx > 0$, for $h = P, R$. Policy x is strongly pro-poor if the model-based index defined in (1) $I_x > 0$, non-pro-poor if $I_x < 0$, and poverty-neutral if $I_x = 0$. If $d\mu_h/dx < 0$, policy x is weakly pro-poor if $I_x < 0$ and non-pro-poor if $I_x > 0$.

If $d\mu_P/dx$ and $d\mu_R/dx$ are of opposite sign, I_x is always negative, and the above definition (based on relative effects and the sign of I_x) is no longer meaningful. It can be replaced by a direct evaluation of the sign of each absolute effect.

Definition 2: If $d\mu_P/dx > 0$ and $d\mu_R/dx < 0$, policy x is strictly pro-poor, whereas if $d\mu_P/dx < 0$ and $d\mu_R/dx > 0$, policy x is strictly non-pro-poor.

    Thus, according to Definition 1, a policy can still be considered pro-poor (although in a weak sense)—even it if entails a fall in mean consumption of the poor—as long as this fall is less than the reduction in consumption of the non-poor. Put differently, when a policy operates in the same direction on consumption of the poor and the non-poor, it is the relative magnitude that matters. But, as indicated in Definition 2, if mean consumption of the poor falls, whereas mean consumption of the non-poor increases, policy x can never be deemed pro-poor—even if the fall in consumption of the poor is small relative to the increase in consumption of the non-poor. In addition, Definition 1 above differs from the broad definition adopted by some in the literature: in the present setting, a policy that leads to higher consumption of the poor but at the same time increases consumption of the non-poor by the exact same magnitude is defined as poverty-neutral, not as pro-poor.
    The index defined in (1) can be easily generalized to the case of a combination of policies x_h, with $h = 1, \ldots, n$:

$$I_{x_1 \ldots x_n} = \left(\frac{d\mu_R}{dx_1 \ldots dx_n} \right)^{-1} \left(\frac{d\mu_P}{dx_1 \ldots dx_n} \right) - 1$$

with obvious modifications to Definitions 1 and 2.
    The proposed definitions (which depend, of course, on how mean consumption of the poor and non-poor is measured in the structural macro model) are simple and quite appealing empirically. Their 'macro' nature is evident in the fact that they do not account explicitly for changes in the distribution among the poor and the non-poor, thereby assuming implicitly that within-group distributions are homogeneous. Moreover, mean consumption could be replaced by a poverty index specific to the poor and the non-poor. The advantage of doing so is that changes in the poverty line would be explicitly accounted for, as in some of the applied macro models discussed later where the purchasing power of the consumption basket of various household groups is determined endogenously. The previous definitions, in contrast, assume that the poverty line is fixed in real terms. But given uncertainties associated with the exact location of the poverty line, focusing directly on changes in real consumption also has advantages.
    Model-based measures of the pro-poorness of policies can also incorporate a temporal dimension. With a static model, I_x can be viewed as meas-

uring long-term effects; but with a dynamic macro framework, I_x can be calculated for different time horizons—say, the short term (two years after a shock), the medium term and the long term. Specifically, let $\mathrm{d}\mu_h/\mathrm{d}x|_j$ denote, for h = P, R, the numerical effect of a change in x on μ_h at horizon j, where j = s, l (for short and long term), and define I_x^j, using (1), accordingly. The following definition therefore complements Definition 1.

Definition 3: Let $\mathrm{d}\mu_h/\mathrm{d}x|_j > 0$ (respectively < 0), $\forall h$ = P, R and j = s, l. Policy x is dynamically strongly (respectively, weakly) pro-poor if, $\forall j$, $I_x^j > 0$ (respectively, <0), dynamically non-pro-poor if $I_x^j < 0$ (respectively, >0) and uniformly poverty-neutral if $I_x^j = 0$. If $\mathrm{d}\mu_h/\mathrm{d}x|_j$ changes sign for j = s, l, policy x entails a dynamic trade-off with respect to group h.

Similarly, in a dynamic setting Definition 2 can be complemented with the following definition, which involves comparing the sign of each absolute effect at the same horizon.

Definition 4: If $\mathrm{d}\mu_P/\mathrm{d}x|_j > 0$ and $\mathrm{d}\mu_R/\mathrm{d}x|_j < 0$, policy x is strictly pro-poor at horizon j, whereas if $\mathrm{d}\mu_P/\mathrm{d}x|_j < 0$ and $\mathrm{d}\mu_R/\mathrm{d}x|_j > 0$, policy x is strictly non-pro-poor at horizon j.

Thus, a policy can be pro-poor in the long run but non-pro-poor in the short run, or vice versa. The reason is, of course, that policies may affect income and consumption differently in the short and the longer term, perhaps because demand-side effects tend to predominate initially, whereas supply-side factors operate more gradually. If the structural macro model is sufficiently disaggregated, the policy index (1) can also be given a regional dimension—by distinguishing, for instance, between urban and rural areas.

The key question to ask, then, is not whether growth itself is pro-poor, but rather what are the policies needed for growth to be pro-poor. Such policies, to have lasting effects on poverty, should focus on fostering long-run growth, not short-run increases in income. Here, there are of course many lessons to keep in mind. There is ample evidence suggesting that one of the key engines of growth in the long run is human capital accumulation.[11] In turn, this requires a growth process that raises the demand for skilled labor—in part through greater public and private investment in physical capital, due to complementarity effects. By raising skilled wages, the increase in labor demand would act as a 'signal' for investment in human capital. For many low-income countries, the key is thus to reduce barriers to access to education (possibly through credit market reforms), not to promote labor-

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[11]See Agénor (2004b, Ch. 13) for an overview of the evidence for developing countries, and the study by Coulombe *et al.* (2004) for industrial countries.

intensive growth. Of course, the need to increase the skills composition of the labor force does not create a *prima facie* case for government intervention; incentives could also be provided through higher subsidies to private education. In addition, the composition of growth matters, and this must be reflected in the design of growth-enhancing adjustment programs. In particular, the allocation of public investment matters, not only between functional components (namely, infrastructure, education and health, as discussed later) but also across regions. If the poor are concentrated in rural areas, as is the case in many of the poorest countries, pro-poor growth policies must be designed accordingly. The key then is to improve productivity in the rural sector—through higher and 'strategic' public investment in irrigation, roads and so on. Such growth would not only improve standards of living in rural areas, but also (by reducing rural-to-urban migration flows) raise income levels in the informal urban sector. Through these linkages, therefore, the benefits of these policies can spread out to the rest of the economy. But because these are supply-side effects, such strategy requires taking a longer-term view of what pro-poor policies can achieve. In other words, one should refrain from using changes in income calculated over relatively short periods of time to make statements about the 'pro-poorness' of particular policies. In order to do so, it is crucial to use a macro framework that is dynamic in nature.

The foregoing discussion has important implications for the research program of many institutions, including the IDIs. For the World Bank, the challenge is to broaden its research agenda to go beyond the current goals of improving current household survey data and (micro) methods of poverty and inequality analysis. The focus on measurement and microeconomic issues has to give way to a more balanced agenda involving deeper analytical research on some of the key macroeconomic issues facing low-income countries and greater focus on micro–macro linkages for poverty analysis. Other institutions like the IMF and regional multilateral banks (particularly the African Development Bank, whose role in this agenda has so far been largely marginal) face similar challenges.

3   Transmission of Macro Shocks to the Poor

In the short run, macroeconomic shocks are transmitted to the poor through changes in output, employment, wages and prices. After a general discussion of the role played by the labor market in the transmission process, this section identifies how these various channels operate. Specifically, it focuses on changes in aggregate demand; changes in inflation and expenditure deflators; changes in the real exchange rate; and macroeconomic volatility. In addition, longer-run effects of macroeconomic policy through growth and distribution, and possible asymmetric effects of negative output shocks on the poverty rate, are also discussed.

3.1 The Central Role of the Labor Market

Labor markets play an important role in the transmission process of macro-economic and structural adjustment policies. In developing countries, a typical labor market consists of three segments (see Agénor, 1996, 2004b): the rural sector, which continues to employ a sizable proportion of the labor force in some countries (particularly in sub-Saharan Africa); the informal urban sector, which is characterized by self-employment, a limited proportion of hired labor, a high degree of wage flexibility, a low degree of employment security and a lack of enforcement of labor regulations; and the formal (public and private) urban sector, where workers are hired on the basis of explicit contracts and the degree of compliance with labor market regulations is higher. The share of informal sector employment in total urban employment is sizable in many developing countries, as indicated in estimates provided by Blunch *et al*. (2001), Saavedra (2003) and the International Labor Organization in its *Global Employment Trends* reports. One reason is that unemployment insurance or compensation schemes are not well developed in these countries; as a result, workers cannot afford to remain openly unemployed for long. Underemployment (or disguised unemployment) in the informal sector tends therefore to be far more pervasive than open unemployment—at least for some categories of workers.

Segmentation of the urban labor market is often induced by government-imposed regulations (such as minimum wage laws, firing restrictions and severance payments); the existence of trade unions, which may prevent wages from being equalized across sectors by imposing a premium for their members; or wage-setting behavior by firms leading to efficiency wages. In all three cases, wage determination departs from market-clearing mechanisms. The basic idea of efficiency wages (whether they are due to nutritional factors, large turnover costs or productivity considerations) is that firms set wages so as to minimize labor costs per efficiency unit, rather than labor costs per worker. For instance, workers' level of effort may depend positively on the wage paid in the current sector of employment (say the urban formal sector), relative to the wage paid in other production sectors (say the informal economy). The outcome of the firms' wage-setting decisions may be a markup of formal sector wages over informal sector wages. Because the efficiency wage may exceed the market-clearing wage, such models also help to explain the existence of involuntary unemployment.

The complex structure of the labor market in developing countries implies that macroeconomic models, theoretical or applied, designed to study the transmission of macroeconomic shocks and adjustment policies to economic activity, employment and poverty, must be carefully specified to avoid incorrect inference in assessing how a given policy measure affects the poor. As I illustrate later, accounting for these distortions has been one of the key features of the recent literature on the macroeconomics of poverty reduction.

3.2   Changes in Aggregate Demand

In most circumstances, aggregate demand tends to respond fairly rapidly, and often significantly, to monetary, fiscal and exchange rate policies. Changes in aggregate demand, in turn, may have a sizable effect on poverty through changes in employment and wages. Fiscal shocks, in the form of layoffs and wage cuts in the public sector, may raise directly the poverty rate, particularly in the absence of a safety net or if they occur during periods when economic activity is subdued to begin with (such as during downswings or crises). Other shocks, such as reductions in government transfers and cuts in current spending on goods and services or capital spending (which have longer-run supply-side effects as well, as discussed later), may also increase poverty, by reducing aggregate demand and the demand for labor. In addition, if fiscal adjustment lowers overall government expenditure and reduces pressures for monetization of the budget deficit, it may lower inflation and generate an indirect benefit for the poor (see below). The net welfare effect in present value terms, therefore, is ambiguous because of conflicting effects on current and future income.

In addition to the level effect associated with reductions in public expenditure, there may be a compositional effect. For instance, the impact of a cut in social expenditure (including spending on education and health) on the poor often depends on who benefits from these expenditures in the first place. If higher-income households benefit disproportionately, large cuts in social expenditure may have little impact on the poorest among the poor. Castro-Leal *et al*. (1999) found that in Africa public spending on education and health tend to benefit the richest income quintile, not the poorest households. More generally, the share of social spending in total government expenditure may actually increase at the same time that overall spending is being cut.[12] Transfers in particular may fall as a percentage of both GDP and total government expenditure without any adverse effect on poverty if, at the same time, improved targeting of social spending takes place—thereby improving the flow of resources actually reaching the poor. Thus, even in cases where fiscal consolidation requires a reduction in the overall level of public expenditure, it may still benefit the poor; the composition of spending cuts is crucial in that regard.

Macroeconomic policy also affects aggregate demand through changes in private spending. Fiscal adjustment, for instance, can lead to a reduction in private expenditure if public capital and private sector investment are complementary (particularly with regard to public capital in infrastructure, as discussed later) or if an increase in tax rates on wages or profits reduces private expenditure on consumption and investment, by lowering expected income

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[12]Conversely, of course, social spending may fall more than proportionately during periods of fiscal consolidation.

and the net rate of return on capital. Restrictive credit and monetary policies may lower private expenditure as well, either directly (by increasing the incidence of credit rationing) or by raising interest rates. However, cuts in public expenditure may also lead to *higher* private expenditure, for instance, if the reduction in financing requirements by the public sector reduces the cost, or increases the availability, of bank credit to the private sector. Thus, although there are various channels through which macroeconomic policy may reduce aggregate demand and worsen the plight of the poor, there are also channels through which they may lead to an increase in aggregate demand, lower unemployment and a reduction in poverty.

3.3 Expenditure Deflators and Inflation

Because the poor allocate a large share of their income (or own production, if they are self-employed in agriculture or the urban informal sector) to subsistence, the impact of macroeconomic shocks on the behavior of the prices of the goods and services that they consume matters significantly. If, for instance, basic staple foods account for a large share of expenditure of low-income households, and if the prices of these commodities are kept under control, a positive shock to inflation may have little impact on the poor. Conversely, increases in prices of goods and services produced by the public sector (such as electricity and other utilities) may reduce sharply the purchasing power of the poor's income; a reduction in subsidies on goods and services (such as basic food items) that are consumed by the poor would have a similar effect. In general, the net effect of this type of measures on the poor will depend on their expenditure pattern and their ability to dissave (or borrow) to offset a negative income shock.

But the behavior of overall inflation matters also. The poor are more vulnerable to inflation than higher-income groups because their income (wages or income from self-employment) is often defined in nominal terms and they do not benefit from indexation mechanisms. They also have limited access to inflation hedges—few real assets, such as land, and usually no indexed financial assets—with which to insulate themselves from the effect of price increases, and their holdings of cash balances are subject to the inflation tax.[13] Lower inflation also contributes indirectly to growth—as shown in various empirical studies (see Agénor, 2004b, Ch. 13)—by increasing the level and efficiency of private investment.

Thus, by lowering the level of inflation (and possibly the variability of inflation, as discussed below), macroeconomic policy may provide substan-

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[13]In principle, it is possible that revenue from the inflation tax serves to finance a higher level of public expenditure that benefits the poor directly—thereby mitigating the adverse, partial equilibrium effect of the tax. In practice, however, it is seldom possible to make that direct connection.

tial benefits to the poor. Recent empirical evidence has indeed corroborated this assertion (see Agénor, 2004a, 2004c). However, other factors must also be taken into account. To the extent that disinflation is accompanied by a contraction in aggregate demand and employment (as discussed earlier), the excess supply of labor may lead to downward pressure on wages and higher poverty. And even if reducing inflation has desirable effects in the longer run, the short-run effect of disinflation may be to worsen poverty if (as also noted earlier) fiscal adjustment takes the form of extensive cuts in social programs. Thus, a dynamic trade-off may emerge between short-term costs and longer-run benefits.

3.4   The Real Exchange Rate and the Supply Side

A sustained depreciation of the real exchange rate—brought about either through a nominal depreciation or, less commonly, through a fall in the price of non-tradable goods—is the key channel through which macro-economic policy aims to foster a reallocation of resources toward the tradables sector and correct external imbalances. In turn, a real depreciation may affect poverty in at least two ways. First, if it is implemented through a nominal depreciation, the domestic price of imported goods will typically rise. Whether this increase hurts the poor depends on how large the result-ing adverse income effect is; this, in turn, depends on whether the poor consume these goods relatively more than non-tradables. In general, the urban poor tend to be affected more than the rural poor, because they tend to consume more imported goods. Second, a real depreciation tends to foster a reallocation of resources toward agricultural exports, raising the income of export-crop farmers and rural households. Thus, in countries where the poor are predominantly located in rural areas (as is the case in sub-Saharan Africa), a real depreciation will normally tend to reduce poverty.

A more competitive exchange rate may have other supply-side effects as well. Because resources are reallocated toward the tradable sector, the demand for labor in the non-tradable sector may fall; lower employment and nominal wages (in the presence of downward rigidity of prices) may trans-late into a fall in real wages and a higher incidence of poverty. In particular, if the urban poor are also producers of non-traded goods (because they operate in the informal sector, for instance), urban poverty may increase at the same time that rural poverty is falling. Alternatively, a real depreciation can lead to an increase in the user cost of capital in the tradable sector, because capital goods (machinery and equipment) are imported. This may lower investment in fixed capital and, as a result of complementarity, reduce the demand for skilled workers. To the extent that skilled and unskilled labor are net substitutes (as the evidence suggests for many countries), the demand for unskilled labor may increase, raising employment and average income of

the poor, thereby reducing the incidence of poverty. However, if the real depreciation is accompanied by a cut in tariffs, the cost of imported capital goods may actually fall—thereby leading to an increase in the demand for skilled labor, a fall in unskilled employment and an increase in poverty. Finally, as discussed at length in Agénor and Montiel (1999, Ch. 8), if the real exchange rate depreciation is brought about by a nominal devaluation, and if the economy is a net importer of intermediate inputs (such as oil), the real depreciation will also represent a negative supply-side shock which may reduce the demand for labor in all production sectors—so much so that the net effect may be a contraction in output, an increase in unemployment of all labor categories and a higher incidence of poverty.

3.5 Macroeconomic Volatility

A high degree of macroeconomic volatility, as measured by large and erratic movements in inflation and real exchange rates, is a well-documented feature of the economic environment in developing countries (see Agénor and Montiel, 1999, Ch. 4; Agénor *et al.*, 2000). Such volatility very often results from external factors (such as changes in a country's terms of trade or fluctuations in world interest rates) but it is also sometimes policy induced, in part as a result of 'stop-and-go' policies.

Macroeconomic volatility can affect the poor in various ways. First, volatility tends to distort price signals and the expected rate of return for investors; in the presence of irreversibility effects, the decision to wait may lead to lower private investment and lower growth rates. Second, increased macroeconomic volatility may heighten the perceived risk of default, and either increase the incidence of credit rationing or lead to a higher risk premium and borrowing rates for private firms (see Agénor and Aizenman, 1998). This may have an adverse effect on labor demand and possibly on poverty, by depriving small and labor-intensive firms of the loans needed to finance their working capital needs. Third, the propensity to save (of rich and poor households alike) may increase if macroeconomic volatility translates into higher income uncertainty (see, for instance, Agénor, 2004b, Ch. 2, Appendix) or an increased probability of facing borrowing constraints in 'bad times', as in Agénor and Aizenman (2004). Soto (2004), for instance, found that in Chile, during the period 1990–2002, unemployment had an adverse, short-term impact on consumption of non-durable goods. A possible explanation of this inverse correlation is that unemployment is positively related to income volatility. In turn, increased uncertainty regarding future income may lower consumption by enhancing the precautionary motive for saving. It is also important to note, however, that an increase in saving induced by higher volatility may actually lead to higher growth rates, despite adverse short-term effects on employment and poverty; the issue, then, becomes one of intertemporal evaluation of benefits and costs.

3.6   *Growth and Distributional Effects*

Macroeconomic policy affects the poor through its impact not only on the level of output or short-run changes in income, but also on income growth rate over time. There are several channels through which this can occur. For instance, if cuts in public sector investment (particularly in infrastructure) lead also to lower private investment through a complementarity effect, they may lower the rate of economic growth. Tax increases in the formal sector may encourage evasion and the shifting of activities to the informal economy—so much so that the net impact may be a fall in revenue. In turn, the loss in resources may reduce the government's capacity to invest in infrastructure and lower the rate of economic growth. At the same time, a reduction in inflation associated with a tightening of macroeconomic policy may increase growth rates through its effect on the level and efficiency of investment.

The impact of growth on poverty depends also on changes in income distribution, as noted earlier. In general, large differences may exist between countries regarding the extent to which growth (even when it is distribution-neutral) will affect poverty. Initial distribution may affect subsequent growth through credit market imperfections, which often translate into collateralized lending requirements. If the poor lack assets, their ability to borrow and invest in acquiring skills will therefore be limited, and poverty may perpetuate itself (see, for instance, Galor and Zeira (1993) and the discussion of poverty traps below). Inequality may also have an adverse effect on growth through changes in macroeconomic volatility, as a result for instance of greater political instability.[14]

An important question is, then, what accounts for changes in income distribution? Recent formal econometric studies (e.g. Barro, 2000) have been unable to find a robust relation between per capita income and inequality. In particular, the Kuznets curve hypothesis (an inverted U-shape relation between income levels and inequality) appears to be fragile. Bleaney and Nishiyama (2004), for instance, found that the estimated parameter on the initial Gini coefficient in various cross-country growth regressions does not seem to vary with the level of per capita GDP. At the same time, these parameters are never significantly negative. There is stronger evidence that changes in income distribution are related to human capital inequality—and thus to borrowing constraints, as noted earlier (see Castelló and Doménech, 2002; Iradian, 2005). A worsening in income distribution may therefore be the result of growing inequalities in educational opportunities and inadequate access to credit markets. Inflation may also explain changes in distribution: by lowering the values of both nominal assets and liabilities, it favors debtors and holders of real equity over lenders and owners of nominal assets.

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[14]See Aghion *et al.* (1999) for a discussion of alternative channels.

The net distributional effects will depend on access to hedging instruments and the distribution of nominal assets and liabilities across income groups. Bulir (2001) found indeed that inflation has an adverse effect on income distribution; this effect is highly significant at high inflation levels.

3.7 Recessions and Crises: Asymmetric Effects

That large output contractions can have a significant impact on the poor in developing countries is well recognized. Economic downturns, by reducing the demand for labor, tend to put downward pressure on wages and raise unemployment in the formal sector. The greater the degree of downward rigidity in wages, the larger the increase in the number of unemployed. Both effects tend to increase poverty in the formal economy. In addition, in the absence of well-functioning credit markets (and thus limited ability to borrow in bad times) and often with no state benefits available for the unemployed, workers (particularly the unskilled ones) cannot remain unemployed for long. In some countries they migrate back to the rural sector; in others they move into the informal sector, where the poorest among the urban poor are usually concentrated. The resulting increase in labor supply in the informal urban economy tends to depress wages there. Thus, recessions and crises raise poverty in two related ways: directly by lowering wages and increasing the rate of job losses and the number of poor in the formal sector; and indirectly, by lowering the going wage of those who are already employed (or quasi-unemployed) in the informal economy.

These labor market effects are compounded by a number of factors, which tend to exacerbate the impact of adverse economic shocks on the poor. As noted earlier, the poor lack assets and often have no direct access to credit markets to smooth the impact of these shocks. In addition, there is growing evidence that cyclical downturns and economic crises may have an asymmetric effect on poverty: recessions and/or sharp output contractions tend to increase poverty rates significantly (through some of the channels identified above), whereas expansions tend to have a more limited effect. Understanding the sources of asymmetric effects of economic cycles and crises on poverty, and assessing the strength of these effects, is thus essential for the design of effective policy responses.

I have reviewed elsewhere (see Agénor, 2002) some of the evidence related to the effect of crises on the poor; Appendix A summarizes five main classes of explanations.[15] The first dwells on parents' decisions regarding their children attending school; the second is based on asymmetric changes in expectations and confidence factors; the third relies on a 'credit crunch' faced by employers, with rationing resulting from either adverse selection problems

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[15]For evidence related to the effect of crises on the poor, see also Fallon and Lucas (2002). However, they did not elaborate on the possible sources of asymmetric effects.

or negative shocks to net worth; the fourth emphasizes the impact of borrowing constraints on household consumption behavior; and the fifth dwells on 'labor hoarding' by firms facing high turnover costs for more educated labor. In particular, in a recession or crisis-induced contraction, unskilled workers (among which the poor tend to be concentrated) are often the first to lose their jobs as firms 'hoard' their highly trained workers. The incentive to hoard results from the existence of high hiring and training costs associated with the use of skilled labor, and is higher the more the shock is perceived to be temporary, regardless of its size. Legally mandated severance payments (which often serve as a substitute for unemployment benefit payments in developing countries) may also tend to limit layoffs of skilled workers. When the 'good times' come back, however, firms have incentives to recoup, in priority, the productivity losses incurred during the downturn. Given the greater degree of complementarity between skilled labor and physical capital, they may be tempted to increase fixed investment instead of increasing their demand for unskilled labor. Unemployment and poverty may therefore persist for that category of workers.

   In sum, the channels through which macroeconomic policy affects poverty are complex and often operate in opposite directions in the short and the longer run. It is thus hard to generalize or make blanket statements about the poverty effects of specific policies, given the fact that many of them entail dynamic trade-offs. In fact, it is tempting to repeat the conclusion of Winters *et al.* (2004, p. 73), following their review of the impact of trade liberalization on poverty, which highlights the importance of careful empirical analysis:

> there are no general comparative static results about whether trade liberalization will increase or reduce poverty. Simple statements about 'the poor' will lose information, at best, and simple generalizations about all countries will just be wrong.

4   THEORETICAL MODELS FOR POVERTY ANALYSIS

As noted earlier, although it is well recognized that the poor in developing countries often generate a sizable share of their income from wage employment, the role of the labor market in the transmission of macroeconomic policy shocks to lower-income groups has not (until recently) been explored in its full complexity in analytical and empirical models. Understanding this role is all the more important given the peculiarities and imperfections that often characterize labor markets in these countries.

   My contention is that macroeconomic models (both theoretical and applied) designed for poverty analysis must incorporate a specification of the labor market that reflects the characteristics highlighted earlier. This section illustrates how this can be done in a simplified version of an open economy analytical framework that I have developed elsewhere (see Agénor, 2005f) and

examines the impact of a 'typical' macro shock, a cut in government spending, on the urban poor.

4.1   A Two-household Framework

Consider a small open economy in which there are two segments: a formal sector, which produces an exportable good and whose output is entirely sold abroad, and an informal sector, which produces a non-traded good used only for domestic consumption. There are three categories of agents: producers, households and the government. There is a single producer in each sector, and two households: a rich household, which consists of all workers employed in the formal economy, and a poor household, consisting of those workers employed in the informal sector. The rich household optimizes consumption, pays taxes, saves and borrows abroad. The poor household pays no taxes and spends all of its income.[16] Both rich and poor households supply labor inelastically and consume, in addition to the non-traded good produced in the informal sector, an imported good which is imperfectly substitutable for the home good.

4.1.1   Production and Labor Demand.   Production of exportables in the formal economy, Y_E, requires both labor categories, in quantities n_S and n_U:

$$Y_E = n_S^\alpha n_U^{1-\alpha} \tag{2}$$

where $\alpha \in (0, 1)$. The world price of exportables is exogenous and normalized to unity. The domestic price of exportables is thus equal to the nominal exchange rate, E, which is assumed fixed.

Unskilled workers are paid a government-mandated minimum wage, ω_m, which is fixed in terms of the price of exportables. The skilled real wage, ω_S, measured also in terms of the price of exportables, is given by

$$\omega_S = \theta(z) > \omega_m \tag{3}$$

where $z = E/P_N$ denotes the relative price of imports in terms of non-tradables (referred to in what follows as the real exchange rate), and $\theta' < 0$. Equation (3) indicates that the skilled wage is related negatively to the real exchange rate. It can be derived from an efficiency wage setting in which effort is a function of the *consumption* wage, whereas firms determine the *product* wage (see Agénor, 2004c). A similar result could be obtained if instead firms face high turnover costs associated with skilled labor and if the quit rate is a function of the consumption wage as well (see Agénor, 2001). Alternatively,

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[16]Dynan *et al.* (2004) provide evidence that the rich tend to save more, or more generally that saving rates tend to increase with the level of income. They identify various reasons for this pattern, including differences in rates of time preference. Ogaki and Atkeson (1997) also provide evidence that the poor save proportionately less than the rich.

(3) could be derived by assuming that the skilled wage is determined by a centralized labor union whose objective is to minimize a quadratic loss function that depends on deviations of employment and the consumption wage from their target levels, subject to the firm's labor demand schedule (see Agénor, 2005a).

Profit maximization requires equating the marginal product of each category of labor to the relevant product wage:

$$\alpha\left(\frac{n_U}{n_S}\right)^{1-\alpha} = \omega_S \qquad (1-\alpha)\left(\frac{n_S}{n_U}\right)^{\alpha} = \omega_m$$

which can be combined to give the skilled–unskilled wage ratio:

$$\frac{\omega_S}{\omega_m} = \frac{\alpha n_U}{(1-\alpha)n_S} \tag{4}$$

The demand functions for labor can be derived as

$$n_S^d = n_S^d(\overline{\omega}_S; \overline{\omega}_m) \qquad n_U^d = n_U^d(\overline{\omega}_S; \overline{\omega}_m) \tag{5}$$

Equations (5) indicate that, as a result of gross complementarity, an increase in the product wage for either category of workers reduces the demand for both categories of labor.

Substituting these results in equation (2) and using (3) yields

$$Y_E^s = Y_E^s(\overset{+}{z}) \qquad Y_E^{s\prime} > 0 \tag{6}$$

which shows that a depreciation raises output of exportables.

In the informal sector, production of the non-traded good, Y_N, requires only unskilled labor, in quantity n_N:

$$Y_N = A_N n_N^{\eta} \tag{7}$$

where $A_N > 0$ is a shift parameter and $\eta \in (0, 1)$. Profit maximization yields equality between marginal revenue and marginal cost, $\omega_N = Y_N'/z$, where ω_N denotes the real wage in the informal sector, measured in terms of the price of exportables. I assume that $\omega_N < \omega_m$, i.e. that the minimum wage is higher than the informal sector wage. This condition is necessary to prevent a corner solution in which unskilled workers have no incentive to seek employment in the formal economy.

Setting for simplicity $A_N = 1/\eta$, labor demand is given by

$$n_N^d = (\omega_N z)^{1/(\eta-1)} \tag{8}$$

where $\omega_N z$ measures the product wage in the informal sector and $n_N^{d\prime} < 0$. Substituting (8) in (7) yields the supply function of informal sector goods:

$$Y_N^s = (\omega_N z)^{\eta/(\eta-1)} \qquad Y_N^{s\prime} < 0 \tag{9}$$

4.1.2 Informal Labor Market. The informal labor market absorbs all unskilled workers who do not queue up for employment in the formal sector.[17] Suppose that N_U, the total number of unskilled workers in the labor force, is constant. The supply of unskilled workers in the informal sector is thus $N_U - n_U^d$. Using (5) and (8), the equilibrium condition of the informal labor market is thus given by

$$N_U - n_U^d(\omega_S; \omega_m) = n_N^d(\omega_N z)$$

Wages adjust continuously to equilibrate supply and demand. Using (3) to solve this condition for ω_N therefore yields

$$\omega_N = \upsilon(z) \tag{10}$$

where[18]

$$\upsilon' = -\left[1 + \theta'(n_N^{d\prime})\left(\frac{\partial n_U^d}{\partial \omega_S}\right)\right]$$

A real exchange rate depreciation (a rise in z) has, in general, an ambiguous effect on the market-clearing wage. On the one hand, a real depreciation lowers the demand for labor in the informal sector, because the product wage in the informal sector, $\omega_N z$, tends to increase. To eliminate the excess supply of labor, the informal sector wage must fall. On the other hand, the rise in z lowers the skilled wage in the formal sector, which tends to increase the demand for unskilled labor in the formal sector. This reduces labor supply in the informal economy and puts upward pressure on wages there. The net effect on ω_N therefore depends on the relative strength of the direct and indirect effects. I will assume in what follows that the direct effect dominates (or, equivalently, that θ' is sufficiently small), to ensure that $\upsilon' < 0$.

Moreover, given that $\theta' < 0$, $|\upsilon'| < 1$ and the product wage increases as a result of a real depreciation ($\partial(\omega_N z)/\partial z = 1 + \upsilon' > 0$). Thus, a real depreciation lowers employment and output in the informal sector, even if the informal sector wage (measured in terms of the price of exportables) falls. These results are important to understand the impact of policy shocks on poverty, as discussed below.

4.1.3 Household Consumption. The rich household's consumption decisions follow a two-step process. First, the level of total spending is determined, based on intertemporal optimization and subject to a flow budget constraint. Second, that amount is allocated between consumption of the home good and the imported good, based on relative prices.

[17]See Agénor (2001) for a discussion. Agénor (2004c, 2005a) considers the case where labor mobility between the formal and informal sectors is imperfect.
[18]In what follows a tilde over a variable is used to denote a steady-state value. Derivatives are all evaluated at steady-state values of z and ω_N of unity.

The rich household's discounted lifetime utility is given by

$$\int_0^\infty \ln c_R e^{-\rho t} dt \tag{11}$$

where c_R is total consumption (measured in terms of the price of exportables) and $\rho > 0$ is the rate of time preference, assumed constant.

Let D_R denote the rich household's stock of foreign debt, measured in foreign-currency terms. Its flow budget constraint can thus be written as

$$\dot{D}_R = i^* D_R + c_R + T - Y_E^s \tag{12}$$

where i^* is the cost of borrowing on the world capital market and T is lump-sum taxes, also measured in terms of the price of exportables.

The world capital market is imperfect. Specifically, the interest rate facing domestic borrowers is the sum of a risk-free rate, i_f^*, and a country-risk premium, which varies positively with the economy's foreign borrowing:

$$i^* = i_f^* + \kappa(D) \tag{13}$$

where $\kappa' > 0$, $\kappa'' > 0$ and $D = D_R + D_G$ is the economy's total stock of external debt, defined as the sum of the rich household's debt, D_R, and government debt, D_G.[19]

The rich household treats Y_E^s, i^* and T as given, and maximizes (11) subject to (12) by choosing a sequence $\{c_R\}_{t=0}^\infty$. The optimality condition is the standard Euler equation:

$$\dot{c}_R / c_R = i_f^* + \kappa(D) - \rho \tag{14}$$

Ruling out Ponzi games also requires imposing a transversality condition on D.

The rich household allocates total consumption spending between purchases of the informal sector (respectively, imported) good, c_R^N (respectively, c_R^M):

$$c_R^N = \delta z c_R \qquad c_R^M = (1 - \delta) c_R \tag{15}$$

where $0 < \delta < 1$.

Income of the poor household (measured in terms of exportables) consists of informal sector output, $z^{-1} Y_N^s$. All income is spent on consumption, c_P:

$$c_P = z^{-1} Y_N^s \tag{16}$$

Assuming for simplicity an allocation rule across consumption goods that is similar to the rich household's yields

$$c_P^N = \delta z c_P \qquad c_P^M = (1 - \delta) c_P \tag{17}$$

[19]As in Agénor (2005f), the debt-to-exports ratio, D/Y_E^s, could be used instead of the absolute level of debt.

4.1.4 Government. The government derives revenue by levying lump-sum taxes on the rich household. It spends on imported goods, G, and services its foreign debt, D_G, also at the (premium-inclusive) rate i^*. It finances its deficit by borrowing on world capital markets:

$$\dot{D}_G = i^* D_G + G - T \tag{18}$$

4.1.5 Market for Informal Sector Goods. The equilibrium condition of the market for informal sector goods can be written as

$$Y_N^s = c_R^N + c_P^N \tag{19}$$

Using equations (9), (15) and (17), this condition becomes

$$Y_N^s(\omega_N z) = \delta z(c_R + c_P)$$

which can be rewritten as, using (16),

$$Y_N^s(\omega_N z) = \frac{\delta}{1-\delta} z c_R \tag{20}$$

The price of the non-traded good is flexible and adjusts to eliminate excess demand. Condition (20) can therefore be solved for the equilibrium real exchange rate:

$$z = z(c_R, \omega_N) \tag{21}$$

where

$$z_{c_R} = \left(Y_N^{s\prime} - \frac{\delta \tilde{c}_R}{1-\delta} \right)^{-1} \frac{\delta}{1-\delta} < 0$$

$$z_{\omega_N} = -\left(Y_N^{s\prime} - \frac{\delta \tilde{c}_R}{1-\delta} \right)^{-1} Y_N^{s\prime} < 0$$

so that $|z_{\omega_N}| < 1$. This equation shows that an increase for instance in ω_N (for c_R given), by raising the product wage and lowering the supply of goods in the informal sector, requires an appreciation of the real exchange rate (a fall in z) to eliminate excess demand. This effect is less than proportional because the appreciation mitigates the initial adverse effect of the rise in ω_N on the product wage. An increase in expenditure by the rich household raises demand for informal sector goods and also leads to a real appreciation.

Substituting (10) for ω_N in (21) yields

$$z = \chi'(c_R) \tag{22}$$

where $\chi' = z_{c_R}/(1 - z_{\omega_N} \upsilon')$.[20]

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[20]Note that, because $|\upsilon'|, |z_{\omega_N}| < 1$ from (10) and (21), $1 - z_{\omega_N} \upsilon' > 0$.

4.1.6 Informal Employment, Consumption and Poverty. Suppose that the legal minimum wage corresponds to the official poverty line, and that average income in the informal sector, $P_N Y_N^s / n_N^d$, is less than $E\omega_m$ at all times; given (8) and (9), this implies that $\omega_N < \omega_m$, as assumed earlier. In the present setting, two approaches can be used to measure poverty. The first is to define a headcount poverty index, H, as the number of workers employed in the informal sector, plus unemployed skilled workers in the formal economy, divided by the total size of the labor force, N:

$$H = \frac{1}{N}\left[n_N^d + (N_S - n_S^d)\right]$$

or equivalently, given that $N_S = N - (n_U^d + n_N^d)$,

$$H = 1 - \left(\frac{n_S^d + n_U^d}{N}\right) \tag{23}$$

The headcount poverty index is thus given by the number of workers that are not employed in the formal sector, as a proportion of the labor force.

Alternatively, if unemployed skilled workers are assumed to benefit from a non-market source of income that keeps them above the poverty line, the poverty index can be defined as

$$H = \frac{n_N^d}{N} = 1 - \left(\frac{N_S + n_U^d}{N}\right) \tag{24}$$

The second approach is to use equation (1) provided earlier. In the present case, assuming that G (government spending on imported goods) is the policy instrument yields

$$I_G = \frac{d\left[(n_N^d)^{-1} c_P\right]/dG}{d\left[(n_S^d + n_U^d)^{-1} c_R\right]/dG} - 1$$

Given that from (16) $c_P = z^{-1} Y_N^s$, and that $Y_N^s / n_N^d = \omega_N z$, this expression is equivalent to

$$I_G = \frac{d\omega_N/dG}{d\left[(n_S^d + n_U^d)^{-1} c_R\right]/dG} - 1 \tag{25}$$

which can be used to determine whether a change in G is pro-poor. Unemployed skilled workers are excluded from the calculation of mean income of the rich, $c_R/(n_S^d + n_U^d)$, but this can easily be modified.

4.2 Equilibrium

Figure 1 depicts the partial equilibrium of the labor market, under the assumption that skilled workers who are unable to obtain a job in the formal sector opt to remain unemployed rather than seek employment in
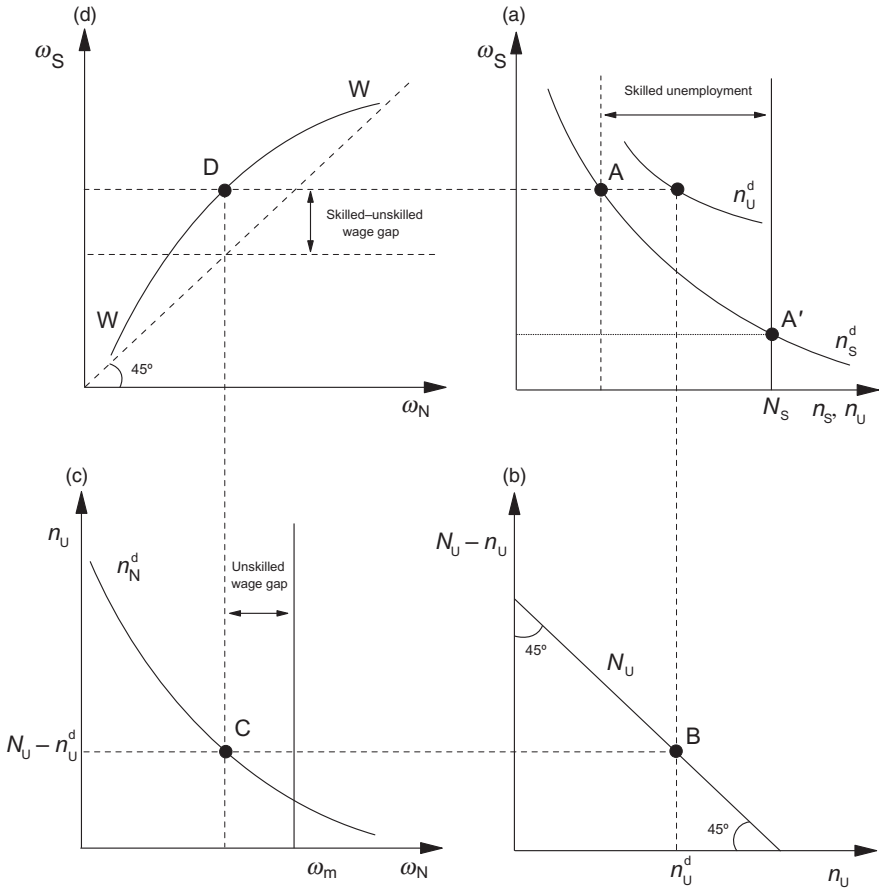
Fɪɢ. 1 Partial Equilibrium of the Labor Market

the informal economy.[21] Panel (a) depicts the demand functions for labor in the formal sector. Both demand curves for skilled labor, n_S^d, and unskilled labor, n_U^d, are downward-sloping, because they are negatively related to ω_S, the skilled wage (see (5)). Panel (b) determines the supply of labor (and thus actual employment) in the informal economy, $N_U - n_U^d$, given unskilled employment in the formal sector (point B). Given the labor demand curve in the informal sector n_N^d, the market-clearing wage is determined at point C in

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[21]See Agénor (1996, 2003) for a further discussion of this hypothesis and a review of the evidence on skilled unemployment in developing countries. In general, whether skilled workers who are not successful in applying for a job in the formal sector decide to seek employment in the informal economy depends on factors such as the efficiency of on-the-job search activities and demotivation effects.

panel (c).[22] Curve WW in panel (d) depicts the positive relationship between the skilled wage and the informal sector wage (for c_R given), which is obtained by substituting z from (21) into (3). Skilled unemployment (which can be deemed 'quasi-voluntary') is given in panel (a) by the distance between the supply of skilled labor, N_S, and the equilibrium point on the demand curve n_S^d (point A).[23] At point A, the skilled wage is too high (relative to the market-clearing wage, corresponding to point A′) to eliminate the excess supply of labor and skilled unemployment prevails. Both the skilled–unskilled wage gap (which can be derived from (4)) and the unskilled wage gap (i.e. the difference $\omega_m - \omega_N$) are also shown in the figure.

Appendix B shows how the complete model can be reduced into a dynamic system in c_R, consumption of the rich household, and D, the economy's total stock of debt. The phase diagram of the system is depicted in the upper northeast quadrant of Fig. 2. The phase curve CC represents the combinations of c_R and D for which consumption of the rich is constant ($\dot{c}_R = 0$), whereas the phase curve DD represents the combinations of c_R and D for which the current account is in equilibrium ($\dot{D} = 0$). Curve CC is vertical, whereas curve DD is downward-sloping. As shown in Appendix B, saddlepath stability is always ensured. The saddlepath itself, denoted SS, has a negative slope, which is steeper than DD. Thus, starting from a position (c_R^0, D_0), transition to the long-run equilibrium (which is reached at point E) requires consumption of the rich and external borrowing to evolve in opposite directions. In the upper northwest panel, the curve NN shows the relationship between c_R and z given by (22), whereas curve LL in the lower northwest panel displays the relationship between z and ω_N given in (10). The equilibrium real exchange rate is determined at point B, which is translated to point H, whereas the equilibrium informal sector wage is determined at F. The demand curve for labor in the informal sector, obtained solely as a function of z by combining equations (8) and (10), is shown as $n_N^d [\upsilon(z)z]$ in the lower northeast panel. Equilibrium informal employment is determined at point J. Finally, the lower southeast panel shows the determination of the poverty headcount index solely as a function of informal sector employment, as defined in (24). The poverty rate is determined at point M.

4.3　Cut in Government Spending

The above framework can be used to study the impact and steady-state effects of a variety of macroeconomic policy shocks. Given the illustrative nature of

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[22]From equation (8), n_N^d is negatively related to $\omega_N z$. From (21), with c_R given, z is inversely related to ω_N, with $|z_{\omega_N}| < 1$. Thus, the derivative of n_N^d with respect to ω_N is $n_N^{d\prime}(1 + z_{\omega_N}) < 0$, which implies that the demand curve is indeed downward-sloping.

[23]Because there is no unemployment benefit scheme in the present framework, unemployed workers are implicitly assumed either to turn to a subsistence activity (home production) or to rely on other members of the household for their survival.
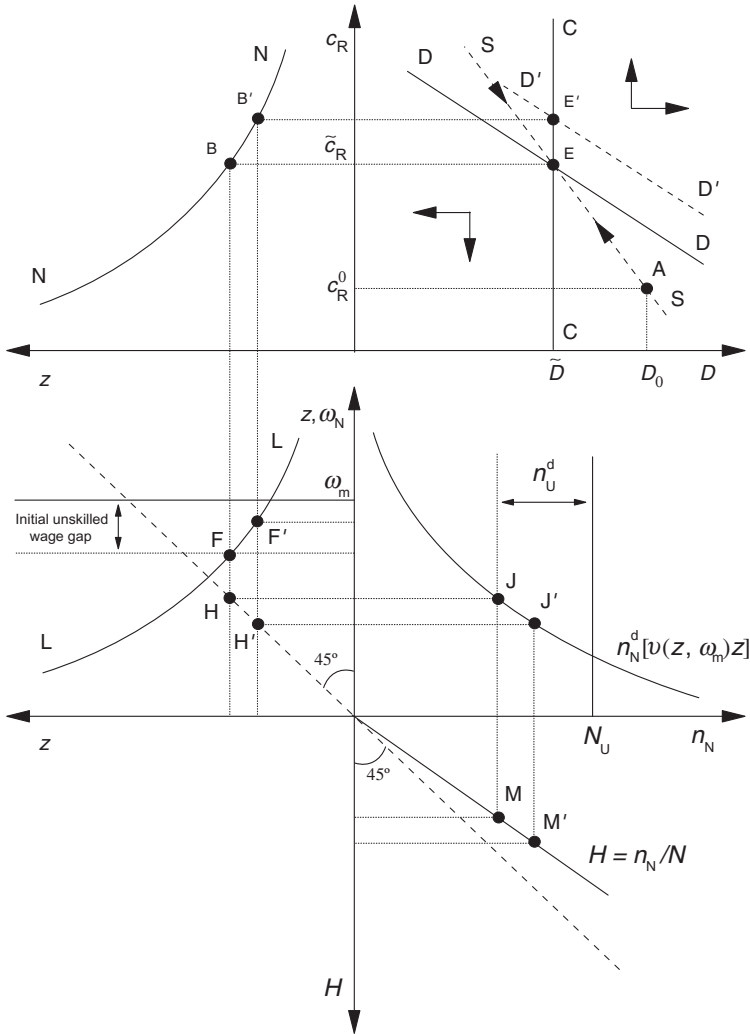
Fig. 2 General Equilibrium and Determination of the Poverty Rate
Source: Adapted from Agénor (2005f).

the exercise, I will confine my analysis here to a permanent (and unantici-
pated) cut in government spending on imported goods, G.

As can be inferred from (14) with $\dot{c}_R = 0$, and as formally established in
Appendix B, a cut in G has no effect on the economy's stock of debt in the
long run (see equation (A10)). Given that the current account must be in
balance in the steady state (i.e. $\dot{D} = 0$), the reduction in G must be offset by
an increase in private consumption of the rich or a reduction in domestic
supply of exportables. This requires an appreciation of the real exchange rate

to either eliminate excess demand for informal sector goods or reduce incentives for producing exportables. The appreciation, in turn, leads to an increase in the informal sector wage, but to a fall in the product wage in that sector (recall that $\partial(\omega_N z)/\partial z > 0$). The demand for labor and output in the informal sector therefore increase, and so does the headcount poverty index. At the same time, the real appreciation raises the skilled wage (as implied by (3)), which tends to reduce output and employment of both categories of labor in the formal sector. Skilled unemployment rises, whereas the reduction in demand for unskilled labor increases supply in the informal sector, thereby mitigating the upward movement in wages in that sector. Consumption of the poor increases, as implied by (16), given that z falls and Y_N^s rises.

Because the stock of foreign debt D cannot change on impact, and does not change across steady states either, a permanent increase in G entails no transitional dynamics. Graphically, curve CC (which does not depend on G) does not change; curve DD, on the contrary, shifts upward to D′D′. The economy jumps immediately from point E to a point like E′ located on CC.[24] Consumption of the rich increases, the real exchange rate appreciates from B to B′ or from H to H′, the informal sector wage rises from F to F′, informal employment rises from J to J′ and the headcount poverty index increases from M to M′. The unskilled wage gap (the difference between the minimum wage and the informal sector wage, both measured in terms of the price of exports) falls, reducing inequality among workers.

As shown in Appendix B, $d\tilde{c}_R/dG < 0$, whereas $d(\tilde{n}_S^d + \tilde{n}_U^d)/dG > 0$. Thus, the net effect of the cut in G on average consumption of the rich, $\tilde{c}_R/(\tilde{n}_S^d + \tilde{n}_U^d)$, is unambiguously positive. Moreover, given that $d\tilde{\omega}_N/dG < 0$, the net effect of a reduction in G on mean consumption of the poor, $\tilde{c}_P/\tilde{n}_N^d$, is positive.

Given these results, and the index defined in (25), a reduction in G is pro-poor (i.e. $I_G > 0$) if

$$\frac{d\tilde{\omega}_N / dG}{d\left[\left(n_S^d + n_U^d\right)^{-1} \tilde{c}_R\right]/dG} > 1$$

a condition that depends, in particular, on the elasticity of output with respect to labor in the informal sector. Indeed, because spending by the poor is based on their current resources, the higher η is, the higher will be the wage elasticity of labor demand, $-(1 - \eta)^{-1}$ (see (8)). As a result, the lower will be the increase in the informal sector wage needed to absorb the increase in informal labor supply induced by the cut in government spending, and the more likely it is that the policy will not be pro-poor. Put differently, whether a cut in government spending reduces poverty depends on how the 'pro-poorness'

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[24]Of course, a temporary shock to G would entail transitional dynamics, as would any shock that leads to a shift in DD, such as a change in the world risk-free interest rate (see Agénor, 2005b).

effect is measured. Because employment shifts to the informal sector, where workers earn a wage that is lower than the poverty line, poverty (as measured by the number of workers employed in that sector) increases. At the same time, however, because the increase in output in the informal economy leads to higher income, it is possible for consumption of the poor to rise by more than consumption of the rich.

More generally, the model helps to illustrate that the poverty effects of macroeconomic policies in a typical developing-country context operate through complex channels involving changes in aggregate demand and supply in the formal and informal sectors, as well as changes in relative prices and wages. In the foregoing analysis, a key issue is the impact of the shock on the demand for unskilled labor in the formal and informal sectors. The contraction in the demand for that category of labor in the formal economy requires the product wage in the informal sector to fall to stimulate demand there and generate an increase in output. Accounting for these general equilibrium effects is crucial to determine whether macroeconomic policy benefits or hurts the poor.[25]

5 APPLIED MODELS FOR POVERTY ANALYSIS

As noted earlier, from a macroeconomic perspective, growth, inequality and poverty are all endogenously determined and causality can run in different directions. However, because of the complexity of these interactions, small and tractable analytical models (of the type discussed earlier) are difficult to formulate; recourse to numerical techniques becomes essential for policy analysis. Indeed, much effort has been devoted in recent years to the development of a new breed of applied structural macroeconomic models for poverty and distributional analysis. These models capture interactions in ways that small, theoretical models (of the type developed in the previous section) are unable to do and are particularly important to address dynamic policy trade-offs. As noted earlier, large budgetary cuts may fall to a significant extent on transfers to households and other types of social expenditure, thereby worsening the plight of lower-income groups in the short term. At the same time, these groups tend also to be the ones most adversely affected by rapid inflation, credit rationing and high interest rates. To the extent that fiscal austerity leads to a durable reduction in inflation, greater access to credit by private firms and lower borrowing rates, the poor may benefit from government spending cuts in the longer run. In designing poverty-reduction strategies, it is therefore important to carefully evaluate the net benefits (in present value terms) that such trade-offs entail.

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[25]Note that the foregoing analysis assumes that the poverty line is fixed at the level of the minimum wage. In general, of course, the poverty effects of government spending shocks will depend not only on changes in employment levels but also on where the different after-tax wages (formal and informal) lie relative to the poverty line.

Some of the recent attempts to develop applied macro models for poverty analysis are, in my view, obvious failures. A key reason is that many of these attempts entailed 'recycling' models that were built for a very different purpose. Under the false pretense of 'simplicity', some of the fundamental characteristics of developing countries (especially with respect to the labor and credit markets) are ignored, and some of the most important channels through which macroeconomic policy affects the poor are left out. As a result, they are also unable to address some of the key policy issues (and trade-offs) that policymakers in these countries are faced with—including, as discussed later, those related to the allocation of public investment. Other attempts have been, fortunately, more successful, despite (or, rather, because of) their greater degree of complexity and the recognition that models are issue-specific. Trying to 'force' a model to answer questions that it is not designed to address is counter-productive; it simply hampers our ability to address relevant policy questions. More generally, models are not built only to produce numbers but also to provide qualitative insights, particularly into general equilibrium effects. In that regard, although simplicity can be a virtue in an environment where technical capacity is limited, it may entail significant costs. Factoring in too much 'simplicity' into the transmission process may render policy analysis meaningless. One has to be very clear as to what is being left out, and it should always be remembered that, in the end, complexity, just like beauty, is very much in the eye of the beholder.

In what follows I will discuss a class of models that I believe goes a long way toward capturing many of the transmission channels highlighted earlier. These models are not 'off the shelf' instruments and require time and resources to develop; at the same time, I believe that this is the price to pay to understand a complex phenomenon and provide policymakers with reliable tools to address some of the issues that they are faced with. Lack of adequate data is almost always a problem with applied models and some have argued that it precludes any serious attempt at macroeconomic modeling in low-income countries. But the right approach is not to wait until the data have improved sufficiently (policymakers do not have that luxury) but rather to start with existing numbers, no matter how imperfect, and improve the database gradually.

The class of applied macro models that I want to discuss here relates to the integrated macroeconomic model for poverty analysis (IMMPA), developed by Agénor (2003) and Agénor *et al.* (2003, 2005b). At the heart of the model is a production structure that is sufficiently disaggregated to allow rural and urban poverty to be studied separately, while at the same time capturing the interdependent nature of production, demand, trade and financial factors in a general equilibrium setting. IMMPA has been put to good use in a number of countries to study the poverty and unemployment effects of a large range of shocks. The next sections provide a brief presentation of IMMPA's theoretical structure and describe some empirical applications that

illustrate how it can be used to analyze the poverty, employment and distributional effects of adjustment policies.[26]

5.1   Structure of IMMPA Models

The first important feature of IMMPA is its detailed treatment of the labor market. As noted earlier, the structure of this market has a major impact on the transmission of macroeconomic shocks and adjustment policies to economic activity, employment and relative prices. However, applied models for development policy analysis have often captured only a narrow set of its features—such as an economy-wide rigid minimum wage. In many models prior to IMMPA, the treatment of the labor market, and more specifically wage formation mechanisms, often failed to capture the complex intersectoral relationships that are observed in practice. As illustrated in the theoretical model presented earlier, for instance, feedback effects between formal and informal sector wages through relative price changes play a critical role in the transmission process of macroeconomic shocks in a context where efficiency considerations matter in the determination of formal sector wages. More generally, early models paid insufficient attention to the macroeconomic implications of alternative sources of labor market segmentation and feedback effects between relative prices and wage decisions by price-setting firms. Labor market segmentation, in particular, tends to restrict labor mobility and can be associated with persistent wage differentials, as noted earlier; these, in turn, may prevent the reallocation of resources necessary to cope with external and policy-induced shocks. Again, because the poor in many developing countries generate a significant fraction of their income from labor services, accounting explicitly for the complexity of the labor market is crucial for understanding the impact of macroeconomic shocks on poverty.

Another important characteristic of IMMPA is that it accounts explicitly for the channels through which various types of public investment outlays affect the economy. Economists have long recognized that different forms of public investment can have different effects on output and employment, but the channels through which alternative forms of public capital outlays operate have seldom been incorporated explicitly in applied macroeconomic models used for development policy analysis. In IMMPA, the stock of public capital in infrastructure and health affects directly the level of production in the private sector—and thus the marginal productivity of primary factors employed in that sector. In addition, public capital in infrastructure is positively related to private investment, as a result of a complementarity

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[26]Alternative approaches include, for instance, Cockburn (2002) and Jung and Thorbecke (2003). The latter study combines a computable general equilibrium approach and micro simulation techniques to examine the effect of aggregate shocks on poverty. However, these types of model often remain too simple in their specification of the macro structure.
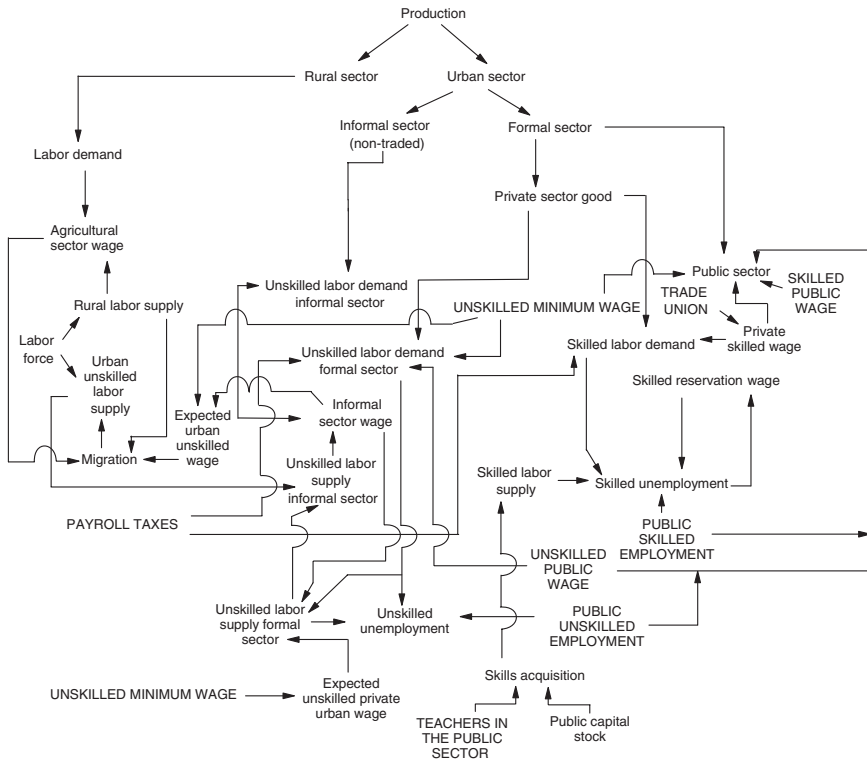
Fɪɢ. 3 Mini-IMMPA: Production Structure and the Labor Market
Source: Agénor (2003a).

effect. The capital stock in education has a direct impact on the decision to acquire skills; this effect operates in addition to movements in relative wages across skill categories and the initial level of individual wealth, which acts as a constraining factor in the presence of credit market imperfections.

These and other features of IMMPA are well illustrated by considering mini-IMMPA, which is a specialized (real side only), and less data intensive, version of IMMPA. The structure of production and the labor market in mini-IMMPA are summarized in Fig. 3. Production activities take place in both rural and urban areas. The rural sector produces a single good, which is sold either on domestic markets or abroad. Urban production includes both formal and informal components; in addition, the urban formal sector produces both private and public goods. Value added in the rural sector is produced with land (which is in fixed supply) and a composite factor, which consists of unskilled labor and public capital in health and infrastructure. Value added in the urban informal sector depends only on labor and is subject

to decreasing returns to scale. In the public sector employment is exogenous and value added is measured by the wage bill. Private formal production uses as inputs both skilled and unskilled labor, as well as public infrastructure and private capital. Skilled labor and private physical capital have a higher degree of complementarity (lower degree of substitution) than the physical capital-skilled labor bundle with unskilled labor. Firms in the urban formal sector are subject to a payroll tax on unskilled labor.

Unskilled workers are employed in both the rural and urban sectors, whereas skilled workers are employed only in the urban formal economy. Wages in the rural and urban informal sectors adjust to equilibrate supply and demand. Unskilled workers in the urban economy may be employed in either the formal sector, in which case they are paid the minimum wage, or the informal economy, where they receive the going wage. The skilled wage in the private sector can be determined in various ways—either on the basis of an efficiency wage mechanism (as in Agénor and Aizenman, 1999), through bilateral bargaining, or in a monopoly union approach (as in Agénor, 2005a). In the latter case, the consumption real wage is set by a representative labor union, whose objective is to maximize a utility function that depends on deviations of both employment and the consumption wage from their target levels, subject to the firm's labor demand schedule. The union's target wage is related negatively to the skilled unemployment rate. Education is a pure public good; the flow of unskilled workers who become skilled is a function of the number of teachers in the public sector and the stock of public capital in education.

Incentives to rural–urban migration depend on the differential between expected rural and urban wages in the tradition of Harris and Todaro (1970). The expected (unskilled) urban wage is a weighted average of the minimum wage in the formal sector and the going wage in the informal sector. The degree of mobility of the unskilled labor force between the formal and informal sectors is also imperfect and is a function of expected income opportunities. The supply of labor in the informal economy is obtained by subtracting the number of unskilled job-seekers in the urban formal sector from the urban unskilled labor force, which increases as a result of natural urban population growth and migration from the rural economy, and falls as a result of some unskilled workers acquiring skills and leaving the unskilled labor force.

Full-blown IMMPA models also have a fairly detailed financial side, which captures several important features of developing countries. Most importantly, banks are taken to play a predominant role in the financial intermediation process. Linkages between bank credit and the supply side operate through working capital needs; firms must finance their working capital requirements prior to the sale of output. As a result, the bank lending rate affects the effective price of labor, thereby providing a crucial channel through which the real and financial sectors interact. In addition, balance

sheet (or net worth) effects play an important role, in addition to funding costs, in the determination of bank lending rates. The 'finance premium' is modeled along the lines of recent research on credit market imperfections and the role of collateral, as discussed, for instance, by Agénor and Aizenman (1998), Bernanke *et al*. (2000) and Krishnamurthy (2003).[27]

5.2   *Poverty Analysis in IMMPA Models*

To assess the poverty effects of policy and exogenous shocks, IMMPA requires linking the simulation results derived from the structural macro component described earlier to a household income and expenditure survey. The basic procedure, which is discussed at length in Agénor *et al*. (2003, 2004a), involves the following steps.

- Step 1. Classify the data in the household survey into the categories of households contained in the macro framework—for instance, in mini-IMMPA, workers in the rural sector, those in the urban informal economy, unskilled workers in the formal sector, skilled workers in the formal sector and profit earners.
- Step 2. Initiate a shock and generate the growth rates in per capita consumption and disposable income for all categories of households, up to the end of the simulation horizon.
- Step 3. Apply these growth rates separately to the per capita (disposable) income and consumption expenditure for each household in the survey. This gives a new vector of absolute income and consumption levels for each individual in each group.
- Step 4. Update the initial rural and urban poverty lines to reflect increases in rural and urban price indexes, and calculate poverty indicators, using the new vector of absolute levels of income and consumption.
- Step 5. Compare the post-shock poverty indicators with the baseline values to assess the impact of the shock on the poor.

A potential drawback of this approach is that it assumes that household groups are homogeneous and that intra-group distribution is constant. Thus, following a shock, the rank ordering of households remains unchanged within each group and distributional changes reflect only shifts across groups. Implicitly, households that are withdrawn from one group to join another leave the distribution of income in their original group unchanged and assume immediately the distribution characteristics of the new group that they join.

Alternative approaches that do not rely on the assumption of constant within-group distributions have also been developed. In some studies, survey

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[27]See Wasmer and Weil (2004) for an alternative, but perhaps more debatable, approach to credit market imperfections based on search frictions.

data (at the individual or household level) are included directly in the macro-economic model and, assuming that the within-group distribution follows a well-defined statistical distribution, micro-simulation techniques are used to exploit intra-group information. For instance, suppose that individual income in each group, Y, is strictly positive and distributed lognormally, i.e. $X = \ln Y$ is normally distributed with mean μ and variance σ^2. The distribution function of X, $\Lambda = \Pr(X \leq x)$, can thus be written as

$$\Lambda(x|\mu, \sigma^2) = \begin{cases} 0 & \text{for } x \leq 0 \\ N(\ln x) & \text{for } x > 0 \end{cases}$$

with a density function, for $x > 0$,

$$\mathrm{d}\Lambda(x|\mu, \sigma^2) = \frac{1}{x\sigma\sqrt{2\pi}} \exp\left[-\frac{1}{\sigma^2}(\ln x - \mu)^2\right]\mathrm{d}x$$

and a single mode at $x = \mathrm{e}^{\mu - \sigma^2}$. The mean, α, and variance, β^2, of this distribution are given by $\alpha = \mathrm{e}^{\mu + \sigma^2/2}$ and $\beta^2 = \alpha^2(\mathrm{e}^{\sigma^2} - 1)$. It can also be shown (see Aitchinson and Brown, 1957, pp. 112, 113) that the Gini coefficient is directly related to σ^2, implying that the group-specific value of σ^2 can be interpreted as a reasonable measure of the concentration of incomes in that group.

This approach has the benefit of allowing the analyst to account explicitly for changes in intra-group distribution in the evolution of poverty and inequality measures. At the same time, however, because it requires manipulating a sizable amount of data, it is more costly to implement. As discussed later, from an operational standpoint, the benefit of using this alternative approach, compared with the basic IMMPA approach described above, does not appear to be large in some experiments.

5.3   IMMPA Applications

Various IMMPA country applications have been developed in recent years. 'Real' applications include Morocco (see Agénor and El Aynaoui, 2003), and ongoing work in Benin and Niger. Real-financial applications include Brazil (see Agénor *et al.*, 2005b), Turkey (Agénor *et al.*, 2005d), Tunisia, as well as Argentina, Bolivia and Colombia at the Inter-American Development Bank. The Turkey application is the most advanced among all of these models, given its explicit modeling of dollarization, government bond financing, default risk and credibility—all in a setting where the labor market plays a central role, along the lines described earlier. A forthcoming volume (Agénor *et al.*, 2005c) collects together several of these applications.

Many fruitful lessons on the impact of adjustment policies on unemployment and poverty have already emerged from these studies—particularly with respect to labor market reforms, tax reform and disinflation policies based on high interest rates. For instance, drawing on their analysis of the

growth and employment effects of labor market reforms in a prototype labor-exporting country in the Middle East and North Africa, Agénor *et al.* (2004b) concluded that, in assessing the impact of these reforms, it is critical to account not only for direct (partial equilibrium) effects but also for dynamic general equilibrium effects. A case in point is a subsidy to unskilled employment in the private formal sector to reduce unemployment. A partial equilibrium analysis reveals indeed that, by lowering the relative cost of unskilled labor, a subsidy leads to an increase in the demand for that category of labor, which may be particularly significant if wages are fixed (as a result, say, of a binding minimum wage). As long as the increase in labor demand does not prompt greater participation in the labor force (i.e. if unskilled labor supply is fairly inelastic), unskilled unemployment will fall. However, the increase in subsidies must be financed, and this can occur in a variety of ways. If the government chooses to let its fiscal deficit increase and borrow from the rest of the economy, large crowding-out effects can lead to a fall in private investment, thereby slowing the economy's growth rate and restraining the expansion of demand for all categories of labor over time. Thus, the longer-run effect of the policy on unskilled labor may be either nil or negative. An increase in, say, taxes on profit earners and rentiers to keep the deficit constant may also restrain private capital formation (by reducing the expected net rate of return) and have an adverse effect on employment in the medium and the long run. A reduction in payroll taxes aimed at stimulating the demand for unskilled labor could have similar effects, depending on how the government chooses to adjust its spending pattern and other tax instruments.

6   SOME RESEARCH DIRECTIONS

The foregoing discussion suggests that much has been learned in recent years on how macroeconomic policy affects the poor. However, there are still important gaps in our knowledge, and the scope for further research remains considerable. In what follows I provide my own perspective on what could be fruitful areas of investigation. The suggested list of topics is by no means exhaustive and reflects heavily my own research interests. Some of these topics fall under the broader issue of determining what policy measures can spur more rapid growth and lead to improvements in living standards. Others, however, are motivated by the recognition that although much research is needed on issues that are essentially 'macro' in nature, there are many questions that involve understanding interactions between micro and macro factors. Specifically, issues that I identify as important areas for research include poverty traps, the sources of asymmetric effects of output shocks, links between macro models and household surveys, trade-offs between unemployment reduction and poverty alleviation, the allocation of public investment and growth, and the extent to which redistribution can hurt the poor.

6.1 Poverty Traps

Why do poor countries remain poor? This issue has long been the subject of intense scrutiny by economists. As noted earlier, the 'circular relationship' between growth and poverty emphasized by Nurkse (1953) suggests that at low levels of per capita income (and thus low saving and investment rates) countries may be caught in a low-growth trap from which it is difficult to escape. Put succinctly, a country may be poor because it is poor to begin with.

This view, and much of the early literature on low-growth traps, focused on settings in which the equilibrium is unique, in the sense that, given the economy's characteristics, and the policy environment, there is only one possible growth outcome—stagnation. In contrast, much of the subsequent literature on poverty traps is based on models with multiple equilibria, in which a low-income or low-growth trap is but one of possible outcomes or steady-state properties of the economy. A key feature of these models is that whether the economy settles on a low- or high-growth equilibrium depends on some inherent nonlinearity in the economy, such as threshold externalities associated with human capital or non-convexities associated with the production technology.

Externalities associated with human capital formation provide a good illustration of how multiple steady-state growth rates can emerge. Various models have shown indeed that countries that are identical in their structural characteristics, but differ in their initial level (or distribution) of human capital, may cluster around different steady-state growth equilibria, as a result of either social increasing returns to scale from human capital accumulation (as in Azariadis and Drazen, 1990) or credit market imperfections (coupled with a fixed cost in the production of human capital, as in Galor and Zeira (1993)). For instance, an economy with a low stock of human capital to begin with will also offer low returns to education, and consequently be trapped in a stage of underdevelopment. Conversely, growth perpetuates itself when an economy starts with a high level of human capital. Alternatively, by preventing the poor from making productive, but indivisible, investments in human capital, credit constraints (due either to imperfect information about individual abilities or to the inability to enforce the terms of loan contracts) can perpetuate a low-growth, high poverty process. Inequality in the initial wealth distribution, which determines how many agents can save and invest in the acquisition of human capital, can therefore have a significant negative impact on poverty. Furthermore, the more inequitable the initial distribution is (or equivalently, the greater the number of poor households that are credit-constrained to begin with), the more severe this effect will be.

Threshold externalities associated with public capital in infrastructure (such as roads, electricity and telecommunications) may also lead to a low-growth poverty trap. Indeed, as indicated earlier, public capital in infrastructure may have not only a positive effect on the marginal productivity of

private inputs (as emphasized in various growth models in the tradition of Barro (1990)) but also a complementarity effect on private investment. But this complementarity effect may be subject to a threshold—the productivity effect of public capital on the private rate of return must be sufficiently high, to begin with, to stimulate private capital formation. If this effect is too low (perhaps because of indivisibilities, due to the fact that some types of investment in infrastructure are lumpy in nature), the economy may be stuck in a low-growth, high poverty trap, in which small increases in public capital outlays in infrastructure bring few benefits. A 'big push', i.e. a large increase in public investment, may raise the public capital stock sufficiently for the complementarity effect to 'kick in', unleashing 'animal spirits' and eventually lifting the economy to a higher growth path (see Agénor and Aizenman, 2005). This increase in public capital formation, in turn, may result from a large inflow of foreign aid, or alternatively an increase in available domestic resources induced by debt relief. By implication, countries with a large external public debt may be 'trapped' in poverty, because debt servicing absorbs an excessive fraction of the resources that could be available to finance public investment in infrastructure.

Various other sources of poverty traps have been identified in the recent literature. They relate to malnutrition and ill health (resulting, for instance, from exposure to tropical diseases), gender inequality and high fertility rates, extreme geographical limitations (for instance, landlocked countries where trade is hampered), coordination failures among private agents and weak political institutions (leading, for instance, to a highly corrupt government bureaucracy). Figure 4, for instance, suggests a positive correlation between malnutrition and poverty in developing countries. Fertility decisions, for their part, affect both women's labor supply and decisions to invest in human capital. Thus, fertility tends to be inversely related to women's wages, or the most common proxy for wages, education. Figures 5 and 6 show that fertility rates are also inversely correlated with income per capita and the growth rate of income, whereas Figs 7 and 8 suggest that fertility in developing countries is positively correlated with the illiteracy rate for adult females and poverty—although, in the latter case, the dispersion in the diagram is much higher. Moreover, some of these cross-section relationships appear to be significantly nonlinear: for instance, if the fertility rate is regressed on the current and squared values of the log of GDP per capita (as shown in Fig. 5), the linear term has a coefficient of −4.614 (with a Student's t of −3.746), whereas the squared term has a coefficient of 0.394 (with a Student's t of 2.171). Put differently, high income tends to reduce fertility but only up to a point—beyond a certain level of income, the relationship tends to flatten out.

Kremer and Chen (1999) provide a good illustration of how the interaction between wages, fertility and the cost of education can lead to poverty traps. Their model is based on three major assumptions: higher wages reduce
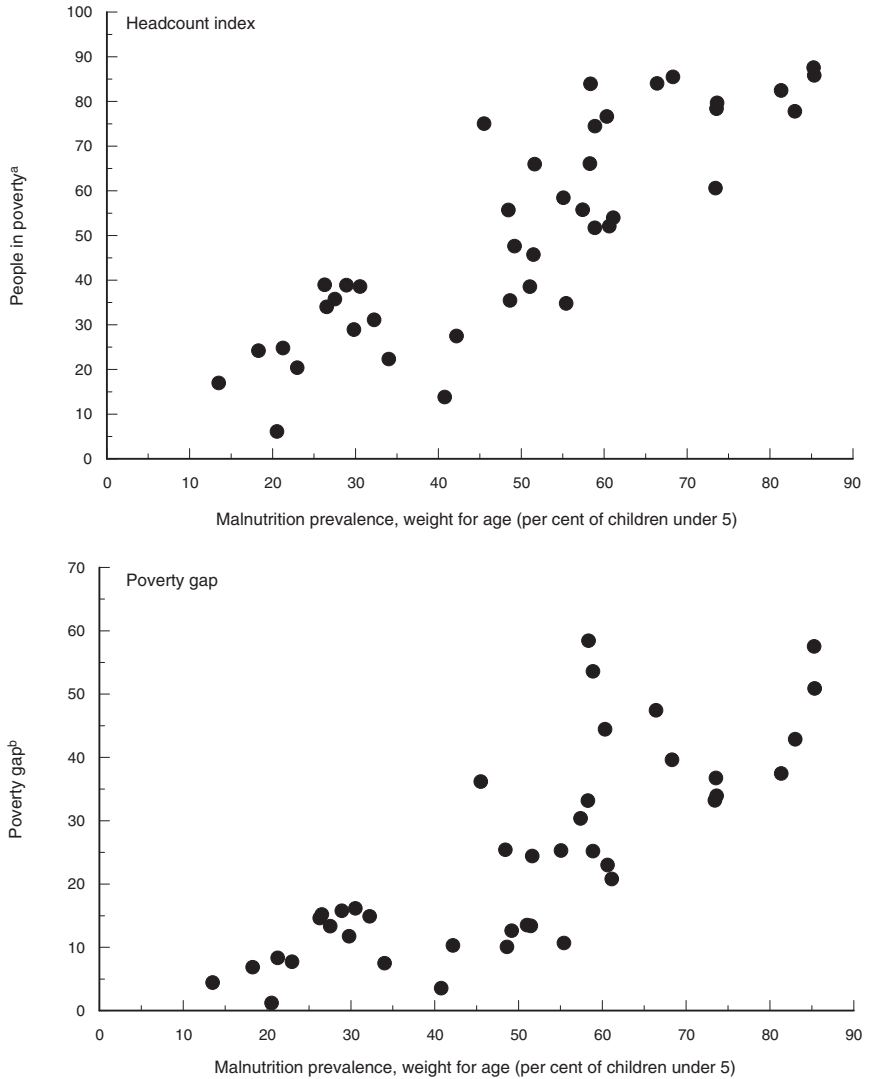
Headcount index

People in poverty[a]

Malnutrition prevalence, weight for age (per cent of children under 5)

Poverty gap

Poverty gap[b]

Malnutrition prevalence, weight for age (per cent of children under 5)

FIG. 4 Developing Countries: Malnutrition and Poverty (in Percent)
Source: World Bank.
[a]Proportion of the population earning US$1.08 or less a day, various survey years.
[b]Poverty gap at US$1.08 or less a day, various survey years.

fertility; children of the unskilled are more likely to be unskilled; and skilled and unskilled workers are complements in production. Fertility and incentives to acquire education depend on the wage structure, and thus on the fraction of skilled labor in the workforce, whereas the fraction of skilled labor
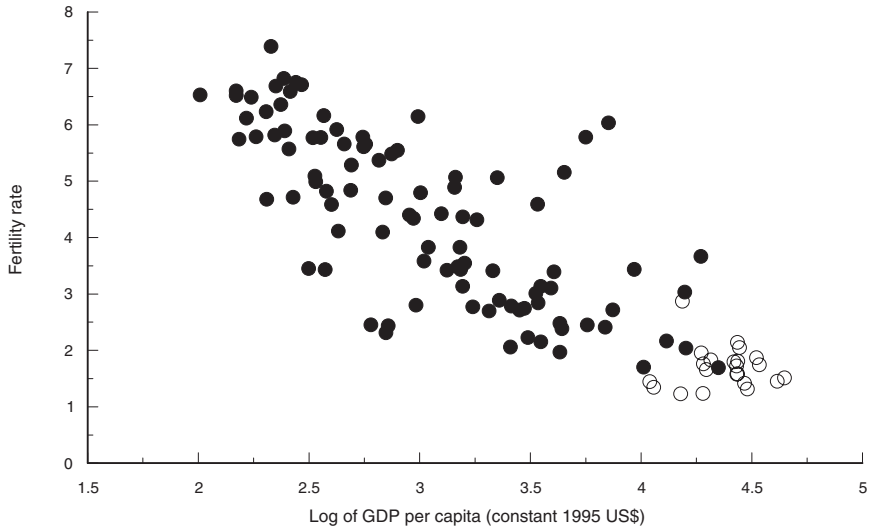
Fig. 5 Fertility and Income per Capita (Annual Averages, 1990–99)
Source: World Bank.

Note: Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her child-bearing years and bear children in accordance with prevailing age-specific fertility rates. The light-colored circles represent industrial countries, which include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States.

Developing countries include Algeria, Argentina, Bahamas, Bahrain, Bangladesh, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, Colombia, Congo (Democratic Republic), Congo (Republic), Costa Rica, Cote d'Ivoire, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, India, Indonesia, Iran, Jamaica, Jordan, Kenya, Korea, Kuwait, Lebanon, Lesotho, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Morocco, Mozambique, Namibia, Nepal, New Zealand, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Rwanda, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, South Africa, Sri Lanka, Suriname, Swaziland, Syria, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, Uruguay, Venezuela, Yemen, Zambia and Zimbabwe.

depends itself on fertility and the decision to invest in the acquisition of skills. Thus, the positive feedback between fertility differentials and wage inequality may lead to multiple steady states. If the initial proportion of skilled workers is high enough, wage and fertility differentials between skilled and unskilled workers will be small, allowing the economy to converge to a steady state with low inequality. However, if the initial proportion of skilled workers is too low, inequality will be self-reinforcing, and the economy may approach a steady state with a low proportion of skilled labor and a high degree of inequality between skilled and unskilled workers.
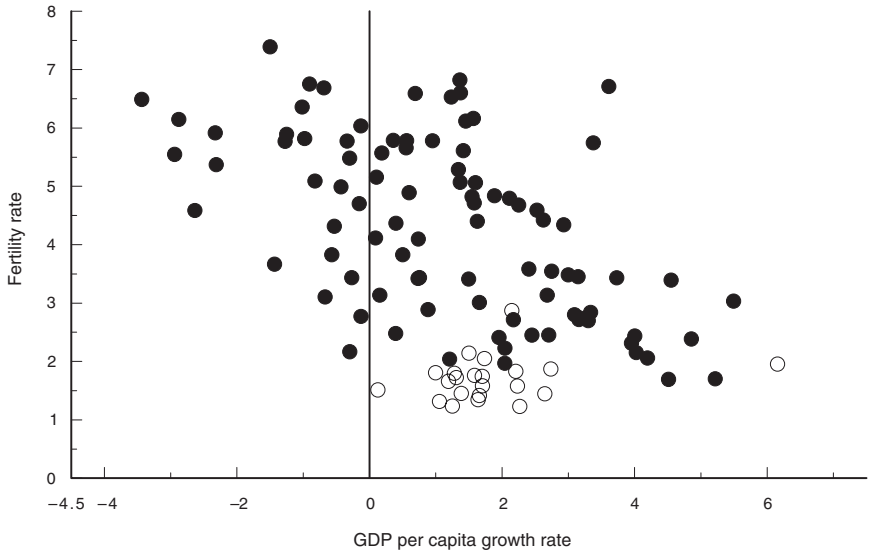
FIG. 6 Fertility and Growth (Annual Averages, 1990–99)
Source: World Bank.
Note: See note to Fig. 4 for the definition of the fertility rate and the list of countries.
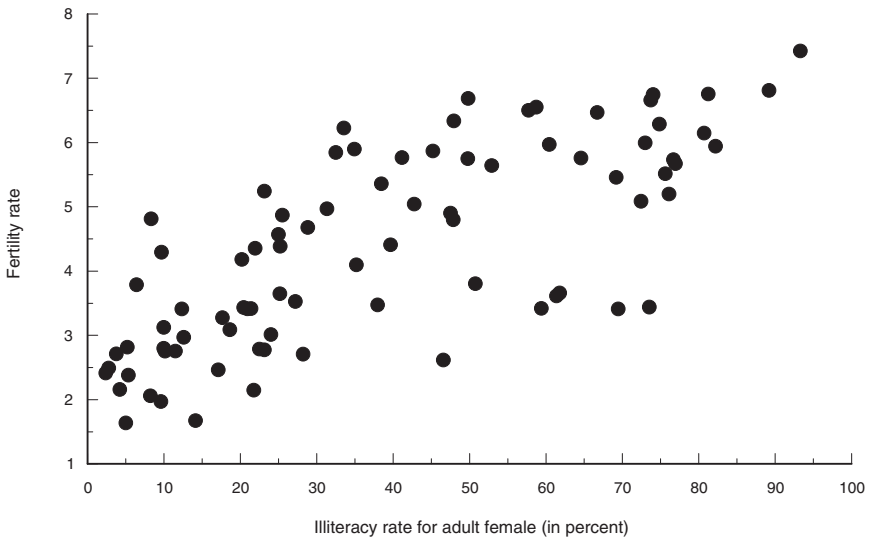

FIG. 7 Developing Countries: Fertility and Illiteracy for Adult Female (Annual Averages, 1990–99)
Source: World Bank.
Note: See note to Fig. 4 for the definition of the fertility rate and the list of countries.
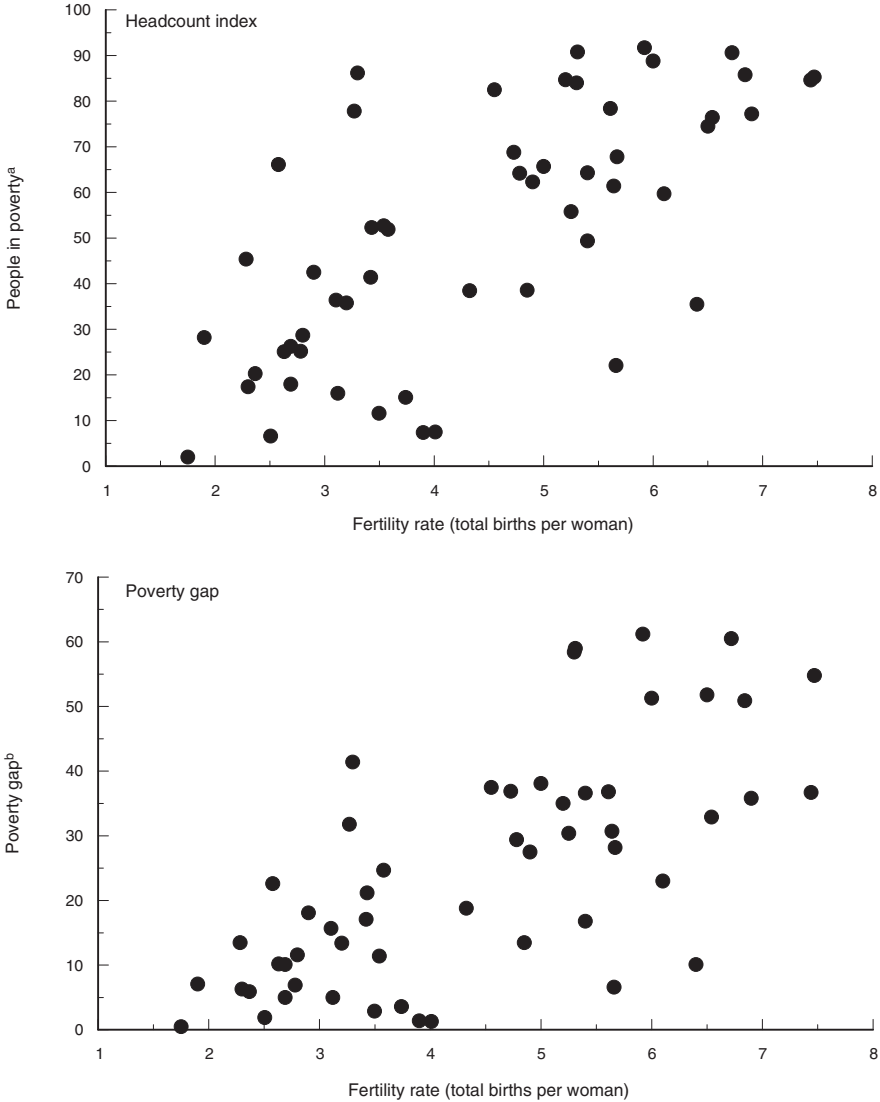
FIG. 8 Developing Countries: Fertility and Poverty (in Percent)
Source: Table 4 in World Bank, *World Development Report* (2000/2001) and World Development Indicators.
Note: Sample consists of 54 countries for which data are provided in the *World Development Report*.
[a]Proportion of the population earning US$2 or less a day, various survey years.
[b]Poverty gap at US$2 or less a day, various survey years.

I have reviewed elsewhere other sources of poverty traps and their policy implications (see Agénor, 2005e). This is important because, as noted earlier, the policy message that one can take from analytical models is not always relevant in practice. And because poverty traps can result from multiple causes, the issue of how best to sequence public policies to escape from them arises also. Much depends therefore on what causes the trap to emerge in the first place. For instance, what role should the state play, in 'solving' coordination failures, if one takes the view that these failures are a key reason that prevents countries from growing? History suggests that too much optimism about the success of centralized coordination mechanisms would be misplaced. However, it is possible for even a temporary change in government policies to alter private beliefs sufficiently to lead to a switch from a 'bad' equilibrium to a 'good' equilibrium. As a matter of fact, Tirole (1996) showed that a government anti-corruption program of sufficient duration and depth can lead to a switch from an equilibrium with high corruption (sustained by expectations of high corruption) to one with low corruption (sustained by the belief of a less corrupt bureaucracy).

Another important policy issue for low-income countries is the role of foreign aid. Indeed, for many of the poorest countries, a large increase in aid may be crucial to provide the 'big push' to public investment alluded to earlier, given that the ability to mobilize domestic resources through taxation is limited. Key issues in this context are what type of conditionality should aid be subject to without hampering its catalytic role (see Mosley *et al*., 2004), and whether aid entails diminishing returns, as a result of absorption constraints. Analytical research on these issues remains, however, limited. For instance, in their analysis of the macroeconomic effects of aid, Dalgaard *et al*. (2004) focus on the impact of foreign assistance on productivity. But they do not account for a possible link between aid (or at least some components of it) and public investment.[28]

In addition, there is a crucial need to develop rigorous empirical tests of the existence of poverty traps and, equally important, tests that would allow the investigator to identify the most important factors, or causes, leading to these traps. Most of the available evidence on poverty traps is indirect and relies on conditional convergence tests. By and large, these tests have shown that per capita incomes in poor countries appear not to be catching up with developed economies. Instead of 'global' convergence, economies appear to gravitate around 'convergence clubs', whereby wealthy economies converge to common high-level income growth paths while poor countries converge to common low-level income growth paths (see Islam, 2003; Agénor, 2004b).

However, as emphasized in an early contribution by Durlauf and Johnson (1995), standard regression models used for testing for cross-country convergence are based on linear specifications and do not provide great

[28]By affecting the terms of trade, aid may also have an impact on private investment. See Djajic *et al*. (1999).

insight as to the sources of multiple steady states. The reason is that poverty trap models are fundamentally nonlinear in nature, and in standard applications of panel data methods individual heterogeneities are not explicitly accounted for (Durlauf and Quah, 1999, p. 286). Using regression tree analysis, Durlauf and Johnson (1995) found evidence that different countries follow indeed different growth paths when grouped according to initial conditions. More recent research is also encouraging: Canova (2004), for instance, presented an approach that dwells on the econometric literature on testing for the existence of an unknown break point in time series. Although Canova provides empirical results only on industrial countries, his approach shows some promise for addressing the broader issue of poverty traps. At this stage, however, the lack of direct empirical tests remains problematic from a policy standpoint. Given the large number of competing hypotheses, it is crucial for researchers to devise more elaborate tests that would allow one to discriminate among these hypotheses and determine which factors are important from a policy perspective.

6.2 *Crisis-coping Strategies and Asymmetric Output Effects*

As discussed earlier, business cycles and economic crises may have an asymmetric effect on poverty. Accounting for these effects is important for evaluating the welfare costs of recessions and crises, and for judging the correlation between growth and poverty: observing a negative correlation between growth and poverty can be misleading in the presence of asymmetry. Indeed, if it results essentially from associations that pertain to recessions rather than expansions, it may lead to erroneous predictions about the potential of growth-oriented policies to reduce poverty.

As discussed in Appendix A, there are several potential sources of asymmetric effects. Discriminating among them is also important for policy design. However, the techniques that have been used so far to assess the scope of asymmetric effects are silent in that respect. Depending on the exact source of asymmetry, a proper policy response may involve the implementation of a social safety net focusing on subsidies to keep children in school, measures to help the poor access credit markets, or incentives for firms to restrain from firing unskilled workers during downturns. Some of these policies may have unintended longer-run consequences for poverty; for instance, raising firing costs may increase labor market rigidities and may reduce firms' incentives to hire unskilled workers in the first place—thereby affecting the poor by constraining employment growth.

6.3 *Welfare Costs of Macroeconomic Volatility*

As noted earlier, macroeconomic volatility can affect growth and poverty through a number of channels. Some of these channels have been explicitly accounted for and quantified in cross-country empirical regressions. However,

there has been relatively little quantitative research on the cost of macroeconomic fluctuations for the welfare of the poor—despite the well-documented fact that developing countries tend to be more exposed to volatility than industrial countries (see Agénor and Montiel, 1999). Suppose that the poor are risk averse, and that the lack of access to effective risk-coping mechanisms (such as well-functioning credit markets) forces them to engage in 'risk avoidance' strategies, which involve allocating resources to low-risk, low-return activities to reduce their vulnerability to idiosyncratic shocks. Intuition suggests that, in such conditions, macroeconomic volatility may entail large welfare losses. The simulation results of Pallage and Robe (2003), although based on archetype economies with a single representative consumer, suggest that this is indeed likely. They also found that even if consumers are only moderately risk averse, eliminating these fluctuations altogether may be preferable to a permanent increase in consumption growth.

An important direction of investigation would therefore be to extend the Pallage–Robe analysis to a multi-agent setting to analyze the implications of differences in the degree of risk aversion for measuring the welfare effects of macroeconomic fluctuations. To the extent that their results hold in this more general setting, they would have an important policy implication: if the focus is on the welfare of the poor, as opposed to consumption growth *per se*, policies aimed at reducing volatility in consumption may be equally, or even more, beneficial to the poor than policies aimed at stimulating growth. Such policies may include greater and better access to credit markets to the poor, to allow them to smooth the impact of income shocks, but also policies aimed at reducing the vulnerability of the economy to adverse external shocks—through, for instance, greater diversification of production and foreign trade. Arrangements designed to limit price fluctuations on world commodity markets could also be desirable from that perspective. Moreover, some of these policies may be useful to limit the impact of microeconomic volatility as well. Indeed, the poor typically face a multitude of risks at the micro level—such as the risks of crop failure due to area-specific drought or floods, and livestock disease, for farmers and rural households—which can also translate into high consumption volatility. Greater access to credit markets would help the poor to cope with these shocks.

6.4 Linking Macro Models and Household Surveys

In the basic IMMPA approach to linking macro models and household surveys described earlier, changes in within-group distribution are ignored, and poverty indicators reflect essentially changes across groups. As I indicated before, while appealing from a practical point of view, this approach is open to the criticism that it does not account for heterogeneity among agents within groups and introduces only in a partial manner the relevant changes that occur at the macro level as a result of shocks (most importantly, changes

in employment) to the micro component of the analysis. More generally, the assumption that within-group rank ordering of households and individuals is unchanged and unaffected by policy shocks implies that workers are withdrawn from the sector of origin in a representative manner (leaving the distribution of income there unchanged) and that, as they move from one sector to another, they assume immediately the income distribution characteristics of the sector of destination. Thus, some workers may be poor not because of their personal characteristics, but rather because of the economic circumstances that characterize their sector of employment.

At the same time, however, the practical gains entailed by dropping the assumption of a stable within-group distribution and accounting fully for heterogeneity at the micro level remain a matter of debate. Agénor *et al.* (2004a) compared three approaches aimed at linking macro models and household surveys to analyze the poverty and distributional effects of policy shocks. The first approach is the one followed in most IMMPA applications described earlier, which they refer to as the 'micro-accounting method'. The second approach extends the first in the sense that it not only incorporates changes in income and consumption occurring at the macro level in the household survey, but also accounts for changes in the employment structure predicted by the macro component. This is done by modifying the weight given to each household in the survey. They refer to this approach as the 'micro-accounting method with reweighting'. The third approach, referred to as the 'distribution approach', imposes a fixed, parametrically estimated distribution of income within each group and assumes that shocks shift the mean of these distributions without, however, modifying their shape (see, for instance, Decaluwé *et al.*, 1999). Poverty and distributional indicators are then computed on the basis of these distributions.

The numerical simulations performed by Agénor *et al.* (2004a) show that although the distributional and poverty effects indicated by the three approaches differ in quantitative terms, they differ neither in the direction of the effects nor in the ranking of the household categories with respect to poverty. They also suggest that the micro-accounting method combined with reweighting for changes in the employment structure is the most appealing method among the three, despite the fact that it has its own shortcomings. The reason is that the simple micro-accounting method ignores changes in the employment structure, whereas the distribution approach relies on approximate, instead of real, income distributions and depends therefore on the quality of the corresponding estimates of the shape parameters. Before drawing firm conclusions, however, more experiments along these lines are desirable. It is also important to move away from the unidirectional link between macro models and surveys (as in the IMMPA approach), and account for the reverse effect of changes in the poverty rate on behavioral parameters. In that regard, a key feedback effect may be due to the impact of poverty and unemployment rates on precautionary savings.

6.5 Unemployment–Poverty Trade-offs

The focus on reducing poverty in low-income countries has, to some extent, overshadowed another key policy goal—the reduction in unemployment. Indeed, progress has remained elusive on that front as well. During the 1990s, many developing counties (particularly in Latin America and in the Middle East) experienced major increases in unemployment.

In some of my recent work, I have argued that unemployment reduction and poverty alleviation may entail trade-offs (see Agénor, 2004d). An obvious reason is that the higher growth rates of output and job creation that are needed to absorb an increase in the supply of labor and reduce unemployment may require a significant drop in real wages. In turn, the deterioration in living standards may lead to higher poverty. Thus, the share of the 'working poor' in total employment may increase, as observed in several countries in recent years (see International Labor Organization, 2003).

A trade-off between unemployment and poverty may also result from specific policies, such as labor market reforms. An increase in employment subsidies, for instance, may have a direct, beneficial impact on unskilled employment; at the same time, if it is financed by an increase in the sales tax on domestic goods, it may increase poverty, because of the adverse effect that the tax hike may have on the cost of living and the consumption wage. Depending on the exact nature of the tax that is used to offset the impact of the increase in spending on the budget (whether it is indeed an increase in the sales tax, or on the contrary a rise in income tax on individuals or firms), as well as the composition of household spending, the impact may be significant for the poorest households in urban areas. It is possible for poverty to increase in the informal sector (because workers in that sector bear the brunt of the increase in consumer prices, for instance), while at the same time unskilled unemployment falls in the formal economy. A reduction in the payroll tax on unskilled labor (a policy that has often been advocated to reduce unemployment) may have similar results. If the reduction in the payroll tax is financed by a mixture of higher taxes on domestic goods and corporate income, and the reduction in the net rate of return on physical capital accumulation lowers investment incentives, the net effect on employment may be mitigated. As a result of gross complementarity between capital and labor, the demand for labor may not increase over time as much as it would otherwise. Unemployment may thus fall to a limited extent, whereas poverty among the most vulnerable urban groups can increase significantly—again, because higher taxes on domestic goods have a large impact on the cost of living faced by that category households.

The existence of trade-offs between unemployment and poverty reduction—either at the aggregate, economy-wide level or at the level of individual household groups (e.g. urban households)—must receive greater attention. To determine whether these trade-offs exist is not straightforward,

because unemployment and poverty are jointly endogenous; the correlation between them is driven by factors that vary over time, depending on the nature of shocks that affect the economy. Nevertheless, to the extent that they do exist, these trade-offs imply that to assess the welfare effects of adjustment policies a composite index may be needed to gauge performance with respect to both objectives, i.e. the degree to which policies are 'pro-poor, pro-employment'. An interesting issue, then, is how to generalize the index proposed in (1), given that poverty and unemployment may receive different weights in social welfare.

6.6   Public Investment Allocation and Growth

Public investment can affect growth through a variety of channels (see Agénor, 2004b, Ch. 12). First, public investment (particularly in infrastructure) may increase private capital formation and thus the overall rate of accumulation of physical capital. Second, public investment may affect output growth by influencing the rate of productivity growth, independently of its effect on factor accumulation. Physical capital may enhance the productivity of (skilled) human capital if there is, as is often the case in practice, a high degree of complementarity between these factors. Similarly, if there is sufficient complementarity between the services produced by public capital in infrastructure and private physical capital, an increase in public investment outlays would not only lead to higher private investment (as argued earlier) but also make the existing stock of private capital more productive.

But public investment may also displace private capital formation, and therefore reduce the economy's capacity to sustain a higher level of output. Such crowding-out effects may occur if increases in public investment are financed through higher taxes (which may reduce the net rate of return on private investment, and therefore the incentive to invest) or by borrowing on domestic financial markets, thereby driving up domestic interest rates (thereby raising the cost of capital) or leading to greater rationing in the quantity of credit allocated to the private sector.

Various empirical studies have shown that public investment, particularly in infrastructure, plays indeed an important role in developing countries. According to the World Bank (1994), services associated with the use of infrastructure account for roughly 7–9 per cent of GDP in low- and middle-income countries, whereas investment in infrastructure represents about 20 per cent of total domestic investment and between 40 and 60 per cent of public investment. Physical infrastructure is thus an important input in the production process of the private sector, affecting both productivity and efficiency. In a more formal study, Loayza *et al*. (2004) found that public infrastructure (measured by the number of telephone lines per capita) has a positive and significant effect on growth in Latin America and the Caribbean. The evidence of a robust and substantial effect of the share of total domes-

tic investment in output on steady-state growth provided by Bond *et al.* (2004) is also consistent with the view that public investment plays an important role (either directly or indirectly, through private investment) in the growth process.

An issue that has attracted much interest in recent years relates to the optimal allocation of public investment in a growth context. My own contributions have focused on the allocation between education, infrastructure and health in an endogenous growth framework (see Agénor, 2005b, 2005c, 2005d). In all of these models, I abstract entirely from private decisions to acquire skills and assume instead that education is a public good. I also account simultaneously for the provision of various types of public services, in order to study potential trade-offs associated with the allocation of public spending. In Agénor (2005b), for instance, growth depends on government provision of both education and infrastructure services. As a result, the optimal allocation of tax revenue can be examined, given the effect of public infrastructure and education services on the marginal productivity of private capital. However, we need to understand better interactions between components of public investment in order to determine optimal allocation rules. For instance, a significant body of research has shown that food intake and health are important factors in determining the quantity and quality of human capital (see Galor and Mayer-Foulkes, 2004). Healthier and well-fed children tend to do better in school, and healthier workers perform their tasks better. Thus, increasing the health of individuals may increase the effectiveness of education. At the same time, increasing education can also improve health. This suggests that escaping from a poverty trap through a 'big push' (as suggested earlier) may require not only a large increase in public investment in infrastructure, but also an increase in investment in education and health.

This point is worth stressing. In models emphasizing the role of public investment in infrastructure (such as Agénor and Aizenman, 2005), the ability of a 'big push' to lift a country from its poverty and low-growth trap depends on how the increase in public capital formation is financed. If financing occurs through a cut in unproductive spending, an increase in foreign aid or debt cancellation, this may be a very effective instrument—despite the possibility that, with an aid-financed increase in public investment, Dutch disease effects, and adverse effects of aid on tax effort, may be important in the short run (see Agénor *et al.*, 2005a). In contrast, if the increase in investment in infrastructure is financed by a reduction in other types of productive government spending, such as on education or health, then higher public spending on roads, telecommunications and the like may not allow the government to pull the economy out of its poverty trap, because the lack of qualified and healthy workers may continue to act as a constraint. Thus, in designing a program aimed at helping countries escape a poverty trap, accounting for policy complementarities is also important.

An important issue also in these models is the existence and magnitude of congestion costs, which imply that the productivity gains associated with a greater stock of public capital may diminish over time because the services produced by this stock are over-used. This is a particularly acute problem for some types of public infrastructure, such as roads, which tend to get over-crowded due to the lack of alternatives. But it may also be the case for health and education services. According to World Bank estimates, in 1999, the pupil–teacher ratio in primary schooling (a common indicator of the quality of education) was 16.9 for high-income countries, but only 21.4 in middle-income countries and 38.9 in low-income countries. In the same year, the ratio was 41.5 in South Asia and 46.7 in sub-Saharan Africa. Although I have provided some initial results regarding the impact of congestion costs in education on the optimal allocation rule for public investment (see Agénor, 2005b), more research is needed.

Empirical macro models have now begun to account explicitly for the channels through which the various components of public investment and capital affect growth. This is essential to understand the dynamic trade-offs associated with the allocation of public spending. As noted earlier, a key feature of IMMPA models is precisely to account for the composition of public capital and investment. This composition is also integrated in the simpler macro framework for poverty analysis developed by Agénor *et al.* (2005a). But the specifications that are typically used in these models can be improved upon—by modeling, for instance, mixed public–private education systems and interactions between public and private investment in learning technology.

6.7 Can Redistribution Hurt the Poor?

A fashionable idea in some policy circles is that redistribution is essential to reduce poverty rapidly in some countries, because changes in income are unlikely to be sufficient. Clearly, the more pronounced the degree of inequality in a country, the smaller the impact of economic growth on the poor. More equal distribution is desirable for a number of reasons, but whether it is so because of its impact on poverty reduction is not clear. First, in theory the relation between growth and income distribution can go both ways (see Aghion *et al.*, 1999). At the empirical level, results are also mixed. Knowles (2001), for instance, showed that the relationship between inequality and growth can change once one distinguishes between data based on income measures of inequality and those based on consumption data, instead of mixing the two data sets. Bleaney and Nishiyama (2004), as noted earlier, report fragile results as well. Deininger and Olinto (2000) found that it is asset (land) inequality that is negatively correlated with growth, not income inequality. Thus, if anything, policymakers should be more concerned about

poor households' access to assets and their ability to accumulate them, than about the distribution of income.

Second, changes in income distribution may have feedback effects on growth. Asset and income redistribution may mitigate the impact of growth on poverty by adversely affecting growth itself. For instance, imposing greater equality through higher taxation of income may lower the propensity to save of capitalists and their ability to invest, although general equilibrium interactions may mitigate the aggregate effect on growth.[29]

Third, much of the literature fails to recognize that what can be achieved through the redistributive measures that are often suggested (social funds, targeted cash and in-kind programs) is likely to be quite limited. The reality is that governments in poor countries have limited ways to alter inequality. Taxing the very rich is often unfeasible due to their political connections. Forced redistribution of assets (through government-mandated reallocation of land, for instance) is politically difficult and often a recipe for disaster. Market-based land reforms, where the poor receive subsidies to purchase land from willing sellers, are often too limited in scope to have much of an impact on income distribution—in part because the poorest among the poor are often excluded (Bardhan, 1996). Progressive taxation (in the form of inheritance taxes, for instance) is either not feasible or ineffective due to administrative constraints. Transfer payments through social safety nets are temporary, not permanent, measures to reduce poverty, to a large extent because they create moral hazard problems. They do not foster self-reliance and may reduce incentives to invest in skills. Thus, even in a dynamic perspective, redistribution is not a panacea.

Fourth, redistribution policies can have unintended effects. In models of poverty traps that emphasize the role of initial inequality, redistributing wealth from the rich to the poor may help individuals with no assets to escape from poverty. In the model of Galor and Zeira (1993), for instance, redistribution would allow the poor to invest in human capital. Thus, a policy-initiated shift in the distribution of income might shift the economy to a 'good' equilibrium. However, it could also push the economy into a new form of poverty trap, if it leads over time to a reduction in saving and investment by the rich, which 'helps' the poor through its effect on growth.

Other theoretical studies that have pointed out the possibility of a positive association between inequality and growth include early contributions by Lewis (1954) and Kaldor (1957), and studies by Perotti (1993) and Li and Zou (1998). In Lewis (1954), for instance, entrepreneurs save a larger fraction of their profit income than the other groups in the economy; income

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[29]To the extent that some of the increased tax revenue is used to finance higher public investment in infrastructure (in addition to financing transfers to the poor), the net effect on growth may be positive.

inequality may therefore lead to more savings overall and faster growth for the economy as a whole. A similar idea is developed in Kaldor (1957), where the saving rate of the working class is set to zero. Perotti (1993) found that a very egalitarian but poor economy may be unable to kick off a growth process, whereas an economy with a very unequal income distribution may be in the best position to do so. Li and Zou (1998) found that when government revenues collected through income taxation are used to finance public consumption instead of production, a more equal distribution of income may lead to a higher income tax rate and lower economic growth—even though welfare effects can be positive (as one would expect if public consumption enters households' utility functions).

In sum, although there are plausible arguments to suggest that high levels of inequality may hurt growth and the poor, there are equally plausible reasons (at least on analytical grounds) to suggest that greater equity may have similar effects. A fair conclusion therefore is that, given the state of the empirical literature, the emphasis on redistributive policies (as, for instance, in Klasen, 2003) as a way to lower poverty may be misplaced, particularly in low-income countries.

7 CONCLUDING REMARKS

The purpose of this paper has been to provide an overview of some of the recent literature on the macroeconomics of poverty reduction and to offer some perspectives (mostly my own, actually) on future research. Section 2 argued that the research agenda on poverty, in the profession at large and in IDIs in particular, was biased toward measurement and micro issues, partly as a result of a lack of interest by macroeconomists. My contention is that the bias in the agenda has done a lot of good, but also much harm. The lack of rigorous analytical and empirical research on poverty traps (a critical issue for low-income countries) at the IMF, the World Bank and other IDIs illustrates the problem well. I emphasized that growth and inequality are both endogenous; it is policies, not growth *per se*, that have to be considered pro-poor or not. The implication is that much of the recent debate on measuring pro-poor growth is misguided. *Ex post* additive decompositions of changes in poverty into growth and inequality components are useless to inform policy design; the elasticities that are derived from these decompositions do not differentiate between policies and shocks, and they say nothing about the interactions, and transmission channels, between growth and inequality. Recognizing the fact that only policies can be deemed pro-poor has an important methodological implication—measuring the degree of 'pro-poorness' of policies requires using a structural macroeconomic model, where poverty, growth and income distribution are endogenously determined. I proposed a simple, model-based index based on changes in consumption of the poor and the non-poor. With a dynamic macro framework, the index also has a

temporal dimension and, if the model is sufficiently disaggregated, a regional dimension can be incorporated. It can therefore provide a guide to the potential trade-offs (temporal and spatial) that policymakers may face in designing poverty reduction strategies.

Section 3 reviewed various channels through which macroeconomic policy can affect the poor in developing countries. The essential role played by the labor market was emphasized at the outset, although distortions in goods and credit markets also play a role. I then examined how macroeconomic policies affect the poor through changes in aggregate demand, inflation and relative prices, the real exchange rate and the supply side, aggregate volatility, and growth and redistribution effects. It was noted that in periods of fiscal consolidation the tendency has been to cut public capital outlays more than current expenditure. Although this strategy may protect social spending in the short run, and prevent an increase in poverty, the longer-run effects may be much worse because the lack of new investment may hamper growth. Conversely, sharp cuts in social expenditure in the short run may be beneficial to the poor in the long run if they bring lower inflation and interest rates, as a result of smaller deficits. This argument is particularly relevant if social expenditures are not well targeted to the poor. It was also noted that a growing body of evidence suggests that cyclical downturns and economic crises may have an asymmetric effect on poverty: recessions or sharp output contractions may increase poverty rates significantly, whereas expansions tend to have a more limited effect. Various reasons as to why such effects may occur were explored.

Sections 4 and 5 examined analytical and applied macro models designed for poverty analysis. The importance of a proper modeling of the labor market was illustrated in a two-household framework, and the response of poverty to a government spending shock was analyzed. It was then argued that applied models are useful to measure quantitatively how different policies contribute to poverty reduction (in both the short and the long run), and to study policy complementarities in the context of a comprehensive poverty reduction strategy. I described the class of models related to the IMMPA, and highlighted some areas where these models can be improved—by accounting, for instance, for feedback effects from poverty and unemployment to behavioral rules.

Section 6 focused on directions for future research. I identified the following areas: causes of, and empirical evidence on, poverty traps; the identification of the sources of asymmetric effects of output shocks; the welfare effects of macroeconomic volatility; links between macro models and household surveys; trade-offs between unemployment reduction and poverty alleviation; the allocation of public investment and growth; and the extent to which redistribution can hurt the poor. I argued, in particular, that a lot more empirical research is needed on poverty traps. There are many competing explanations regarding the causes of these traps, but given how limited the

existing evidence is, it is difficult to conclude in favor of one or another. In turn, the lack of reliable evidence hampers the ability to design policies to escape from poverty traps.

I also argued that the possible existence of trade-offs between unemployment and poverty reduction has received scant attention in the analytical literature focusing on labor market reforms and poverty reduction. Many economists regard labor market rigidities as being a major obstacle to an expansion of employment in the formal economy and a reduction of urban poverty, which tends to be concentrated in the informal sector. But if unemployment is also a source of concern, and trade-offs exist between unemployment reduction and poverty alleviation, then a question arises regarding the relative importance of each policy goal in the social welfare function. I also urged caution in adopting the view that redistribution can help to alleviate poverty. Theory and facts suggest that the relationship between growth and inequality is ambiguous, and reducing inequality may have adverse effects on growth. For instance, lower inequality may reduce the propensity to save and invest of capitalists, thereby reducing growth rates and hurting the poor indirectly. This implies that the emphasis on redistributive policies as an attempt to reduce poverty may be misplaced, particularly in low-income countries. In the long run, growth is essential for alleviating poverty. It tends to reduce poverty through rising employment, increased labor productivity and higher real wages. It creates the resources to raise incomes and increase public investment, and even if 'trickle down' is insufficient to bring the benefits of growth to the poor, governments will have scope for stronger redistributive measures when income is higher and growing faster.

A great deal has been learned about the macroeconomics of poverty reduction in the past few years. But, in my view, a lot more remains to be done. Policy research on poverty traps, in particular, is in its infancy. IDIs have a particular responsibility to foster research on this topic, as well as others identified earlier, given their mandate to assist low-income countries in the pursuit of their development goals. To do so they must redesign the research agenda that they have followed in the past and give the macro dimension the place that it deserves. For macroeconomists in general, this is also a call to arms and a plea for greater focus on one of the most pressing challenges of the new millennium.

APPENDIX A: ASYMMETRIC EFFECTS OF OUTPUT SHOCKS

There are at least five main sources of asymmetry in the impact of output shocks on poverty (see Agénor, 2002). First, the fall in real income associated with economic downturns may have an irreversible impact on the human capital of the poor. Children in poor families are sometimes taken out of school and put to work in response to large adverse shocks (thereby mitigating the fall in the household's income) but do not return to school in upswings. Second, confidence in the economy's prospects may

change over the course of the business cycle and during crises. The degree of pessimism of consumers and firms may be higher during recessions and crises than the degree of optimism during expansions. If so, a positive output shock—induced by, say, a cut in interest rates—may have a smaller impact (and thus be less effective) on private spending decisions during recessions. Output and labor demand may thus be less sensitive to positive shocks, implying that the initial increase in poverty induced by higher unemployment or lower wages may be more persistent.

Third, recessions and crises may be accompanied by high or increasing interest rates. An economic slowdown may raise the risk of default and may lead banks to increase the premium that they charge over and above the cost of funds; or the need to defend the domestic currency on foreign exchange markets may force the central bank to raise interest rates. High borrowing costs may have an adverse effect on output—particularly if, as is often the case in developing countries, firms rely significantly on bank lending to finance their short-term working capital needs (see Agénor and Montiel, 1999). An initial increase in policy interest rates may also lead to a tightening of credit constraints if banks are unwilling to lend more, because higher loan rates are perceived to increase the debt burden of borrowers and may raise the risk of default, leaving only riskier borrowers willing to take on loans, in Stiglitz–Weiss fashion. To avoid the deterioration in the quality of their loan portfolio, banks may opt to ration credit. The tightening of credit constraints magnifies the impact of the initial recession or output contraction on borrowing and spending, through a direct supply-side effect. The resulting fall in labor demand, and thus the effect on poverty, may also be (all else equal) compounded. Thus, if credit constraints bind only in periods when output is below capacity, they may impart an asymmetric bias to output shocks.[30] If small and medium-size firms (particularly in the manufacturing sector) tend to be more dependent on bank credit than large firms, they may suffer the most from a credit crunch induced by a perceived increase in the risk of default in a downturn.[31] And because small and medium-size enterprises tend to use more labor-intensive production technologies, the reduction in output and employment induced by the drop in the availability of credit may be particularly large, implying a potentially severe adverse effect on poverty.

Credit constraints may also affect the ability of households to smooth consumption and thereby impart an asymmetric bias to the response of poverty to output shocks. Of course, the possibility of binding borrowing constraints in adverse states of nature does not, by itself, result in an asymmetric effect: households may well be able to achieve some level of consumption smoothing by depleting their assets (selling land, for instance) or using non-market mechanisms (such as increased own production) when faced with unfavorable shocks. It is also possible that households may decide, in response to income risk, to accumulate more assets or engage in precautionary savings in 'good' times in order to shelter consumption in 'bad' times (see Agénor and Aizenman, 2004). Nevertheless, for the poor specifically, the available evidence suggests that risk sharing and consumption smoothing remain imperfect (see Alderman and Paxson, 1994; Dercon, 2002). Households may thus respond to a sharp

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[30]An alternative argument that may explain a credit crunch in an economic downturn is based on net worth effects (see Agénor, 2002).

[31]See, for instance, Arbeláez and Echavarría (2003) for evidence on the impact of financing constraints on small firms in Colombia.

drop in income, associated with a crisis, by changing not the level of expenditure (as a result of liquidity constraints), but instead the composition of expenditure, reducing spending on durables and non-essential items (including primary health care) in order to maintain spending on basic food items. McKenzie (2003), using survey data, found evidence of this mechanism in Mexico, in the aftermath of the peso crisis of December 1994. He also finds that households postponed having children. He found no evidence of an increase in child labor; school attendance rates actually increased for children aged 15–18 years. Transfers from abroad also increased. Despite these coping strategies, consumption fell dramatically, indicating that households were unable to completely smooth adverse shocks to income.

A final source of asymmetry relates to 'labor hoarding' by firms facing high turnover costs for skilled labor. In a recession or crisis-induced contraction, unskilled workers (among whom the poor tend to be concentrated) are often the first to lose their jobs as firms 'hoard' their highly trained workers. The incentive to hoard may be related to high turnover costs (or high severance payments) associated with the use of skilled labor, and is greater the more temporary the shock is perceived to be, regardless of its size. When the 'good times' come back, firms may want, in priority, to recoup the productivity losses incurred during the downturn. Given the greater degree of complementarity (or lower degree of substitutability) between skilled labor and physical capital, they may therefore increase fixed investment instead of increasing their demand for unskilled labor. As a result, unskilled unemployment and poverty may display a strong degree of persistence in the aftermath of a negative output shock.

Appendix B: Dynamic Structure and Stability Conditions

The model consists of equations (6), (12), (13), (14), (18) and (22), which are repeated here (in compact form) for convenience:

$$\dot{D}_R = i^* D_R + c_R + T - Y_E^s[\chi(c_R)] \tag{A1}$$

$$i^* = i_f^* + \kappa(D) \tag{A2}$$

$$\dot{c}_R / c_R = i_f^* + \kappa(D) - \rho \tag{A3}$$

$$\dot{D}_G = i^* D_G + G - T \tag{A4}$$

To derive the dynamic form of the model, the first step is to combine the rich household and government budget constraints, equations (A1) and (A4). Together with (A2), this yields

$$\dot{D} = [i_f^* + \kappa(D)]D + G + c_R - Y_E^s[\chi(c_R)] \tag{A5}$$

where $D = D_R + D_G$. Note that in (A5), c_R corresponds also to total imports by the rich and the poor (see Agénor, 2005f).

The model therefore boils down to (A3) and (A5). These equations form a dynamic system in c_R and D^* that can be linearized around the steady state to give

$$\begin{bmatrix} \dot{c}_R \\ \dot{D} \end{bmatrix} = \begin{bmatrix} 0 & \kappa \hat{c}_R \\ 1 - Y_E^{s'} \chi_{c_R} & i^* + \kappa(\tilde{D}) + \kappa' \tilde{D} \end{bmatrix} \begin{bmatrix} c_R - \tilde{c}_R \\ D - \tilde{D} \end{bmatrix} \tag{A6}$$

where $1 - Y_E^{s'} \chi_{c_R} > 0$, given that $Y_E^{s'} > 0$ and $\chi_{c_R} < 0$.

Saddlepath stability requires one unstable (positive) root. A necessary and sufficient condition is thus that the determinant of the matrix of coefficients A in (A6) be negative:

$$\det A = -\kappa'\tilde{c}_R(1 - Y_E^{s'}\chi_{cR}) < 0 \tag{A7}$$

a condition that always holds.

From the linearization given above, the stable manifold is given by

$$c_R = \tilde{c}_R + (D_0 - \tilde{D})\exp(vt) \tag{A8}$$

or equivalently

$$c_R = \tilde{c}_R + \beta(D - \tilde{D}) \tag{A9}$$

where β is the slope of the saddlepath (denoted SS in Fig. 2), defined as

$$\beta \equiv \frac{v - [i_f^* + \kappa(\tilde{D}) + \kappa'\tilde{D}]}{1 - Y_E^{s'}\chi_{cR}} = v^{-1}\kappa'\tilde{c}_R < 0$$

with v denoting the negative root of (A6). With $v < 0$, $|\beta|$ is greater than the absolute value of the slope of DD, which is given by $-[i_f^* + \kappa(\tilde{D}) + \kappa'\tilde{D}]/(1 - Y_E^{s'}\chi_{cR})$. Thus, SS is steeper than DD, as shown in Fig. 2.

In the long-run equilibrium, with $\dot{c}_R = 0$, (A3) yields

$$\tilde{D} = \kappa^{-1}(\rho - i_f^*) \tag{A10}$$

which indicates that the more impatient domestic agents are (the higher ρ is), the higher the foreign debt will be. Setting $\dot{D} = 0$ in (A5) implies that in the steady state the current account must be in equilibrium:

$$[i_f^* + \kappa(\tilde{D})]\tilde{D} + G + \tilde{c}_R - \tilde{Y}_E^s = 0 \tag{A11}$$

The long-run effect of an increase in G on $\tilde{c}_R$ and $\tilde{D}$ is determined by setting $\dot{c}_R = \dot{D} = 0$ and calculating $d\tilde{D}/dG$ and $d\tilde{c}_R/dG$. From (A10), $d\tilde{D}/dG = 0$; using this result, (A11) implies that $d\tilde{c}_R/dG = -1/(1 - Y_E^{s'}\chi_{cR}) < 0$. Thus, $d\tilde{z}/dG > 0$, $d\tilde{\omega}_N/dG < 0$, $d(\tilde{\omega}_N\tilde{z})/dG > 0$, $d\tilde{n}_N^d/dG < 0$ and $d\tilde{Y}_N^s/dG < 0$.

From (A9), the impact effect of a rise in G on consumption of the rich, given that D cannot change instantaneously (so that $dD_0/dG = 0$), is

$$\frac{dc_R(0)}{dG} = \frac{d\tilde{c}_R}{dG} - \beta\left(\frac{d\tilde{D}}{dG}\right) = \frac{d\tilde{c}_R}{dG} \tag{A12}$$

given that $d\tilde{D}/dG = 0$. Thus, because the economy jumps instantaneously to the new equilibrium, impact and long-run effects are the same.

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