

A Poverty Analysis Macroeconomic Simulator (PAMS) Linking Household Surveys with Macro-Models

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Abstract

The Poverty Analysis Macroeconomic Simulator (PAMS) is a model that links standard household surveys with macro frameworks. It allows users to assess the effect of macroeconomic policies—in particular, those associated with Poverty Reduction Strategies papers—on sectoral employment and income, the incidence of poverty, and income distribution.

PAMS (in Excel) has three interconnected components:

- A standard aggregate macro-framework that can be taken from any macro-consistency model (for example, RMSM-X, 123) to project GDP, national accounts, the national budget, the BoP, price levels, and so on, in aggregate consistent accounts.

- A labor market model breaking down labor categories by skill level and economic sectors whose production total is consistent with that of the macro framework. Individuals from the household surveys are grouped in representative groups of households defined by the labor category of the head of the household. For each labor category, labor demand depends on sectoral output and real wages. Wage income levels by economic sector and labor category can thus be determined. In addition, different income tax rates and different levels of budgetary transfers across labor categories can be added to wage income.

- A model that uses the labor model results for each labor category to simulate the income growth for each individual inside its own group, assumed to be the average of its group. After projecting individual incomes, PAMS calculates the incidence of poverty and the inter-group inequality.

PAMS can produce historical or counterfactual simulations of:

- Alternative growth scenarios with different assumptions for inflation, fiscal, and current account balances. These simulations allow test tradeoffs within a macro stabilization program.

- Different combinations of sectoral growth (agricultural or industrial, tradable or nontradable goods sectors), within a given aggregate GDP growth rate.

- Tax and budgetary transfer policies.

For example, PAMS will simulate a baseline macro-scenario for Burkina Faso corresponding to an existing IMF/World Bank-supported program and introduce changes in tax, fiscal, and sectoral growth policies to reduce poverty and inequality more effectively than the base scenario. So, the authors argue that there are several possible “equilibria” in terms of poverty and inequality within the same macro framework.

This paper—a joint product of the Office of the Senior Vice President and Chief Economist, Development Economics, and the Poverty Reduction Group, Poverty Reduction and Economic Management Network—is part of a larger effort in the Bank to provide better tools to evaluate the poverty impact of economic policies. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Roula Yazigi, room MC4-328, telephone 202-473-7176, fax 202-522-1158, email address ryazigi@worldbank.org. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at lpereiradasilva@worldbank.org, bessamanssah@worldbank.org, or isamake@worldbank.org. September 2002. (66 pages)

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**A Poverty Analysis Macroeconomic Simulator (PAMS)
Linking household surveys with macro-models¹**

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1. Introduction and Motivation

1.1. Objective of the PAMS package

The Poverty Analysis Macroeconomic Simulator (PAMS) is a three-layer package of five **simple, inter-connected** tools operating in an Eviews - Excel™ environment. Its main objective is to help economists / analysts conduct historical and counterfactual dynamic simulations i.e. project over a chosen time period the poverty and distributional effects of macro and structural policies on representative households (RHs) or socio-economic groups within a developing economy. The three-layer approach allows simulations of scenarios comprising the macroeconomic framework chosen by a country, the employment situation and a projection of the country's distribution of income and poverty levels (through a top-down approach, i.e. from the macro to the micro levels). The simulation process consists in projecting the mean income of each of the several RHs of the economy, resulting from changes in the macro situation –either because of policies or shocks–, assuming that there are no effects to the intra-group distribution of income or expenditure.

The package is designed as a “shell” that can host data from any country. The minimum requirement is a macro-consistency framework (for example a RMSM-X) and a household survey linked together as described in Annex 4. PAMS extracts information from the country's Household survey (HHS) and stores it in a particular format (described in Annex 5). Its operating principles are very similar to those of most spreadsheet based tools. The package uses five components that are inter-connected (see Figures 1(a) and 1(b) below).

- A macro-consistency accounting framework and/or any macroeconomic model
- A Labor and Wage-Income module
- A Simulator of Poverty and Distribution
- A Household Survey (HHS)
- A procedure to extract data from the HHS in a specific format (e.g., broken down by RA)

PAMS is a simple tool to answer some of the questions about the distribution, poverty and social effects of Structural Adjustment Programs as well as of “globalization”. These questions became a practical operational objective for multilateral and other aid agencies². Poverty reduction and pro-poor growth

² The current international debate on debt relief for highly-indebted, low-income countries: has led to associate the goal of sustained poverty reduction –now the main objective of adjustment programs—with demands for specific monitoring indicators relating poverty to other macroeconomic variables. In practice, on Dec. 22, 1999 the IMF and the World Bank endorsed the elaboration of a Poverty Reduction Strategy Paper (PRSP) as the central mechanism for providing concessional lending to low-income countries. One of the objectives of the PRSPs is to provide a

strategies require policy choices to be evaluated *ex ante* (and monitored *ex post*) for their impact on poverty and distribution. But few quantitative methods are presently available to meet that need. This paper proposes a method in between simple aggregate approaches and more sophisticated models³. PAMS keeps the simplicity of macroeconomic consistency frameworks used in many public and private agencies (e.g., RMSM-Xs or other country-based macro-consistency models). At the same time it goes beyond a poverty-distribution analysis conducted with aggregate relations between the economy's mean income (GDP per capita) and poverty-distribution-social indicators levels based on cross-section regressions⁴. But it stops short of being a fully disaggregated macro-econometric or CGE framework.

1.2. Summary of the features of the package

PAMS simulates the income changes of various RHs for any given change in output growth disaggregated by sector. The insight (the “technique”) upon which PAMS built is the basic principle of decomposition in Bourguignon [2002], i.e. the change in poverty can be decomposed into two parts: the change related to the uniform growth of income and the change that is due to changes in relative incomes. Predicting the consequences of a policy affecting aggregate output growth on poverty can be done with this sort of technique, under the assumption that the policy under scrutiny will be distribution neutral or conversely assuming a specific quantifiable form for the distributional change.

The solution that is proposed extends this relationship between macroeconomic outcomes (e.g., GDP growth, consumer price , inflation, employment) and the income of various groups in the economy, by breaking it down to various socio-economic groups and economic sectors in the same economy. The solution is a distributional dynamic process between several “typical” socio-economic groups using the RH hypothesis. Each RH is employed in a different economic sector. Hence, it is necessary to disaggregate the production side of the economy. In addition an explicit labor market is needed that reflects the skill composition of the labor force, the dichotomy between rural and urban areas, the effect of sectoral output growth and of real wages on the demand for labor.

In a nutshell, the PAMS package:

- takes a macro-framework from any macro-consistency package (RMSM-X, 123 or a Government model);

country-owned, medium-term framework to reduce poverty and generate more rapid growth, with assistance from bilateral donors and multilateral institutions. The challenge now consists in providing PRSPs with the proper set of quantitative instruments enabling them to achieve their goal.

³ See Bourguignon, Pereira da Silva and Stern [2002]

⁴ See D. Chen and A. Storozhuk [2002]

- takes the initial poverty headcounts and the income distribution from the household survey (regrouping individual observations into representative groups RHs defined by the labor category of the head of household);
- disaggregates production into economic sectors to match the labor categories created from the household survey; each economic sector employs one labor category (one RH) only;
- simulates labor demand and supply in a disaggregated labor market (with options for accepting or rejecting wage flexibility in specific segments of the labor market); hence determines wage income for each RH;
- endogeneizes the price level (production price only) through a mark-up on wages, hence can project a poverty line accordingly;
- simulates the effect of applying different (average) income tax rates across labor categories;
- simulates the effect of applying different budgetary transfers across labor categories, consistent with the macro envelope for current expenditures given by the macro framework;
- calculates income growth for each labor category;
- feeds these growth rates into the household survey broken down by representative agents of each labor category;
- simulates the new poverty headcount and the new level of inter-group inequality (Gini)

There are two caveats for the approach. First, PAMS uses the macro framework of the macro model that runs on top of it. In that sense, it will inherit the strengths and weaknesses of that model. If the model is a RMSM-X, there will be no relative price effects on the production side of the economy (with the exception of real exports and imports reacting to changes in the real exchange rate RER). Moreover, using an aggregated fixed coefficient production function⁵ eliminates from the discussion any substitution effect between factors of production coming from changes in relative factor costs.

⁵ One of the theoretical underpinning of the macro-consistency models used by the World Bank and the IMF is the Harrod-Domar hypothesis of a linear and stable long-term relation between the rate of growth of output and the investment-to-GDP ratio. The origin of the ICOR is Domar's celebrated 1946 paper, but a very similar approach can also be found in the central planning economic literature, largely inspired by an engineering approach to economics. Domar's growth story posits a fixed relationship between growth and the share of (net not gross) investment to GDP (I/Y).

$$Y_t = \sigma K_{t-1}$$

$$\Delta Y_t = \sigma \Delta K_{t-1} \Rightarrow \frac{\Delta Y_t}{Y_{t-1}} = \sigma \frac{\Delta K_{t-1}}{Y_{t-1}} = \sigma \frac{I_{t-1}}{Y_{t-1}}$$

Assuming that output (Y) is a fixed proportion of the stock of capital (K), that there is also no depreciation, a first difference transformation divided by output yields Domar's relation later also stated by Harrod. The σ was also labeled by economists the inverse of the Incremental Capital-Output Ratio (ICOR), which measured the ratio of required investment to desired growth. A country with an investment-to-GDP ratio of 10% and an ICOR of say 4 would grow at 2.5%. In order to achieve higher growth, additional investment (hence more domestic savings) would have to be mobilized. As pointed out by Easterly, the Harrod-Domar story was not meant to be a relationship for the long-run but rather for short-term output changes in developed countries. Nevertheless, for a variety of reasons – lively described by Easterly [1997]– pertaining to the political economy of the Cold War and the directions taken by the High Development Theory of the 1950s, the ICOR remained for 50 years at the center of the design of development assistance.

The second caveat comes from the assumption (a single representative household or RH) used to determine income (wages, transfers). The simulations assume that the mean income growth of each RH affects homogeneously all households in that particular group (e.g. there is no change in the intra-group distribution of income, e.g., no individual heterogeneity). Moreover there are no changes in the demographic composition of each of the RHs. For example, there is no endogenous shift between workers from one RH to another for those households that could “migrate” from one group to another given their characteristics and the incentives provided by relative income growth rates.

These two caveats, however, can be partially “corrected” by the end-user of the PAMS. The flexibility of the EViews-Excel environment allows precisely to construct simulations that do not need to be a simple “mechanical” top-to-bottom exercise. Some exogenous “additional” assumptions related to the “supply” side of the model can play a role in a carefully designed simulation.

1.3. Policy simulations that can be addressed by the new package

Broadly speaking, based on an internal survey conducted at the World Bank on Poverty Reduction Strategy Papers (PRSPs)⁶, the main policy issues which –according to the survey-- need to be evaluated --in their poverty and distribution dimensions-- are as follows:

- o What is the poverty-impact of specific changes in public spending? How can changes in the delivery of public services, especially for health and education affect the poor?
- o What is the poverty-impact of specific changes in taxation? How can the financial and administrative burden of taxation on poor people be reduced?
- o What is the poverty-impact of improving public expenditure targeting? How can public expenditure and revenue be better monitored and improved?
- o What is the poverty impact of structural reforms such as trade policy, privatization, agricultural liberalization and price decontrol? How could policy sequence these reforms?
- o What is the poverty impact of changes in the macro framework such as the fiscal, inflation and exchange rate targets? How can policy best deal with the possible trade-offs between several objectives?

⁶ The sample consisted of 4 full PRSPs (100% of actual, Uganda, Burkina Faso, Tanzania, and Mauritania) and 13 Interim or I-PRSPs (40% of actual, Yemen, Chad, Ghana, Cameroon, Kenya, Zambia, Rwanda, Cambodia, Vietnam, Bolivia, Honduras, Albania, and Georgia). The objective of the exercise was to identify in the sample what were the most common policies and instruments used for poverty reduction. The macroeconomic policy measures included monetary, fiscal, and exchange rate policies. The structural reform measures encompassed institutional changes (including anti-corruption, decentralization, tax administration, and budgetary reform), sectoral reform policies such as privatization, changes in tax rates, and expenditure increases/decreases in specific sectors.

- What is the poverty impact of terms of exogenous shocks such as trade shocks, capital flows volatility, changes in foreign aid and foreign payment crises? How can policy mitigate these effects?
- Finally, what is the poverty impact of the quality of governance in its relation to investment and to growth (through the effect on the perceptions by private investors of the stability of the business environment in which they will operate, i.e. the “investment climate”). What measures, policies can improve governance and productivity?

Despite PAMS’ simplicity, there are some interesting macro and (some micro) policy issues that can be addressed within this framework. PAMS can address some (but not all) of the issues listed above. The package can provide quantified simulations for the following policy scenarios:

- alternative scenarios for GDP growth (policy-driven or external shock), including different combinations of inflation, fiscal and current account deficits to achieve higher poverty reduction targets;
- alternative scenarios for pro-poor growth strategies emphasizing sectoral growth (agricultural or industrial) tradable or non-tradable (within a given GDP growth rate);
- applying different rates of taxation to income by group (within the macro-consistent budget constraint);
- applying different levels of social (budgetary) transfers to different groups (within the macro-consistent budget constraint).

The paper is organized as follows. Section 2 describes the main features of the PAMS. Then, in Section 3, the main analytical relations of the Labor and Wage-Income module are discussed. Section 4 explains the operation of the Simulator for the HHS. Section 5 summarizes some policy simulations based on the case of Burkina Faso. Finally in Section 6 we provide concluding remarks.

2. The Main Characteristics of the Poverty Analysis Macroeconomic Simulator (PAMS)

2.1. General Features

PAMS comprises (1) A base year household survey or HHS; (2) A macro-consistency accounting framework or a macro model (e.g. a RMSM-X); (3) A labor market model; (4) A household survey simulator or HHSS; and (5) a procedure to extract household data in a specific format (to construct the RHs) from the base year HHS.

The first four of these five components are Excel worksheets. The fifth is an Eviews procedure that extracts data from the HHS, and stores it in an Excel HHS database in a specific format. This procedure can also be implemented using other software (e.g., SPSS, STATA, etc.).

One of the features –by design- of the package is that each component can operate independently of the others. Alternatively, it can receive inputs from the others and simulate the impact of policies and shocks in a consistent way.

The macro-consistency accounting framework or macro model (e.g., a RMSM-X or any other macro model available and used by the country) is the component of the package that provides macro consistency to the PAMS. This first layer, the macro model could be a general equilibrium model as well, or even a more sophisticated macro-econometric model whose coefficients and relationships are estimated with the country's time series data. This component gives national accounts consistency, in real and nominal terms (price consistency) and ensure that economic agents' budget constraints are respected at an aggregate level.

The base year household survey or HHS is the component of the package that provides the information about initial levels of income and expenditure by economic sector of employment, skill levels, location (urban or rural) and degree of formality. It breaks down the total labor force into the categories that are needed to simulate the functioning of the labor market. Finally, the average wage and non-wage income of workers in each RH group will come from the latest available (and reliable) household survey.

The labor market model is the component of the package that simulates the labor market linked to the consistency macro-economic framework (labor demand and supply functions can be modeled and elasticities can be estimated econometrically with country-specific time-series). First, the module breaks down the economy into two basic components: rural and urban. Then within each component, we distinguish the formal from an informal sector. Within each one of this sectors, PAMS defines sub-sectors

producing tradable are distinguished from non-tradable ones. This breakdown allows one to link each sub-sector of the production side of PAMS to each component of the segmented labor market.

Labor supply is driven by demographic considerations and exogenous migrations of labor and skill categories. Labor demand is broken down by economic sector, skill level and location -rural/urban- and dependent upon the relevant sectoral demand (output growth) as well as real wages. Hence, the new module determines wage income broken down by socio-economic categories, skill levels and location (rural/urban).

The module also features a sub-section on taxes, transfers and social expenditures (consistent with the macro model and the Government's budget). For each of the country's socio-economic categories (e.g., along the lines of a macro-consistent incidence analysis) it will be able to make average transfers or average taxation of that specific RH with a specific average tax or transfer instrument. It is also able to simulate the cost of attaining certain socio-economic goals, such as the International Development Goals (IDGs)⁷ with their 2015 targets, in a normative solving mode; and calculate which goals can be achieved given the country's macroeconomic constraints.

The Household Survey Simulator (HHSS) is the component of the package that simulates/projects the effect of the labor market and the macro-consistent framework using the initial information from the HHS. Since we have a starting level of income for each RH and projected levels of income after taxes and transfers by labor category (by RH), we are able with the Simulator to apply the projected average growth rate for each RH to all the households or individuals that belong to that same RH. Therefore, we can calculate income distribution indicators (e.g., Gini). With specific assumptions regarding the initial and projected poverty lines and assuming no change in the intra-group distribution of income, we can project absolute levels of poverty head counts.

2.2. Sources of Tools and Data

A significant number of household surveys can be found at the World Bank and the relevant statistical units in Government. For example, there are relevant Websites such as the Poverty Monitoring Database, [HTTP://WWW.WORLDBANK.ORG/POVERTY/DATA/POVMON..HTM](http://www.worldbank.org/poverty/data/povmon.htm) that has six Main Components:

- Household Surveys: 124 countries, classified by country, year or region.
- News on upcoming surveys, studies and poverty assessments.

⁷ The International Development Goals (IDGs) are targets that help frame the World Bank's business strategy and have been extensively discussed by the international community of donors. They are multidimensional benchmarks (income poverty, education, health, gender and environment). Their role in each country –and the capacity of that country to achieve them– requires careful assessment of the countries economic, demographic and institutional characteristics. Costing should take into account these characteristics

- Social Indicators
- Summaries of all poverty assessment by WB since 1993
- Basic Information on participatory poverty assessments by WB and other institutions.
- Links to Other Relevant Sites

RMSM-Xs. Can also be found as generic “shells” that need to be calibrated specifically for each country case. The World Bank’s DECDG site features a special menu area where typical RMSM-Xs, user guides and instructions can be downloaded. Alternatively, many Government agencies operate RMSM-Xs and/or other macro-models that can be used to ensure consistency.

The labor market model is also a generic “shell” that can be adapted to each new country case. It operates in a standard Excel™ worksheet composed of several separate spreadsheets (see Annex 4). There are several possibilities described in Annex 4 for connections with other macro-models and macro consistency frameworks. The new module can be hooked to the RMSM-X (Real economy, RX and Debt module, DM) but there could be other ways to generate the aggregate level of output as the starting point for the Labor and Wage-Income module. Finally, there is a need for a careful calibration of elasticities in the labor market model. This is described in Annex 3.

Figure 1(a): Main Linkages of the PAMS using the RMSM-X macro framework

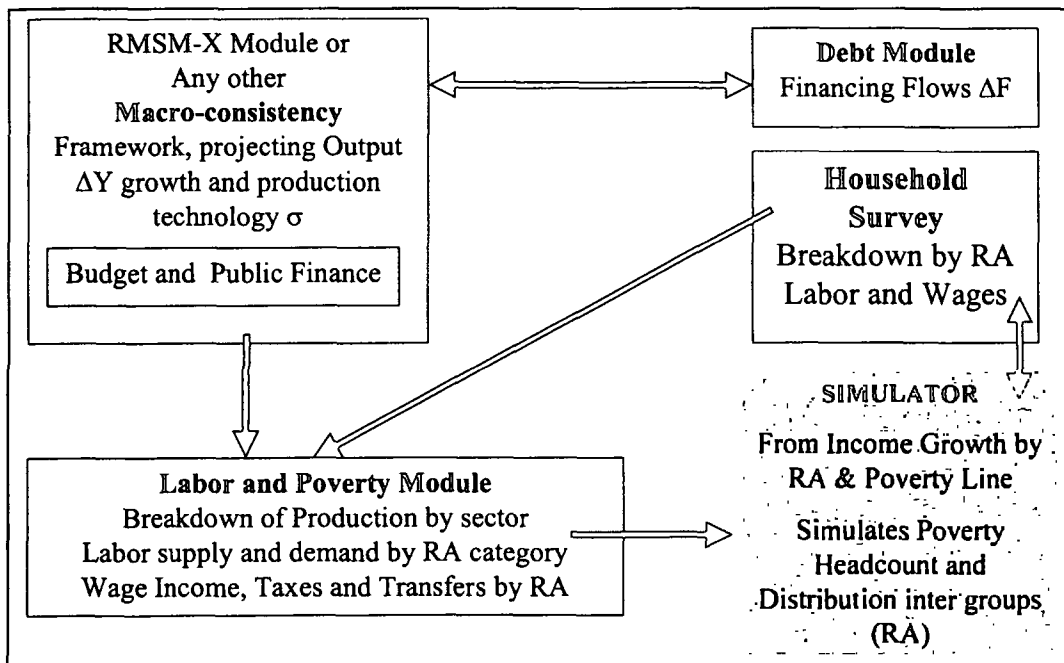
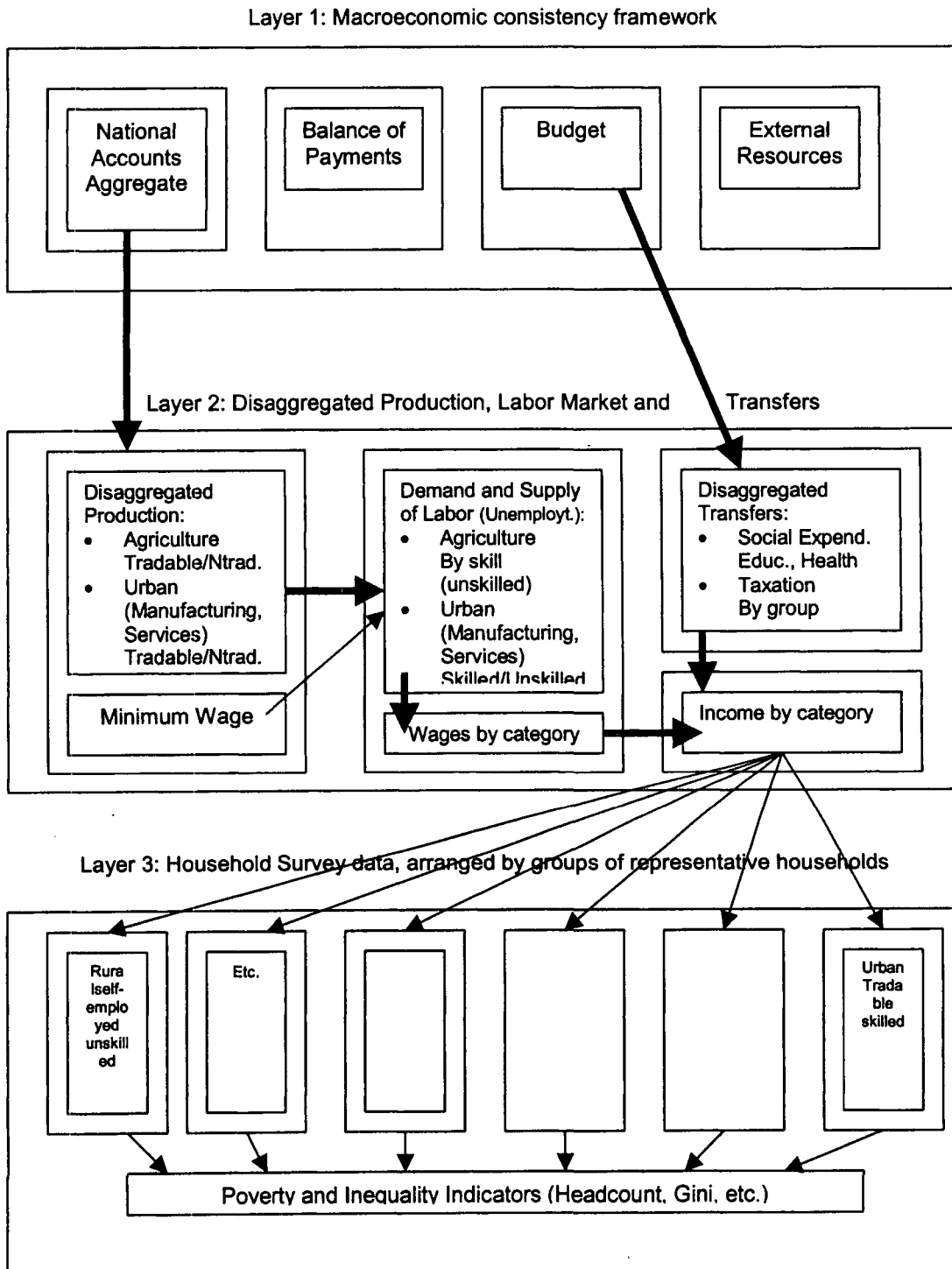


Figure 1(b): Diagram explaining the functioning of the PAMS

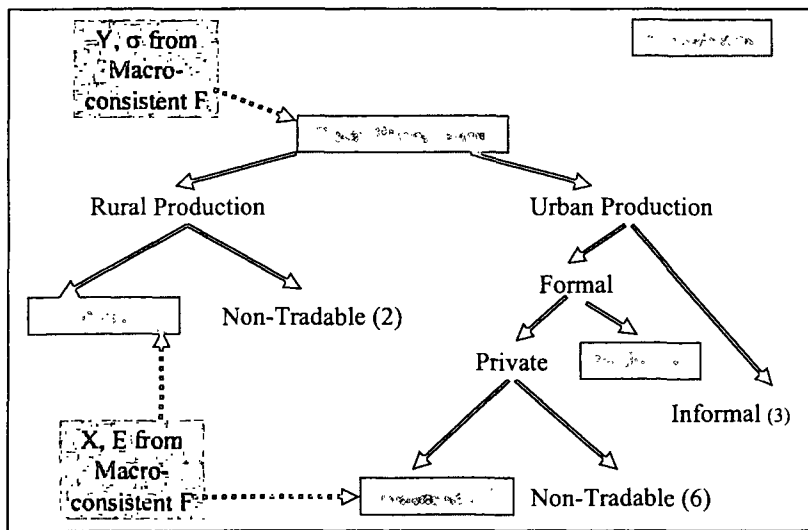


3. The Structure of the Labor Market model

3.1. Production

In order to determine income by RH, one way is to match each RH group with a specific sector of production (i.e. like in Agénor and alii [2001]). PAMS distinguishes urban and rural production, formal and informal and tradable and non-tradable goods production. One reason for that is to argue that the production technology (use of labor and capital, mix of skills) is very different between these sectors. That, in turn, makes labor demand of each of these sectors different. Hence wages will also be significantly different. These differences produce the heterogeneity in the pattern of the overall income distribution and estimates of poverty.

Figure 2: Production breakdown



We use the following production breakdown. Gross Domestic product (GDP) or Y is taken from the macro-consistency framework and is therefore exogenous. Then Y is broken down between rural (Y_{RUR}) and urban (Y_{URB}). Rural GDP is divided between 2 sectors (in parentheses, we put numbers for each sector): (1) the production of cash crops X_{RUR} (tradable goods for exports) and (2) subsistence agriculture (D_{RUR}). Urban GDP is divided between a formal and an (3) informal sectors. The formal sector includes the private and the (4) public sectors. Finally, the private sector is divided between (5) tradable goods (exports) and (6) non-tradable domestic goods (i.e. the sector number (3), the informal urban sector is also a non-tradable goods sector and also private). There are in total, 6 sectors and assuming all prices normalized to one, the accounting framework becomes:

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$$Y = Y_{RUR} + Y_{URB} = (X_{RUR} + D_{RUR}) + [(X_{URB,PRIV} + Y_{URB,PRIV}) + Y_{URB,PUB} + D_{URB}]$$

To keep the simplicity of (and the linkage with) the macro consistency framework, the aggregate production of this economy (total GDP or Y) is derived from there and residual sectors such as the informal urban sector (number (3)) and the rural subsistence agricultural sector (sector number (2)).

will ensure the overall consistency. Similar linkages with other macro models can be envisaged as well (e.g. macro-econometric models or CGEs).

The export sector of the economy is divided between agricultural exports and non-agricultural (urban) exports. For both, the level of production is exogenous⁸, dependent upon foreign demand (Y^*) and the respective real exchange rates for each sector based on the relevant domestic and foreign prices.

$$X = (X_{RUR} + X_{URB,PRIV})$$

$$X_{RUR} = X \left(Y^*, \frac{Ep_{RUR}^*}{P_{RUR,D}} \right)$$

$$X_{URB,PRIV} = X \left(Y^*, \frac{Ep_{URB}^*}{P_{URB,Y}} \right)$$

In the rural economy, there are several options to determine output. One is to take agricultural production as given by the RMSM-X. Another is to model rural production separately. Under the latter option, the simplest specification is to calculate Y_{RUR} using a constant elasticity (δ_{RUR}) of output to rural labor. In a more complicated specification, there could be complementarity between factors of production and infrastructure (public investment) such as roads, etc. In such a case, rural “production technology” depends also on public investment (I_{RUR}^G) in infrastructure in rural areas, measured on a per capita basis. The reason could be that a minimal level of infrastructure (say rural feeder roads) is necessary to make non-subsistence agricultural production profitable. However, for public investment in rural areas to be effective for development, a minimum level is required, below which returns are zero. The elasticity (δ_{RUR}) is positive. One of the specifications below can be chosen.

$$Y_{RUR} = \overline{Y_{RUR}}$$

$$Y_{RUR} = \kappa_{RUR}^Y \cdot L_{RUR}^{\delta_{RUR}}$$

$$Y_{RUR} = \kappa_{RUR}^Y \left(I_{RUR}^G \right)^{\gamma_{RUR}} \cdot L_{RUR}^{\delta_{RUR}}$$

⁸ In the version of the PAMS linked to the RMSM-X, exports (tradable goods sectors) are determined in the Trade sheet of the RMSM-X model. The functional form of export determination, however, follows a traditional demand specification –using the small country assumption– dependent upon foreign demand and the real exchange rate.

Once X_{RUR} and Y_{RUR} are determined, non-tradable rural output or subsistence agricultural output (D_{RUR}) can be calculated as a residual.

In the urban economy, the breakdown of production is the following:

Total urban GDP (Y_{URB}) production is calculated, with the production of tradable (export) goods defined earlier as $X_{URB,PRIV}$ and the public sector product being exogenous and fixed. $Y_{URB,PUB} = \overline{Y_{URB,PUB}}$.

$$Y - Y_{RUR} - X_{URB,PRIV} - \overline{Y_{URB,PUB}} = (Y_{URB,PRIV} + D_{URB})$$

Similar options exist for the urban non-tradable and formal private GDP ($Y_{URB,PRIV}$) regarding the choice of a production function. One solution is to use a “private urban” incremental capital output ratio (ICOR). All private investment in the economy ($I = I_{URB,PRIV}$) takes place in the formal private urban economy where there is all the private capital stock (K). The growth rate of output in the urban economy is therefore given by a fixed-coefficient relation to the ratio of investment to output. Other options would include modeling a specific functional form for private urban investment.

$$\frac{\Delta Y_{URB,PRIV}}{Y_{URB,PRIV,-1}} = \sigma_{URB} \cdot \frac{I_{URB,PRIV,-1}}{Y_{URB,PRIV,-1}}$$

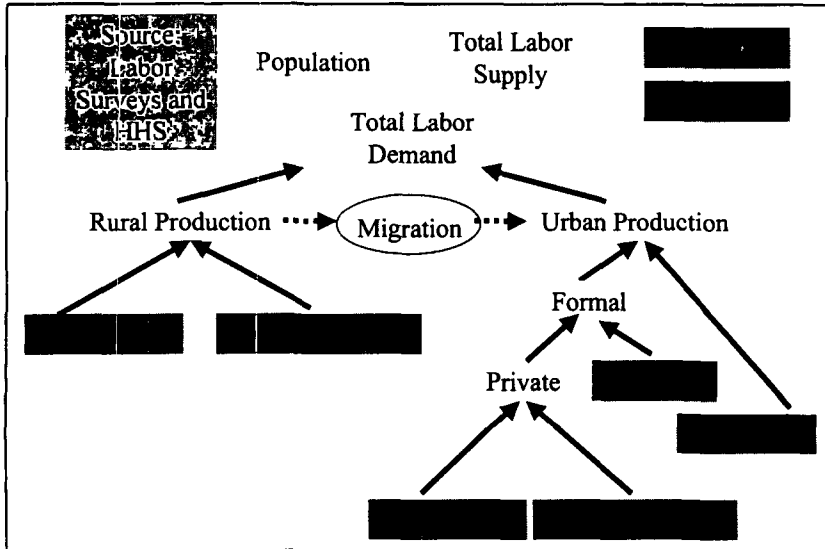
Hence, after determining the 5 sectors, it is possible to determine the output of the 6th, the residual of urban output i.e. the informal non-tradable goods. Calculating total GDP minus total agricultural output minus the urban private production of tradable goods minus the public sector, minus the private production of non-tradable goods gives the production of the informal non-tradable good sector D_{URB} as the residual.

Where in the labor market model could relative price affect supply decisions, i.e. resource allocation? It is easy to show that these effects could be introduced in the rural and urban formal private sectors.

3.2. Labor Market, Employment and Migration

Employment determination in the labor market model follows the breakdown of the economy into its real components, with the additional dimension of the two types of labor (skilled and unskilled). The departure point for modeling labor supply and demand is the breakdown of production.

Figure 3: Labor Demand breakdown



The total labor force is a fraction of total population. There are two labor categories, skilled and unskilled only. Each sector on the production side, is assumed to hire only one type of labor, skilled or unskilled. There is no production process in this simple model that employs both categories of labor and there is no substitution

between labor in two different sectors except for a possibility of exogenous migration that follows a Harris-Todaro-like process. Hence employment is divided between unskilled labor employed in the rural economy (in both the export and the subsistence sectors), skilled labor employed in the formal export sector of the urban economy; unskilled labor employed in the non-tradable sector of the urban economy; unskilled labor employed in the informal sector and public sector employees (which are assumed to be skilled labor only). Writing (as below) subscripts RUR and URB for the sectoral origin of demand, the superscript D for Demand and superscripts UNSK and SK for unskilled and skilled labor respectively; and subscripts X, for tradable, D for domestic informal, non-tradable, Y for domestic formal, non-tradable, and G for public sector, we can decompose labor demand into its components according to the production side of the model.

$$L_Y^D = L_{RUR}^D + L_{URB}^D = (L_{RUR,X}^{D,UNSK} + L_{RUR,D}^{D,UNSK}) + [(L_{URB,X}^{D,SK} + L_{URB,Y}^{D,UNSK} + L_{URB,D}^{D,UNSK}) + L_{URB,G}^D]$$

The rigidity of this representation of the labor market can be amended in a couple of ways. First, while each sector hires only one type of labor as depicted in Figure 3, and labor categories are “pre-assigned” to the relevant sector, the starting wage rates in different sectors for the same level of skills are different, allowing for a differentiation of average wage incomes across sectors. Second, there is migration between the rural and urban economies, and between skills categories. The process is not modeled explicitly but left to the judgment of the end-user of the PAMS package. Finally and third, as we shall see below, unemployment will affect real wage rates differently and introduce more differentiation between the wage income of the various categories of labor in the model.

a) Employment, Migration in the Rural Economy.

The rural economy produces (Y_{RUR}) tradable (exports, cash crops) and non-tradable goods but employs only unskilled workers. Employment in the rural economy follows the Lewis tradition of a situation of “unlimited supply” of unskilled workers growing with the population growth rate $\eta(POP)$. However, migration flows from the rural to the urban economy need to be subtracted.

$$L_{RUR}^{S,UNSK} = L_{RUR,-1}^{S,UNSK} \cdot [1 + \eta(POP) - MIGR]$$

Labor demand in the rural economy depends positively on both components of rural output ($Y_{RUR} = X_{RUR} + D_{RUR}$) with an elasticity of ω_{RUR} (which could take a unitary value hence making a labor demand per unit of output a function of the real wage) and negatively on the real wage rate with an elasticity α_{RUR} . Since the rural sector comprises only unskilled workers, workers will opt for being employed first in whichever sector offers a higher real wage. The export (cash crop) sector has higher (real) wages $w_{RUR,X}^{UNSK}$ than in those in the subsistence agricultural sector $w_{RUR,Y}^{UNSK}$. The basis for real wage setting is a fixed minimum sectoral subsistence wage $\overline{w_{RUR,X}^{UNSK}}$ that adjusts if wage are assumed to be flexible (see below). The nominal (product) wage is the product of the real wage by the sectoral producer price.

$$\begin{aligned} L_{RUR,X}^{D,UNSK} &= \kappa_{RUR,X} X_{RUR}^{\omega_{RUR,X}} \cdot w_{RUR,X}^{UNSK}^{-\alpha_{RUR,X}} \\ W_{RUR,X}^{UNSK} &= P_{RUR} w_{RUR,X}^{UNSK} \\ \left\{ \begin{array}{l} w_{RUR,X}^{UNSK} = \{1 + \lambda\} \overline{w_{RUR,X-1}^{UNSK}} \\ \text{or} \\ w \text{ flex \& } U_{RUR,X}^{UNSK} > 0 \Rightarrow w_{RUR,X}^{UNSK} \text{ adjust} \end{array} \right. \end{aligned}$$

The supply of unskilled labor in the informal subsistence agricultural sector is the residual of labor supply minus labor employed in the export sector. A similar wage determination mechanism is introduced in the subsistence agricultural sector. However, there is a higher probability there that the real wage rate is flexible and adjusts more rapidly to clear the market following a wage-curve specification. Alternatively, the model can also feature other types of specifications for the rural informal sector: either assuming real wage rigidity or an instantaneous wage clearing specification.

$$L_{RUR,D}^{S,UNSK} = L_{RUR}^{S,UNSK} - L_{RUR,X}^{D,UNSK}$$

$$L_{RUR,D}^{D,UNSK} = \kappa_{RUR,D} D_{RUR}^{\alpha_{RUR,D}} \cdot W_{RUR,D}^{UNSK}^{-\alpha_{RUR,D}}$$

$$\left\{ \begin{array}{l} W_{RUR,D}^{UNSK} = \{1 + \lambda_3\} \overline{W_{RUR,X-1}^{UNSK}} \\ or \\ w \text{ flex \& } U_{RUR,D}^{UNSK} > 0 \Rightarrow W_{RUR,D}^{UNSK} \text{ adjust} \end{array} \right.$$

$$MIGR = \overline{MIGR}$$

$$W_{RUR,D}^{UNSK} = P_{RUR} W_{RUR,D}^{UNSK}$$

Migration from the rural to the urban economy follows the Harris-Todaro tradition. Unskilled labor moves to town –at no cost and at the rate MIGR-- attracted by the (expected) wage differential between the rural and the urban economies (which traditionally depends on the perceived probability of getting an unskilled job in the urban economy).

b) Employment, Upgrading Skills in the Urban Economy.

The Urban economy is divided between a formal and an (3) informal sectors. The formal sector includes the private and the (4) public sectors that employs only skilled labor. The private sector is divided between (5) tradable goods (exports) employing skilled labor and (6) non-tradable domestic goods employing unskilled labor. The sector number (3), the informal urban sector is also a non-tradable goods sector and employs only unskilled workers.

Labor demand in the public sector is exogenous. Given the advantages (fringe benefits and perks) associated with public sector employment, workers will opt to be employed first in the public sector. The civil service employs a fixed number of skilled workers only that are subtracted from the urban labor supply.

$$L_{URB,G}^D = \overline{L_{URB,G}^{D,SK}}$$

The rest of the urban sector is the private sector. There, we specify labor demand for the formal sector and then leave employment in the informal sector as a residual. The other simplification that we make is to assign unskilled labor only to the formal non-tradable goods sub-sector and skilled labor to the tradable goods sub-sector. Hence, labor demand for unskilled (respectively skilled) workers in the two formal sub-sectors of the urban economy depends positively on the components $Y_{URB,PRIV}$ and X_{URB} of urban output

(Y_{URB}) with their respective elasticities ($\sigma_{URB,Y}^{UNSK}$ and σ_{URB}^{SK}) and negatively on the real wage rate with an elasticity α_{URB}^{UNSK} (respectively α_{URB}^{SK}).

$$L_{URB,Y}^{D,UNSK} = \kappa_{URB,PRIV}^{UNSK} Y_{URB,PRIV}^{\sigma_{URB,Y}^{UNSK}} W_{URB,Y}^{UNSK - \alpha_{URB}^{UNSK}}$$

$$L_{URB,Y}^{D,SK} = \kappa_{URB,PRIV}^{SK} X_{URB}^{\sigma_{URB}^{SK}} \cdot W_{URB,Y}^{SK - \alpha_{URB}^{SK}}$$

The supply of unskilled (respectively skilled) labor in the urban economy can be modeled in several ways. In the simplest, current specification it grows with the rate of population growth, the rate of migration from rural areas (for unskilled labor only) and the rate of upgrading unskilled workers. In more sophisticated models, it can also depends (as in the two specifications L1 and L2 below, on the wage premium (for skilled labor).

We also assume that there is no “skilled unemployment” in the urban economy. Skilled workers that can not find a job at the prevailing wage do not “downgrade” to the unskilled segment of the labor market. They rather stay idle (voluntary unemployment) waiting for job opportunities. Alternatively, one can also introduce an equation for “emigration” where unemployed skilled workers will leave the country and find job in foreign labor markets. In such a case, the supply of skilled workers would be reduced by a rate of emigration EMIGR that would depend on skilled unemployment and the difference between expected wage abroad and prevailing wage for skilled labor in the domestic economy.

$$\frac{\Delta L_{URB}^{S,SK}}{L_{URB,-1}^{S,SK}} = L1 \left[\left(\frac{\Delta W_{URB}^{SK}}{W_{URB,-1}^{SK}} \right), \left(\frac{W_{URB}^{SK}}{W_{URB}^{UNSK}} \right), \eta_{URB}^{SK} (POP), UPGR, EMIGR \right]$$

$$\frac{\Delta L_{URB}^{S,UNSK}}{L_{URB,-1}^{S,UNSK}} = L2 \left[\left(\frac{\Delta W_{URB}^{UNSK}}{W_{URB,-1}^{UNSK}} \right), \left(\frac{W_{URB}^{SK}}{W_{URB}^{UNSK}} \right), \eta_{URB}^{UNSK} (POP), MIGR, UPGR \right]$$

$$UPGR = \overline{UPGR}$$

$$EMIGR = \overline{EMIGR}$$

$$U_{URB}^{SK,UNSK} = \frac{L_{URB}^{S,SK,UNSK}}{L_{URB}^{D,SK,UNSK}} - 1$$

The determination of wage rates in the urban economy for unskilled workers is as follows:

The nominal wage rate in the public sector is exogenous. It is also possible to add a specific condition where public sector wages for skilled workers are set to be above (or below) comparable private sector wage rates.

$$W_G = \overline{W}_G \quad W_G = P_{URB} w_G > P_{URB} W_{URB}^{UNSK}$$

Unskilled workers will choose to work first in the formal urban sector, at its given wage rate (assumed to be always higher than that of the informal urban sector). Unskilled workers will then turn to the informal urban sector job market. We assume that there are frictions in the formal urban labor market and that adjustments there can be more or less sluggish, thus generating involuntary urban unemployment.

c) Wage determination for unskilled workers

The real wage determination for unskilled workers depends on the following considerations in both the rural and urban sectors. There is a “minimum historical subsistence” wage level for unskilled labor that is set by institutional arrangements (e.g., unions bargaining power or a benevolent Government or both). Two forces pull in different directions. On the one hand, unions push for a regular increase in the “minimum historical subsistence” wage level for unskilled labor in urban areas. On the other, the flux of migrant workers tend to increase the supply of unskilled workers and hence to depress the real wage (by increasing unemployment). For each of the “sectors” of the economy, and for unskilled labor,

$$w_{SECTOR}^{UNSK} = \lambda_{SECTOR} \cdot (U_{SECTOR}^{UNSK})^{-\delta} \cdot (1 + \varepsilon) \cdot \overline{w_{SECTOR,-1}^{UNSK}}$$

If $\lambda_{SECTOR} = 0$, the wage for unskilled labor is fixed at its historical subsistence level, $\overline{w_{SECTOR}^{UNSK}}$ plus whatever the increase ε obtained by unions.

If $\lambda_{SECTOR} = 1$, the wage level is related to the level of unemployment through a wage-curve type of relation (Blanchflower and Oswald [1994]). Alternatively, one could use a specification where it is the change in the wage rate that is negatively related to unemployment (e.g., a Phillips-curve type of relation).

Then, the nominal wage becomes:

$$W_{SECTOR}^{UNSK} = P_{URB} w_{SECTOR}^{UNSK}$$

Now the wage of the residual informal sector has to be determined. The sector is a residual for both production and employment. We opt here for the same type of adjustment. Here too, a market clearing wage can be used.

Finally the wage rate in the urban economy for skilled workers follows efficiency wage considerations to create incentives for skilled workers to remain in the domestic economy and avoid shirking. Hence, employers are prepared to pay a premium for skills over unskilled labor wage rates. One of the reasons is that skilled labor is a closer substitute for capital. However, in our simple framework, the determination of the premium can not be based on the possibility of substituting skilled labor by capital. Nevertheless, upgrading unskilled labor would aim precisely at making it more substitutable to capital. Hence, the user of the PAMS framework has to rely on the information of the HHS to proxy the premiums between labor categories.⁹

d) Skills acquisition and upgrading of labor

Skills acquisition depends on expenditures –private and public—in education (see below). But this can only occur in urban areas (e.g., there is no skills upgrading in the rural economy). Skills acquisition allows unskilled labor to join the skilled labor category in the urban economy.

In order to account for structural changes in the economy, coming from changes in the composition of the labor force (skills), its allocation across sectors (sectoral labor demand) and the relative shifts in the structure of production, PAMS re-weights the number of households belonging to each RH from the original sample to reflect the sectoral structure of production and employment in the simulated scenario.

Notice finally that this framework is simple and assumes no substitution between labor categories and sectors other than the ones that can be exogenously inserted into the simulation. Other options for the macro and labor models are possible (see for example for South Africa, Fallon and Pereira da Silva [1994]) where a specific two-level nested CES production function allows substitution factors of production and determines factor prices (real wages, price of capital) accordingly.

⁹ One way to proxy the workings of a production function $Y = f(L^{UNSK}, [L^{SK}, K])$ with three inputs (unskilled labor, and skilled labor substitutable with capital), is to consider that the premium that employers would pay is at minimum equivalent to the rental of one unit of capital. The rental of one unit of capital can be proxied by an opportunity cost such as the rate of profit (e.g., the economy's profits (PROF) or the returns on the stock of capital). However in the absence of information on the stock of capital (K), we proxy rate of profit by assuming that it is equivalent to the domestic lending interest rate r plus a commercial risk premium (ρ). Therefore,

$$w_{URB}^{SK} = (1 + r + \rho)w_{URB,Y}^{UNSK}$$

$$(r + \rho) \approx \left(\frac{PROF}{K} \right) = \left(\frac{p_r Y - \sum_i W_i L_i}{K} \right)$$

3.3. Prices

The Labor and Wage-Income module is run under the umbrella of the macro-consistency framework mentioned above. The general (GDP) price level of the macro-framework applies to the aggregate production. However, there are two endogenous determinations of changes in the price indices allowed once an initial price level is chosen.

Export prices are exogenous (following the traditional small country assumption). If E is the nominal exchange rate, and p^* the foreign currency price of exports, $p_x = E.p^*$.

In the rural areas, the price index is the weighted average of cash-crop prices and the prices of subsistence agriculture. The weights are their contributions to agricultural GDP. The change in the price index in the subsistence agriculture sector is a mark-up over cost components which include a weighted average of the minimum subsistence wage for the informal rural sector and formal rural wage cost.

$$p_{RUR} = E.p_{RUR}^* \frac{X_{RUR}}{Y_{RUR}} + p_{RUR,D} \frac{D_{RUR}}{Y_{RUR}}$$

$$p_{RUR,D} = (p_{RUR,D-1}) \left[1 + (\theta_1 \Delta w_{RUR,D} + \theta_2 \Delta w_{RUR,Y}) \right] \quad \theta_1 + \theta_2 = 1$$

In urban areas, we assume an identical procedure for determining price indices.

$$p_{URB} = E.p_{URB}^* \frac{X_{URB}}{(Y - Y_{RUR})} + p_{URB,Y} \frac{(Y - Y_{RUR} - X_{URB})}{(Y - Y_{RUR})}$$

$$p_{URB,D} = (p_{URB,D-1}) \left[1 + (\mu_1 w_{URB,D} + \mu_2 w_{URB,Y}) \right] \quad \mu_1 + \mu_2 = 1$$

Therefore, in nominal terms, GDP ($p_Y Y_Y$) can be expressed as the sum of nominal agricultural production ($p_{RUR} Y_{RUR}$), nominal exports (expressed in local currency, $p_x Y_x$) and the nominal value of domestic goods produced at the given domestic price ($p_D Y_D$) of non-tradable. Alternatively, the aggregate price level of the macro consistency framework (say the RMSM-X or another) can be used and one of the sectoral price levels would adjust residually.

$$p_Y Y = p_{RUR} Y_{RUR} + p_x X + p_D D$$

$$p_x X = p_{RUR,X} X_{RUR} + p_{URB,X} X_{URB}$$

$$p_D D = p_{RUR,D} D_{RUR} + p_{URB,Y} Y_{URB} + p_{URB,D} D_{URB}$$

These two RUR and URB price levels will be used to project the poverty lines in the rural and urban areas.

3.4 Income and Expenditures of Representative Households (RHs)¹⁰

a) Representative Households, Wage Income and Profits

We have now determined nominal wage income and employment (hence sectoral wage income) for the following categories of workers which constitute our i - representative households for this economy ($i = 1$ to 6).

Rural unskilled workers of the tradable goods sector: $W_{RUR,X}^{UNSK} \cdot L_{RUR}^{X,UNSK}$, $i = 1$

Rural unskilled workers of the non-tradable goods sector: $W_{RUR,D}^{UNSK} \cdot L_{RUR,D}^{X,UNSK}$, $i = 2$

Urban unskilled workers in the non-tradable formal private sector: $W_{URB,Y}^{UNSK} \cdot L_{URB,Y}^{UNSK}$, $i = 3$

Urban unskilled workers in the non-tradable informal private sector: $W_{URB,D}^{UNSK} \cdot L_{URB,D}^{UNSK}$, $i = 4$

Urban skilled workers in the tradable sector: $W_{URB,X}^{SK} \cdot L_{URB,X}^{SK}$, $i = 5$

Urban civil servants (skilled): $W_G \cdot L_{URB,G}$, $i = 6$

In addition, there is seventh non-working group that receives income in this economy. Capitalists and rentiers get non-wage income or profits $PROF = p_Y Y - \sum_i W_i L_i$, which is the difference between all income generated in the economy and wage income. We assume that there are no financial assets in this economy held by non-capitalist groups. There are, however, many ways in which this assumption can be relaxed if the distribution of financial assets is known (say from a detailed household survey). For example, the interest revenue from the macro-consistency framework could be split between various groups.

¹⁰ In Annex 5, we depart from the rule explained so far of 6 groups of RHs plus a 7th group of "Rentiers", by adding from the Burkina Faso case, used as an example, "Self-Employed", "Unemployed" and a small category of skilled workers in the Urban Non-Tradable Urban" sector.

Therefore, for this economy, the distribution of income by group is known and one can draw indicators of inter-group income inequality.

b) Disposable Income, Taxes and Transfers

Each RH pays income tax at a category-specific average rate τ over its respective gross income. Each RH also receives lump sum budgetary transfers T from the Government's budget. The Government initially is not capable of targeting the transfers T and therefore simply provides them on a per capita basis. Hence, disposable income is composed of wage income (or profits) plus social transfers from the budget to a specific labor category, minus taxes paid by that specific category of labor.

$$DINC_i = (1_i - \tau_i)(W_i L_i + PROF) + \left(\frac{T_i}{L_i}\right)$$

$$DINC = \sum_{i=1}^7 DINC_i$$

For consistency purposes, the sum of income taxes paid should be equal to the Government's budget's total income tax (and checked against the figures that appear in the macro-consistency framework such as the RMSM-X). A similar consistency check has also to be done for the total disposable income. The breakdown of total income between its wage and profit components should also be consistent with national account identities in the macro framework.

c) Expenditures, public and private

Each RH has also a structure of expenditures once its disposable income is determined.

In particular, we are interested by the complementarities between its expenditures on specific items such as education, health, social services and the same expenditures by the public sector. We assume that the social outcome on these social sectors will depend from both private and public spending.

The sums of both private and public expenditures on each specific item (such as education, health, etc.) should respect private and public budget constraints, included in both the household survey data, the budget data and the RMSM-X consistency framework.

$$DINC_i \leq \sum_{j=1}^J \kappa_i^j DINC$$

$$G \leq \sum_{j=1}^J \kappa_G^j G$$

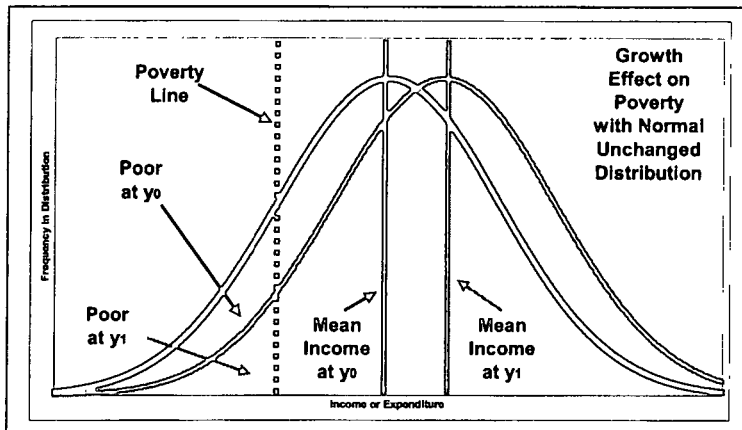
κ are the shares of each specific item (such as education, health, etc.) in private (i subscript indices) and public (G subscript index) budgets.

4. The Household Survey Simulator of the PAMS

The Household Survey Simulator is an Excel based program (written with Excel's visual basic macro instructions) that performs a projection of the structure of the HHS of a base year, according to a set of assumptions regarding the nominal growth rates of after-tax-and-transfer disposable income (DINC) of a set of representative households (RHs). The basic principle of the Simulator is simple. It is an extension of Bourguignon [2002] "decomposition" rule to several RHs.

$$DINC_t^{k,RH1} = (1 + g_t^{RH1}) \cdot DINC_{t-1}^{k,RH1}$$

Figure 4: Changing the DINC of each RH



For each household in the sample, the program will project its DINC according to the growth rate g_t^{RH1} that is given by the labor market simulation for the group to which this individual household belongs. Graphically, it corresponds, for each RH, to shifting the entire distribution of DINC to the right or to the left, depending on the macro-result of

the policy or the shock. For example, in Figure 4, if the distribution of income for all households inside a specific RH can be proxied by a normal density function, what the simulator does is to re-calculate for the whole economy (the 6 RH) the resulting changes in the inter-group poverty and income distribution, after changing the DINC of each household in each RH with its proper growth rate.

4.1. Income Distribution between RHs

Once we have established the disposable income for each of the 6 representative groups of this economy (and as a residual, the income of the “capitalists” and/or “rentiers”), it is easy to calculate a Gini coefficient measuring (disposable) income inequality. The Gini provides a measure of the distance between the perfect equality curve (Gini=0) where each group receives a share of income exactly proportional to its population size and the Lorenz curve obtained by the actual cumulative incomes of each group.

$$Gini = \frac{1}{2 \cdot n^2 \overline{DINC}_i} \sum_i \sum_j |DINC_i - DINC_j|, \quad i, j = 1, 2, 3, 4, 5, 6 \quad n = 7$$

$$\overline{DINC}_i = \frac{\sum_i DINC_i}{n}$$

In addition, one can also calculate a Gini for Rural and Urban areas separately. Also, note that the above inter-group Gini may be computed as twice the covariance of the mean income of each group and the group's relative rank, divided by the overall mean income¹¹

4.2. Projecting Poverty Headcount

PAMS is able to measure the effects of changes in policies and macro variables on the disposable incomes of each of our RH groups. Then, the framework uses household survey data to estimate the changes on the poverty headcount and the poverty gap.

Let us assume that we can define Poverty lines for the rural and urban sectors.

$$z_{RUR} = \bar{z}(p_{RUR})$$

$$z_{URB} = \bar{z}(p_{URB})$$

The labor market model generates growth rates of disposable income for each of our 6 groups and the group of capitalists and rentiers (6+1=7 groups). There is also information on household incomes or expenditures from a standard household survey (HHS). The P0 and P1 indices are projected by linking

¹¹ See Yitzhaki and Lerman (1991: 322) for details.

the results of the PAMS projected mean income of each of the 7 income groups to the income/expenditure levels of each household in the whole sample of the HHS¹².

The following are the key assumptions for the exercise:

The head of each household in the HHS belongs to one of the labor categories of PAMS. The HHS data provides the specific number of household members. PAMS assumes (as explained above) that the overall income or expenditure of each household grows by the same growth rate as the mean net income (minus taxes plus transfers) of the category to which it belongs. Thus the assumption here is that the distribution of income within each of our 7 groups is unchanged. Once this is done for a given year, a new poverty head count (P0) and poverty gap (P1) can be calculated counting all households in each of the 7 categories of RA, assuming a new projected level (nominal income-based) poverty line for rural and urban areas. By comparing the ex-post and ex-ante P0 and P1, an analysis of the impact of the shock or the policy change can be conducted.

4.3 Social Indicators and Solving for IDGs

PAMS can also feature as additional options new modules that can be constructed aiming to assess how the composition of expenditures (both public and private) affect macroeconomic outcomes. The underlying assumption is that there is a long term effect between skills accumulation and total factor productivity, for example *a la* endogenous growth.

It is possible to model this “micro” to “macro” linkage through –for example– the RMSM-X ICORs on the production side of PAMS and an “implicit” production function for social services. Recall that –in one of the possible specifications– the technology of production for rural output, depends on the (public) investment in rural infrastructure. Similarly, it can also be assumed that the skill composition in the economy could affect the urban ICOR σ_{URB} . The effect of skills is to increase productivity, i.e. to reduce the need for a higher share of fixed investment.

How would PAMS treat the accumulation of skills? First, there are public (exogenous) policies that favor skills upgrading. Spending in Education for example. But the “behavior” from unskilled workers can be also taken into account (also “exogenously” but with a rationale): they would spend a greater fraction of their disposable income into skills acquisition because of the income (wage) returns to education. There

¹² On additional feature: in order to account for structural changes in the economy, coming from changes in the composition of the labor force (skills), its allocation across sectors (sectoral labor demand) and the relative shifts in the structure of production, PAMS re-weights the number of households belonging to each RH from the original initial sample to reflect the sectoral structure of production and employment in the simulated scenario.

is finally an assessment of the efficiency of social expenditures on social items. Let us take the example of Education (Primary) enrollment below.

Education :

$$POP_i = \mu_i^{EDU} .POP$$

$$x_{G,i}^{EDU} = \frac{\kappa_{G,i}^{EDU} G}{POP_i}, x_{PRIV,i}^{EDU} = \frac{\kappa_i^{EDU} DINC_i}{POP_i}$$

$$\lambda_i^{EDU} = \Psi(DINC_i, x_{G,i}^{EDU}, x_{PRIV,i}^{EDU}) = DINC_i^\Omega + \left[\frac{2 \cdot \exp(\phi_{PRIV,i}^{EDU} x_{PRIV,i}^{EDU} + \phi_{G,i}^{EDU} x_{G,i}^{EDU})}{(1 + \exp(\phi_{PRIV,i}^{EDU} x_{PRIV,i}^{EDU} + \phi_{G,i}^{EDU} x_{G,i}^{EDU}))} - 1 \right]$$

$$IDG^{EDU} = g \left[\sum_i \mu_i^{EDU} \lambda_i^{EDU} \right]$$

$$GAP^{EDU} = \frac{IDG^{EDU}}{POP_i} = \Psi^{-1} \left(\frac{IDG^{EDU}}{POP_i}, x_{PRIV,i}^{EDU}, x_{G,i}^{EDU} \right)$$

It is possible to define the incidence of (private and public) expenditures on say, an education goal such as “enrollment ratio in primary schools”, for each of our RH groups. One has to assume the proportion of children that falls into the primary school category for each of our (i) groups (or in the current version, as an aggregate). Then per capita expenditures are calculated. The “enrollment” ratio is defined as a function of two arguments:

- Income per capita level of the labor category, and
- A logit function, normalized to yield results comprised between 0 and 1, is defined to determine the “enrollment” ratio, for each labor category. The logit function posits that the “enrollment” ratio is the joint product of complementary public and private expenditures on education. The estimation of the parameters $\phi_{PRIV,i}^{EDU}$ and $\phi_{G,i}^{EDU}$ for each group will tell the degree of complementarity between the public and the private expenditures.

The model can be solved in two modes:

- Positive mode: PAMS computes the enrollment rates resulting from the levels of (private and public) per capita expenditures on a specific social item.
- Normative mode: PAMS computes the levels of public per capita expenditures on a specific social item that is needed to achieve the desired level of an IDG, given an assumed level of private per capita expenditures.

5. Conclusions

This paper provides a general simple procedure for linking simple macro models (and particularly the macro-consistency frameworks such as the RMSM-X or the Financial Programming frameworks) to Household Surveys.

The method used in the PAMS sees growth as distributional dynamic process across several “typical” socio-economic groups or RHs. The framework determines the income of each group using a Representative Household (RH) hypothesis. It disaggregates production and “link” sectors with an explicit labor market broken down by labor categories. It simulates the top-bottom effects of macro economic policies and shocks on poverty and distribution using country-specific household survey (HHS).

But PAMS rests on a set of assumptions (and limitations) that have to be kept in mind by the user. The framework breaks down production from a pre-existing macro model. If –as it is the case with the RMSM-X—production comes from a fixed coefficient production function, it will remain so in the PAMS. Similarly, there is only partial (rural/urban) endogeneity of the changes in price indices. The framework –in general—continues to assume that there are limited relative price effects (except for the effect of the real exchange rate on exports and imports) affecting resource allocation in the economy.

The framework also assumes limited substitution between categories of labor, except for possible migration between rural and urban areas for unskilled workers.

The projected levels of poverty and inequality derive from the assumption that there are no changes in the distribution of income within each representative group, once the mean income of the economy is projected.

Finally, to see in practice how PAMS performs, we refer the reader to Annex 6 where we simulate a baseline macro scenario for Burkina Faso corresponding to existing poverty-reduction macro programs (a PRGF and PRSC) with the IMF and the World Bank. We introduce –within the assumptions of these existing programs—marginal changes of tax, fiscal and sectoral growth policies to reduce further poverty and the level of inequality vis-à-vis the base case. Hence, we make the case for the existence of several possible “equilibria” in terms of poverty and inequality within the same macro-stabilization framework.

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Annex 1¹³:

Policy Questions

**Areas of Policy Change Most Commonly Examined
in a Sample of PRSPs and I-PRSPs**

A survey was undertaken to assess the policy content of a sample of PRSPs and I-PRSPs. The objective of the exercise was to test in the sample what were the most common policies and instruments used for poverty reduction.

The sample consisted of 4 full PRSPs (100% of actual)¹⁴ and 13 I-PRSPs (40% of actual)¹⁵. Countries from MENA (1 I-PRSPs), AFR (4 PRSPs, 6 I-PRSPs), EAP (2 I-PRSPs), LAC (2 I-PRSPs), and ECA (2 I-PRSPs) were included.

To tabulate the policy content of existing PRSPs/I-PRSPs, the following methodology was used. Policy measures in each sample PRSP/I-PRSP were catalogued based on a list of specific macroeconomic and structural reform measures. The macroeconomic policy measures included monetary, fiscal, and exchange rate policies. The structural reform measures encompassed institutional changes (including anti-corruption, decentralization, tax administration, and budgetary reform), sectoral reform policies such as privatization, changes in tax rates, and expenditure increases/decreases in specific sectors. When a sample strategy advocated a specified policy change, a "hit" was generated in the table. The number of "hits" per policy was added up, and the percentage of I-PRSPs and PRSPs which cited that particular policy was calculated.

Some trends are apparent in the aggregation of the data. The most commonly advocated poverty reduction policies are expenditure increases in social sector spending, including primary health, education, and water & sanitation. Almost all of the sample strategies mention anti-corruption measures as well. Other institutional reform measures such as decentralization, civil service reform, and budgetary reform are also commonly cited. Although most policy measures advocate for some type of increase in expenditure, there is little mention of changes in macroeconomic policy targets to fund this increase. Instead, according to many of the strategies, governments will fund the increase in expenditure through improvements in tax administration and changes in the tax rates.

Every strategy in the survey promotes some increase in social sector spending.¹⁶ Areas of focus are primary health care, primary education, other education activities (adult training is frequently mentioned), and water and sanitation. All PRSPs and I-PRSPs mention increasing primary health and education expenditures. Most strategies also call for more investment in water and sanitation facilities and non-primary health and education. Governments also advocate for a reexamination of cost-recovery in social sectors in a number of strategies (38% of I-PRSPs, 50% of PRSPs).

Institutional reform measures to improve government efficiency and transparency are stressed in virtually all of the strategies. All PRSPs and almost all I-PRSPs (92%) promote some sort of anti-corruption policy. Decentralization of government activities is cited in virtually all the sample strategies (92% of I-PRSPs and 100% of PRSPs). Many strategies also mention civil service and budgetary reform.

¹³ This Annex was written by Alya Husain (PRMPR)

¹⁴ Uganda, Burkina Faso, Tanzania, and Mauritania

¹⁵ Yemen, Chad, Ghana, Cameroon, Kenya, Zambia, Rwanda, Cambodia, Vietnam, Bolivia, Honduras, Albania, and Georgia

¹⁶ In a few I-PRSP documents, this was implied rather than explicitly stated.

As noted earlier, very few strategies advocate macroeconomic policy changes (from previous IMF programs). The most commonly cited macroeconomic measure is a change in the fiscal target (23% of I-PRSPs, 50% of PRSPs). Although we have a very small sample, it may be of some significance that half of the PRSPs mention relaxation of the fiscal targets. As we move into the stage where more countries are preparing PRSPs with fully articulated public expenditure programs, the macroeconomic targets may be revisited.

Structural reform measures including trade reform, privatization, financial sector reform, and agricultural sector reform are frequently cited in the sample strategies. Policies advocated include customs reform, lines of credit for small and medium enterprises, privatization of utilities, and reform of the regulatory system. Among the most commonly cited agricultural policies are land reform and investments in rural infrastructure.

Improvements in tax administration as well as changes in tax rates and tax composition are commonly mentioned as a vehicle for increasing state revenues, especially in I-PRSPs. The resulting revenues are seen as crucial for financing the public expenditure program.

Very few strategies promote any decreases in expenditures. The Uganda PRSP is the only document which mentions that the government will decrease military expenditures, and few strategies also cite a decrease in specific subsidies. Most common among expenditure reductions are cuts in civil service employment taken in the context of a civil service reform.

Because of the absence of a significant sample of full PRSPs, the findings should be seen only as indicative. In most I-PRSPs, it was ongoing policies as opposed to fully articulated strategies which were assessed. As more PRSPs are developed, some of these conclusions, particularly those pertaining to the macroeconomic and fiscal areas could change.

Annex 2:

Extracting Relevant Information about Socioeconomic Groups from a Household Survey (HHS)

The analysis of the distributional impact of shocks and policies requires that information be organized according to the relevant socioeconomic groups that make up the society under consideration. The purpose of this annex is to explain in details the type of data required and how they could be extracted from a household survey. Some of the procedures involved will be illustrated in the context of the Burkina Faso 1998 Priority Survey.

I. Data Requirements

Fundamentally, the impact of shocks and policies on the living standard of individuals or household depends on their participation in the socioeconomic activity. The reward they get from this participation depends in turn on the source of their livelihood and how they allocate their resources. Thus employment status, and the level of earnings and expenditures are the key variables that must be combined with demographical information to organize the data in the desired structure.

Where to find this information in a household survey depends on the structure of the questionnaire. The 1998 Burkina Faso Priority Household Survey is Organized as follows:

- Section 0 provides information on the head of household such as her/his ethnic group or nationality, language, or religion.
- Section 1 contains information on the demographics of each household. For each household member, this section collects information on (1) the relation with the head of household, (2) age, (3) marital status, and (4) gender.
- Section 2 collects health information
- Section 3 contains information on education for members who are at least six years old.
- Section 4 collect information about literacy and migration for all members of the household who are at least 10 years old.
- Section 5 concerns the employment of all members of the household who are at least 10 years old. It gathers information on the principal occupation, the secondary occupation and previous employment. This is where one finds information on whether or not the household member is currently (i.e. at the time of the survey) employed, the type of employment (permanent or temporary position), the sector of employment, the skill profile, earnings and other compensations.
- Section 6 is on housing
- Section 7 is on agriculture and livestock
- Section 8 is on non-agricultural activities
- Section 9 collects information on access to basic social services.
- Section 10 provides information on household expenditure.
- Section 11 contains information revenues classified by source: Salaries, agricultural income, non-agricultural income and transfers.
- Section 12 has information on household assets.
- Section 13 provides anthropometrical data for children between 6 and 59 months of age.

The pilot version of PAMS is based essentially on information from Sections 0,1,5 and 10. Information on the revenue Section was deemed unreliable. We now move to explanation of how the data was processed to conform to the needs of PAMS.

II. Data Processing

Data processing is conducted into two basic steps. The first one is to define the following basic categorical variables.

- Working = 1 if the individual in question worked during the year of the survey, 0 otherwise.
- Rural=1 if individual resides in rural area, 0 otherwise.
- Public=1 if individual works in the public sector, 0 otherwise.
- Private=1 if individual works in the private formal sector, 0 otherwise.
- Tradable=1 if individual works in a sector producing tradable goods, 0 otherwise.
- Skilled=1 if individual is considered skilled, 0 otherwise.

The second step builds a global categorical variable by aggregating the basic variables defined above. In fact each final socioeconomic group is a subset of the cross-product of the elemental categorical variables. Example the group called Rural Nontradable Unskilled is defined as follows: Rural =1 and Tradable=0 and Skilled=0.

The following is an EViews Subroutine that defines the basic variables and does the aggregation:

```
'BFALPCLASS.PRG: A global subroutine called by BFALPGROUPS to restructure the 1998
Household Priority Survey for Burkina Faso according to the categories of the LP Module of
RMSM-X-LP.
'B.Essama-Nssah, PRMPR (World Bank) November 17, 2001
SUBROUTINE BFALPCLASS
'Make sure to start with a full sample
Smpl @all
Series LPSEG 'Socio-Economic Groups of LP
Series RURAL' =1 if G4=2 and 0 otherwise
Series WRKNG 'Dummy indicator of Economic Activity based on GSE <>7 and 9
Series PUBLIC 'Dummy indicator of Public Sector based on GSE=1
Series PRIVATEF ' Dummy indicator of Formal Private Sector based on PUBLIC=0 and GSE=2
Series TRDBL 'Dummy indicator of whether individual works in a tradable sector based on
GSE=5 or S51Q9>=10 and <=14
Series SKLD 'Dummy indicator of skill level mainly for the private formal sector based on
S51Q10=1-5; 6-8;9-10
'Recode Rural Sector
Smpl if g4=2
rural=1
Smpl if rural<>1
rural=0
'Assign Economic Status (working or not)
Smpl if S51Q2=1
wrkng=1
Smpl if wrkng<>1
wrkng=0

'Create Public Sector
Smpl if gse=1
Public=1
Smpl if Public<>1
Public=0
'Create Formal Private Sector based on gse
Smpl if gse=2
Privatef=1
Smpl if Privatef<>1
```

```

Privatef=0
'Define Sectors Producing Tradable Goods based on GSE and S51Q9: cotton and Mining
Smpl if (gse=5 or (s51q9>=10 and s51q9<=14))
  Trdbl =1
Smpl @all if trdbl<>1
  Trdbl=0
'Assign Skill Levels
Smpl if s51q10<=5
  skld=1
Smpl if (s51q10=6 or s51q10=7 or s51q10=8)
  skld=0
Smpl if s51q10>=9
  skld=2

'Build LPSEG

'Rural Nontradable (Assumed Unskilled)
Smpl if ((rural=1 and wrkng=1 and gse>=2) and (trdbl=0 and skld<=2))
  Lpseg=1
'Rural Tradable (Also Asummed Mostly Unskilled)
Smpl if ( (lpseg=na and rural=1 and wrkng=1) and (trdbl=1 and skld<=2))
  Lpseg=2

'Public Sector
Smpl if (lpseg=na and Public=1)
  Lpseg=3

'Urban Tradable Skilled (formal Private Sector )
Smpl if ( (lpseg=na and wrkng=1 and rural=0 and Public=0) and (privatef=1 and trdbl=1 and
skld=1))
  lpseg=4
'Urban Nontradable Skilled (Formal Private sector)
Smpl if ((lpseg=na and wrkng=1 and rural=0 and Public=0 ) and (privatef=1 and trdbl=0 and
skld=1))
  Lpseg=5
'Urban Nontradable Unskilled
Smpl if ((lpseg=na and wrkng=1 and rural=0 and public=0) and (privatef=1 and trdbl=0) and
(skld=0 or skld=2))
  Lpseg=6
'Urban Informal Economy (all assumed unskilled)
Smpl if ((lpseg=na and wrkng=1 and rural=0 and public=0) and (gse=4 or gse=5 or gse=6 or
gse=8))
  Lpseg=7

'Self-Employed
Smpl @all if ((lpseg=na and wrkng=1 and rural=0 and public=0 ) and (gse=3 and skld<=2 ))
  Lpseg=8

'Rentiers
Smpl if ( lpseg=na and S51Q2=6)
  lpseg=9
'Not working
'smpl if (lpseg=na and wrkng=0 and s51q2<>6)
smpl if (lpseg=na and (wrkng=0 or gse=7 or gse=9))
lpseg=10
'Back to full sample

```

```

Smpl @all
uno.statby(sum,nomean,nostd) lpseg 'To test for empty groups
ENDSUB

```

The above subroutine is embedded in the following program that does two things. It recodes the global categorical variable if there are some empty groups. After recoding, it processes a group of variables e.g. household size, household weight, per capita expenditure, total household expenditure, or total income. This process constructs distributions of these variables by socioeconomic groups. The final result is then exported to Excel creating a separate file for each socioeconomic group.

'BFALPGROUPS.PRG does two things: (1) It creates socioeconomic groups according to LP classification (this is done by calling the subroutine BFALPCLASS);(2) it processes a group of variables according to that classification and exports the results into Excel files. The program requires two arguments: the workfile and the categorical variable used in the creation of subsamples. These arguments must be specified within the call as in the following examples:

```
'Run(v) bfalpgroups bfa98lp lpseg or run(q) bfalpgroups bfa98lp lpseg
```

```
'B. Essama-Nssah, PRMPR (World Bank) November 17, 2001
'Revised March 7, 2002
```

```

Include BFALPCLASS
Load %0
Call BFALPCLASS

```

```

'Recode categories since preliminary tests revealed that LPSEG=4 yields an empty set; If not just
set lp=lpseg
Series LP 'To use in the call
Smpl if lpseg<=3
  lp=lpseg
Smpl if lpseg>4
  lp=lpseg-1

```

```
%v="lp"
```

```
smpl @all
```

```

Freeze(unotab) Uno.statby %1
!cat=@max({%v}) 'Total number of sub-samples

```

```
'Create group of variables to be processed
```

```
Group grp rural pdum hhsz hhwgt pcx tothx totinc
```

```
!gsz=grp.@count
```

```

'Initialize first column to receive results
!t=1

```

```

For !j=1 to !gsz
  %st= grp.@seriesname(!j)
  for !i=1 to !cat
    smpl if %v=!i
    !k=@obs({%v})
    if !k then 'To protect against vectors of null dimension
      vector(!k) v{%st}{!i}={%st}

```

```

        matrix(!k, !gsz) mat{!i}
        colplace(mat{!i}, v{%st}{!i}, !t)
    endif
next
!t=!t+1
Next
Smpl @all
For !i=1 to !cat
    mat{!i}.write(t=xls, a2) bfa{%v}mat{!i}
Next

```

'Note: if any of the above matrices has more than 8,193 rows EViews will issue an error message stating that the maximum size for a spreadsheet has been exceeded. When this happens, one may resort to the copy/paste facility or to an alternative platform such as SPSS. If any subgroup has more than 65,536 observations then there is no way to export the results to the current version of Excel (Excel 2000).

```

'Turn matrices into tables
For !i=1 to !cat
    freeze(bfa{%v}tab{!i}) mat{!i}
    setline(bfa{%v}tab{!i}, 3)
Next
'Label table columns
For !col=1 to !gsz
    %st= grp.@seriesname(!col)
    for !i=1 to !cat
        bfa{%v}tab{!i}(1, !col+1)=%st
    next
Next

```

'End of Program

One needs to keep the above limitations in mind. EViews will issue an error message if any of the socioeconomic group has more than 8,193 observations. The error will say that the maximum size for a spreadsheet has been exceeded. We are told by the makers of EViews that this is to maintain backward compatibility with an older version of Excel! However, one can go around this constraint by resorting to the copy/paste facility, provided that the number of observations to be exported is less than or equal to 65,536 (Excel 2000). Otherwise, one should think about moving to another platform.

III. Data Availability

Information on available household data sets may be found on the following Websites

The Poverty Monitoring Database

[HTTP://WWW.WORLDBANK.ORG/POVERTY/DATA/POVMON.HTM](http://www.worldbank.org/poverty/data/povmon.htm)

This site has six main components:

- o Household Survey for 124 countries (currently) classified by country, year or region.
- o News on upcoming surveys, studies and poverty assessments.
- o Social Indicators.
- o Basic information on participatory poverty assessment by the World Bank Group.
- o Links to other Relevant sites.

Africa Household Survey Databank

[THTTP://WWW4.WORLDBANK.ORG/AFR/POVERTY](http://www4.worldbank.org/AFR/POVERTY)

- The site provides information on access policy for both Bank and non-Bank users.
- As of August 1, 2001 the status of the Databank showed the following:
 - 110 surveys covering 37 countries
 - 28 Priority Surveys
 - 15 Household Budget Survey/Income and Expenditure Surveys
 - 21 Integrated Surveys
 - 1 Core Welfare Indicators Questionnaire (CWIQ) Survey
 - 40 Demographic and Health Surveys (DHS)
 - 1 Demographic and Health survey (non-DHS)
 - 4 Others

Annex 3¹⁷:**Labor Demand Elasticities for the PAMS****I. Objective**

The Labor and Poverty module features a simple segmented labor market. The user of the PAMS needs to estimate the coefficients (elasticities) of the labor demand equations that are described in the PAMS main document for the specific country he/she is concerned about.

In the absence of adequate time-series, this requirement could be a problem. This Annex aims at providing the user with a review of the literature on labor demand elasticities of wage and output for two heterogeneous labor groups (skilled and unskilled).

The present literature survey is not exhaustive. It aims simply to (1) provide an illustration of acceptable ranges of wage and output elasticities for labor demand; (2) identify labor databases that are accessible for economists; and (3) provide actual estimates of wage and output elasticities of labor demand using aggregated data of manufacturing and agricultural sector for two regions (Africa and Latin America).

II. Data Sources on Employment, Wage Rates and Output**II.1. Sources**

Useful labor data can be found in the following sources.

(1). Martin Rama and Raquel Artecona [1999] " A Database of Labor Market Indicators across Countries". This database covers most of the countries and report five years average figures to increase the reliability of the data from 1945-49. While this procedure tends to strengthen the quality of the data, only a limited number of observation is available.

(2). World Bank Database : SIMA. The World Bank database covers most of the developing countries for aggregate labor data (although there is some disaggregated data). However, this database comprises missing observations and is difficult to use for country specific research.

(3). IMF's IFS. This database is helpful for country specific analysis since it provides time series annual data for employment, output and aggregate average wage rate (disaggregated data is not available).

II.2. Extraction of Data**(2). The World Bank SIMA**

The data can be easily downloaded from Bank Intranet in Excel format. Here are some tips for the first users.

First: go to Bank Intranet and select Data shortcuts from full-down menu

Second: select SIMA query from the menu

Third: Double click QUERY in the box to activate the extraction process

Fourth: Select database (e.g., Regional Africa or others depending on your target)

Fifth: Select target countries

Six: Click series and select series (e.g. employment of agriculture as a % of total employment, Monthly wages of agricultural sector, value added as a % of total GDP)

¹⁷ This Annex was written by Hong-Ghi Min (PRMPR)

Seven: Click periods and select periods (e.g., 1980-1995)
 Eight: Click show data, this will show you requested data in Excel format
 Finally, Click File and double click export data from full-down menu
 Ten, Select Excel and assign a file name for data file you extracted.

III. Literature Review

In this section we report the results of a rapid survey of the literature on elasticities of labor demand grouped by industry, educational level, occupation, region, and countries.

III.1. Wage Elasticity of Labor Demand

Table A3-1 shows the results for some published studies on wage elasticity of labor demand. The results are that, first, estimates varies from -0.12 (Nadiri, 1968) to -1.54 (Symon and Layard, 1984) and most of elasticities are usually lower than 1 (in absolute value). Second, Heckman and Sedlacek (1985) report that in most cases, the manufacturing sector's age elasticity is smaller than that of non-manufacturing sectors.

III.2. Output Elasticities of Labor Demand

Table A3-2 provides the output elasticities of labor demand for different countries. First, the minimum value is 0.2 for the United States (Estevao, 1996) and the maximum value is 1.0 for the United States (Shapiro, 1986). In particular, Hamermersh (1993) finds that output elasticity is relatively insensitive to the functional form of the production function and that most estimates vary between 0.15 to 0.75.

IV. Data Collection and Estimation

We also collected data and conducted our own estimates for labor demand elasticities. Our findings are below.

IV.1. Data Collection

We used " A Database of Labor Market Indicators across Countries" by Martin Rama and Raquel Artecona., 1999 as well as (2) World Bank Database: SIMA. We have a set including Latin American and African countries. There is a relatively small number of observations available.

IV.2. Panel Estimation

The tested functional form is as follows:

$\text{Log}(\text{Labor}^{\text{demand}}) = a_0 + a_1 * \text{Log}(\text{Wage}) + a_2 * \text{Log}(\text{Output})$, where, a_1 is wage elasticity and a_2 is output elasticity of labor demand.

(1). Labor Demand Elasticity In Latin America

Fixed effect estimation, random effect estimation, and White (1980)'s heteroscedasticity consistent estimation method were employed and labor demand elasticities for Latin America as a whole is reported in Table A3-3. The estimation shows that the wage elasticity lies between -0.20 and -0.78 . Output elasticities lie between 0.3 to 0.87. All estimates are significant as is the case with wage elasticity. Actual estimation results are consistent with the literature surveyed in the previous section.

(2). Labor Demand Elasticity in Africa

First, we estimated the labor demand elasticities of manufacturing sector and results are reported in Table A3-4. For the manufacturing sector, wage elasticities hover from -0.2 to -0.71 and that of output hover between 0.32 to 0.92 . All estimates are significant except the wage elasticity of fixed effect model.

Next, we estimated the elasticities of labor demand for the agricultural sector and results are reported in Table A3-5. For the agricultural sector, wage elasticities hover from -0.44 to -0.88 and that of output hover between 0.64 to 0.72 . All estimates are significant at 1 percent critical level.

When we compare the absolute value of agricultural sector with that of manufacturing sector, estimates of elasticities for the manufacturing sector are higher than that of the agricultural sector.

IV. Conclusion

In the absence of country specific time-series, the recommended range of labor demand elasticities for the calibration of Labor and Poverty module, based on literature survey and actual estimation, can be summarized as follows.

(1). Estimates of manufacturing sector (proxy for the demand for urban labor)

We would recommend values between -0.20 to -0.9 for wage elasticity and 0.3 to 0.9 for the output elasticities.

(2). Estimates of agricultural sector (proxy for the demand for rural labor)

We would recommend value between -0.10 to -0.9 for wage elasticity and 0.2 to 0.9 for the output elasticities.

Table A3 - 1. Wage Elasticities of Labor Demand: Literature

Authors	Industry, Period, Country	η_{LL}
Kollreuter (1980)	Manufacturing, 71-77, West Germany	-0.20
Hsing (1989)	Manufacturing, 53-78, United States	-0.70
Heckman and Sedlacek (1985)	Manufacturing, 68-81, United States Non-manufacturing	-0.49 -0.93
Franz and Konig (1986)	Manufacturing, Translog, 64-83, U.S.	-0.96
Pencave and Holmlund (1988)	Manufacturing, 50-83, Sweden	-0.75
Harris (1985)	Manufacturing, 68-81, U.K.	-0.21
Nadiri (1968)	Manufacturing, Translog, 68-81, U.S.	-0.12
Layard and Nickell (1986)	Aggregate, 54-83, U.K.	-0.93
Andrews (1987)	Aggregate, 50-79, U.K.	-0.51
Harris (1990)	Aggregate, 65-87, New Zealand	-0.24
Symons and Layard (1984)	Manufacturing, 56-80, 5 OECD countries	-1.54
Wadhvani (1987)	Manufacturing, 62-81, U.K.	-0.38
Begg et al. (1989)	Aggregate, U.K., 53-85 Japan, 53-86	-0.40 -0.45
Maximun - 1.54 Minimum - 0.12		

Table A3 - 2. Output Elasticity of Labor Demand: Literature

Study	Country	OEL*
Nadiri & Mamuneas (1996)	US	0.36-0.37
Munnell (1990)	US	0.59
Estevao (1996)	US	0.2-0.22
Shapiro (1986)	US	1.00
Feldstein (1967)	UK	0.75-0.90
Lesli & White (1980)	UK	0.64
Hart & McGregor (1987)	Germany	0.31
Roberts & Skoufias (1997)	Colombia (Manufacturing)	Skilled 0.733, Unskilled 0.661
Pessino (1997)	Argentina	0.25
Lim (1976)	Malaysia	0.45-0.67
Gujarati (1999)	(Manufacturing)	0.67
The World Bank (2000)	Taiwan (Agric.)	0.38 (=share of labor)
Maximum 1.00 Minimum 0.20		

Table A3-3. Labor Demand Elasticity in Latin America: Manufacturing Sector

	Fixed Effect	Random Effect	White's Estimation
Constant	-----	4.97 (0.46)**	4.80 (0.79)**
Wage	-0.20 (0.08)*	-0.45 (0.07)**	-0.78 (0.12)**
Output	0.30 (0.07)**	0.57 (0.04)**	0.87 (0.04)**
Adjusted R-squared	0.45	0.88	0.95
No. of Observations	33	33	33

Note:

1. Panel of 11 countries with 11 observations (missing values)
2. Double asterisks denote that estimates are significant at 1 percent critical level
And single asterisk at 5 percent critical level.

Table A3-4. Labor Demand Elasticity in Africa: Manufacturing Sector

	Fixed Effect	Random Effect	White Estimation
Constant	-----	1.54 (0.78)	-1.76 (0.48)**
Wage	-0.20 (0.21)	-0.63 (0.15)**	-0.72 (0.09)**
Output	0.32 (0.07)**	0.62 (0.05)**	0.92 (0.04)**
Adjusted R-squared	0.25	0.58	0.95
No. of Observations	96	96	33

Note:

1. Panel of 12 countries with each of 16 observations are used (many missing values).
2. Double asterisks denote that estimates are significant at 1 percent critical level
And single asterisk at 5 percent critical level.

Table A3-5. Labor Demand Elasticity in Africa: Agricultural Sector

	Fixed Effect	Random Effect	White Estimation
Constant	-----	4.97 (0.46)**	1.06 (0.77)
Wage	-0.45 (0.21)*	-0.45 (0.07)**	-0.87 (0.07)**
Output	0.64 (0.08)**	0.57 (0.04)**	0.72 (0.04)**
Adjusted R-squared	0.45	0.88	0.89
No. of Observations	76	33	33

Note:

1. Panel of 11 countries with 16 observations are used (many missing values).
2. Double asterisks denote that estimates are significant at 1 percent critical level
And single asterisk at 5 percent critical level.

V. References

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Annex 4:

Linking PAMS with macro-consistency frameworks

Procedure for the RMSM-X¹⁸

We use the built-in linkages between cells in Excel worksheets to link the Labor and Wage-Income module and the RMSM-X.

The procedure to link cells in Excel is straightforward. You select the cell that you want to link by clicking on it. You type a equal sign (=) to prompt the cell for receiving an input. You then move your cursor to the RMSM-X sheet that you need, by clicking on the bottom bar of names for the relevant sheet. Then you go to the relevant cell and click on it. Type return and the link will be automatically selected. Usually, the mode under which the link is established is absolute. It means that the cell will register the link with the name of the worksheet, the name of the sheet inside the worksheet and the absolute references of the cell using dollar signs for the cell row and column (e.g., ='[RMSM-X_BRZ00.xls]PIT'!\$E\$45). When you need to copy the same reference to the right (in order to project the line) you will need to remove the first \$ sign (the column sign) to avoid copying the cell for this particular year only.

I. Loading files, databases and re-saving them

Load the Light Data Base (LDB) and any other Excel database that is necessary for your work (e.g., IFS, UNIDO, ILO, WBDI, WBGDF, etc.) and that might be available in the World Bank SIMA system of information.

Load the RMSM-X and the shell of the Labor and Wage-Income module, both in Excel.

Save under the shell of the Labor and Wage-Income module under the same directory as your RMSM-X, with a different name, related to the country you are working with.

Re-link the shell with the RMSM-X worksheet you are working with. Go to Edit in the bar menu of Excel, go down to Links... and select it.

When the Links window opens, click once on the RX file to highlight it. Then chose the Change Source button and click on it. For each database that is needed, use the same procedure.

Changing the data sources will produce some "errors", "#NA" in the Labor and Wage-Income module, because Excel select exactly the cell referenced in the shell, and the relevant data might not in the exact same cell in another database. Updating databases will therefore imply now a thorough examination of each spreadsheet in the Labor and Wage-Income module.

¹⁸ In this Annex, we depart from the rule explained in the PAMS of a fixed number of 6 groups of RH plus a 7th group of "Rentiers". We add from the Burkina Faso case, used as an example, "Self-Employed", "Unemployed" and a small category of skilled workers in the Urban Non-Tradable Urban" sector.

II. Updating the Original Data

Go to the Original Data spreadsheet (ORIGINAL DATA) in the Labor and Wage-Income module.

PRODUCTION	
Gross Domestic Product at mp	
RURAL	
GDP mp Agriculture (Primary Sector)	
GDP mp Agriculture, Tradable (Exports)	
GDP mp Agriculture, Non-Tradable	
Invest (Public sector in Agric. Infrastruct.)	
URBAN	
GDP mp Urban	
GDP mp Urban, Formal, Tradable (Exports)	
GDP mp Urban, Formal, Non-Tradable ()	
GDP mp, Urban, Informal	

The top of the spreadsheet should look like this. You need to update all the information in the blue column, including changing the base year for the projections (which should be consistent with the base year of the RMSM-X).

Some of the links with the LDB data base and/or the RMSM-X that you are using might have worked well, some not because of discrepancies between the exact location of

the cell referenced by the new module. You will have to check each cell in detail and make sure that it is the adequate information that is used by the Labor and Wage-Income module. Most of the data will come from the macroeconomic information available in the LDB data set.

LABOR FORCE TOTAL (unit: Millions)	
EMPLOYED LABOR FORCE TOTAL (unit: Millions)	
URBAN LABOR	
Skilled	78.105
Unskilled	
Public Sector	
Tradable Goods	
Skilled	
Non-Tradable	
Skilled	
Unskilled	
Informal (unskilled)	

However, in other instances (particularly regarding the composition and breakdown of the labor force and its associated remuneration) the information most likely will come from the local household survey.

For example, you have to fill all the relevant cells that will inform the model about the composition of the labor force

III. Linking/Updating the Production Data

Go to the Production spreadsheet (PRODUCTION) in the Labor and Wage-Income module.

PRODUCTION	1999	2000	2001
N.B. pink numbers = new production ICOR			
N.B. red numbers = from RMSM-X, SNA sheet			
N.B. blue numbers = from RMSM-X, TRADE			
PRODUCTION CONSTANT PRICES			
Gross Domestic Product at mp		1,028,875	1,117,516
RURAL			
GDP mp Agriculture		1,004,097	1,029,199
GDP mp Agriculture, Tradable (Exports)		37,436	46,948
GDP mp Agriculture, Non-Tradable		966,660	982,251
Invest (Public sector in Agric. Infrastruct.)		10,712	150,614
URBAN			
GDP mp Urban		24,778	88,317
GDP mp Urban, Formal, Tradable (Exports)		72,161	87,103
GDP mp Urban, Formal, Non-Tradable ()		674,228	676,348
GDP mp Urban, Informal		(721,611)	(675,134)

Check how the automatic change of Links has worked out. Whether the projected production data seems consistent. For example, there should not be any sudden jump in time series liked the one you can see in the GDP for Agriculture.

In the first line, GDP at market prices (mp), the first red cell (the first projected year) should be linked to the same cell (for the same year) of

GDP in constant prices in the SNA sheet in the RMSM-X.

In the second line (and the first red cell) GDP mp in Agriculture, should be linked to the Agricultural GDP in constant prices in the SNA sheet in the RMSM-X. The third line (blue), should be linked to the GDP in constant prices in the trade sheet in the RMSM-X (TRA). The relevant cell there is the one (or the sum of those) accounting for the exports of Agricultural products. Similar procedures should apply for the GDP mp in Urban sector.

The pink line represents the only line where the module projects its own view about a production function. It represents the private sector urban formal sector. You can chose your own view, or mimic the RMSM-X fixed coefficient ICOR procedure.

IV. Linking/Updating the Prices and Population Sheets

Similar procedures are needed for linking the price and population projections in the Labor and Wage-Income module with the relevant projections in the relevant sheets in the RMSM-X.

PRICES	1999	2000	2001
1= base year			
N.B. red numbers = from RMSM-X, PIT sheet			
EXTERNAL			
Exchange Rate, Nominal (LCU per USD)		1.0200	1.1016
Foreign Prices			
Export Agricultural prices (cotton)		0.9996	1.0269
Export Manufacturing prices		0.9770	1.0122
PRODUCTION			
Gross Domestic Product at mp		1.0441	1.1025
RURAL, Domestic prices			
GDP mp Agriculture		1.0225	1.0904
GDP mp Agriculture, Tradable (Exports)		1.0196	1.1312
GDP mp Agriculture, Non-Tradable		1.0250	1.0506
URBAN, Domestic Prices			
GDP mp Urban		1.0459	1.1036
GDP mp Urban, Formal, Tradable (Exports)		0.9965	1.1150
GDP mp Urban, Formal, Non-Tradable ()		1.0500	1.1025
GDP mp Urban, Informal		1.0500	1.1025

Go to the sheet PRICES in the Labor and Wage-Income module. The first step is to ensure that the exchange rate (based 1 in the base year for the simulations) is properly set up. Go to the first line where the nominal exchange rate in Local Currency Units (LCU) per one US dollar is displayed. The value of the line should follow the nominal depreciation of the exchange rate. If not, you should link the exchange rate

cells with the relevant cells in the RMSMS-X, in the Price and Interest Rates sheet (PIT).

A similar procedure has to be performed for the sheet POPULATION. Ensure that the serie of projection is adequately related to the population projections of the RMSM-X.

V. Linking/Updating the Income sheet.

Go to the Income sheet (INCOME) of the Labor and Wage-Income module. Two lines need to be linked properly and/or updated.

The Income sheet ensures that the projected sum of incomes of all agents in the economy adds up to the total disposable nominal income that is calculated in the macro-consistency framework (here the RMSM-X). That is done in the first line of the sheet, where the income of "Capitalists & Rentiers" is calculated as a residual between the total disposable nominal income that appears in the Private Sector sheet of the RMSM-X (PRS) and sum of incomes of all agents in the economy.

The other line that ensures consistency is the total direct tax payments by all agents that need to be consistent with the total income (direct) tax reported in the Government sheet in the RMSM-X. This line has to be linked to the GOV spreadsheet in the RMSM-X (direct taxes).

VI. Linking/Updating the Budget sheet.

BUDGET		1999	2000
BUDGET (Million of LCUs)			
REVENUE (Million of LCUs)			
Total Revenue including grants from RMSM-X		448,072	
Tax Revenue		291,836	
o/w Income Taxes (Direct Taxes) generated		51,940	
Nominal Deficit (from RMSM-X)		(98,866)	
Percent of GDP		-9.3%	
EXPENDITURE (Million of LCUs)			
A. Current Expenditures			
Public Sector Wages		45,171	
N.B. Wages from RMSM-X budget		20,000	
Other Non-Wages Current Expenditures (Residual Item)		183,469	
a) Military Expenditures		73,388	
b) Social Expenditures		110,081	
b1) Education of which		36,694	
Primary Ed.		11,008	
Second. Ed.		3,669	
Tertiary Ed.		22,016	
b2) Health		36,694	
b3) Income Transfers		40,363	
B. Capital Expenditures			
Investment Expenditures from RMSM-X		20,138	
C. Interest Payments			
Interest Payments from RMSM-X		223,126	
Total Expenditure (Constrained by RMSM-X deficit)		446,732	
in Percent of GDP		42.0%	

Go to the Budget sheet (BUDGET) of the Labor and Wage-Income module. Several items need to be reconciled in order to make the budget allocations in the Labor and Wage-Income module consistent with the overall envelope of public resources in the RMSM-X. The following lines need to be linked to the proper lines in the RMSM-X.

All the necessary links concern the GOV sheet in the RMSM-X.

Annex 5

Household Survey Simulator (HHSS)

I - Introduction

The HHSS is a set of two Microsoft Excel-Based worksheets that stores detailed relevant variables for analyzing and forecasting the impact of policy shocks (e.g. exogenous change in public wages, institutional change in the national minimum wage, change in public transfers, tax system, pension system, etc.) or macroeconomic performance (e.g. Economic growth, Inflation, etc.) on poverty reduction and income distribution. In fact HHSS (i) stores original data from a country 's household survey (ii) simulates poverty incidence and income distribution effect by category and by geographic region over ten (with possible extension to fifteen) years head from the base year for any given geographic poverty line profile and/or any income profile by category.

II - HHSS package

The HHSS package comprises two Excel worksheets. The original Household Database (called HHbase-country_ acronym) and the Simulator module (called Hhproj-country_ acronym). Both are described in the present guide that serves as a preliminary reference manual for running and extending the method to other countries. This guide contains explanations of files, worksheets, buttons, simulation rules, and output sheets.

III - The Household data (HHbase-country_ acronym)

The HHbase stores the original data from a given country 's household survey (HHS) into a specific format (the data is retrieved and arranged according to the procedure described in Annex 2). HHbase is the input file for the simulator module. HHbase is just a database file and does not contain any Excel macro. It contains fourteen worksheets.

- o The first sheet: Content worksheet describes the relevant information contained in the file
- o From the second to the eleventh sheet HHbase contains data for ten labor/income categories (See below for detailed information about these categories).
- o The twelfth worksheet contains the weights of each observation, according to the HHS information, by category and by individual observation.
- o The thirteenth worksheet contains the income by category and by individual observation
- o And the fourteenth worksheet is the expenditure by category and by individual observation.

The last four worksheets constitute input data for the simulator Module (HHProj).

The Categories of the Household data (HHbase)¹⁹

PS-1	<i>Public Sector assumed Skilled</i>
RSE-2	<i>Self-Employed assumed from Rural Zone</i>
RNTU-3	<i>Rural Non-Tradable assumed Unskilled</i>
RTU-4	<i>Rural Tradable assumed Unskilled</i>
UIU-5	<i>Urban Informal assumed Unskilled</i>
UNTU-6	<i>Urban Non-Tradable assumed Unskilled</i>
UNTS-7	<i>Urban Non-Tradable assumed skilled</i>
UTS-8	<i>Urban Tradable assumed Skilled</i>
KAP-9	<i>Capitalist assumed Skilled</i>
UNEMP-10	<i>Unemployed and other non active</i>
UNWEIGHT	<i>Unweighted series or Household weight from each category's sheet</i>
WEIGHT	<i>Weighted series or Individual weight with respect to the population from each category's sheet</i>
Income	<i>Individual or Household Income series from each category's sheet</i>
Expend	<i>Individual or Household expenditure series from each category's sheet</i>

IV - The simulator module (HHProj)

The HHProj is a separate worksheet and simulates poverty incidence and income distribution effect by category and by location (rural/urban) over fifteen years starting from a given base year, for a given poverty line and for income growth assumptions by category. It can operate as a stand-alone simulator as described in the main text of the PAMS. It suffices to input "exogenous" guess-estimates of the growth of nominal income for each of the ten categories of the Hhbase and run the Excel macro to obtain a simulation of the projected poverty incidence and Gini. Naturally, such an exercise will not be "macro-consistent" because the inputted growth rates would not necessarily be consistent with macroeconomic equilibria.

IV-1- Description: HHproj is linked to HHbase by a macro

The sheet "**McrSht**" is the starting worksheet containing the macro instructions to undertake a simulation.

The first step is to select a Baseline scenario. The worksheet is updated (and a Baseline is selected) by clicking on the button "Update the Baseline". This selected the last output of any simulation as a base.

The second step is to run a simulation by clicking in one of the four buttons **according to the type of simulation that the user wants**. Four types of simulations are possible, each corresponding to one of the four buttons available. The user can choose to simulate the poverty reduction and income distribution indicators in terms of household "Expenditure" or "Income" and in terms of weighted (W) representative household or un-weighted representative households (UW). Weights correspond to the number of people in the household, i.e. a "correction" for large households that will increase the likelihood of being in poverty.

¹⁹ In this Annex, we depart from the rule explained in the PAMS above of 6 groups of RH plus a 7th group of "Rentiers". We add from the Burkina Faso case, used as an example, "Self-Employed", "Unemployed" and a small category of skilled workers in the Urban Non-Tradable Urban" sector.

The sheet "McrSht"

Burkina Faso

Click Below to Update

At Individual Level (Weighted) At HouseHold Level (Unweighted)

Expenditure (W) Expenditure (UW)

Income (W) Income (UW)

These Updates Cover The Base Year and 10 Years ahead Projection.

Click here to update The baseline scenario → Update the Baseline Scenario

Household Survey, 1998

NB: Check that Excel is set in Automatic Calculation mode (Menu "Tools", then "Options", then "Calculation")
Check that Household Survey Data Base is Open

The sheet "**Assumpt**" is where assumptions are inputed. It contains (in columns):

- a. Two poverty lines:

In the Rural poverty line, the user has to input in the green highlighted cells, the starting level (\$/day or local currency/day) of the Poverty Line and the rule for indexing it to a given price index (or not). The Rural Poverty Line will be the threshold against which the incomes of households in the following categories will be assessed: Rural Non tradable Unskilled (RNTU), Rural Tradable Unskilled (RTU), Self-Employed (RSE), Unemployed and other non-active (UNEMP).

A similar requirement applies for the Urban poverty line. Again, the Urban Poverty Line will be the threshold against which the incomes of households in the following categories will be assessed: Public Sector (PS), Urban Non tradable Skilled (UNTS), Urban Non tradable Unskilled (UNTU), Urban Informal (UIU), Capitalists (KAP), and Urban Tradable Skilled (UTS).

- b. Assumptions of Nominal Income Growth by category.

The sheet "Assumpt"

Assumptions for Projection Scenarios, Growth Rates (Nominal, Annual)

Obs.	Year	Poverty lines		Occupational Categories, Representative Groups										
		For Rural and Unemployed	For Urban Sector	Public Sector	Rural Self-Employed	Rural, Non-Tradeable Sect., Unskilled	Rural, Tradeable Sect., Unskilled	Urban, Informal Sect., Unskilled	Urban, Non-Tradeable Sect., Unskilled	Urban, Non-Tradeable Sect., Skilled	Urban, Tradeable Sect., Skilled	Renters and Capitalists	Unemployed	
		PLRUR	PLURB	PS	RSE	RNU	RTU	UN	UNNU	UNTS	UTS	KAP	UNEMP	
Initial Poverty Line 1.2\$PPP/day		1\$/day	2\$/day	Last update statistic by:						Weighted Expenditure				
Inflation correct. only		Growth Rates of Poverty Lines		Growth rates of Average Income/Expenditures (annual) of Occupational Categories, Representative Groups										
Base Y	1998	0.0%	0.0%	3.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
1	1999	0.0%	0.0%	3.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
2	2000	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
3	2001	3.6%	3.6%	1%	7.2%	7.2%	-2.2%	12.7%	34.4%	2.5%	2.5%	11.0%	0.0%	
4	2002	1.8%	1.8%	0.9%	6.1%	6.1%	0.3%	19.3%	6.9%	12.6%	2.5%	4.7%	0.0%	
5	2003	0.9%	0.3%	1.0%	3.8%	3.8%	5.8%	16.3%	6.1%	12.4%	2.5%	6.5%	0.0%	
6	2004	1.6%	1.6%	1.0%	0.2%	0.2%	10.1%	14.9%	6.9%	12.3%	2.5%	6.5%	0.0%	
7	2005	1.8%	1.8%	1.0%	2.2%	2.2%	4.9%	14.5%	7.3%	12.0%	2.5%	5.7%	0.0%	
8	2006	6.0%	6.0%	1.0%	2.0%	2.0%	8.0%	12.9%	8.5%	11.9%	2.5%	6.2%	0.0%	
9	2007	3.0%	3.0%	1.0%	2.2%	2.2%	7.0%	12.6%	8.7%	11.6%	2.5%	5.8%	0.0%	
10	2008	3.0%	3.0%	1.0%	2.1%	2.1%	7.1%	12.2%	8.8%	11.4%	2.5%	5.4%	0.0%	
11	2009	3.0%	3.0%	1.0%	1.9%	1.9%	7.2%	11.9%	8.9%	11.1%	2.5%	5.1%	0.0%	
12	2010	3.0%	3.0%	1.0%	1.7%	1.7%	7.3%	11.6%	9.0%	10.9%	2.6%	5.0%	0.0%	
13	2011	3.0%	3.0%	1.0%	1.4%	1.4%	7.4%	11.4%	9.0%	10.7%	2.6%	5.4%	0.0%	
14	2012	3.0%	3.0%	1.0%	1.2%	1.2%	7.5%	11.1%	9.1%	10.5%	2.6%	5.0%	0.0%	
15	2013	3.0%	3.0%	1.0%	0.9%	0.9%	7.7%	10.9%	9.2%	10.2%	2.6%	4.6%	0.0%	

Update Growth By Category From LP

There are two modes that can be used to input the assumptions on Nominal Income Growth by category. The first is --as mentioned earlier--to input "exogenous" numbers for each year and each category. The second is to use the Excel Macro button "Update Growth By Category from the LP". This instruction will seek the relevant growth rates in the Labor and Poverty LP Module of the PAMS, provided that there is one for the country being analyzed and that it has been stored in the same directory of the HHProj. It is also possible to relate directly each cell of this sheet to the relevant cell of the Labor and Poverty LP Module using an Excel link or an hyperlink.

The sheet "ORIGIN-CFA"

The "ORIGIN-CFA" sheet contains the income or expenditure series by category, using the household data from HHbase

**Household Survey Data for Burkina Faso
Per Capita Expenditures Demominated In CFA Francs**

1	31,218	31,550	1,430	7,335	30,620	45,975	107,048	0	18,900	3,471	
2	39,072	29,025	1,856	9,549	43,920	56,321	113,457	0	26,736	10,078	
3	44,414	30,178	4,950	10,026	37,128	70,860	117,350	0	26,865	11,140	
4	43,171	34,341	5,880	11,889	40,650	71,593	128,300	0	23,150	12,900	

And the individual weight by category

Individual Weight										
1	4940.95	1359.12	1096.27	2603.76	1352.7	418.92	1169.8	0	1292.9	6450.08
2	1065.9	443.68	1479	4534.54	278.43	699.8	1011.9	0	544.6	589.8
3	5922.96	839.76	4961.6	2361.51	773.57	1250.1	890.61	0	780.56	3321
4	6603.1	1066.3	1190.85	2163.8	893.76	1020.87	621.05	0	1556.4	522
5	916.09	1006	2349.15	1457.75	792.66	762.24	875.12	0	1506.72	3601.73
6	443.68	877.68	977.1	5526.18	838.6	576.88	1075.68	0	2536.71	3579.9

Any zero "0" in the column "UTS-US" means that that category does not exist in the simple.

Other sheets in HHProj

The "ProjCalc" sheet contains all the calculations needed to produce the poverty and income reduction indicators. The Projections sheet contains the primary output calculated in "ProjCalc". "CHARTS" plots poverty incidences and income distributions indicators over ten years. "BASE" stores the baseline case (see above). "Chart 1" and "Chart2" provides the pictures of P0 and Ginis for the Baseline Case. "Chart3" provides the picture of the current simulation plotted against the Base as a first difference.

"OUT-TABLE1" contains the first set of summary tables

"OUT-TABLE2" contains a detailed set of indicators by category over ten years.

IV-2- Five steps for simulation of a Scenario

Caution:

Before starting running the HHProj, make sure that the following options are active under Excel's "Tools" bar menu, and "Options" command: The "Calculation" (instruction) has to be set into an "Automatic" mode.

Step 1: Fill out the assumption sheet ("Assumpt"). Chose one of two modes. Stand-alone simulation or Macro-consistent simulation. In the latter case, make sure that the information contained is consistent with or linked (using the Excel Macro) to the Labor module of the PAMS.

Step 2: Make your decision about the type of simulation (income or expenditure, weighted or not) – you would like to use - by clicking on one of the four buttons of the sheet "McrSht".

Step 3: Wait while the macro processes the calculations. Recall that each cell in the HHS of the base year is now "multiplied" by the growth rate of the category to which the household head belongs to.

Step 4: Get your results in "CHARTS", "Chart1", "Chart2", "Chart3", "OUT-TABLE1", and "OUT-TABLE2".

Step 5 (option): The simulator can also update the based line scenario. You have to click on the baseline scenario button.

Annex 6:²⁰

**Application of PAMS to Burkina Faso:
Poverty and Distribution associated with the current macro framework**

After the completion of its full PRSP, Burkina Faso is receiving a Poverty Reduction Support Credit from the World Bank (IDA). This annex summarizes the findings obtained using PAMS to project ex-ante the changes in the social and poverty indicators that one can expect from this credit over the medium-term (up to 2010).

We first set the context. Burkina Faso is a poor landlocked country with a limited resource base, high vulnerability to external shocks and very low human development. Since 1991, the country has embarked upon a comprehensive reform program and has made to date significant headway in its transition towards a market-oriented economy and a more selective role of the State. Despite the good progress achieved, the country remains one of the poorest in the world. Real GNP per capita was estimated at US\$230 in 2001. In the same year, on the basis of its human development index, Burkina Faso was ranked 159th out of 162 countries. According to the most recent poverty survey (1998), some 45.3 percent of the population lives below the poverty line.

I. Macroeconomic and Structural Reforms

Stabilization and Growth. Over the last decade Burkina Faso has established a relatively strong track record on macroeconomic performance. Since 1991 the country has implemented a wide range of economic reforms under a series of stabilization and structural adjustment programs supported by the Bank, the IMF and other donors. Real GDP growth picked up in 1994, after declining during the first half of the 1990s, and averaged 5.1 percent per year between 1997 and 2001. The relatively strong growth performance is attributable to the competitive gains following the 1994 CFA Franc (CFAF) devaluation, the large public investment program, and to financial and structural policies aimed at consolidating the market orientation of the economy and maintaining macroeconomic stability. Inflation, as measured by the consumer price index, steadily declined from 6 percent in 1996 to -0.2 in 2000.

Real GDP growth decelerated to 2.2 percent in 2000 because of adverse weather conditions, which resulted in a smaller cotton crop and a significant cereal deficit, and exogenous shocks.²¹ In 2001, real GDP growth reached 5.7 percent. The primary sector performed well and grew by 12.7 percent. Cotton production increased by 45 percent from the 2000 campaign, reaching 400,000 tons. This was due to good rainfall and an increase in farm-gate prices, which, in turn, led to an expansion of the cultivated area by 35 percent.²² The external current account deficit, excluding current official transfers, declined from 17.6 percent of GDP in 2000 to 15.9 percent of GDP in 2001.

²⁰ The descriptive sections of this Annex draw on the International Development Association (IDA) proposed Poverty Reduction Support Credit to Burkina Faso, April 17, 2002, Washington DC

²¹ Shocks included the increase in oil prices; the appreciation of the US dollar; and the deterioration of the political situation in Côte d'Ivoire, where 3 million Burkinabè reside, a factor that significantly reduced workers' remittances.

²² Producer prices were raised in 2001 by 10 percent (from CFAF 159 to CFAF 175/Kg of seed cotton). In addition, a bonus of CFA 25/kg was paid, representing the distribution of half of SOFITEX pretax profit in the previous campaign.

The fiscal performance in 2001 was mixed: the overall budget deficit (including grants) reached 4.8 percent of GDP (0.3 percent lower than programmed). The mobilization of fiscal revenue, however, was low, reaching 12.5 percent of GDP (1.5 percent of GDP lower than programmed). External assistance was also lower than expected, due to late delivery of certain creditors' contributions under the enhanced HIPC Initiative. Nevertheless, savings on current and capital expenditures contributed to offset this shortfall in revenues while budget expenditure in the social sectors continued to increase. The 12-month inflation rate in 2001 reached 4.9 percent, due to an upward pressure on food price resulting from the previous year's deficit in cereal production. Higher inflation and slight decline of the US Dollar against the Euro resulted in an appreciation of the real exchange rate, although the gains in competitiveness achieved through the 1994 devaluation were largely preserved.

Table A6- 1(a). Burkina Faso: Selected Economic Indicators (1999-2004)

	Actual		Projections			
	Estimate					
	1999	2000	2001	2002	2003	2004
Real GDP Growth (%)	6.3	2.2	5.7	5.7	5.4	5.4
GDP per capita (%)	3.4	-0.6	2.9	2.9	2.6	2.6
Population growth (%)	2.8	2.8	2.8	2.8	2.8	2.8
Inflation (CPI, %)	-1.1	-0.3	4.9	2.0	2.0	2.0
Tax Revenue/GDP	11.9	12.2	12.8	13.8	14.1	14.7
Overall Fiscal Balance/GDP Incl. Grants	-4.0	-4.2	-4.8	-5.9	-4.4	-2.7
/excl. Grants	-13.3	-12.7	-13.0	-13.5	-11.6	9.5
Current Account Balance/GDP, incl. Transfers	-12.8	-14.6	-12.4	-10.3	-9.0	-7.9
/excl. Transfers	-16.0	-17.6	-15.9	-14.1	-13.0	-12.1

Structural Reforms. Burkina Faso has been implementing a wide range of structural reforms in recent years. The country remains the most compliant member regarding the regional norms of the West African Economic and Monetary Union (WAEMU). The Government has greatly improved its budgeting and expenditure management practices and established a multi-year program to enhance staff capabilities on public financial management matters. Under Phase III of the privatization program (2001-2004), the Government aims at privatizing or liquidating 21 public enterprises, including the main public utilities (ONATEL, SONABHY and SONABEL).

The gradual liberalization of the cotton sector has continued. The State has become a minority shareholder of the cotton company SOFITEX (36 percent of capital) and has already indicated its intention to reduce further its share in favor of producer's associations (currently with 30 percent of capital). The monopoly of SOFITEX was ended in December 2001 and two new cotton zones have been opened to private investors. A number of important measures have been implemented in the area of civil service reform, including the adoption of a more compressed salary grid applicable to all civil servants, the interconnection of the payroll and civil service databases, and a new system of merit-based promotion. Furthermore, it is expected that the Supreme Audit Court (*Cour des Comptes*), with senior jurisdiction over the control of public finances, will be fully operational by end-December 2002.

II. Medium-Term Prospects and the Baseline scenario from the RMSM-X

Real GDP growth could reach 5.7 percent in 2002. SOFITEX is expected to break even in the next cotton campaign, and a further increase in cotton production is expected. Seed cotton producer price will remain unchanged at CFAF 175 per Kg.²³ Assuming a normal cereal crop, the primary sector is expected to grow by 3.2 percent. Growth will pick up in the secondary and tertiary sectors (6.6 and 7 percent respectively), as a result of stronger demand linked to the

²³ In reality, producer price will decrease by 12 percent, in that the bonus paid during the current campaign, amounting to CFAF 25 per Kg of seed cotton, will not be paid to the producer during the next campaign.

economic recovery. Inflation should decline to some 2 percent. The current account deficit, excluding current official transfers, is projected to improve to 14.1 percent of GDP, as a result of substantial increase in the volume of cotton harvested in late 2001 but exported in 2002.

The overriding fiscal objective for 2002 and the medium-term is to consolidate Burkina Faso's budgetary position, which entails significant efforts to increase revenues, to improve budgetary management, and to introduce greater efficiency in public spending to support the government's poverty reduction program. For 2002, fiscal revenue is projected to rebound to 13.8 percent of GDP. The disbursement of HIPC resources will be accelerated to make up for the slow start in 2000-2001. Expenditure will continue to be contained to levels compatible with revenue performance, while social expenditure will continue to increase in 2002 (See Annex 6). For the medium term, assuming no exogenous shocks and the maintenance of sound economic policies, growth could remain at around 5.5 percent.

Burkina Faso's PRSP set an ambitious target for the decline in the proportion of people below the poverty line, from some 45 to 30 percent between 2000 and 2015. In the light of recent exogenous shocks that lowered growth in 2000, lower than expected growth in the medium-term, and the continued vulnerability of the Burkinabè economy to export shocks, this ambitious target may not be attained unless significant efforts are taken to ensure that growth will be sustained and pro-poor. In order to do so, it is necessary to find an appropriate mix of fiscal, monetary and public investment policies that would bring the economy to a higher growth path while maintaining an adequate level of consumption.

In the light of the shortcomings of current macroeconomic models utilized by the authorities a new growth/poverty scenario for the medium term is being elaborated in collaboration with the World Bank. This work will benefit from the utilization of new macroeconomic modeling tools that can simulate the impact of alternative policy packages, and shocks of various kinds, on growth, poverty and distribution for the population as a whole and selected socio-economic groups. The first result, including the presentation of growth/poverty scenario for the period 2002-2015, will be presented by end-April 2002.

Table A6- 1(b). Burkina Faso: Projected Baseline Economic Indicators (2001-2010)

Der. Indicator Table for the Public Closure	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Growth Rate of GDP	6.2%	5.8%	5.7%	5.5%	5.5%	5.0%	5.0%	5.0%	5.0%	5.0%
Absorption Growth	5.0%	5.4%	5.7%	5.3%	5.4%	4.8%	4.8%	4.8%	4.8%	4.8%
Consumption Growth	3.4%	5.5%	6.9%	4.9%	5.6%	4.8%	4.8%	4.8%	4.8%	4.8%
Private Consumption	2.9%	3.3%	7.2%	4.9%	5.6%	4.3%	4.4%	4.5%	4.6%	4.3%
Investment Growth (GDI)	10.2%	5.0%	2.0%	6.6%	4.8%	5.0%	5.0%	5.0%	5.0%	5.0%
Investment Growth (GDFI)	10.2%	5.0%	2.0%	6.6%	4.8%	5.0%	5.0%	5.0%	5.0%	5.0%
Import (GNFS) growth	4.8%	4.4%	3.9%	3.9%	3.7%	3.3%	3.2%	3.2%	3.2%	3.2%
Export (GNFS) growth	15.7%	6.9%	1.0%	3.5%	2.1%	2.3%	2.3%	2.3%	2.4%	2.4%
Real Per Capita Growth Rates:										
Gross Domestic Product (GDP)	3.3%	2.9%	2.8%	2.6%	2.6%	2.1%	2.1%	2.1%	2.1%	2.1%
Total Consumption	0.6%	2.6%	4.0%	2.0%	2.7%	1.9%	1.9%	1.9%	1.9%	1.9%
Private Consumption	0.0%	0.4%	4.2%	2.0%	2.7%	1.4%	1.5%	1.7%	1.8%	1.5%
Per Capita US\$ Levels:										
Gross Domestic Product (GDP)	204	219	235	247	259	269	279	289	300	311
Total Consumption	182	193	208	216	227	235	243	251	260	269
Private Consumption	164	171	184	192	202	207	214	221	228	235
memo item : GDP in US\$	2369	2608	2877	3111	3365	3586	3822	4073	4341	4627
Debt and Debt Service (LT+ST+IMF):										
Total DOD (US\$M)	1396	1488	1568	1677	1820	2020	2234	2500	2792	3121
Total Debt/GDP	58.9%	57.1%	54.5%	53.9%	54.1%	56.3%	58.5%	61.4%	64.3%	67.5%
Debt Service (US\$M)	71	60	60	70	26	44	70	132	134	180
Debt Service / Total Exports	22.2%	18.2%	17.0%	17.9%	6.4%	10.2%	15.6%	27.9%	27.0%	34.7%
Debt Service / GDP	3.0%	2.3%	2.1%	2.2%	0.8%	1.2%	1.8%	3.2%	3.1%	3.9%
Interest Burden (LT+ST+IMF):										
Interest Paid (US\$M)	19	-3	-2	0	7	30	44	60	80	102
Interest Due (US\$M)	19	-3	-2	0	7	30	44	60	80	102
Interest / Total Exports	5.9%	-0.9%	-0.6%	0.1%	1.6%	6.9%	9.8%	12.7%	16.1%	19.7%
Interest / GDP	0.8%	-0.1%	-0.1%	0.0%	0.2%	0.8%	1.2%	1.5%	1.8%	2.2%
Goods Market										
As a Share of GDP in LCU:										
Resource Balance	-17.6%	-16.7%	-15.6%	-15.0%	-14.7%	-14.5%	-14.4%	-14.2%	-14.1%	-13.9%
Exports	11.3%	10.7%	10.3%	10.3%	9.9%	9.7%	9.5%	9.3%	9.1%	8.9%
Imports	28.9%	27.4%	26.0%	25.3%	24.6%	24.2%	23.9%	23.5%	23.1%	22.8%
Consumption	88.9%	88.4%	88.6%	87.7%	87.6%	87.4%	87.2%	87.0%	86.9%	86.7%
Private	80.4%	78.3%	78.6%	77.8%	77.7%	77.1%	76.7%	76.3%	76.1%	75.6%
Public	8.5%	10.2%	10.0%	9.9%	9.9%	10.2%	10.5%	10.7%	10.7%	11.1%
Investment	28.7%	28.3%	27.1%	27.4%	27.1%	27.1%	27.2%	27.2%	27.2%	27.2%
Private	12.6%	12.9%	13.1%	12.7%	13.5%	13.5%	13.6%	13.9%	14.4%	14.6%
Public	16.1%	15.4%	14.0%	14.7%	13.6%	13.7%	13.5%	13.3%	12.9%	12.7%
GDFI	28.7%	28.3%	27.1%	27.4%	27.1%	27.1%	27.2%	27.2%	27.2%	27.2%
Changes in stocks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gross Domestic Savings	11.1%	11.6%	11.4%	12.3%	12.4%	12.6%	12.8%	13.0%	13.1%	13.3%
Total Savings	28.7%	28.3%	27.1%	27.4%	27.1%	27.1%	27.2%	27.2%	27.2%	27.2%
Foreign Savings	13.3%	11.5%	10.7%	9.9%	9.9%	10.1%	10.2%	10.4%	10.7%	11.1%
Gross National Savings	15.3%	16.8%	16.4%	17.4%	17.3%	17.0%	17.0%	16.8%	16.5%	16.1%
Monetary Savings	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Government Savings	3.1%	3.3%	3.4%	3.6%	3.6%	2.3%	1.6%	1.0%	0.4%	-0.4%
Private Savings	12.2%	13.5%	13.0%	13.8%	13.7%	14.8%	15.5%	15.8%	16.1%	16.5%

III. Poverty Profile and Social Indicators

Poverty Profile. In 1996 and 2000, the Government issued poverty profiles based on the results of priority surveys conducted in 1994 and 1998. Over this period, poverty incidence remained broadly stable (from 44.5 percent in 1994 to 45.3 percent in 1998). Poverty in Burkina Faso is predominantly rural, accounting for 94.5 percent of national poverty, and the incidence of poverty is markedly higher in rural (51 percent) than urban areas (16 percent). But the incidence of urban poverty has increased from 10 to 16 percent between 1994 and 1998, and this has been accompanied by an increase in urban inequality. The southern region of the country has the lowest poverty incidence, at 37 percent, while the center-north part of the country displays the highest level, 61 percent. Income disparities amongst socio-economic groups vary dramatically. The richest 20 percent of the population account for over 61 percent of aggregate national income, whereas the poorest 20 percent account for less than 5 percent. The analysis of poverty among socioeconomic groups (based on source of income) shows that between 1994 and 1998 the incidence of poverty increased for all groups except cash crop farmers. It is highest among food crop farmers, who account for most of the population living in poverty.

Table A6- 2. Burkina Faso: Distribution of Welfare Across Economic Regions (1994 and 1998)

	Headcount Index (%)		Poverty Gap Index (%)		Relative Contribution (%)	
	1994	1998	1994	1998	1994	1998
Wage public	2.2	5.9	.40	1.6	.20	.50
Wage private	6.7	11.1	2.2	2.5	.40	.70
Artisans/Commerce	9.8	12.7	2.8	2.7	1.4	1.6
Other activities	19.5	29.3	6.4	7.0	.30	.40
Export farmers	50.1	42.4	13.8	12.5	11.8	15.7
Subsistence Farmers	51.5	53.4	16.3	16.5	78.9	77.1
Inactive*	41.5	38.7	14.5	12.1	7.1	4.0
National	44.5	45.3	13.9	13.9	100.0	100.0

*Category including all observations that did not fit the remaining socio-economic groups.

Social Development. Expenditure on social sector (including the utilization of HIPC resources) increased from 4.6 percent of GDP in 1996 to 6.2 of GDP in 2001.²⁴ This reflects the commitment of the authorities to execute the poverty reduction program embedded in the PRSP in its entirety. Overall, social expenditure in 2001 (including HIPC resources) is estimated at 23.3 percent of total expenditure, up from 18.3 percent in 1999 and 20.6 percent in 2000 (see Annex 6) Despite the substantial increase in government resources allocated to social services, commensurate progress in social and human development has not been forthcoming. Although key and education and health indicators have improved in recent years, most social indicators of Burkina Faso are poor, even by Sub-Saharan Africa standards (see also Part IV. B, Section 2).

Table A6- 3. Burkina Faso: Selected Health Indicators (1998/99)

Country	Life expectancy at birth (years)	Infant Mortality Rate (per 1000 live births)	Under five mortality (per 1000 live births)	Total Fertility Rate	HIV Prevalence Rate (%)	Malnutrition Rate (weight for age, %)
Burkina Faso	46	105	219	6.8	7	32.7 (34.3)
SSA	52	91	151	5.6	8	32

²⁴ Expenditure refers to the sum of current and capital expenditure. Social sectors include health, education, women's welfare and other social expenditure and rural roads.

The PRSP Process

PRSP Main Objectives. The PRSP outlined and prioritized the Government's poverty reduction strategy along four main pillars: (i) accelerating broad-based growth; (ii) ensuring that the poor have access to basic social services, (iii) expanding opportunities for employment and income-generating activities for the poor and (iv) promoting good governance. The PRSP focused mainly on three priority sectors – education, health and rural development – where public interventions traditionally have had the highest payoffs in terms of fostering economic growth, increasing employment opportunities, and raising the Burkinabè standard of living.

PRSP First Year Progress Report. Burkina Faso had unforeseen constraints in executing its priority poverty reduction program, chiefly exogenous shocks and lower than expected receipt of funds under the enhanced HIPC Initiative because of delays in finalizing agreements and non-participation by certain creditors in 2000 and 2001. Despite these constraints, the Government has continued to promote an enabling environment to foster growth and carry out its poverty reduction program, ensuring the effective implementation of priority actions, as listed in the PRSP. In October 2001, the Government presented its first PRSP-PR, prepared with extensive consultation with civil society and the donor community.

The PRSP-PR and related JSA were presented to, and endorsed by, the Boards of the World Bank and IMF Boards on November 30, 2001 and December 6, 2001, respectively.²⁵ Overall, the balance of the first year of the implementation of the PRSP was deemed satisfactory. In particular, notable progress was achieved in intensifying the debate on poverty reduction in the country, fostering the participatory process associated with the implementation of the PRSP and its revision, and in the health sector where most of the PRSP targets for 2000 were met or exceeded.

Areas for further improvement were also identified, including: (i) updating of the medium-term macroeconomic framework and its links to poverty reduction, in the light of lower than expected domestic growth for 2000 and beyond and global economic slowdown, (ii) taking concrete action with a view to setting up a monitoring and evaluation system for the PRSP and strengthening the quality of social statistics, and (iii) developing a global vision on rural development, by relying on the program outlined in the PRSP. Since the elaboration of the PRSP-PR, efforts have continued to press ahead with the implementation of the poverty reduction strategy (See Annex 3). Moreover, the proposed PRSC II has taken concrete measure to address some of the recommendations that emerged from the PRSP-PR exercise, as reflected in the Matrix of Policy Action (MPA), presented in detail in Annex 9 and discussed in the Section IV below.

Support to the Implementation of the PRSP: The PRSC Program.

Rationale. The overarching objective of the PRSCs series is to support the implementation of Burkina Faso's PRSP. PRSCs provide highly concessional financial assistance to help Burkina Faso implement the PRSP on the understanding that the resource allocation mechanism is supporting efficient, poverty-oriented expenditures in all sectors. These credits do not provide support to all the policy measures but selectively focus on key policy and institutional reforms in areas where IDA has a comparative advantage. Given the emphasis in the Burkina Faso PRSP on public expenditures as the main tool for PRSP implementation, the focus of PRSCs is predominantly on the reform program to improve the effectiveness of public spending, as well as the transparency and accountability of public resource management. PRSCs, nevertheless, also

²⁵ See IDA/ (...). In the JSA, finalized in October 2001, the staffs of the World Bank and IMF stated that the country's efforts to implement the strategy provide sufficient evidence of its continuing commitment to poverty reduction and, therefore, that the strategy continues to provide a credible poverty reduction framework and a sound basis for World Bank and Fund concessional assistance.

support key sectoral reforms, in the sectors highlighted in the PRSP as priority for poverty reduction.

Sequencing. The time horizon of the PRSC series corresponds to the PRSP and CAS periods. The CAS, finalized in November 2000, supports the Government efforts to achieve sustained growth rates, reduce the incidence of poverty and improve the health and education of the rural population, as described in the PRSP (See Annex 4). The Bank's Board approved the first annual single-tranche PRSC for Burkina Faso on August 23, 2001. The credit established a rolling medium-term policy framework setting out a three-year reform program aiming at implementing the PRSP, with specific progress benchmarks and outcomes indicators defined and agreed with the Government and all donors.

The rolling nature of the policy framework should enhance predictability of funding for the Government and allow the Bank to better monitor progress towards the PRSP target indicators. To the extent feasible and depending on country performance, future PRSC series will be aligned with the country's budget cycle to make sure that resources are available during the first quarter of the calendar year.²⁶

IV. The Results of the PRSC as a Baseline for PAMS

We took the macro scenario outlined above for the PRSC to project a macroeconomic framework with the RMSM-X. The results of this initial run are in Table A6-1(b). The simulated growth story looks quite promising. In particular, there is a steady 2.6% p.a. average growth of per capita income in Burkina Faso during the years of the program, followed by a continuous 2.1% growth in per capita income from 2006 onwards.

This high level of growth –and its steadiness—requires a continuous investment effort (of about 27-28% of GDP) and is accompanied by a required inflow of resources to finance imports of about 14-15% of GDP. Therefore, after the HIPC operation, the baseline scenario still projects an increase in debt-to-export ratios that will have to be addressed by other structural policies relevant to the external balance.

Then, we incorporate this macro framework into the PAMS. We construct a baseline case with PAMS. The picture projected by PAMS looks as follows. For the labor market PAMS projects a stable participation rate. The labor force grows from 6.56 million in 2002 to about 8 million in 2009-2010. We assume a small migration of about 30,000 workers per annum between the rural and urban areas and a labor supply in the urban areas (respectively rural areas) that grows from about 800,000 in 2002 to 1.2 million in 2010 (respectively 5.7 million in 2002 to 7 million in 2010). Labor demand, in turn, in the urban areas (respectively rural areas) grows from about 440,000 in 2002 to 620,000 in 2010 (respectively 5.1 million in 2002 to 5.2 million in 2010). Therefore, unemployment rates tend to grow more in rural areas (and thus cause migration), rising from about 10.5% in 2002 to about 25% in 2010. In urban areas, there is no significant growth in unemployment rates but the overall level remains high throughout the simulation period (from about 45% in 2002 to 46% in 2010).

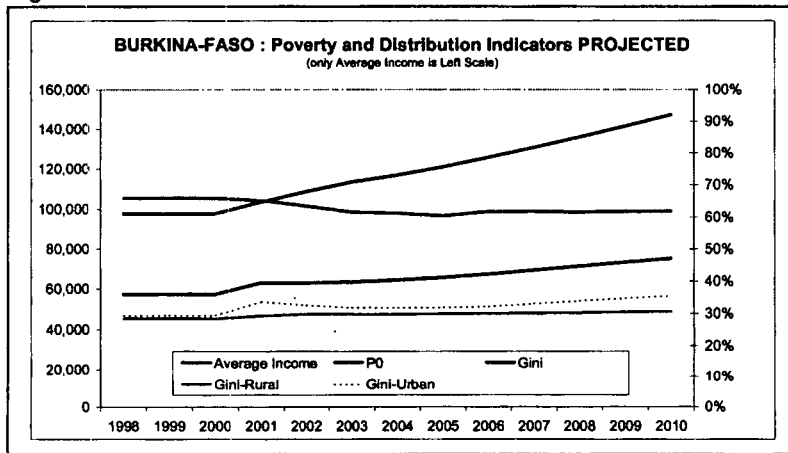
Given the relative sectoral growth rates, labor demand grows faster for both the tradable goods rural and urban sectors, while by construction, there is no "skilled" unemployment in Burkina Faso.

²⁶ Bank lending to Burkina Faso will increasingly take the form of results-driven programmatic credits (PRSCs) and self-standing projects for capacity building, support for Community Driven Development activities (concentrating on rural, social or HIV/AIDS interventions) and infrastructure investments directly targeted to poverty alleviation and private sector development. There will be a continuation of analytical and advisory activities as knowledge is the critical input for progress in the substantive areas presented in the PRSP.

The baseline scenario maintains throughout the 2002-2010 period the structure of public expenditures of the most recently audited budget (that of 1998). The taxes and transfers are therefore projected accordingly. In that context, the projected net (after income taxes) nominal income after transfers can be seen in Table A6-5 below. The beneficiaries of the relatively high growth performance of Burkina Faso are first the skilled workers in the tradable sectors of the economy. Their relative scarcity and the growth in demand explain that their income grow by about 10-12% in urban areas and 5-8% in rural areas on average during the 2002-2010 period. In contrast, unskilled labor in informal sectors in urban areas benefit from budgetary per capita lump sum transfers and their nominal income grow by 12-14% in nominal terms while unskilled workers in rural areas benefit less from growth and their incomes grow by 1 to 2% only.

As a result of these assumptions and results, PAMS can project the poverty indicators for Burkina Faso (see Table A6-6 below). Note that there is a difference between the official Government poverty headcount (P0) initial number (45%) and PAMS' initial P0 (66%) due to the different poverty line that is used (\$1/day in rural areas and \$2/day in urban areas on a PPP basis) and that is higher than the official poverty line. There are also other minor differences between the way the Government projects its own poverty line over the simulation period, and PAMS' indexation of its 2 poverty lines to the RMSM-X inflation rate measured by the consumer price index.

Figure A6-1:



What is interesting is the path obtained by PAMS for the projection period (see Figure A6-1). The results show that the PRSC baseline scenario does manage to reduce P0 by about 4 percentage points (compared to a target of reducing it from 45% to 30% --but in 2015--). A linear interpolation of our result would be that P0 in 2015 would be around 60% (measured

by PAMS poverty lines). While this is encouraging, PAMS' results suggest that growth alone – and even relatively high growth—will not be enough to significantly reduce poverty in Burkina Faso, even when different measures of poverty lines are used. More worrisome, the baseline scenario shows that there is an increase in inter-group inequality in Burkina, measured by the inter-group Gini. The overall inter-group inequality increases from about 0.36 to 0.46. This result is consistent with the sectoral growth that benefits essentially the incomes of urban areas vis-à-vis that of the rural areas where there is a higher concentration of poor people.

There is much more work that is required to refine the simulations of the baseline case. Furthermore, after refining the baseline, more work is needed to simulate “corrective” policies that would reduce poverty further and at least stabilize the level of inequality in the country. One can think for instance in using additional fiscal instruments (e.g., social transfers, differentiated tax rates, etc.) to produce a more likable alternative scenario within the macroeconomic framework defined by the PRSC.

Nevertheless, the objective here is simply to note that PAMS is capable of identifying issues that are relevant for the policy discussion using a consistent three-layer framework that shows poverty indicators projected consistently with a given macroeconomic framework.

Table A6-4: Burkina Faso: Projected Baseline Labor Market (2001-2010) by PAMS

LABOR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
LABOR FORCE (included unemployed) assumed exogenous participation rate	6.31	6.37	6.56	6.74	6.93	7.13	7.33	7.54	7.75	7.97	8.19
LABOR DEMAND											
URBAN LABOR	0.39	0.41	0.44	0.46	0.48	0.50	0.52	0.55	0.57	0.59	0.62
Skilled	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25
Unskilled	0.15	0.17	0.19	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.36
Public Sector	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Tradable Goods											
Skilled (supply constrained)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Tradable											
Skilled (supply constrained)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Unskilled	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.08	0.08	0.09
Informal (unskilled)	0.11	0.12	0.13	0.15	0.17	0.19	0.21	0.22	0.24	0.26	0.28
RURAL LABOR	5.16	4.99	5.13	5.25	5.22	5.24	5.23	5.22	5.22	5.21	5.19
Formal (export) unskilled	1.03	1.01	1.03	1.07	1.15	1.18	1.25	1.31	1.38	1.45	1.52
Unskilled Informal & Self-Employed	3.88	3.98	4.10	4.18	4.08	4.06	3.98	3.91	3.84	3.76	3.67
LABOR DEMAND TOTAL	5.56	5.41	5.57	5.70	5.71	5.74	5.76	5.77	5.78	5.80	5.81
LABOR SUPPLY											
URBAN LABOR (supply / elasticity to real wage, all unemployment)	0.71	0.75	0.79	0.83	0.87	0.92	0.96	1.01	1.06	1.11	1.16
Skilled	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25
Unskilled	0.47	0.51	0.55	0.59	0.63	0.67	0.72	0.76	0.81	0.86	0.90
Public Sector (exogenous, supply=demand)	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Tradable Goods											
Skilled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emigration to Foreign Country (Human Capital Flight)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Tradable (all reported urban unemployed split % to unskilled/informal)											
Skilled	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Unskilled (supply effect of real wages)	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.17	0.17	0.17
Upgrading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Informal (unskilled)	0.33	0.37	0.40	0.44	0.48	0.52	0.56	0.60	0.64	0.69	0.73
Migration from Rural to Urban	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
RURAL LABOR (unlimited supply, determined by pop., includes o	5.59	5.59	5.74	5.88	6.03	6.18	6.34	6.50	6.66	6.83	7.00
Formal (export) unskilled	1.60	1.62	1.63	1.65	1.67	1.68	1.70	1.72	1.73	1.75	1.77
Unskilled Informal & Self-Employed	3.99	3.98	4.10	4.23	4.36	4.50	4.64	4.78	4.93	5.08	5.23
LABOR SUPPLY TOTAL	6.31	6.35	6.53	6.71	6.90	7.10	7.30	7.51	7.72	7.94	8.16
UNEMPLOYMENT											
URBAN LABOR	0.32	0.34	0.36	0.37	0.39	0.41	0.44	0.46	0.49	0.51	0.54
Skilled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unskilled	0.32	0.34	0.36	0.37	0.39	0.41	0.44	0.46	0.49	0.51	0.54
Public Sector	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tradable Goods											
Skilled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Tradable											
Skilled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unskilled	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08
Informal (unskilled)	0.22	0.25	0.27	0.29	0.31	0.33	0.35	0.38	0.40	0.43	0.46
RURAL LABOR	0.43	0.60	0.60	0.64	0.81	0.94	1.11	1.27	1.45	1.62	1.81
Formal (export) unskilled	0.57	0.60	0.60	0.58	0.52	0.50	0.45	0.40	0.35	0.30	0.25
Unskilled Informal & Self-Employed	0.11	0.00	0.00	0.05	0.29	0.44	0.66	0.87	1.09	1.32	1.56
UNEMPLOYMENT RATE											
URBAN LABOR	44.9%	44.9%	44.9%	44.9%	45.0%	45.1%	45.5%	45.9%	46.2%	46.5%	46.7%
Skilled	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Unskilled	67.7%	66.0%	64.6%	63.4%	62.4%	61.5%	61.1%	60.8%	60.4%	60.1%	59.7%
Public Sector	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tradable Goods											
Skilled	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Non-Tradable											
Skilled	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Unskilled	67.7%	59.5%	58.8%	57.9%	57.0%	55.9%	54.8%	53.6%	52.4%	51.0%	49.5%
Informal (unskilled)	67.7%	68.6%	66.8%	65.2%	64.2%	63.2%	62.9%	62.7%	62.5%	62.3%	62.1%
RURAL LABOR	7.7%	10.8%	10.5%	10.8%	13.4%	15.3%	17.5%	19.6%	21.7%	23.8%	25.8%
Formal (export) unskilled	35.9%	37.3%	36.9%	35.2%	31.2%	29.6%	26.4%	23.5%	20.4%	17.2%	13.9%
Unskilled Informal & Self-Employed	2.7%	0.0%	0.0%	1.3%	6.5%	9.9%	14.2%	18.2%	22.2%	26.0%	29.9%

Table A6-5: Burkina Faso: Projected Baseline Net Income after Transfers (2001-2010) by PAMS

GROWTH RATES												
D. INCOME AFTER TAXES AND WITH TRANSFERS												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
URBAN												
Capitalists & Rentiers		11.0%	4.7%	5.5%	6.5%	5.7%	6.2%	5.8%	5.4%	5.1%	5.0%	
Public Sector		1.0%	0.9%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	
Tradable Goods												
Skilled		2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.6%	
Non-Tradable												
Skilled		2.5%	12.6%	12.4%	12.3%	12.0%	11.9%	11.6%	11.4%	11.1%	10.9%	
Unskilled		34.4%	6.9%	6.1%	6.9%	7.3%	8.5%	8.7%	8.8%	8.9%	9.0%	
Informal (unskilled)		12.7%	19.3%	16.3%	14.9%	14.5%	12.9%	12.6%	12.2%	11.9%	11.6%	
RURAL												
Formal (export) unskilled		-2.2%	0.3%	5.8%	10.1%	4.9%	8.0%	7.0%	7.1%	7.2%	7.3%	
Unskilled Informal & Self-Employed		7.2%	6.1%	3.8%	0.2%	2.2%	2.0%	2.2%	2.1%	1.9%	1.7%	
TOTAL		9.4%	4.9%	5.3%	5.5%	5.1%	5.6%	5.4%	5.1%	4.9%	4.9%	

Table A6-6: Burkina Faso: Projected Baseline Poverty Indicators (2001-2010) by PAMS

Country: BURKINA FASO										
Table 1(a). Poverty Line and Income Distribution, Year, TOTAL										
Statistics by:	Base Year 1998	Projected 1999	2000	2001	2002	2003	2004	2005	2006	2007
Weighted Expenditure										
Poverty line (in LCUeq.1-2\$PPP/day)	335	335	335	347	353	355	360	366	388	399
Poverty line (in LCU/year)	80,508	80,508	80,508	83,350	84,822	85,275	88,418	87,803	93,039	95,776
Poverty line (in current USD/year)	0.57	0.54	0.47	0.48	0.50	0.51	0.52	0.53	0.55	0.58
Mean Income	97,782	97,782	97,782	103,531	108,664	113,400	116,734	120,870	125,828	130,691
Income Gap	0.40	0.40	0.40	0.39	0.38	0.38	0.37	0.37	0.38	0.38
Total Population	10,730,330	10,985,700	11,274,000	11,594,119	11,923,142	12,282,302	12,610,878	12,968,271	13,336,002	13,712,077
Sample size (household)	9,933,161	9,933,161	9,933,161	9,933,161	9,933,161	9,933,161	9,933,161	9,933,161	9,933,161	9,933,161
Poor (Headcount in sample)	6,543,950	6,543,850	6,543,950	6,487,642	6,300,491	6,116,018	6,081,232	6,002,025	6,134,888	6,140,020
P0 (Head Count Index)	0.66	0.66	0.66	0.65	0.63	0.62	0.61	0.60	0.62	0.62
P1 (Poverty Gap)	0.26	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.24	0.24
P2	0.13	0.13	0.13	0.13	0.12	0.11	0.11	0.11	0.12	0.12
Gini	0.36	0.36	0.36	0.39	0.39	0.40	0.40	0.41	0.42	0.43
Theil	1.91	1.91	1.91	2.30	2.41	2.52	2.71	2.90	3.11	3.34

V. Alternative policies simulated by PAMS for Burkina-Faso

Given that the baseline growth scenario is relatively optimistic, the objective of this section is to find within the base case, adjustments and new policies that will allow to reduce poverty further while at the same time controlling the rise of inequality. PAMS has three instruments to do so (we assume that these instruments can be implemented within the existing political framework of Burkina, or at least assuming that it will not cause excessive social and political unrest and/or that it could be done with involvement, participation from all parties in civil society through some sort of a "social compact"):

- PAMS can shift the composition of output growth toward the agricultural sector;
- PAMS can increase the (average) income tax rates of the wealthier groups in the economy (e.g., the capitalists-rentiers and the urban civil servants);
- PAMS can increase the room for maneuver for social spending by reducing military expenditures and allocating the resulting savings to transfers to the poorest groups;

Table A6-7:

LABOR DEMAND	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
URBAN LABOR											
Skilled				-0.007	-0.004	-0.002	-0.000	-0.008	-0.007	-0.006	-0.006
Unskilled				-0.007	-0.004	-0.002	-0.000	-0.008	-0.007	-0.006	-0.006
Public Sector											
Tradable Goods											
Skilled (supply constrained)											
Non-Tradable											
Skilled (supply constrained)											
Unskilled				0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.002
Informal (unskilled)				-0.007	-0.004	-0.002	-0.000	-0.008	-0.007	-0.006	-0.006
RURAL LABOR											
Formal (export) unskilled				0.022	0.025	0.024	0.102	0.146	0.173	0.214	0.250
Unskilled informal & Self-Employed				0.022	0.025	0.024	0.102	0.146	0.173	0.214	0.250
LABOR DEMAND TOTAL				0.024	0.022	0.024	0.102	0.147	0.174	0.210	0.247

Hence, we construct an alternative scenario along these lines. Within the same macro envelope of output growth, the Government promotes output growth in the rural areas (e.g., for example through special programs of incentives for farmers, etc.).

There is—as a consequence—more employment in rural areas but given PAMS’ characteristics, i.e. by construction is maintains overall macro-consistency, there is simultaneously less employment in urban areas. Overall, unemployment fall in rural areas by about 1 to 4% and (new) job creation in rural areas rises (see Table A6-7) from 25,000 in 2004 up to 250,000 in 2011.

Table A6-8:

TAXES ON INCOME (Million of LCUs)	
URBAN	
Capitalists	10%
Public Sector	25.00% (35.00%)
Tradable Goods	
Skilled	25.00% (25.00%)
Non-Tradable	
Skilled	25.00% (25.00%)
Unskilled	10.00% (20.00%)
Informal (unskilled)	
	5.00% (15.00%)
RURAL	
Formal (export) unskilled	5.00% (0.00%)
Unskilled	5.00% (0.00%)

In parallel, the Government decides to make its average income tax rates more progressive. Urban rentiers, civil servants and some workers in the non-tradable urban sector get heavier tax rates. They get an additional surcharge of 10% or 0% over their existing average tax rates that can be seen in Table A6-7). In parallel, rural workers get tax rebates (-5%) bringing their tax rates to zero. Overall, these transfers in terms of income taxes are done within the same tax envelope provided by the baseline scenario. The workers’ tax brackets end up being respectively 35% for civil servants; 25% for workers in the urban tradable goods sector and skilled workers in the

non-tradable goods sector; 20% for unskilled workers in the non-tradable goods sector; 15% for the unskilled workers in the urban informal sector, and 0% for workers in the rural areas.

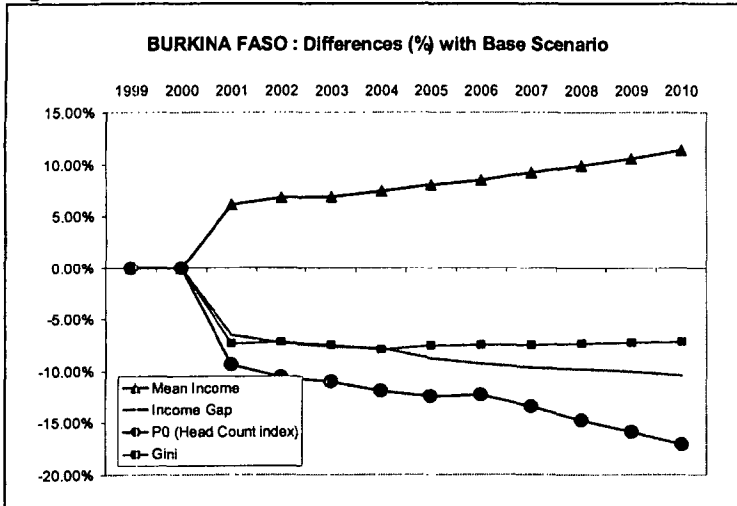
Table A6-9:

COMPOSITION OF PUBLIC SPENDING	
Investment (Percent of Total Expend.)	10.00%
Military (Percent of Other Expenditures)	35.00%
Social (Residual, Percent of Other Expenditures)	65.00%
a) Education (Percent of Social)	33.33%
Primary Ed.	50.00%
Second. Ed.	40.00%
Tertiary Ed.	10.00%
b) Health (Percent of Social)	33.33%
c) Income Transfers (Residual, Percent of Social)	33.33%

Finally, there are some policy changes in the budget that affect social transfers. The Government manages to reduce military expenditures to 35% (down from 50%) of non-wage, non-capital, other expenditures. The available savings, are allocated to a “social fund” that provides income transfers to the poor.

PAMS simulates the new scenario, which keeps the same basic macro framework that was simulated with the baseline. What can we expect? We have not changed significantly the macro story of the base case: we have the same "baseline" aggregate growth outcome, the same aggregate fiscal deficit and the same aggregate external balance (BoP). However, we have now made "policy changes" that brought a different composition of social spending, a more progressive income tax burden and more incentives to agricultural-led growth. Given the characteristics of Burkina (i.e. the poor are in the rural areas), we should expect a reduction in poverty and –hopefully–also a reduction in inequality due to the transfers that are made from the rich to the poor. Figure A6-2 below shows the deviations of the results of the new simulation vis-à-vis the baseline case.

Figure A6-2:

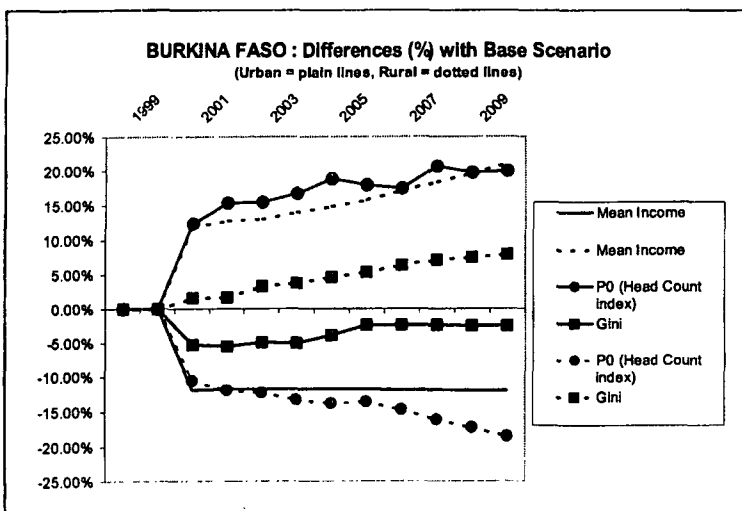


The new policies that we listed above do indeed contribute to an increase in the aggregate wage income (recall that we are transferring resources from an overall unchanged aggregate disposable income, and hence that the "losers" are the "capitalists" and "rentiers"). More importantly, there is also an additional reduction in the overall poverty headcount. That comes from the set of transfers that targeted the poorest groups of the rural areas (through lower

income taxes and social benefits). Finally, in addition, there is also a reduction in the level of inequality, vis-à-vis the baseline case. Therefore, the overall conclusion is that the macro framework associated with Burkina Faso's PRSC does allow –with the proper set of additional fiscal, tax and transfer policies—to make a stronger attack on poverty levels.

Unfortunately, the story is not that simple. Let us look now at the decomposition of poverty and inequality between rural and urban areas, as depicted in Figure A6-3.

Figure A6-3:



Although the new simulation has managed to reduce inequality "on aggregate", there is a significant difference between the situations in the rural (plain lines in Figure A6-3) and urban areas (dotted lines in Figure A6-3). Recall that the policies envisaged "favored" agricultural growth and redistribution to the rural poor. The counterpart of that is to reduce the size of the urban economy vis-à-vis the base case and hence to "increase" the level

of urban poverty vis-à-vis the base case. This is due to the sensitivity of the urban informal sector to any slowdown and the consequent increase in urban unemployment. There is also a decline (always vis-à-vis the base) of urban wage income that increases urban poverty. The disaggregated result is thus mixed. Yes, on average, poverty went down further and so did inequality. But in fact rural poverty went down dramatically while urban poverty increased. And while urban inequality went down (an effect of the transfers that affected relatively more the rich urban households) there is a relative increase of inequality in rural areas, due to the combination of tax breaks and transfers affecting the two types of poor rural households.

As a conclusion, PAMS shows that the intuitive results that one can get from cross-section regressions, where aggregate growth "by definition reduces poverty", –by the sign of the estimated elasticity of growth to P_0 -- can sometimes hide different situations in terms of where (rural/urban) is poverty reduced, and whether it is done with an increase or a decrease of inequality. Although the simulations shown here are crude and tentative, they illustrate how the model is capable of initiating a richer policy dialogue and contribute to the design of better policies.

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