


THE ILO SOCIAL BUDGET MODEL

A Technical Guide

(Version 8/1999)



The International Financial and Actuarial Service (ILO-FACTS)
Financial, Actuarial and Statistical Branch
Social Security Department
International Labour Office

Geneva

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The first generation of the model described in this manual was developed jointly by the ILO Team for Central and Eastern Europe (CEET), the Financial, Actuarial and Statistical Branch of the Social Security Department and MH Consulting in the framework of an EU-Phare financed social security project in 1994.

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Foreword

This technical manual provides the basic guide on the use of the generic version of the ILO social budget model. It does not provide detailed descriptions of the methodology used in each of the sub-modules of the model. For that, please refer to the textbook on Social Budgeting. This technical guide merely describes the structure of the generic social budget model, it guides technicians through the model structure. The model is not a computer game. We believe that it can be applied in every country. But it is only a starting point, a point of departure, for national model developments. In any national case it needs adaptation, as national social protection systems vary considerably. It also needs national data. The generic version has a data base, which refers to a fantasy country called Demoland. This data base permits the user to experiment with the model and understand its interactions.

As with all models the generic version of the social budget model is not static. Nor is it intended to be ever final. Since the first version of the manual and the model came out in 1996, the modeling team has been introducing many changes into the model to improve it and correct programming errors. This version is an update of the June 1999 version. As long as we learn more about national social protection systems and their quantitative mapping, it will be further modified. Likewise, national specifications of the model have to be modified when new or revised data are released or new legislation is put into force. It might have to be modified when there are some specific needs to simulate particular policy changes. We hope, that needs and ideas for modifications and improvements will also be coming from the users working with the model for alternative assumptions and policy options. We hope that users will let us know about their suggestions, so that we can improve the generic version and again make it available to the users. Whenever major changes are introduced to the generic version we will make an announcement on our Website. We are hoping to start and maintain an international technical debate on the model and the social budget concept with our colleagues around the world. Please contact us at:

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or visit our web site at:

<http://www.ilo.org/public/english/110secso/socbud/indexsb.htm>.

This technical guide is composed of two sections. The first section provides hints and tools for the use of the social budget model. These may refer to the options provided with the base software Microsoft Excel as well as the options and particularities of the model components. The second section of the technical guide looks into each of the social budget model components individually and gives a brief methodological description of each as well. This is the core of the guide and will provide the user with the knowledge of how to manipulate the model components.

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Geneva, August 1999

Introduction: A primer on social budgeting

Even if it is not possible to introduce the full methodological concept of social budgeting a few introductory paragraphs are necessary. For more details and background the user is referred to the textbook on Social Budgeting.

A social budget is not, in a classical sense, the budget of an institution or a government covering all or a certain part of its income and expenditure. The term "social budget" is used here as a social accounting concept compatible with the one in the European Union and its member countries which, at regular intervals, compile total national social expenditure and its financing statistics. A social budget hence encompasses social expenditure and income (earmarked to cover social expenditure) of different institutions, as well as the government and (to a lesser extent) the private sector. The exact contents of overall national social budgets might vary from country to country depending on the traditional organization of national social protection systems, as well as the range of benefits offered. However, there are core elements which are represented in all national social budgets. On the expenditure side these core elements include:

- (a) employment-related social security expenditure on:
 - pensions (by different institutions and/or the government);
 - short-term cash benefits;
 - health care;
 - unemployment benefits;
- (b) publicly financed social protection expenditure on:
 - family benefits;
 - health care;
 - social assistance;
 - tax benefits;
- (c) private sector/collective agreement-based social protection expenditure on:
 - occupational pensions;
 - other enterprise-based social benefits, etc.

On the income side, all resources used to finance the above expenditure are accounted for. The most important ones are social security contributions, taxes (general and earmarked from central and local governments), private or collective insurance contributions and investment income. A social budget is thus, first of all, an accounting summary of the financial status of a pluralistic social benefit delivery system.

The social budgeting process normally includes the accounting of all social expenditure and income in a given observation year or a number of observation years. But social budgeting as understood here goes beyond the accounting of past events, it also provides forecasts of income and expenditure for normally a medium-term period and/or simulations of social expenditure and revenues under alternative economic, demographic or legislative assumptions. The latter aspect is a critical component of the government budgeting and mid to long term planning process.

Social budgeting serves two main purposes. It is - or at least should be - on the one hand, a part of the social policy planning and, on the other hand, it is - or should be - part of any medium-term financial planning of the government and other major social protection institutions.

Social budgeting is thus a macro-device in national financial planning. National financial planning, i.e. essentially the attempt to reconcile public and semi-public expenditure with tax and contribution revenues, is an indispensable part of responsible governance in any society under any economic system.

The social budget thus supports the political decision-making process at the increasingly sensitive intersection between social policy and national financial planning. It permits to:

- (a) describe how the present system of social protection would behave in financial and fiscal terms in the future if the provisions governing the financing and benefit expenditure do not change (status quo projections); this would:
 - force decision-makers to define what level of expenditure and hence social protection they want the country to afford and, secondly,
 - help to assess if the present system could be maintained in the light of the future demographic and assumed economic developments; and
 - if so, which funds have to be set aside by which financiers to finance it; and
 - if not, to identify subsystems which would need adjustment to avert potential financial, fiscal and social problems;
- (b) explore which modifications of the present financing and benefit provisions might help to improve the financial and fiscal performance or alter the social and economic impact of the social protection system as a whole or the subsystems (simulations); such modifications can generally not be tested in the real world without taking major social, financial and fiscal risks.

Social budgeting is thus a crucial tool for sound social and fiscal governance.

Part I: The Model environment

1. The technical specifications

1.1. Hardware requirements

The social budget model has been developed for IBM-compatible PCs. The model can be run on an IBM compatible Pentium processor PC with a minimum of 16 MB RAM (memory), if not all the components are loaded at the same time. However, a processor with 32 MB of RAM is highly recommended for efficient use of the model. A CPU (central processing unit) speed of at least 120 MHz is suggested. This would help speed up the run time of the model when modifications and tests are done. The model components require a minimum of approximately 13 MB of hard disk space to load.

1.2. Software used

All components of the social budget model have been developed for the Microsoft Excel 97 for Windows 95 environment. Both the spreadsheet characteristics as well as the programming characteristics (in Visual Basic for Applications, or VBA) of Excel have been used.

The whole model is essentially a system of interlinked spreadsheets. Within a spreadsheet, standard procedures (which are independent of the specific country or the scheme) are "delegated" to visual basic modules (e.g. calculation of the poverty line and model interface characteristics) or functions which are called from specific places within the "backbone" spreadsheets.

The spreadsheets provide total transparency, as each cell in each matrix displays the mathematical formula that leads to the result returned by the model (with the exception of cells calculated by VBA modules). The programming of the VBA modules has also been done in a manner which makes it easy for the user to understand what is being calculated. Comments are provided where necessary and variable names describe clearly what they represent.

1.3. Model files

Following is a list of files (workbooks) provided to the users:

- Basic social budget model:
 - ILO_LAB.xls
 - ILO_ECO.xls
 - ILO_SOC.xls
 - ILO_GOV.xls
- Population projection model:
 - ILO_POP.xls
 - ILO-POP.xls
 - MORT.xls
 - FERT.xls

MIG.xls

- Model structure and Scenario manager files:

STRUCTUR.xls

SCENAR ~ 1.xls

- Pension projection model:

ILO_PEN.xls

It is recommended to place all the files in the same directory. The generic model files are filled with data to permit experimentation by users. Clearing all the model cells would have resulted in output sheets with zeros, which would have limited the potential learning experience. The data come from a country which we call Demoland. Once you have downloaded the model you may wish to start by changing Demoland's future growth path and observe how that affects the country's social expenditure.

Sometimes the files which are transferred from CD_ROM's will retain the "read-only" attribute when they are transferred to the hard disk of your PC. To change this, in **Windows Explorer** select each file individually and in the **F**ile menu select the **P**roperties item. Under the **A**tttributes option remove the cross before the read-only option.

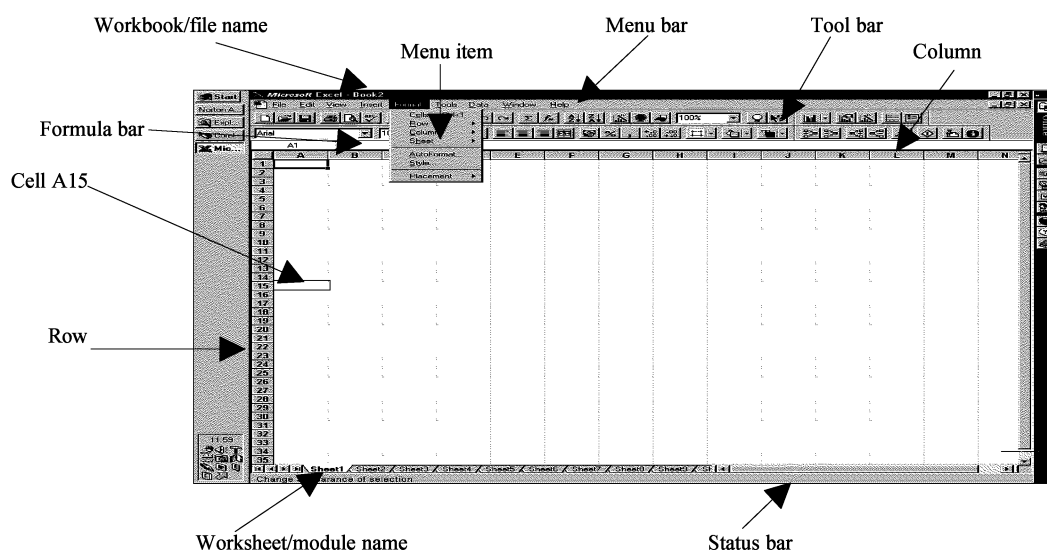
2. Useful Excel tools

2.1. Introduction

The aim of this section is to specify some of the basic characteristics of Excel, and to indicate some Excel tools that may come in handy while working with the Social Budget Model. We assume that the users of the Social Budget Model already have a good working knowledge of Excel. The experienced Excel user might skip this section.

As the manual will refer to the various features of the Excel window, figure 1 standardises these features for reference purposes.

Figure 1: The Excel window



WHEN WORKING WITH THE MODEL, PLEASE TAKE NOTE OF THE INDICATIONS PROVIDED IN THE *STATUS BAR*

Calculating: means that Excel is currently calculating cells in the workbook(s).

Calculate: means that the calculation process in the workbook has not taken place, or is not finished. Therefore, results in the cells may not be correct. In order to recalculate the cells, press the **F9** key.

Circular: means that somewhere in one of the open workbooks there is a circular reference. If the sheet which contains the circular reference is open, the status bar will indicate **Circular B5** (i.e. the address of the cell).

Ready: means that all the cells have been calculated, and that Excel is ready for other manipulations.

2.2. Some useful Excel hints

2.2.1. To open linked files

As already mentioned, the social budget model is composed of a set of interlinked worksheets and workbooks. Therefore, when files which have links are opened, Excel displays a window with the following message:

"The workbook you opened contains automatic links.....click No."

If you select the "Yes" button, then the cells which are linked are refreshed with the most recent data.

When one saves a linked document, Excel automatically recalculates all the cells and updates them with the latest data. If all the linked documents are open, then all their cells are also automatically updated during this process. However, if some of the linked documents are closed during this process, then the above option to "Update links?" will permit an update of the linked data the next time that they are opened.

No specific order needs to be followed to open the social budget model files. However, we do recommend that ILO_PEN.xls be opened last, as having it open slows down the process of file loading.

2.2.2. *To work more efficiently*

Each time a parameter is modified, all the various links need to be updated. Excel does this automatically each time a linked cell value is modified. For example, when changing a whole row of values, Excel will automatically recalculate the values of cells which are linked to the one/s which have been modified. This can be very time consuming, and in this case, it is worthwhile to recalculate the various links only once all modifications have been made. To allow this, you can switch off the automatic recalculation function and choose the manual recalculation option instead. To do this:

- Go to the **Tools** menu
- Select **Options...**
- Select the **Calculation** tab in the Options window
- Select the **Manual** option

In order to recalculate the sheet after all modifications have been made, press the **F9** key

2.2.3. *To identify which files provide information to a workbook*

As the social budget model is comprised of a collection of interlinked workbooks, it is sometimes necessary to identify the workbooks which are linked to the one you are working on. This is especially necessary when you are modifying a workbook. In order to identify linked workbooks:

- Go to the **Edit** menu
- Select **Links ...**
- You will now see the workbooks that are linked to the file you are using. For example, the workbook ILO_LAB.xls is linked to ILO_POP.xls (from where it obtains official population projections from Demoland) and to ILO_ECO.xls (from where it obtains input on total employment figures)
- If you would like to input United Nations population projection figures (provided in ILO-POP.xls) instead of the official population projection figures, modify the link from ILO_POP.xls to ILO-POP.xls:
- highlight/select ILO_POP.xls in the **Links** window

-
- click on the **Change Source...** button
 - select the file ILO-POP.xls
 - click on the **OK** button

Please note that the Links window only shows which files provide information to the current workbook. It does not indicate the files which receive information from the current workbook. Therefore, when modifying a workbook it is not enough to open only those workbooks which are shown in the Links window.

2.2.4. *To identify the links to and from a cell*

Data cells hold either data or the results of calculations, and are generally referred to by other cells. Cells which are a result of calculations can refer to other cells for their values, or can be used to calculate the values of third cells. In order to be able to see these links between cells, Excel offers an auditing tool bar:

- Go to the **Tools** menu
- Select **Auditing**
- Select the **Show Auditing Toolbar** option

The Auditing toolbar has nine buttons:

Trace Precedents:

identifies, with arrows, the cells from which the selected cell obtains data

Remove Precedent Arrows:

removes the above arrows

Trace Dependants:

identifies, with arrows, the cells which receive data from the selected cell

Remove Dependent Arrows:

removes the above arrows

Remove All Arrows:

removes all the arrows to and from a selected cell

Trace Error:

indicates to a certain extent the source of error, if any, in a selected cell

New Comment:

permits to attach a note to the selected cell. When a note is attached to a cell, a small red dot will appear on the upper right-hand corner of the cell. In order to view the contents of this note in Excel 5, click on the Show Info Window button. In Excel 97 for Windows 95, the attached notes will be automatically visible when the cursor arrow is placed on the cell

Circle Invalid Data

Clear Validation Circles

2.3. Some hints on modifying the social budget model workbooks

The social budget model relies on a system of interlinked worksheets within a given workbook, of interlinked workbooks, and of VBA programmed sections. Therefore utmost care must be taken when modifying any or all components of the model. If care is not taken then, the results obtained will no longer be correct.

It is crucial when opening workbooks, to "**update**" the links between the workbooks. Otherwise results in cells will no longer be correct (see point 2.2.1).

We will consider two types of modifications, those that do not alter the structure of a worksheet, and those that do.

2.3.1. *Modifications which do not alter the structure of a worksheet*

The following operations are examples of modifications that do not alter the structure of a worksheet (not an exhaustive list):

- modifications to the contents of a cell, row or column, by updating data;
- revision of formulas within a cell or VBA module.

In these cases, a recalculation of the workbook(s) and the VBA modules will automatically adjust the values in all linked workbooks (see point 2.2.1).

2.3.2. *Modifications which alter the structure of a worksheet*

The following operations are examples of modifications that do alter the structure of a worksheet (not an exhaustive list):

- deletion or move of a linked workbook to another directory;
- modifications to names of linked worksheets;
- deletion of a linked worksheet;
- insertion of rows or columns before cells which have links;
- deletion of rows or columns which have links;
- modifications of the address of output areas within VBA modules.

As a measure of security, open all the model files with the exception of MORT.xls, FERT.xls, and MIG.xls, unless the population projection files are being modified.

Once the structural modifications have been made, **save all workbooks**. For modifications that alter the structure of a worksheet, **all linked workbooks must be open** when the changes are made. It is not enough to open only those workbooks which are indicated in the Links window (see point 2.2.3). All workbooks to which the modified workbook provides data must also be open.

If the above care is not taken, then even the "re-establish links" option when a workbook is opened will not reflect the structural modifications of the linked workbooks, and the model will no longer generate correct results.

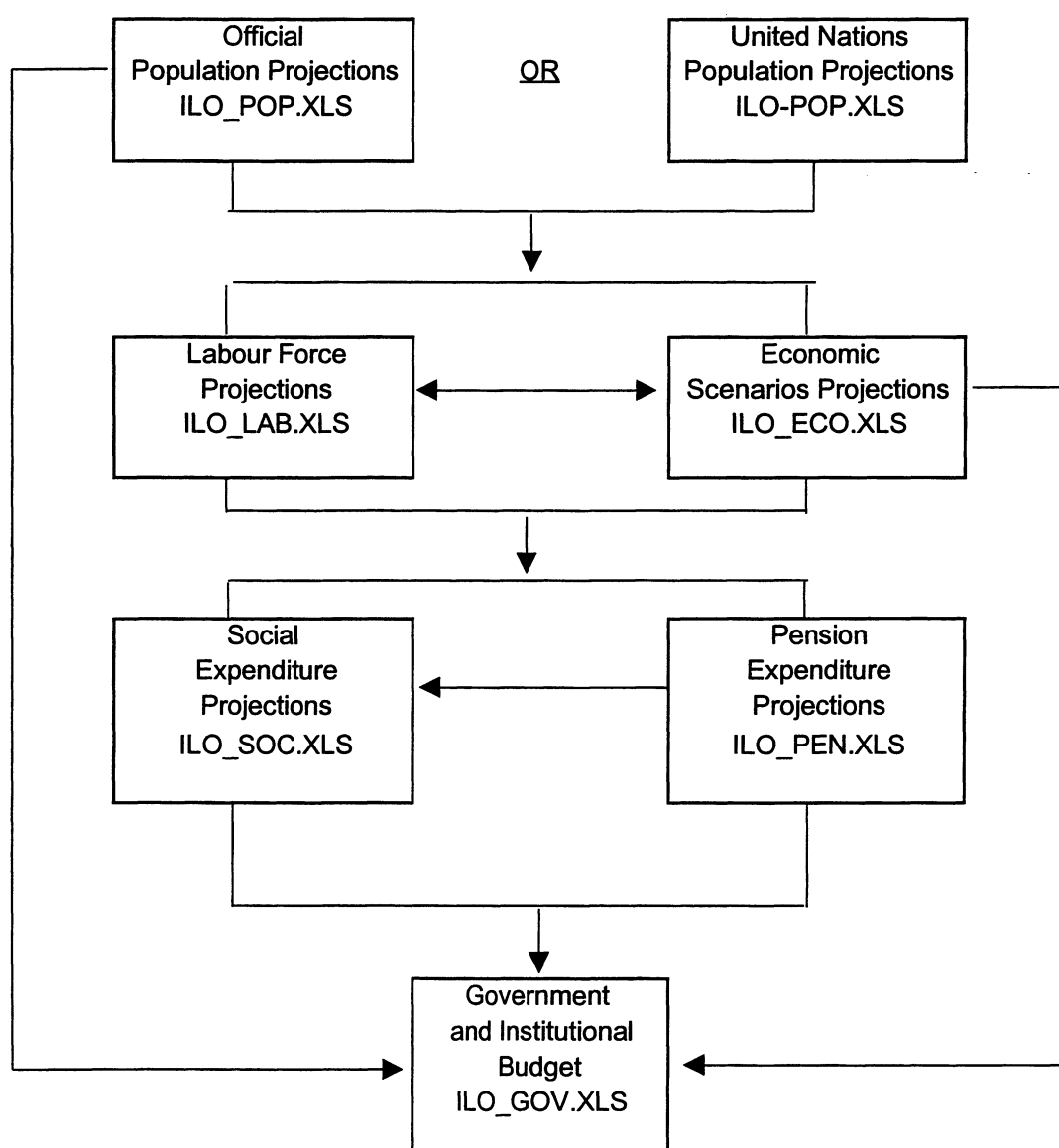
Where results are calculated by VBA modules, these modules will need to be modified and recalculated.

3. The social budget model design

3.1. The structure of the social budget model

The following figure provides the structure of the social budget model and the links between the various model workbooks. The social budget model is composed of a set of population projection workbooks, a set of social budget projection workbooks and a pension projection workbook. In addition there is a model structure workbook and a scenario manager workbook. A full list is provided in section 1.3.

Figure 2: Structure of the social budget model



3.2. The general organization of the files

3.2.1. Common features in all model components

There are a certain number of features which are common to all the social budget model files.

All files (workbooks) are composed of a number of worksheets. Each worksheet deals with a particular issue (for example, the Pension Fund Budget worksheet in the ILO_GOV.xls workbook provides the budget figures for the Pension Fund). The names of the worksheets provide an indication of their content.

All worksheets, with a few exceptions for special supporting worksheets in ILO_ECO.xls and ILO_PEN.xls, are organized by year of observation or projection, in columns:

Data in column C represent figures for 1992

Data in column D represent figures for 1993

Data in column E represent figures for 1994

Data in column F represent figures for 1995

...

Data in column Z represent figures for 2015

Within the worksheets:

Cells with a **grey** background contain input data

Cells with a **green** background contain main scenario assumptions (in ILO_ECO.xls)

Cells with a **yellow** background contain other assumptions and parameters

Cells with a **blue** background require user input or verification

Cells with a **light purple** background contain the most important results (e.g. functional summaries)

All cells with a white background contain calculated values. The grey cells containing input data can be updated as needed. When final and official data are available, calculated values for that year can be replaced with actual statistical data. The user might wish to modify the starting year and the time frame. Start-year modifications have to be introduced in all spreadsheets by hand! The projection period can be extended by copying the last column in the respective spreadsheets.

All the variable names in English are in the first column (A) of each worksheet. Column (B) has been left blank in order to contain eventually the translation of the variables in the national language of the user. One has a possibility to choose the working language and then only one of these columns will be seen on the screen.

In each workbook that provides this language option, VBA modules contain macros enabling the language selection and the DBLangSel dialog sheet provides the frame for the dialog box. To see the VBA module one has to click on **Tools** menu, select the **Macro** option, then select **Macros**. In the dialog box one has to select and highlight the name of the desired macro and click on **Edit**.

If you would like to change the language while working in a file:

- Select the **Tools** menu
- Choose the **Select_language()** menu item corresponding to the workbook name.

3.2.2. Common features of the Population Projection files

The population projection files (ILO_POP.xls and ILO-POP.xls) and the labour force projection file (ILO_LAB.xls) are organized by year of projection in columns (see point 3.2.1.) and by individual ages in rows. Thus:

Data in row 4 displays data for population of age 0

Data in row 5 displays data for population of age 1

Data in row 104 displays data for population of age 100

Row 105 in certain worksheets contains a total of all the entries from ages 0 to 100.

Files FERT.xls, MORT.xls and MIG.xls contain a number of worksheets which serve for data entry or to store intermediary results. These are organized differently.

The population projection and the labour force projection files are further organized by sex. Thus, worksheet names ending with **M** are for males, **F** are for females, and **T** are for totals.

3.3. Moving from the generic model to a model reflecting the specific national situation

Each national social protection environment is different. The generic model serves as a ready-made frame which will provide the base for the analysis of the specific national social protection environment. Therefore, the generic model will need to be modified not only to reflect the specific national data situation but also the social protection environment. Thus, in the case of Ukraine for example, as a special Fund exists which administers benefits to victims of the Chernobyl disaster, this will need to be taken into account in the social budget model. The flexibility of the model structure allows for this. Thus, the social budget modeling procedure has to start with a thorough analysis by the modeler of the national social protection environment. A modeler needs to understand the legal provisions and administrative procedures of the social protection systems as well as any social policy planner or manager.

Part II: The social budget model

1. Using the components of the social budget model

In this chapter, we will look at some of the specific characteristics of the individual model components (modules - not to be confused with the VBA modules). Each component has a specific function within the overall social budget projection. A detailed description of each component is provided in the main book on Social Budgeting. This chapter provides only a practical guide so that the user can make modifications within the components.

1.1. The population projection files

The population projections used can be either the official population projections, or the calculated population projections based on the United Nations (UN) methodology.

1.1.1. *The official population projection file (ILO_POP.xls)*

Population projections for this file can be obtained from National Institutes/Bureaux of Statistics and entered by single ages, by sex and by urban/rural classification for the projection period. Data in the generic model are provided for each five-year period, and then interpolated for each year of projection. If official data exist for each individual year these can be included.

1.1.2. *The population projections according to UN methodology*

Population projections using the standard UN projection methodology and the UN mortality and fertility assumptions for Demoland have also been provided. The model applies initial fertility, mortality and migration rates age specifically to a statistically observed initial population. The model can accommodate alternative assumptions regarding the future development of fertility and mortality rates. The population projection model is composed of a set of four files. They are as follows:

MORT.xls	provides age and sex specific mortality rates over the entire projection period;
FERT.xls	provides age specific fertility rates over the entire projection period;
MIG.xls	provides age and sex specific net migration data for the whole of the projection period;
ILO-POP.xls	provides the age and sex population projections over the entire projection period.

(a) Mortality rate projections (MORT.xls)¹

The UN mortality rate projections are determined for five regional mortality patterns. These patterns are determined on the basis of statistically observed data on death and disease during the previous three or four generations². The workbook MORT.xls contains these regional mortality patterns.

Input worksheet "Workmort" is used to select basic assumptions and parameters.

Since the UN mortality patterns are based on observations of the previous three or four generations they usually do not include very recent patterns of mortality, as for example those developed under the impact of AIDS. Therefore, if the model is to be applied for a country with a high incidence of AIDS, the user has to carefully choose and possibly determine the mortality data which will be used for the population projections. This may be done by modifying the official population projections, using ILO-POP.xls.

Figure 3: Assumptions for national mortality rate projections, 1995-2015

The screenshot shows the 'Workmort' worksheet in Microsoft Excel. The 'Regional patterns' section includes dropdowns for 'Improvement of life expectancy' (set to 'Slow') and 'Initial life expectancy' (set to 'Constant life expectancy'). The 'Estimated life expectancy at birth (every 5 years)' table shows values for 1995, 2000, 2005, 2010, and 2015 for Males and Females. The 'Table of quinquennial gain in the life expectancy at birth' shows gains for Males and Females under different assumptions (fast, middle, slow).

YEAR	1995 0	2000 5	2005 10	2010 15	2015 20
Males (gain)	62.2	62.2	62.2	62.2	62.2
Females (gain)	72.9	72.9	72.9	72.9	72.9

life expectancy		IN USE		Males			Females		
from	to	Males	Females	1 fast	2 middle	3 slow	1 fast	2 middle	3 slow
55.0	57.5	2.0	2.0	2.5	2.5	2.0	2.5	2.5	2.0
57.5	60.0	2.0	2.0	2.5	2.5	2.0	2.5	2.5	2.0

In this worksheet, areas where user input is required are coloured in blue. Required types of input are as follows:

- Input of the **initial year** from which population projections start. The same initial year will also be assumed in all the rest of the population workbooks. Initial statistically observed age and sex specific population data are also required for this year (as input in ILO-POP.xls);
- Input of the sex-specific **initial life expectancy** observed in the initial year. They have been set at 62.2 years for males and 72.9 years for females for the initial year 1995 as an example;

¹ For more details refer to: K. Hirose: *UN population projection model, User manual*. ILO Geneva, 1997.

² Refer to the UN: *Unabridged model life tables corresponding to the new United Nations life tables for developing countries*, New York, 1982.

-
- Assumption on the **speed of improvement in life expectancy** over the projection period, if there is an increase expected (in cell D5). There is a choice between slow, middle or fast. This will only affect the mortality rates if the choice of the **development of life expectancy** over the projection period (see below) is based on the **UN World Population Prospects**. In the generic model, as life expectancy has been maintained constant over the projection period, the speed of improvement has no effect;
 - Choice for the **regional pattern** (in cell B7), if the **development of life expectancy** over the projection period (see below) is based on the **UN World Population Prospects**;
 - Assumptions on the **development of life expectancy** over the projection period. Three options have been provided:
 - **Constant life expectancy**, where the life expectancy observed in the initial year is held constant over the projection period. This option was actually chosen for Demoland;
 - **Based on Demoland data (declining life expectancy)**, from where statistically observed data provided the basis for declining life expectancy assumptions. This option should be changed by the user as it will not reflect the users country situation. The modifications should be made in cells T15-X15 (for males) and in cells T17-X17 (for females);
 - **Based on UN World Population Prospects³**, assumptions which consider an improving life expectancy from the chosen initial level of 62.2 years for males and 72.9 for females in the year 1995, to the level indicated in the UN World Population Prospects.

For the standard projection, a constant life expectancy was assumed.

After entering the above inputs, the workbook automatically calculates future sex and age specific mortality rates for 1995-2015. The projection period can be modified by the user. However, when the projection period is extended care must be taken to extend table T13-X19. Furthermore, the VBA subroutine "Choice" in the VBA module must also be modified wherever it says "Range("T14:X14").Select". For example if one wants to extend the projection period till 2030 then the "X" in the above range must be modified to "AA" i.e. "Range("T14:AA14").Select".

Worksheet "*MortM5*" (for males) and worksheet "*MortF5*" (for females) contain age specific mortality rates for each fifth year of the projection period. Worksheet "*MortM*" and worksheet "*MortF*" contain age specific mortality rates calculated for each individual year of projection.

(b) Fertility rate projections (FERT.xls)

The FERT.xls workbook calculates age-specific fertility rates according to the standard UN projection methodology. As with the mortality rates workbook, this one also requires a certain amount of user input. There are two input worksheets: "*Intfert*" and "*ULTfert*" where inputs are required. Fertility rates apply to women in childbearing ages (between 15 and 49).

³ See *UN World Population Prospects*, 1996 Revision, New York, 1996.

Figure 4: Initial fertility data for national fertility rate projections

Source: Ministry of Statistics, DEMOLAND (1995 data)

age	FERT	class	In Use	Pattern in Use Eastern Europe	Fert
15	0.00000	15-19	54.37	38	
16	0.02583	20-24	116.91	132	
17	0.05976	25-29	65.56	89	
18	0.08469	30-34	27.46	44	
19	0.10157	35-39	9.87	18	
20	0.11927	40-44	2.06	4	
21	0.12315	45-49	0.12	0	
22	0.12147	Total	1.38	1.63	
23	0.11522				
24	0.10544				
25	0.09218				
26	0.07549				
27	0.06119				
28	0.05222				
29	0.04672				
30	0.03980				
31	0.03233				
32	0.02606				
33	0.02133				
34	0.01777				
35	0.01462				

Required input on initial fertility in worksheet "Intfert" is as follows:

- The **total fertility level (TFR)** for the initial year of the projection. The total fertility rate represents the average number of children who would be born to a woman over her lifetime if she were to experience the birth rates observed (or assumed) in the selected starting year, and if she were to survive the entire child-bearing period;
- If fertility rates by five-year age group for the initial year are available, then they should be input in cells G7-G13, which correspond to the **fertility rates in use**. If these rates are not available, then a fertility pattern corresponding to the region should be chosen and the link of cells G7-G13 should be reestablished to cells H7-H13. For the generic model, five-year age group fertility data were input for 1995 and applied.

Assumptions on the ultimate level of total fertility as well as other assumptions are also required. These assumptions are to be input in the worksheet "ULTfert":

Figure 5: Further national fertility assumptions

The screenshot shows the 'Fert.xls' worksheet in Microsoft Excel. The interface includes a menu bar (File, Edit, View, Insert, Format, Tools, Data, Window, Help) and a toolbar. The worksheet is divided into several sections:

- Input Section (Cells A1-G5):**
 - Child-bearing schedule: early (dropdown)
 - Ultimate TFR level: low (dropdown)
 - Target year: 2015 (input)
 - Ultlevel= 1.36175 (input)
 - age (column header for FERT rates)
 - class (column header for fert*5 rates)
 - Sex ratio of newborn: 20 (input)
- Age-specific Fertility Rates (FERT) (Cells A8-A29):**

age	FERT
15	0.00000
16	0.03188
17	0.06160
18	0.08376
19	0.09911
20	0.11087
21	0.11496
22	0.11441
23	0.10999
24	0.10247
25	0.09206
26	0.07895
27	0.06679
28	0.05750
29	0.05014
30	0.04170
31	0.03261
32	0.02531
33	0.02067
34	0.01789
35	0.01528
36	0.01315
- Class-specific Fertility Rates (fert*5) (Cells F8-F13):**

class	fert*5
15-19	0.27635
20-24	0.55270
25-29	0.34544
30-34	0.13818
35-39	0.05527
40-44	0.01382
45-49	0.00000
Total	1.38
- Child-bearing schedule (Cells I1-L12):**

class	1	2	3	late
15-19	4%	12%	20%	intermediate
20-24	22%	31%	40%	early
25-29	40%	31%	25%	high
30-34	22%	16%	10%	intermediate
35-39	10%	8%	4%	low
40-44	2%	2%	1%	
45-49	0%	0%	0%	
Total	100%	100%	100%	
- Ultimate TFR level (Cells I16-M21):**

Initial level		1	2	3
from	to	high	intermediate	low
...	1.5	1.9	1.7	1.36175
1.5	2.1	2.1	1.85	1.5
2.1	2.6	2.6	2.1	1.6
2.6	...	2.6	2.1	1.6

- The **Ultimate TFR level** can be obtained from the UN assumptions. The level assumed in our example is 1.38, since we assumed a constant level of fertility. The user need not maintain this assumption. What is required is to select the future fertility level: **low, intermediate or high**. To choose this level the user needs to check and possibly change the data in the box delimited by cells I16 to M21 (under the heading **Ultimate TFR level**) and then:
 - find the range (i.e. row) in which the Initial level of the TFR (input in the Intfert worksheet) falls;
 - find the cell in which the Ultimate TFR level falls and the corresponding column subheading (i.e. high, intermediate or low);
 - select the proper level (high, intermediate or low) in cell B2.
- The target year for reaching this ultimate TFR level needs to be entered in cell B3.
- The **child-bearing schedule** needs to be selected. This will depend on historical data indicating approximately the period during the child-bearing years when childbirth occurs. A number of factors affect this schedule, namely professional career, late marriage and other economic or social factors. The user has a choice between early, intermediate and late (area delimited by the cells I1 to L12). For our example, an early child-bearing schedule was chosen.
- The **age-sex ratio of births** needs also to be input (cell G3). This will indicate whether proportionately more boys (if the ratio is greater than 1) or more girls (if the ratio is less than 1) are born on average.

Calculated age-specific fertility rates for the projection period can be found in the worksheet "Fert".

The worksheet "newborn" calculates the number of newborns by sex for each year of projection.

(c) Net migration projections (MIG.xls)

If age and sex specific data are available and assumptions are made on the net migration (immigration minus emigration), then these data should be entered into the workbook MIG.xls. Assumptions on net migration over a period of time are not an easy task, as they depend on many economic, political and social factors. For the generic model, net migration rates were assumed for the initial year then kept constant for the first five years of the projection period. Afterwards (starting from 2000) net migration was assumed to be equal to zero.

(d) Population projections (ILO-POP.xls)

Basic input is the population data by age and by sex for the initial year of projection (1995 in this case). The model calculates future population, for the projection period, by single ages and by sex, taking into account mortality and fertility rates as well as the migration figures calculated under sections (a), (b) and (c) above. Urban and rural population was calculated as well. These proportion were taken from the official population projections (see ILO_POP.xls).

2. The labour force projection file (ILO_LAB.xls)

2.1. Labour force worksheets

Labour force projections are included in the workbook ILO_LAB.xls. As in the population projection files, data has been organized in separate worksheets for male, female and total population. Labour force by age and sex is calculated by multiplying population by labour force participation rates for single ages up to the age of 100. Assumed future labour force participation rates are in the workbooks PartM and PartF. The worksheets:

<i>PopM, PopF:</i>	import population projection data from ILO_POP.xls (or ILO-POP.xls);
<i>PopT:</i>	calculates total population figures for both sexes;
<i>Pop_Pyramid:</i>	provides a possibility to see the population structure for a chosen year in the form of a population pyramid chart;
<i>PartM, PartF:</i>	contain assumed labour force participation rates for males and females, respectively, by single age and for each year within the projection period. Initial data for the year 1995 by five-year age class are taken from the " <i>Labour Force Survey initial dat</i> " worksheet in ILO_ECO.xls. For the status quo projections, these initial values are kept uniform within the age class and constant throughout the projection period;
<i>LabfM, LabfF, LabfT:</i>	contain calculated labour force figures for males, females and the total, respectively, by single age for all the projection period.

Actual future employment levels by age and sex are then calculated. In our example, the global employment figure for each year is calculated in the workbook ILO_ECO.xls, in the "*Economic scenarios*" worksheet. This figure is then divided into total male and female employment levels using assumptions on the proportion of men and women in employment. The worksheet:

<i>AssumEmp:</i>	contains the assumed distribution of total employment by sex;
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<i>EmplM, EmplF:</i>	calculate future employment by age and by sex. Global employment figures are imported into these worksheets in rows 105 and then multiplied by the assumed shares of male and female employment (from the worksheet AssumEmp). Further, total employment figures are distributed by single ages, using the age distribution of the labour force;
<i>UnemplM, UnemplF:</i>	contain projections of unemployment, which are calculated as the difference between the labour force and employment, by age and by sex;
<i>EmplT, UnemplT:</i>	contain total employment and unemployment projections by age.

2.2. The Interface modules

The workbook contains VBA modules providing instructions for interfacing and dialog sheets enclosing the frames for the dialog boxes. These modules do not need to be modified by the user. They are hidden. To display them one has to follow the procedure described at the end of section 3.2.1 (of Part I). The modules and dialog sheets are as follows:

<i>Chart_Module:</i>	contains the subroutines which provide code for the population pyramid chart;
<i>Main_Module:</i>	contains the subroutines which provide code for the choice of the population projection file used;
<i>Language:</i>	contains the subroutines for the selection of the language used in the workbook;
<i>DB LangSel:</i>	Dialog sheet with frame for language selection dialog box;
<i>PopSelect:</i>	Dialog sheet with frame for population selection dialog box.

2.3. Custom Menu

The ILO_LAB.xls workbook contains a special menu entitled **Custom** (next to the File Menu) which provides the user with the possibility of:

- choosing the population projection workbook which will form the population base for the model (refer to section 1.1. above for a detailed description of each of the population files);
- choosing the language to be displayed;
- one option to compress the file and one option to decompress the file.

3. The economic scenarios workbook (ILO_ECO.xls)

The ILO_ECO.xls workbook contains basic macro-economic assumptions as inputs (on GDP, labour productivity and wage growth, future inflation etc). It projects the aggregated employment and unemployment figures. Some of the main results of the model are also shown in this workbook. It also contains switches enabling feedback calculations and automatic adjustments of the contribution rates.

Future real economic growth rates and productivity increases are exogenous inputs (assumptions). These two assumptions allow to see the impacts of less or more labour intensive

future growth scenarios. In this model version GDP growth and productivity assumptions are made referring to the whole economy. It is strongly recommended that users try to disaggregate this module by main economic sectors (at least for agricultural and non-agricultural sectors). Future inflation rates (GDP deflator and CPI) are also exogenous. Aggregate employment for each year results from the division of the calculated current value of GDP by the calculated current value of labour productivity. The difference between labour supply (i.e. the labour force) and aggregate employment gives unemployment. Employment and unemployment are then distributed among individual age groups in line with the age distribution of the labour force (which is a simplification). In general the model calculates the number of insured (covered employed and covered unemployed) persons by applying coverage rates to the labour force, and the number of insured who are actually contributing by applying compliance rates to the employed, by individual age and sex. The number of inactively insured then is the difference between the two groups.

In the current version of the model, future growth rates of real wages are also assumed exogenously. The total wage fund is obtained for each year by the multiplication of the calculated current average wage by the number of employed wage earners. Total labour costs are a sum of the wage fund plus the total of social security contributions (plus other labour costs, whose share in the total is assumed to be constant over the whole projection period). Share of labour costs in GDP will thus change depending on employment growth (resulting from a given set of GDP and productivity assumptions), relation of the real wage growth rates to assumed GDP and productivity growth and financing requirements of the social insurance provisions. Calculated levels of average wages are one of the essential inputs for calculations of the social protection benefits.

The following box explores the option to incorporate feedbacks between social expenditure into the model. As the topic is conceptually not without controversy we place the explanations into the following box. The first version of national social budget models built on the basis of the ILO methodology will almost certainly be constructed without the feedback mechanism.

Box : Potential feedbacks between social expenditure and the economy

The nature and size of possible feedbacks between the social protection system and the economy are the subject of a controversial academic debate. The outcome of the debate is inconclusive as no effort to isolate the effects statistically or econometrically has met with methodological consensus.

Four basic types of feedbacks between the social security systems and the economy are quoted in the debate:

- The incentive effect, which assumes the payment of transfer incomes to non-employed persons (almost regardless as to whether these transfer incomes are unemployment benefits, social assistance payments or pension payments) are de facto discouraging people to stay in the workforce or seek re-employment;
- The budget deficit/interest rate effect, which assumes that high social expenditure might lead to government deficits which push up national interest rates which in turn will compress investments and growth;
- The labour cost effect, which assumes that high labour cost due inter alia to high contribution rates suppress the demand for labour which can have two effects:
 - it reduces the level of economic activity and thus growth due to reduced employment of labour at constant productivity rates;
 - it leads to less labour intensive technologies, increases average labour productivity, produces higher unemployment (and social protection cost) but does not affect growth;
- The human capital effect, which assumes that increased social protection, i.e. notably good health care and income security, enhances the productivity of the individual worker at constant conditions, without increasing the labour or the capital cost of production and thus positively affects economic growth.

Due to the absence of any statistical information about the sizes of the effects, these effects have been analytically parameterised. This means that the modeler is given the option to undertake economic experiments by making assumptions on the different sizes of the feedbacks and can isolate the overall effects on growth and government and institutional budgets of these assumptions by comparing the outcomes of the experiments with a baseline scenario without feedbacks.

The present version of the model does not include the first of the above feedback (incentive effect), there is thus no impact of the social protection benefits on labour force participation rates and employment.

The three remaining feedbacks are technically defined in the form of elasticities:

- (a) The budget deficit/interest rate, implicitly assumes a relationship between the increase of the deficit and the level of the interest rate to bring the demand for investment resources and savings into equilibrium. It is then, again implicitly, assumed that the reduction of investment leads to a lagged effect on growth. This effect is expressed by the elasticity of economic growth rate with respect to the growth rate of the government deficit in the previous period. The elasticity is supposed to be a negative one. It is also assumed that this feedback works only as long as the public budget is in deficit (i.e. there is no effect on growth from increasing/decreasing the hypothetical surplus of the public finance);
- (b) The labour cost effect, is mapped in the form of the elasticity of the growth rate of average labour productivity with respect to the relative change in the labour costs' share in GDP in the previous period. This elasticity is supposed to be positive, thus an increase in the share of labour costs in GDP will increase next period's labour productivity level and thus will have a negative impact on the employment level. The potential negative impact of labour costs on the level of economic activity is not included in the present version of the model;
- (c) The human capital effect, is mapped in the form of an assumed elasticity of GDP growth rate to the relative change in the share "employment enhancing" social expenditure in GDP in the previous period. For this purpose expenditure on education are added to social expenditure calculated by the model and expenditure of the Demoland special Fund and on pensions are excluded. This effect thus assumes that increased spending on education and on social benefits for working age population, for example the better health and social care provided by the social protection system has a positive measurable impact on the productivity of workers. This productivity effect has no impact on labour cost and thus should have a direct positive effect on economic growth. Increased social expenditure leads, through this feedback, to higher GDP and higher employment.

These elasticities, are assumed to be lagged by one year, i.e. for example the increased labour cost in year t does not affect the growth rate in year t but in year $t+1$. This simplifies the modeling as no iterations to a new equilibrium are necessary in the year t and also reflects the fact that an economic production process does not react instantaneously to changing exogenous conditions.

3.1. The "Economic scenarios" worksheet

Here one should input the main economic assumptions for the projection period. In the generic model these are:

GDP real growth rate (cells H2 to Z2);

Labour productivity real growth rate (cells H3 to Z3);

Inflation_GDP deflator (cells H5 to Z5)⁴;

% of unemployed registered (cells H7 to Z7) - assumed percentage of all those unemployed who are registered. This assumption is imported from the worksheet "*LF Balance Assumptions*" (see below);

Real wage growth (cells H9 to Z9);

Minimum unemployment rate (cells H10 to Z10) - assumption preventing the calculated unemployment rate to fall below an assumed threshold;

Contributing as % of employed (cells H24 to Z24) - assumes a proportion of all those (formally and informally) employed who actually pay social security contributions;

CPI -Consumer price index (cells H35 to Z35);

Interest rate, real (cells H49 to Z49);

Minimum wage (cells H50 to Z50)⁵.

In the "*Economic scenarios*" worksheet one can also enable or disable the feedback links. This should be done in a row 31. To switch off the feedback links one should enter "0" in cell F31. To switch on the feedback links the value in this cell should be put to "1". In the next three rows one can enter assumed values for the following elasticities for the feedback links:

Elasticity of GDP growth to change in current public deficit share in GDP - cells H32 to Z32;

Elasticity of productivity growth to change in labour costs' share in GDP - cells H33 to Z33;

Elasticity of GDP growth to change in growth and employment stimulating expenditure in GDP - cell H34 to Z34.

One should remember that enabling feedbacks causes the recalculation of the whole model to take much longer.

Another option in the "*Economic scenarios*" worksheet relates to the assumed contribution rates. The choice has to be made in row 54: If the value in cell F54 is "0" then contribution rates will stay constant over the projection period at the levels assumed for 1998 (in cells I56-I61). If the value in cell F54 is equal to "1" then, starting from 1999, rates of contributions to the Pension Fund, Employment Fund and Demoland special Fund will be automatically adjusted. The rates

⁴ In the current version these figures are calculated from the assumed Consumer Price Index figures (in row 35). In some cases however, one may wish to assume GDP deflators separately.

⁵ In the current version future minimum wage is calculated and assumed to stay in the same proportion to the average wage as in 1996. One may wish to enter future absolute values instead.

are adjusted (according to a lagged adjustment formula) to the levels necessary to balance these funds. The adjustment formula assumes that the current period's contribution rate will be equal to the rate of the previous period plus an average of differences between the required PAYG rates and the current rates from the previous two periods. The user, who is willing to change the way contributions are being adjusted, can of course modify this formula. The **initial contribution rates** have to be input in rows 83 to 88, columns F to Z.

In the "*Economic scenarios*" worksheet, one can also find main results of the model such as:

employment growth (row 4), unemployment rate (row 6), share of labour costs in GDP (row 25), shares of social expenditure in GDP (rows 63 to 66), share of public finance deficit in GDP (row 71) and PAYG contribution rates necessary to balance social funds (rows 90 to 96).

At the bottom of this worksheet (rows 107-118) inputs are requested for the **rate of administrative expenditure as a share of benefit expenditure** for the different schemes.

3.2. Charts

There are two worksheets with charts. The "*Economic scenarios chart*" graphs main assumptions on GDP, labour productivity and wage growth rates and projected employment growth resulting from these assumptions. The "*Unemployment rate chart*" graphs the projected unemployment rate (total and registered).

3.3. Labour force worksheets

The worksheet "*Labour Force Balance*" provides tables balancing projected population, labour force, employment and unemployment.

The worksheet "*LF Balance Assumptions*" serves to input some of the assumptions related to the labour market. These are the following:

- **Urban labour force participation rates** (male, female);
- **Proportion of male in employment;**
- **Proportion of urban employment** (male, female);
- **Proportion of employees in total employment;**
- **Proportion of urban employees;**
- **Proportion covered by social insurance within the total number of employed** (urban, rural);
- **Proportion of unemployed registered.**

The worksheet "*Labour Force Survey initial dat*" should contain data from a recent Labour Force Survey. In particular, it contains labour force participation rates which are used as assumptions in calculating labour force projections in ILO_LAB.xls.

The worksheet "*Labour force and employment*" contains estimates of the labour force and employment for 1995 and 1996 based on different sources: a labour force survey and (e.g.) Ministry of Labour statistics. It has been used to check assumptions which were made.

The worksheet "*Registered unemployment*" contains (monthly) statistics on registered unemployment and on unemployment benefits. The statistics are then used to calculate the

unemployment benefit replacement rate and take-up rate. They are further used for unemployment benefit expenditure projections in ILO_SOC.xls.

3.4. The "Primary income distribution" worksheet

This worksheet contains statistical data on the primary distribution of income. This data may be used to check correctness of calculations of wages and other labour costs in the "Economic scenarios" worksheet. It has no links to other parts of the model.

3.5. The Interface modules

Language: contains the subroutines for the selection of the language used in the workbook;

DB LangSel: Dialog sheet with frame for language selection dialog box.

4. The social budget workbook (ILO_SOC.xls)

In this workbook, projections of all the major components of social protection expenditure are made (with the exception of the long-term benefits - old-age, invalidity and survivors pensions - which are projected in the separate pension model workbook ILO_PEN.xls).

Each functional category of benefits is projected in a separate worksheet. Features common to all worksheets are described in the section 3.2.1 (of Part I). Each worksheet is structured in the following manner:

- by year of projection in columns and by category projected in rows;
- all assumptions on specific parameters are provided in the top section (in yellow);
- the assumptions section is always followed by the summary of expenditure and revenue for a given functional category of benefits (areas in light purple);
- projection calculations are done below the first two sections.

Some of the worksheets use VBA macros and are thus linked to VBA modules. The VBA modules can contain either functions or macro procedures. The cells in workbooks containing values calculated by VBA macros are indicated in the descriptions of the respective worksheets.

Remember: Functions are recalculated automatically when some of the input data are changed. Macros will recalculate the model **only** when the respective macro button is clicked.

In the following sub-sections different worksheets of ILO_SOC.xls are described.

4.1. The "Social budget", the "Graph", and the "Soc_prot" worksheets

The main projection results, provided in the functional expenditure and receipt summary information section of each worksheet, are imported into the "Social Budget" worksheet. This worksheet provides a summary of projections of the national social budget. They are presented in two tables: one in absolute terms (in national currency) and the other in relative terms (as a percentage of GDP).

The *"Graph"* worksheet presents, as a chart, projected expenditure on various social benefits (measured in percent of GDP). The graph is automatically modified to changing projection results.

The Soc_prot worksheet contains a summary of the expenditure of the different schemes in per cent of GDP.

4.2. The "Pensions" worksheet

Projected benefits and administrative expenditure and respective revenue are presented in this worksheet. However, actual projections of old age, invalidity, and widows' pensions, funeral benefits for deceased pensioners, and other benefits that are borne by the pension scheme as well as the revenues of this contributory scheme are calculated in a separate workbook, ILO_PEN.xls, and the results are then imported into the *"Pensions"* worksheet in ILO_SOC.xls.

4.2.1. Pension workbook ILO_PEN.xls

Let us at this point move for the time being outside the ILO_SOC.xls workbook to see the pension model in ILO_PEN.xls. This is a simplified version of the generic ILO pension model (ILOPENS.xls).

ILO_PEN.xls includes a number of worksheets which each accomplish a given task. They are the following worksheets: *"Pensions"*, *"contributors and wages - m"*, *"contributors and wages - f"*, *"service and savings - m"*, *"service and savings - f"*, *"newpensm"*, *"newpensf"*, *"PensM"*, *"PensF"*, *"widowspens"*, *"DC benefits - m"*, *"DC benefits - f"*, *"Mortality rates -m"* and *"Mortality rates -f"*. It also includes VBA modules: *"Matrix_module"*, *"Ins_earnings_module"* and *"DC_module"*. All the worksheets follow to a certain extent the same structure as the other main worksheets of the model.

Demographic and revenue calculations

From a programming point of view, the pension model ILO_PEN.xls is an extension of ILO_LAB.xls. It generates the numbers of the contributing population in an age-specific manner, by applying a uniform compliance or participation rate to the estimated number of employed persons in ILO_LAB.xls. The model calculates the group of the inactively insured population as the difference between the insured population (proportion of the labour force covered by the social protection provisions) and the currently contributing population. New pensioners and those entitled to an old-age grant are calculated for the actively insured and the inactively insured population separately.

It assigns age-specific average insurable wages to each age cohort of insured persons.

The average income subject to contributions of the insured population is not identical to the average wage in the economy as calculated by ILO_ECO.xls. There are several reasons for this:

- The respective scheme might not be able to collect all contributions due;
- There might be a ceiling on the maximum income subject to contributions;
- Low incomes might be exempted from contribution payments;
- Total insurable income might include elements that are not defined as "wages" in macroeconomic terms, etc.

The model calculates earnings subject to contributions in the individual schemes as the product of the average sex specific national wage multiplied by the compliance rate - which one might also call a "catchment factor". This factor is usually calculated by dividing the base year values of average insurable incomes in the individual social insurance schemes (e.g. pensions, short-term benefits, health care) and in the unemployment fund by the average national wage. Age specific wages are assumed. Based on these values, assumptions regarding the sum of all wages subject to contributions can be made.

On the expenditure side, the overall number of existing old age pensioners and average pensions is first allocated to single ages, based on the age structure of the population and available information on pensioners (such as the number of those under the retirement ages of 60, and of those over this benchmark). Then projections are done for the years which follow. This is done by ageing the existing pensioners (taking into account mortality rates for this group) and by adding the number of new pensioners for that year. For the calculation of the numbers of new pensioners, in a first stage the number of pensioners before the benchmark retirement age are calculated⁶. The projection is made by holding constant the ratio of retirees to the total population in the single ages. Then the difference between the number of pensioners of age x in year t and the surviving pensioners of age $x-1$ of year $t-1$ is taken as the number of new pensioners. At the benchmark retirement age, the number of new retirees for the actively and inactively insured persons is calculated as the differential between the contributing/inactive persons respectively of age x in year t and those of age $x-1$ in year $t-1$ minus the number of person who died between age $x-1$ and age x . On the one hand this is a prudent assumption as some of these workers might simply withdraw for other reasons from the labour market, but on the other hand there might be additional beneficiaries coming from the pool of persons who had pension entitlement but were not employed immediately before the retirement age. It is therefore assumed that these two effects cancel each other out. The same procedure is applied to the age (benchmark + 11). This assumes that the retirement phase is largely concluded in the early 70s. Between these two bounds people retire, but overall retirement cannot be calculated by the same method as at the benchmark age. Some people might not fulfil the benefit conditions at the benchmark retirement age and re-enter the labour market at this late stage, to qualify for benefits at a later date. Using the same method as at the benchmark age might thus lead to "negative new pensioners" in some cases. The model calculates the new retirees for these intermediate ages by a product of the numbers of contributors/inactives respectively and the probability to retire (i.e. the retirement rates which are noted in column C of the newpensm and the newpensf worksheets). From the numbers of retirees, the persons entitled to receive pension benefits (new old-age pensioners) and those entitled to only an old-age grant are calculated. This is done by taking into account the reference wage, past service credits and the pension formula. The calculation is done in the VBA "Matrix_ module".

Disability pensioners are projected as a constant proportion of the contributing population and social pensioners as a constant proportion of old age and invalidity pensioners. Survivors pensioners are projected in the "*widowspens*" worksheet by ageing the existing widows and projecting new survivors from the insured population as well as from the (old age) pensioner population.

⁶ These pensions usually are awarded to members of prescribed occupational groups (e.g. miners) or persons who worked under hazardous and precarious conditions. They usually have more favourable conditions as to pensionable age, than the rest. It is assumed that the possibility to get those (early) pensions will prevail throughout the whole projection period.

Calculating average pensions and total pension expenditure

Average (old age) pension amounts for all ages are calculated on the basis of the reference wage, past service credits and the pension formula. Past service credits are the total number of insurance months or years which are taken into account in the specific pension formula. These insurance periods include contribution periods but also periods considered as fictitious contribution periods such as periods credited for child rearing, studies or military service, etc. Reference wage is a function of the past annual or monthly wages which are taken into account in the pension formula. This might be equal to the average of the adjusted last *n* annual wages or the best *n* annual wages within the last *m* years, or the average of all indexed annual wages throughout the career. In the present version the latter option is taken.

The pension component in the ILO_PEN.xls operates on the basis of a discrete bi-variant distribution of past service and wages for the calculation of newly awarded old age pensions. This distribution is described as a 9 x 9 matrix which has in the third head row (not counted as a matrix row) nine classes of past service lengths expressed as multiples of the average past service. The fourth head row (also not counted as a matrix row) gives the average past service in the nine classes. The first leading column (not counted as a matrix column) consists of 9 classes of wages expressed as multiples of the average (cohort) wage. The second leading column (also not counted) gives the average wages in the respective classes. Each of the cells of the 9 x 9 matrix contains the proportion (relative frequency) of all new pension awards which are calculated on the basis of that specific combination of wages and past credits. This distribution is used for each age of actual retirement and each age specific wage. Different distributions are established each for the actively insured and the inactive insured for males and females respectively (i.e. four different distributions). The user has to pay particular attention when setting up these matrixes, some assistance as to the distribution of past service is built into the header of the matrixes.

The pension formula is indicated in the "*Matrix_module*". The user will need to enter the following information:

- the number of years of projection;
- the contribution period to qualify for an old-age pension;
- the manner in which the reference wage is to be calculated, i.e. career average or as a proportion of the average wage;
- the period over which the reference wage is calculated, i.e. whole career or over a defined period;
- the flat-rate component of the pension formula;
- the accrual-rate component of the pension formula;
- the maximum pension (as a proportion of the reference wage).

With the help of the pension formula and the data in the matrix head rows and columns, in the VBA "*Matrix_module*":

- first the retirees entitled to an old-age pension (by individual age and sex) and those entitled only to an old-age grant (total) are calculated for each combination of past service and wage, by taking into account the distribution of the length of past service;
- then the reference wage is calculated according to the option chosen, for each combination of past service and wage that did not result in an old-age grant in the first step;

-
- after this the value of the newly awarded pension for each combination of past service and reference wage can be calculated.

This is done both for the actively insured group and the inactively insured group, by referring to the different distributions/matrixes.

The amount of old-age grant is calculated as a multiple of the old-age pension awarded to a new pensioner aged 60 years. The user will have to put in the number of yearly payments that are taken into account when calculating the lump sum. The present version assumes that the lump sum is calculated as monthly amount times 12, hence one year's payment.

The bi-variant distribution described through the past service-wage matrix is kept constant throughout the projection period, whereas the average number of past service years and the average wage change over time. These changes are particularly significant when the scheme is still maturing, and each year pension entitlements increase structurally because each generation of new pensioners has longer past credits than the previous one since on average they have "served" one year longer. Their reference wage also changes structurally as the full reference period for calculation of the reference wage is also gradually building up. The use of a discrete probability distribution for the pension calculations permits to estimate the number of minimum pensions for each year.

Keeping the relative distribution around an average past service and an average reference wage constant is an obvious simplification but justified, as a "dynamisation" of the future distribution would lead to exponentially increasing numbers of a speculative assumptions.

If the reference wage is chosen as a part of the average wage, the relationship between them is described by a single factor which makes the reference wage a linear function of the average wage (or average insurable wage). It has to be input in cells F30 to Z30 of the "*newpensm*", "*newpensf*" sheets, respectively. This factor might vary over time. It describes structural parameters of the pension scheme, as it implicitly reflects:

- past income biographies;
- the past efficiency of contribution collections; and
- past compliance.

Description of the worksheets used for the projections

The "*Pensions*" worksheet (in its head and end section), provides assumptions which are used for calculation purposes within the workbook. In a second section, the functional summary of the pension forecasts is provided. It imports main aggregated results of the projections performed in the other worksheets (i.e. expenditure by category of pension, average benefits and numbers of beneficiaries and contributors). It also calculates some basic indicators for the pension scheme (demographic and financial ratios, cost-rates (general average premium, etc.) permitting a more in-depth analysis of the situation of one of the major components of the national social budget. Using this sheet the user has to decide whether and how credits can be accrued for periods of employment without actual contribution payment, and/or for periods of registered unemployment. In addition it has to be decided whether or not contributions will be paid to the pension fund on behalf of registered unemployed, who receive an unemployment benefit. The input is required in rows 130-135 and cell G25, respectively. The sheet also contains a button "**Recalculate defined benefits**". This button starts the VBA procedure (included in the "Matrix_module") calculating the new pensions, new grants and the amounts of the newly awarded

pensions. Main disaggregated results are provided in the worksheet "*newpensm*", "*newpensf*", "*PensM*" and "*PensF*".

The "*contributors and wages - m*" and "*contributors and wages - f*" worksheets contain some of the input data (respectively for males and for females). In a first section, the contributing population is calculated taking into account the actual employed population and a compliance factor which represents the proportion of the employed who are covered by the scheme and who actually contribute. This compliance factor has been calculated in the *ILO_ECO.xls* workbook. Following this the insured population is calculated taking into account the labour force and applying a coverage rate (which has been calculated in the *ILO_ECO.xls* workbook). Following this the number of inactively insured persons is calculated on the basis of the difference between the insured population and the contributing population. Next the average wages by age are assumed following which the insurable wages are calculated using the function "*Insurable_earnings*".

The "*service and savings - m*" and "*service and savings - f*" worksheets contain an average past service distribution by age for males and females respectively. The average past service is incremented each year according to the period of contribution payment, and - if so decided - by credits for non-contributory periods, including times of registered unemployment. Following that the average past savings is calculated for each individual age taking into account the average wage, length of past service, the interest rate and the contribution rate, and the savings resulting from periods of registered unemployment, if contributions are paid on behalf of the unemployed for this time. These average past savings will be used if the defined contributions option is selected.

The "*widowspens*" worksheet calculates the numbers of widows and widowers for the calculation of survivors benefits. The initial population of widow(ers) have been distributed by individual age. Then projections for future years were done by taking into account existing survivors, survivors from the insured population and survivors from pensioners. Assumed marriage eligibility rates were also taken into account.

The "*newpensm*" and the "*newpensf*" worksheets contain separate calculations on new pensioners and newly awarded pensions arising from the currently contributing population and from the inactively insured population for males and females respectively. These worksheets also contain the assumptions on the combined distribution of wages and past service in the form of the wage/past service matrixes (separately for male/female contributors and the actively/inactively insured) for those retiring, as described before. On the demographic side, new retirees are projected. From these are calculated the new old-age pensioners and those awarded old-age grants. On the financial side, the average newly awarded pensions (separately for male and female new pensioners and for the formerly active and the formerly inactive) are projected. These are then used to calculate projected average pensions (which take into account newly awarded pensions and pensions already in payment) in the worksheets "*PensM*" and "*PensF*". As mentioned earlier on, the new pensioners (from the actively insured and the inactively insured, the new grants from both these groups and the average pension amounts for both these groups are calculated in the "*Matrix_module*". To calculate these values use the "**Recalculate defined benefits**" button in the "*Pensions*" worksheet.

When any of the assumptions used to calculate pensions or pensioners is modified (e.g. average wage...) use the "**Recalculate defined benefits**" button to recalculate all the values.

The "*PensM*" and the "*PensF*" worksheets contain calculations on the numbers of beneficiaries and amounts of benefits for old-age, invalidity, survivors', social pensions and old-age grants are calculated in these worksheets. For the old-age pensioners this is done for each individual age (newly awarded plus the existing pensioners). For widows, the number of beneficiaries is calculated in the "*widowspens*" worksheet. For invalidity pensioners a total figure is calculated based on the number of contributors, for long-service benefits on the number of old-age pensioners, and for social pensioners on the number of invalidity pensioners and old-age pensioners. On the financial side the amounts of pension benefits are calculated first as average benefits and then as total benefit amounts. Once again only old-age pensions are calculated for each individual age taking into account the newly awarded pensions and existing pension benefits (indexed in line with CPI). The other benefits are calculated as a proportion of the average old-age pension in payment, except the amount of old-age grant that is calculated as a multiple of the newly awarded pensions to pensioners of age 60.

The model also permits the calculation of a defined contribution component. For this purpose the following worksheets are used: "*service and savings - m*" and "*service and savings - f*", "*Mortality rates - m*" and "*Mortality rates - f*", "*DC benefits - m*" and "*DC benefits - f*", and the VBA module "*DC module*". In the service and savings worksheets, the average past savings by age are calculated. In the Mortality rates worksheets, the mortality rates are input. They are input from the MORT.xls workbook and correspond to the mortality rates used for the projection of the population. These rates are then used to calculate the annuity factors in the "*DC module*". These annuity factors are calculated by taking into account a changing (technical) interest rate in line with the assumptions in ILO_ECO.xls, rather than a fixed interest rate for the whole projection period. They refer to the life-table assumed for the year when the pension is first awarded. The annuity factors are output in the "*Mortality rates - m*" and "*Mortality rates - f*" worksheets and are used to calculate the average defined contribution benefits. These average defined contribution benefits are output in the "*DC benefits - m*" and "*DC benefits - f*" worksheets. The calculation is started by pressing the **"Recalculate defined contribution benefits for males and females"** button in the "*DC benefits-m*" worksheet. It is important to note that the defined contribution component is not automatically linked to the "*Pensions*" worksheet. Therefore, if the user would like to use this component a link must be established manually.

4.2.2. The Pension projection model (ILOPENS.xls)

A more sophisticated actuarial valuation of a long-term pension scheme can be done using the Pension projection model (ILOPENS.xls)⁷.

4.3. The "Health" worksheet

In the case of health care, projection results can either be imported from an external health care model or obtained by running the full-scale health component (module) of ILO_SOC.xls. In this section, the internal version of ILO_SOC.xls has been described. This stand-alone component (module) understands that the government will assume the responsibility for the financing of health care for some time to come. Should an independent health insurance system

⁷ A description of this model can be found in the following technical guide: *The ILO pension model. A technical guide*, October, 1997.

be introduced, then a new version of this component would have to be built by modifying the basic structure of the present version.

The model calculates two elements of overall national health expenditure:

- government expenditure through the Ministry of Health (MOH);
- private-sector expenditure (primarily out-of-pocket expenditure).

Government health care expenditure is estimated as the sum of:

1. government administrative expenditure for health care (including, for example, the expenditure of the MOH);
2. expenditure in government outpatient facilities;
3. expenditure in government hospitals;
4. government investment expenditure for health facilities.

Government administrative expenditure for each year of the projection period is estimated as the product of the following factors: (a) the prior year's expenditure, times (b) the rate of increase of the total population, times (c) the rate of increase of wages in the economy, times (d) a factor describing the "usual" differential between wage growth in the government health care administration and the general average wage growth. The values for the deviation factors are normally taken from historically observed statistical data.

Expenditure in the major categories of care (in outpatient facilities and in hospitals) are separated into staff and non-staff costs (per ambulatory care unit and per hospital bed, respectively). These costs are projected separately. The major explanatory variables are the number of ambulatory care units (or number of beds), the development of wages in the economy, and the development and structure of the total population. In addition, the staff and non-staff components are multiplied by deviation factors which describe (a) the historically observed deviation of the change in staff cost per unit or bed from the average wage, and (b) the deviation of the development of non-staff costs from general inflation. In addition, staff costs are multiplied by a development factor which describes the staffing trend per care unit or bed. This allows for simulations of the expenditure differentials triggered by changes in the number of care units or hospital beds, as well as simulations of the effects caused by changes in the intensity of care provided.

The most important factor driving health expenditure, however, is the utilization of care. Health care utilization, in turn, is usually driven by the population structure, since utilization rates differ by age and sex. In addition, there is general statistical evidence that the utilization of care positively correlates with the development of real per capita GDP; in other words, the richer a country becomes, the higher its utilization of health services. The elasticity between growth in health care utilization and growth in GDP per capita must be observed statistically. The elasticity has provisionally been set at zero, meaning that the utilization rates per capita in this version of the model are exclusively driven by the change in population structure. This is reflected by a factor equal to the overall average utilization rate in year t , divided by the overall utilization rate in year t . The overall utilization rate is the weighted average of the utilization rates for different age groups (under 15, 15 to 64, 65-74 and 75+). Since no age-specific utilization rates were available, a typical standard utilization function was used.

Overall gross government expenditure can be calculated based on the above assumptions and data. Net government expenditure is derived by subtracting the amount of patients' co-payments in government facilities from gross government expenditure. Total co-payments are projected as

a constant percentage of gross government expenditure. However, in the future, this factor might well become a policy variable.

Private health care expenditure is estimated as a proportion of government expenditure, to which the amount of co-payments are added. This is a very conservative estimate of private health expenditure, as it is obvious that substantial amounts of additional remuneration in public facilities are paid in the form of under-the-table payments. Due to the very nature of these payments, the order of magnitude of these is unknown and cannot be taken into account.

The health care projections get an input from the:

- economic scenarios workbook: for average wage development to project developments of staff costs, for GDP deflator to project the non-staff costs and for GDP growth rates to calculate GDP adjusted utilization indicators;
- population workbook: for population developments to project a weighted health care utilization indicators, to project the numbers of ambulatory care units and hospital beds and to project administrative expenditure.

As noted in the description of the methodology, a number of assumptions were made to substitute for real statistical data. These should be replaced with actual data.

4.4. The "Unemployment" worksheet

This worksheet calculates projections of the expenditure on unemployment benefits, employment services and employment policy measures and of revenues from contributions and other sources. Expenditure on unemployment benefits is the product of the numbers in registered unemployment, the average wage, the "take-up rate" of unemployment benefits, and the replacement rate (average benefit / average wage). The take-up rate is the ratio of beneficiaries to the total number of registered unemployed. It thus reflects not only voluntary take-up or non-take-up, but also non-receipt of benefits for a variety of other reasons, ranging from administrative failure to the expiration of benefits.

Expenditure on active labour market policies and the administrative costs of the employment service and of the payment of unemployment benefits are calculated as fixed proportions of the expenditure on unemployment benefits. Income is calculated *mutatis mutandis*, as in the pension component. If it was decided that contributions to the pension scheme are to be paid on behalf of the registered unemployed, they are thus accruing credits in the pension scheme, the amount of these contribution is taken as expenditure in this sheet. The user will have to change this, according to the situation in his/her particular country. The input has to be made in the "Pensions" worksheet.

Assumptions on the "take up rate" and the "replacement rate" for the unemployment benefits are imported from the workbook ILO_ECO.xls (from the worksheet "Registered unemployment").

The worksheet also gets an input from the "Economic scenarios" worksheet for projections of the registered unemployment, the contribution rate, the rate of administrative costs, the average nominal wage and the total wage fund.

4.5. The "Short-term ben." worksheet

Projections of short-term benefits paid by the Social Insurance Fund (namely sickness and maternity benefits, benefits on child birth, funeral benefits on behalf of deceased actives and health improving benefits for employees and families) are performed in this worksheet. Calculations of sickness and maternity benefits are executed by VBA functions which have been programmed in the "Short-term Module".

On the expenditure side, the average number of benefit days per insured person, the average replacement rate for the daily sickness benefit, the number of maternity days per woman of age 15 to 45, as well as the average daily maternity benefit and total benefit cost have been calculated or are input. These data are usually derived from the last available benefit data. For status quo projections, the number of per capita sick days, the average replacement rate for sickness benefits, as well as the number of maternity benefits per woman in the fertile age group is held constant. The cost of funeral benefits is extrapolated in line with CPI development. Other expenditure and administrative expenses are calculated as percentages of total benefit expenditure.

On the revenue side, a compliance factor (which should be based on observed data) for collected contribution income should be taken into account.

The worksheet is linked to the:

- labour force workbook: for importing data on the number of newborn to project the child birth benefits and data on the number of employed women in fertile ages (15–45) to calculate the maternity benefit expenditure;
- economic workbook: for importing average nominal wages and numbers of employed to calculate the expenditure on sickness and maternity benefits and to calculate contribution income. The CPI index is also imported to adjust future amounts of the average child birth benefits and funeral benefits.

There is an implicit assumption in the worksheet of the generic model that all the collected revenue from contributions is spent.

4.6. The "Households" worksheet

The social budget model measures poverty in the "Households" worksheet based on the "Poverty Module". The "Households" worksheet contains the input information relating to the poverty line level, household income distribution, household characteristics (i.e. number of households, size of the average household, composition of the average household, etc.) as well as the results of poverty measurements. Two kinds of poverty index are calculated:

- the headcount index which measures the number of households below the poverty line; and
- the poverty gap which takes into account their distribution (i.e. how far below the poverty line these households fall).

The calculation of these have been programmed in VBA in the "Poverty Module". Main calculations have been written in distinct clearly identified subroutines (i.e. Poverty_line_calculation is the subroutine which projects the poverty line level). The descriptive variable names provide the user with transparent identification of what they are meant to represent (i.e. house_under_poverty_line, house_income_distribution, etc.).

Projecting income distribution is one of the most difficult parts in social protection modelling. The overall income distribution has been projected by:

- (a) increasing the average wage in every income bracket by a weighted average reflecting wage growth and the increase in the total volume of non-means-tested benefits (as approximated by the change in volume of all pension payments and non-means-tested family benefits); and
- (b) a procedure which modifies the actual distribution of households among the different income classes.

The latter procedure (b) follows the principle of prudence. It was thus assumed that each additional unemployed person would "pull" an additional household into poverty (three bottom income classes). The newly poor are recruited from these three classes. It is again an artificial assumption and it principally overestimates poverty, leading to a prudent estimate of overall expenditure concerning social assistance and housing benefits.

Based on these income projections and the assumed constant distribution of the household size, the absolute number of households and persons in poverty as well as the poverty gap can be calculated. These variables are the key determinants of social assistance and housing benefits.

The two-part calculation

- (1) The target groups of measures of social assistance are those whose living standard falls below a minimum level. Through the measurement of a minimum basket of goods and services, a poverty line is defined in absolute or relative terms (a proportion of the average wage). In the *"Households"* worksheet the initial level of the poverty line in absolute terms has been provided in the Parameters and assumptions section. From this initial level, the absolute poverty line is projected by indexation to inflation. To do so the **"Calculate poverty"** button is used. A relative level is automatically calculated. As the poverty line level is a policy variable, the user has the possibility to enter an assumption for any year (i.e. if it is foreseen that the poverty line will represent 30 per cent of the average wage in 2000 and then remain constant, these values can be entered in the assumptions section). In order to obtain the absolute poverty line levels, the **"Calculate poverty"** button must be used.

Whenever simulations for different poverty line levels are done or there is a modification of the average wage (i.e. for example through the modification of GDP growth in the economic workbook) or there is a modification of the inflation level then the **"Calculate poverty"** button must be used.

- (2) Once the poverty line level has been calculated, the actual poverty index is calculated. Firstly household income distribution is compared to the poverty line and those households whose income falls below this level are considered poor. These are calculated in the *Household_under_poverty_line* subroutine in the *"Poverty Module"*.

An assumed average total per capita household income distribution (excluding transfers from social assistance and housing benefits) as a proportion of the average wage as well as an average per capita household income distribution from pensions and other transfers (excluding transfers from social assistance and housing benefits) were used to calculate the average per capita income of the poor and the actual poverty gap which needs to be met by social assistance transfers. These are calculated in the various clearly defined subroutines in the *"Poverty Module"*. The average per capita household income distribution from pensions and other transfers (excluding transfers

from social assistance and housing benefits) takes into account transfers from the pension fund in the form of social pensions and also the tax financed family benefits.

Therefore, links in the worksheet are provided to the:

- labour force workbook: to import data on the total population in order to calculate the total number of households;
- economic workbook: to pick up average nominal wage data for the calculation of the poverty line and poverty gap. Data on inflation are picked up for the indexation of the poverty line;
- The "*Pensions*" worksheet and "*Tax finan. family ben.*" worksheet: to take into account the growth of social pensions and tax financed family benefits for calculations of the average per capita household income distribution from pensions and other transfers.

The resulting poverty gap (pre-housing and social assistance benefits) are output to the "*Soc.Assistance*" worksheet.

The above means that this worksheet has to be recalculated manually every time there are any changes introduced into the model that would affect population, unemployment, average wage, inflation, pension expenditure and expenditure on family benefits. This is important as the output produced in this worksheet is used to calculate social assistance and housing benefit expenditure. Without the recalculation, changes in the demographic and economic assumptions would not have the expected effects on those components of social expenditure.

To recalculate this worksheet use the button "**Calculate poverty**".

4.7. The "*Soc.Assistance*" worksheet

Social assistance generally provides two types of benefits - cash and non-cash. Cash benefits are designed to close the gap between the actual income of an individual/household and the poverty line. The social assistance worksheet uses the number of households under the poverty line and the poverty gap calculated as described above to project expenditure on social assistance benefits. Projection of numbers of social assistance beneficiaries is done by adjusting the initial year value in line with the projected changes in the number of poor households (as calculated in the "*Households*" worksheet). The global amount of benefits in each projection year is the product of the starting value and the ratio of the poverty gap in the respective year to the poverty gap in the base year and the respective ratio of the number of poor households. The amount is increased by an assumed amount of administrative cost (in Demoland equivalent to 5 per cent of the benefit costs). In this way, it is ascertained that total expenditure follows need, as expressed by the poverty gap indicator, without making explicit assumptions about the benefit take-up rate or target efficiency (i.e. the degree to which the poverty gap is actually closed by the benefits).

4.8. The "*Housing*" worksheet

Expenditure on housing benefits are projected as follows. The numbers of beneficiaries/households are projected by adjusting initial year data in line with projected changes in the number of poor households (as calculated in the "*Households*" worksheet). The average benefit amount is projected by adjusting the initial year's amount in line with the consumer price index. Total expenditure is then calculated for each year by multiplying the number of beneficiaries/households with the average benefit amount.

4.9. The "Tax finan. family ben." worksheet

The "*Tax finan. family ben.*" worksheet consists of all family benefits which are not financed by the pension or the social insurance funds. In the generic model we have taken these to include parental leave for non-employed persons, benefits for large families, benefits for caring for a disabled child, income support for low-income families with children, benefits for children in foster care, child care benefits for persons in the military service, and benefits for children without alimony. Benefits are calculated as the product of the estimated number of recipient families times the average amount of annual benefits. The number of beneficiaries/households is supplied by the "*Households*" worksheet. The average annual benefit amounts are anchored to the initial observed amounts and indexed according to inflation.

Projections are done by adjusting:

- initial average amounts of benefits in line with CPI;
- initial numbers of cases in line with the growth of the respective population or household group.

4.10. The "Demoland fund" worksheet

All expenditure and revenues of the Demoland special fund are projected in this worksheet. A number of assumptions were made (and input in rows 4-12).

On the expenditure side, most of the individual items of the Demoland special fund are projected based on their initial level and then adjusted in line with CPI, GDP deflator or nominal wage growth. The Demoland special fund is assumed to provide some pensions to a specific clientele. Demoland special fund pension expenditure projections are provided by the pension sheet in ILO_SOC.xls. Part of contributions to the Demoland special fund (equal to expenditure on Demoland special fund's pensions) is assumed to be transferred to the government pension scheme.

This sheet may be used to calculate the expenditure and revenue of other schemes in a particular country, e.g. an employment injury scheme or a workmen's compensation scheme. In this case it has to be totally re-devised and adapted to the structure of that scheme.

4.11. The "Others" worksheet

Other government budget financed benefits that may exist but are not included in the model so far, can be projected in this worksheet. As an example the generic model assumes four types of benefits, particular benefits for disabled civilians, for war veterans and disabled veterans, for the maintenance of social security institutions and other benefits. Assumed initial expenditure levels are adjusted in line with either CPI (for social protection for the disabled and for other benefits) or the GDP deflator (for the rest of the expenditures).

4.12. The Interface modules

Language: contains the subroutines for the selection of the language used in the workbook;
DB LangSel: Dialog sheet with frame for language selection dialog box.

5. The government accounts and the institutional budgets workbook ILO_GOV.xls

In this workbook, one will find worksheets projecting institutional budgets of the social funds and a worksheet projecting the consolidated public budget. With respect to the columns, the layout is the same as in most of the other worksheets of the model (projection years in columns starting with initial data for 1995 in column F and the last year of the projection period in column Z). The first two columns contain variable names in English and eventually the national language of the user. However, the row layout differs among worksheets: each row represents a specific budget line of a given institutional budget.

The worksheet "*Consolidated Public Budget*" projects the overall expenditure and revenue of the public finance. It imports from other parts of the model, projections of the contribution revenue and of the expenditure on social protection benefits and services. With respect to the other items of the consolidated public budget, projections are made based on assumptions. These assumptions are to be input in rows 41 to 46 (yellow background). There are separate assumptions on:

- tax revenue as a proportion of GDP;
- share of non-tax revenue;
- elasticity of education expenditure to GDP growth;
- price subsidies as a per cent of GDP;
- non-social budget expenditure in per cent of GDP.

Results in absolute amounts are presented in rows 3-40. Rows 64-101 present the same results expressed as percentages of GDP. Rows 47-56 present selected summary results.

The total expenditure, revenue and the deficit is presented graphically in the "*Graph*" worksheet. This graph is automatically updated when any of the values is modified.

The following worksheets project revenue and expenditure of the social funds:

- "*Pension Fund Budget*" worksheet;
- "*Social Insurance Fund Budget*" worksheet;
- "*Employment Fund Budget*" worksheet;
- "*Demoland Fund Budget*" worksheet.

The values are based on imported results of projections for the respective functional benefit categories from ILO_SOC.xls. Transfers between the funds are also taken into account (like transfers from the Demoland Fund to the Pension Fund).

The language interface dialog sheet "DB LangSel" as well as the VBA module "Language" are also included in the workbook.

6. Presentation interface and scenario manager

Besides the model files described in the previous sections, there is a general file STRUCTUR.xls, which contains the presentation interface and the scenario manager.

On opening the file, one is presented with a welcome screen with the following three buttons:

MODEL STRUCTURE

SCENARIOS

OPEN WORKBOOK

6.1. Presentation of the model's structure

Pressing the button "**Model structure**" will open the next worksheet, called "*Structure*". This worksheet contains a flow-chart presenting the structure of the model with all the workbooks and links between them. Below the flow-chart there is a short description of some of the main features of the workbooks.

In the flow-chart, each workbook name (except FERT.xls; MIG.xls; MORT.xls) is associated with a separate button. Pressing any one of these buttons will open the respective workbook.

6.2. Scenario manager

Pressing the button "**SCENARIOS**" will open a set of worksheets which enable the user to run the model for three different economic scenarios and to compare results.

The first of these worksheets, called "*SCENARIO*" is used as an input table for scenario assumptions. One can input assumptions on future GDP, labour productivity and real wage growth rates. For the first scenario these are input respectively into rows 3-5, for the second scenario into rows 8-10 and for the third scenario into rows 13-15.

Before starting the simulation procedure one has to open all the workbooks of the model. Then, by clicking on the "**Scenarios Calculation**" button on the top left of the sheet, the model will start the recalculation procedure for all three assumed scenarios. Once the whole procedure is finished, entries of the main economic assumptions (GDP, labour productivity, real wages) in ILO_ECO.xls are reset to the original values.

Depending on the speed of the computer used, the recalculation of the three scenarios may take quite a long time. It would be particularly long (up to one hour) if all the feedback links and the contribution rate adjustment are activated in ILO_ECO.xls. It is not recommended to use the scenario manager on computers with the 486 processor.

Other worksheets of the scenario manager contain comparisons of the results of the three scenarios. The worksheet "*Scenarios Results*" compares calculated values of the main model's results. These results are then presented graphically in charts in the worksheets which follow in the workbook.

Use of the scenario manager is limited to the recalculation of alternative economic scenarios (different GDP, labour productivity and real wage growth rates). If one wants to simulate the effects of other changes to the assumptions and policy variables in the model, then one should save in a separate workbook, all the relevant results of each of the simulation runs (the results of each run in a separate worksheet of this workbook). For example, for each run one can simply

save (as values using the Excel, COPY and PASTE SPECIAL, VALUES commands) the contents of the whole "*Economic Scenario*" worksheet on separate sheets.

6.3. Opening files

Pressing the button "**OPEN WORKBOOK**" allows the user to open a selected file of the model. The workbook STRUCTUR.xls and all the other files of the model should be in the same directory. The "**OPEN WORKBOOK**" button opens files only one by one. It may be used for presentation purposes, but the Excel "Open file" command is certainly quicker when one needs to open all the files of the model.

Annex 1: Tentative list of data for a social budget exercise

The following list provides a standard frame for the data set required for a typical version of the ILO social budget model. We have kept it partially and intentionally redundant in order to indicate that some of the data requirements listed may be used alternatively. Also, the list may equally be regarded a "minimum" or a "maximum" frame, minimum if in a concrete country case, the data basis and modelling environment is much richer than assumed in this book, maximum if circumstances only allow for a limited social budgeting approach. If not specifically mentioned otherwise the data should be collected for at least three observation years, i.e. the start year of the projections and at least two preceding years. Of course, the analytical basis for projections will often improve with the length of the available time-series on past observations. This is especially important with respect to the economic and labour market data.

In section A4.2 the data list comprises a certain number of assumptions on future developments. These are essentially the factors driving the projections.

The list can only serve as a first rough frame to check how labourious the development of a methodological and statistical basis for a Social Budget, including the modelling part, would probably be or to indicate where improvements might be required. It has in each individual country's case to be adjusted to the prevailing realities.

A4.1 Numerical data

A4.1.1 Demographic and household data

- (1) Population by sex and age groups
- (2) Mortality table by sex and age groups
- (3) Fertility rates by age groups
- (4) Net international migration by sex and age groups
- (5) Marriage rate by sex and age groups
- (6) Number of households by size
- (7) Number of households by per capita income
- (8) Number of households by size of accommodation
- (9) Number of households by amount of rent
- (10) Number of households by employment status of household head
- (11) Household income composition by household size
- (12) Household expenditure composition by household size

A4.1.2 Economy

- (13) Nominal GDP by economic sectors (National Accounts = SNA)
- (14) GDP in constant prices by economic sectors (SNA)
- (15) Sectoral GDP deflators
- (16) Nominal GDP by expenditure components (SNA)
- (17) GDP in constant prices by expenditure components (SNA)
- (18) GDP expenditure deflators
- (19) Primary factor income distribution (SNA)
- (20) Employers' social security contributions (SNA)
- (21) Sum of gross wages (SNA)
- (22) Income tax on sum of wages (SNA)
- (23) Employees' social security contributions on sum of wages (SNA)
- (24) National average wage by economic sectors and average grand total (SNA)
- (25) National net average wage by economic sectors and average grand total (SNA)

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- (26) Monthly consumer price index (CPI) for at least 3 observation years
 - (27) Short- and long-term interest rates (market)
 - (28) Short- and long-term interest rates (policy instruments)
 - (29) Exchange rate versus US\$ / EURO / YEN
 - (30) Monthly exchange rate for at least 3 observation years

A4.1.3 Labour force and employment

- (31) Labour force by sex for single age groups and grand total
- (32) Labour market participation rate by sex for single age groups and grand total
- (33) Employed, self-employed and employees by sex for single age groups and grand total
- (34) Employed, self-employed and employees by sectors of the economy (National Accounts)
- (35) Unemployment by age and sex and grand total

A4.1.4 Government accounts

- (36) Accounts of central government (SNA)
- (37) Accounts of state / provincial governments (SNA)
- (38) Accounts of local governments (SNA)
- (39) Accounts of social security system (SNA)
- (40) Consolidated public sector account (SNA)

A4.1.5 Social protection

A4.1.5.1 Financial accounts

- (41) Revenue and expenditure of the pension scheme(s)
- (42) Revenue and expenditure of the public health scheme(s)
- (43) Revenue and expenditure of the unemployment benefit scheme
- (44) Revenue and expenditure of the social assistance scheme
- (45) Revenue and expenditure of family benefit scheme(s)
- (46) Revenue and expenditure of sickness benefit scheme(s)
- (47) Revenue and expenditure of other short-term benefit schemes
- (48) Revenue and expenditure of other social protection schemes
- (49) Revenue and expenditure of other social purpose schemes

A4.1.5.2 Contributions and contributors

- (50) Average insurable earnings of the pension scheme(s) by sex and age groups and average grand total
- (51) Average insurable earnings of the health insurance scheme(s) by sex and age groups and average grand total
- (52) Average insurable earnings of the unemployment insurance by sex and age groups and average grand total
- (53) Average insurable earnings of the other social security schemes by sex and age groups and average grand total
- (54) Contribution collection and / or insurance ceilings on earnings in the pension scheme(s)
- (55) Contribution collection and / or insurance ceilings on earnings in the health insurance scheme(s)
- (56) Contribution collection and / or insurance ceilings on earnings in the unemployment insurance
- (57) Contribution collection and / or insurance ceilings on earnings in other social security schemes
- (58) Legal contribution rates in the pension scheme(s)
- (59) Legal contribution rates in the health insurance scheme(s)
- (60) Legal contribution rates in the unemployment scheme
- (61) Legal contribution rates in other social security schemes
- (62) Number of contributors to pension scheme(s) by sex and age groups and grand total

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- (63) Number of contributors to pension scheme(s) by sex and profession and grand total
 - (64) Number of contributors to health insurance scheme(s) by sex and age groups and grand total
 - (65) Number of contributors to unemployment insurance by sex and age groups and grand total
 - (66) Number of contributors to other social security schemes by sex and age groups and grand total
 - (67) For the pension scheme(s): Number of dependent spouses and children per contributor by sex and age groups and grand total, age difference of spouses by sex and age.
 - (68) For other scheme(s): Number of dependent spouses and children per contributor by sex and age groups of contributor and grand total
 - (69) Average co-payments to health care per patient
 - (70) Number of patients

A4.1.5.3 Average benefits/ costs, beneficiaries and providers

Pensions

- (71) Average amount of old age pensions by sex and age groups
- (72) Average amount of invalidity pensions by sex and age groups
- (73) Average amount of survivors pensions by sex and age groups
- (74) Average amount of minimum / social pensions by sex and age groups
- (75) Number of old age pension(er)s by sex and age groups
- (76) Number of invalidity pension(er)s by sex and age groups
- (77) Number of survivors pension(er)s by sex and age groups
- (78) Number of minimum pension(er)s by sex and age groups
- (79) Total pension benefit expenditure by type of pension

Health care

Government health care scheme

- (80) Total costs per public hospital
- (81) Total costs per public hospital bed
- (82) Total costs per ambulatory clinic / health centre
- (83) Total costs per employed physician
- (84) Total costs per other health care staff
- (85) Dental care expenditure per case
- (86) Pharmaceutical expenditure per prescription
- (87) Number of public hospitals
- (88) Number of public hospital beds
- (89) Number of public hospital days
- (90) Number of hospital days per patient by sex and three age groups: children / youth, actives and pensionable ages
- (91) Number of ambulatory clinics / health centres
- (92) Number of ambulatory care cases by sex and three age groups: children / youth, actives and pensionable ages
- (93) Number of employed physicians
- (94) Number of other health care staff
- (95) Number of dental care cases per patient by sex and three age groups: children / youth, actives and pensionable ages
- (96) Number of prescriptions
- (97) Number of prescriptions per patient by sex and three age groups: children / youth, actives and pensionable ages

Social insurance health scheme

- (98) Number of ambulatory care cases

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- (99) Number of cases per capita by sex and three age groups: children / youth, actives and pensionable ages
 - (100) Number of hospital days
 - (101) Number of hospital days per capita by sex and three age groups: children / youth, and actives and pensionable ages
 - (102) Number of dental care cases
 - (103) Number of cases per capita by sex and three age groups: children / youth, actives and pensionable ages
 - (104) Number of prescriptions
 - (105) Number of prescriptions per capita by sex and three age groups: children / youth, actives and pensionable ages

Private health care

- (106) Number of private hospital beds
- (107) Number of private practitioners and specialists

Sickness and maternity benefits

- (108) Average daily sickness benefit by sex and age groups
- (109) Number of sickness days per year and insured person by sex and age groups
- (110) Number of work days per year
- (111) Average maternity benefit per day
- (112) Number of maternity benefit cases per woman
- (113) Number of maternity days per maternity case

Unemployment benefits

- (114) Average benefit by sex and age groups
- (115) Number of beneficiaries by sex and age groups
- (116) Average duration of benefit payment per case
- (117) Severance pay by sex and age groups
- (118) Severance pay per capita by economic sector
- (119) Number of dismissals
- (120) Number of severance pay cases

Family benefits

- (121) Average benefit per case
- (122) Number of benefit cases
- (123) Number of cases of parental leave

Social assistance

- (124) Average monthly benefits per recipient unit by type of benefit
- (125) Number of benefit recipients by type of benefit
- (126) Minimum subsistence levels for different recipient units

Housing benefits

- (127) Average benefit per case
- (128) Number of cases

Tax benefits

- (129) Estimated total tax benefits (tax credits with a "social purpose")

Other benefits

- (130) Other benefits per case
- (131) Cases of other benefits

A4.2 Assumptions

- (A1) (Official) population projection
- (A2) Projection of labour force participation rates by sex and single age groups
- (A3) Projection of GDP at constant prices
- (A4) Projection of labour productivity
- (A5) Projection of labour productivity by economic sectors
- (A6) Projection of GDP deflators
- (A7) Projection of interest rate(s)
- (A8) Projection of households composition and average household size

A4.3 Legislation

- (L1) Laws on pension scheme(s)
- (L2) Laws on health scheme(s)
- (L3) Laws on unemployment scheme(s)
- (L4) Laws on social assistance scheme(s)
- (L5) Laws on family benefit scheme(s)
- (L6) Laws sickness benefit scheme(s)
- (L7) Laws on other short-term benefit schemes
- (L8) Laws on other social protection schemes
- (L9) Laws on other social purpose schemes
- (L10) Tax laws with a "social purpose"

