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Belmod

Dissemination report : BELMOD: the making of

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Version applicable to 2015-2021 modelling

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1 INTRODUCTION

BELMOD was supported by the Employment and Social Innovation (EaSI) programme of the European Commission (DG EMPL) and was developed to modernise the microsimulation model of the Federal Public Service Social Security (FPS Social Security) in Belgium in order to evaluate policy reforms to reduce the non-take up of income support. In terms of policy evaluation, the objective of the BELMOD model is not limited to the non-take up of social rights or the harmonisation of means tests. The model aims to simulate a broad range of policy measures in great detail in order to be able to evaluate a large scope of policy measures. The new static microsimulation model for ex-ante policy analysis runs on administrative data and is built in collaboration with experts from the Belgian research community and government administrations. The contributing teams come from the Federal Planning Bureau, the Catholic University of Leuven, the University of Antwerp and the University of Essex. The underlying dataset contains a random sample of nearly 1 million Belgian residents and includes anonymized administrative data from the Labour Market and Social Protection Datawarehouse (LM&SP DWH), enriched with fiscal data from the IPCAL-database and real estate information from CADNET.

The model uses the EUROMOD infrastructure to run microsimulations. EUROMOD is the tax-benefit microsimulation model of the European Union. It allows researchers and policy makers to calculate the impact of taxes and benefits on work incentives, poverty and inequality and the budgetary cost of policy changes. EUROMOD is an open source model and regular trainings are being organized[1].

In 2022, a validated version of the model will be made available for (national and international) academics and government institutions through a remote access system. The user friendliness of EUROMOD and the availability through the remote access allows users to simulate policy reforms using the BELMOD model and data. It might also inspire other member states to develop similar tools.

This report describes the process of building a new microsimulation model based on a large administrative dataset. It aims to draw lessons from the experience in linking the EUROMOD platform to a large scale administrative dataset and to inform government administrations and researchers that want to develop similar activities of the main difficulties encountered. The next sections explain the possibilities of the EUROMOD platform to build a microsimulation model, how the administrative data were prepared to run with EUROMOD, how a new microsimulation model BELMOD was built and the possible pitfalls of this process. The following section includes some specific tips and tricks on building a EUROMOD based microsimulation model. Lastly the way to learn about BELMOD or access BELMOD is shortly described.

[1] What is EUROMOD? | EUROMOD - Tax-benefit microsimulation model for the European Union (europa.eu)

2 EUROMOD PLATFORM

EUROMOD is a platform for comparative tax-benefit microsimulation modelling. EUROMOD is three things at once: a tax-benefit *modelling language*, a tax-benefits *software engine*, and a *library of tax-benefit models* for the EU Member States. EUROMOD has been developed at the University of Essex, in collaboration with national teams. Since 2021, the development of the EU models is under the sole responsibility of the Joint Research Centre of the European Commission(JRC), while the EUROMOD software is co-developed by the JRC and the University of Essex, and released open source. As a tax-benefit simulation platform, EUROMOD has been used for developing a number of models for European and non-European countries. The core EU models share the same input data sources (EU-SILC) and common assumptions. However, models for EU countries exist that make use of administrative datasets, mostly developed for and used by national administrations. In particular, a model running on administrative data exists for Greece, while models are under construction for Belgium, Romania, Lithuania and Slovakia.

EUROMOD is a static, non-behavioural tax-benefit calculator, meaning that it allows to compute the fiscal and distributional effects of policy changes on a given population, assuming its characteristics and behaviours do not change (see Box 1 in the Appendix). However, EUROMOD can be linked to behavioural, dynamic and macro models.

EUROMOD is extensively used by both the academic and policy communities for the analysis of the effects of tax-benefit policies and tax-benefit reforms on the household income distribution, public budgets and individual work incentives. Policy rules and input micro-data are generally updated annually.

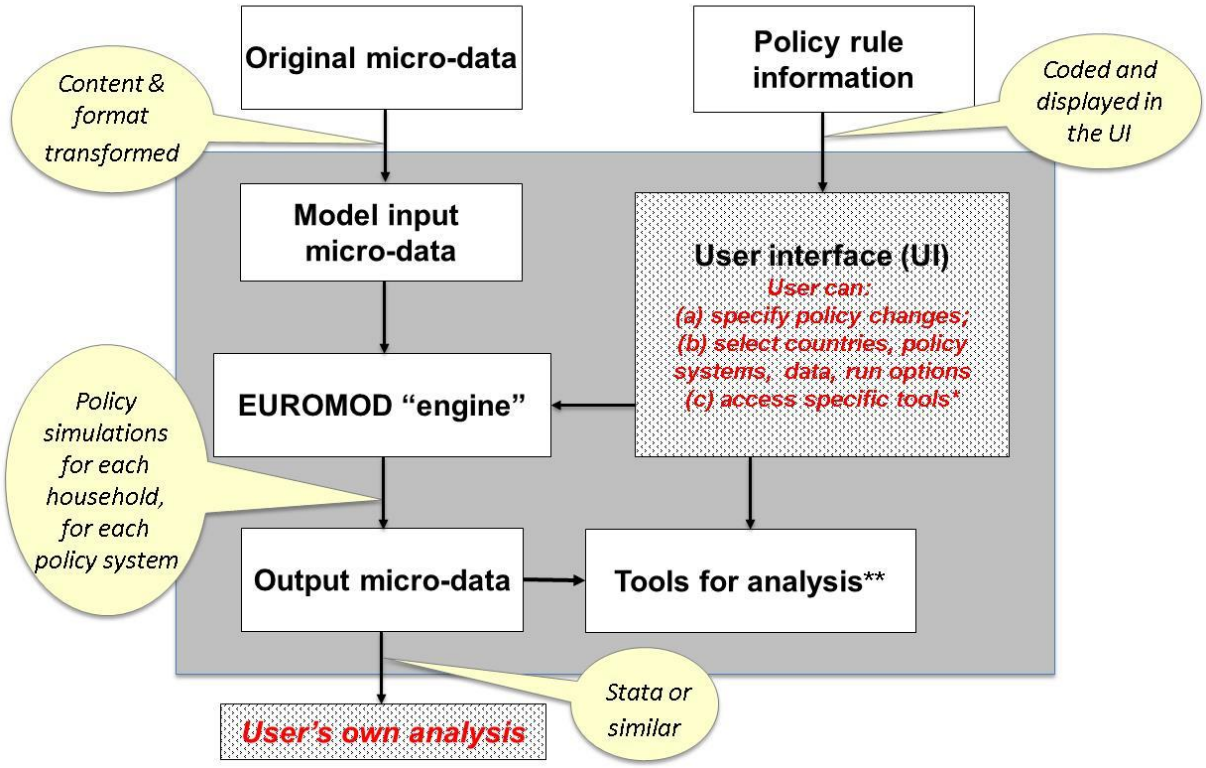
A fundamental feature of EUROMOD is its comparative nature, based upon rigorous modelling conventions (See 2.2 Comparability). Thus EUROMOD is of value in understanding how different policies in different countries may contribute to country specific or common objectives through (i) cross-country comparison of specific tax-benefit instruments, (ii) policy and whole tax-benefit system swapping, and (iii) analysis of the impact of common changes across countries.

2.1 How EUROMOD works

A simplified representation of EUROMOD is shown in Figure 1. The shaded area indicates what happens inside the model and the boxes outside show what feeds in (an original micro-data collection, plus information about policy rules, to be coded in the model) and out (micro-data including simulated output variables for analysis by the user). The dotted boxes show where the user can interact with the model and the call-outs describe the main processes. Within the model, coded tax-benefit policy rules are presented through the model interface. Once the user has made the changes and selected the options and tools that they want to use, the

model "engine" calculates household disposable income and its policy components for each household in the input data, for each policy system and country that has been selected by the user. EUROMOD outputs the detail of the simulated policies at micro-level (for each household) to be analysed separately using a statistical software package. It also provides tools within the model to calculate a set of summary statistics (largely pre-defined, with some user-defined options) or to analyse policy effects across the income distribution using a specific methodology.

Figure 1: The structure of EUROMOD.



Notes: *Special tools for calculation of work incentives (METR) and analysis with hypothetical households (HHOT). **Analysis tools are the Statistics Presenter, the In-depth Analysis plugin and the Policy Effects tool.

EUROMOD simulates as much as possible of the policy components of household disposable income (direct taxes and employee/self-employed social contributions plus cash benefits) and also employer social insurance contributions and minimum wage rules. When some elements cannot be simulated because of lack of relevant information on eligibility conditions in the input data, the amounts received are taken from the micro-data instead, if available. For the remainder, EUROMOD simulates benefit entitlements and income tax and social contribution liabilities based on information in the input data about the person, their income and their household, together with coded policy rules. This is done either for an existing policy system or a reform specified by the user using the purpose-built user interface and tax-benefit modelling language. Results are available at the micro (household) level and can be assembled

and compared to show the impact of changes across the income distribution or by other household characteristics, on the public budget, on poverty and inequality and work incentives; or used to inform other types of analysis, such as the estimation of changes to labour supply.

2.2 Comparability

Cross-country comparability of results is a dimension of quality that is of particular relevance to EUROMOD. It is not straightforward to establish. Focussing on baselines and existing policy systems, there is the possibility to compare the relative validity of results across countries. If one country has a strong assessment and another a weak one, this might suggest a lack of comparability but this does not necessarily follow since it depends on particular use of the model. However, the interpretation of comparisons across countries is aided by country-by-country documentation available with standardised format and content, as is provided in the Country Reports. In general, comparability cannot be established by looking at the results and must be assessed through qualitative examination of inputs, protocols and processes intended to ensure comparable treatments. This means that protocols and processes must be documented and their implementation in practice monitored and reviewed. However, it should be clear that comparability of results does not necessarily result from nor require doing identical things for each country. This is because some features may be more important in some countries than in others.

EUROMOD procedures for maintaining comparability across countries are explained in a document called “EUROMOD Modelling Conventions (EMC)” (EUROMOD, 2018). This sets out guidelines and protocols for building and updating a country in EUROMOD, with the idea that all countries should comply with all guidelines. It is reviewed annually, taking account of any new issues faced in the most recent update. While this document is intended as a guide for those developing the EU-SILC based model, it is also a useful resource for users wanting to understand the assumptions and adjustments that lie behind the model.

2.3 Accessibility

Many microsimulation models are private to their developers but EUROMOD is openly available and intended to be used in many ways by many users in both academic and policy contexts. It is therefore designed to be flexible in many dimensions, with options and assumptions made transparently, and with built-in tools for easy access to key types of analysis.

Annual Country Reports, with extensive documentation on the model assumptions, policy innovations and data issues, are available for the EU models running on EU-SILC data and the UK.

2.4 Flexibility

EUROMOD is made as flexible as possible not only to make it useful for multiple purposes, but also in order to ensure consistency of results and transferability of tax-benefit system components across countries (Sutherland, 2014). The extent of choice available to the user is maximised within a disciplined structure. EUROMOD features that contribute to its flexibility include, firstly, a special-purpose tax-benefit modelling language which includes a set of functions that in combination allow the coding of practically any policy. Secondly, the user interface not only provides guided access to this functionality, but also a wide range of options that are in the control of the user. Thirdly, a set of well-developed work practices and protocols are in place that aim to maximise user choice on the one hand while maintaining cross-country comparability and consistency, on the other. One example is the use of a structured naming convention for variables.

2.5 Adaptability

As already discussed, EUROMOD is a static, non-behavioural tax-benefit calculator. However, its design allows it to be adapted in a number of ways. Firstly, it can be used in conjunction with other tools and models: for example, with econometric models of labour supply behaviour (Bargain, Orsini, & Peichl, 2014), with dynamic models[2], or with macroeconomic models of various kinds (for instance Barrios et al., 2017).

Secondly, it is not necessarily limited to the policy scope that is made possible with the EU-SILC and there are examples of projects that make use of the modelling platform to extend the scope of simulations to indirect taxes (Cansu Akoğuz et al., 2020); or to extend policy scope to include wealth taxes using the ECB Household Finance and Consumption Survey (Kuypers, Figari, & Verbist, 2021).[3]

Thirdly, a tool, known as the Hypothetical Household Tool (HHoT), allows the user to generate input data for EUROMOD based on hypothetical (rather than real) households of the user's own specification (Hufkens et al., 2019). This can then be used for "model family" (also known as "synthetic household") analysis, allowing a focus on household types of particular relevance to the research or policy question, including complex or atypical households (for instance 3+ generations). This moves beyond what is possible with standard estimates of this type, for example when using the tax-benefit calculator from the OECD (Gasior & Recchia, 2018). Budget constraints derived from these calculations can also be very useful for checking the validity of the tax-benefit calculations.

[2] See for instance the LABSim family of dynamic models, developed at the Centre for Microsimulation and Policy Analysis at the University of Essex (https://www.microsimulation.ac.uk/jas-mine/demo/labsim/).
[3] These adaptations have been applied for one country, several or all, depending on data availability. It should be noted that not all of them are made generally available.

Finally, the adaptability of EUROMOD is further demonstrated by its use as a platform for modelling non-EU countries, providing a framework and short-cut to build a coherent and well-functioning model quickly, and also the potential for such a model to be comparable to those of the EU-28 in EUROMOD itself. The pioneer "spin-off" model was SAMOD for South Africa (Wilkinson, 2009; Wright, Noble, Barnes, McLennan, & Mpike, 2016a) and was followed by models for Russia (Popova, 2012), Serbia, (Ranđelović & Žarković Rakić, 2012), Macedonia (Mojsoska Blazevski, Petreski, & Petreska, 2013), Australia (Hayes & Redmond, 2014), Namibia (Wright, Noble, & Barnes, 2014; Wright, Noble, Barnes, McLennan, & Mpike, 2016b) and then, as part of the SOUTHMOD project, five more African countries (Ghana, Ethiopia, Mozambique, Tanzania and Zambia), and Vietnam and Ecuador (Amores & Jara Tamayo, 2018). Such "spin-off" models can also be constructed for regions and one such example is for Trento, Italy (Azzolini, Bazzoli, De Poli, Fiorio, & Poy, 2014).[4]

3 BELMOD DATA BUILDING

The accessibility, flexibility and adaptability of the EUROMOD platform make it the logical choice for the BELMOD simulation model. Although comparability with other countries might decrease by not using EU-SILC, the advantages of using administrative data for microsimulation are numerous.

3.1 The richness of administrative data

BELMOD is a detailed static tax-benefit model that links EUROMOD to national administrative data. The current BELMOD input dataset is based on an existing dataset that was constructed for the MIMOSIS tax-benefit model[5]. It includes 2015 data for nearly 1 million observations (i.e. a 9% sample) from Belgian administrative data. It concerns pseudonymised administrative data from the Labour Market and Social Protection Datawarehouse (LM & SP DWH), enriched with fiscal data from the IPCAL-database and real estate information from CADNET. The LM & SP DWH provides us with data from the national register and 13 Social Security Institutions. The dataset will be updated with 2019 data in 2022.

Even with a sample, the administrative data have a more complete coverage of the population. Therefore the administrative data allow the identification of specific (vulnerable) groups (e.g. disabled children). In addition, the stratified design of the sample ensures representativeness at a regional level and for all age groups.

[4] These models use the same software, structure and general approach, but they are not necessarily comparable in other ways. Using them as the first foundations of "WorldMOD" for global comparisons and analysis, for example, would require additional effort to align concepts, assumptions and —especially— data.
[5] BELMOD, Belmod project | Federal Public Service - Social Security (belgium.be)

Furthermore, the data include much more detail compared to survey data. Incomes (salaries, income from self-employment, income from assets,…) are split in different components and are defined following administrative guidelines. For example, the BELMOD input dataset contains information on the first and second job. The information on salaries distinguishes between employee wage (i.e. the variables *yemwg01/yemwg02*), bonuses (*yembo01/yembo02*), severance payments (*yemse01, yemse02*), wages in the form of lump sum amounts (*yemls01/yemsl02*) and double holiday payment (*yemdh01/yemdh02*). The different components of the gross employee income allow to construct the income list needed to calculate social contribution more in detail. Also labour market characteristics (e.g. type of contract or labour market history) are more detailed. For example, the variable *lemctcc01/lemctcc02* includes the contribution category for each employee for his/her first and second job. The detailed information on the employment income and the contribution category show how eligibility can be checked more in detail when using administrative data compared to survey data. Besides for taxes and social contributions the administrative data allow us to integrate detailed eligibility conditions for the simulation of benefit entitlements. This enables a more accurate computation of social security contributions, taxes and benefits than based on SILC-data.

3.2 Challenges of administrative data

Preparing an administrative dataset requires a major time investment. Mainly because the administrative data need to be structured in a certain way for EUROMOD to run the policies simulations. Both the EUROMOD and BELMOD input dataset contain different groups of variables: demographic variables, labour market variables and income variables. See the documentation report on the BELMOD input dataset for a full description of all variables (BELMOD-report 3). Here, we will focus on a limited selection of variables to show the type of advantages and challenges that can arise when preparing an administrative dataset for a microsimulation model.

Most basic EUROMOD variables have been replicated using the administrative data. However there were some specific challenges when building the input dataset.

Summary of the main challenges:

- The primary source of the administrative data (LM & SP DWH) is a collection of many different data sources: national institute for social security, national employment office, national institute for sickness and disability insurance etc. The information we obtain from the source files must be processed into one line per individual. This limits the information on different jobs and labour market characteristics, contract types, movable assets that can be kept in the input data. This is for instance the case when individuals have different

rights during the course of a year, or different statutes as a wage earner or as an independent. The reduction to one line per observation is generally achieved by taking the characteristics or the right or labour market activity with the highest amount and by adding up the amounts of every line of observation. Concerning the worker category, employer category, or other information on the occupation, we keep the information of the two most important occupations within the specific job category. The most important observation is the one with the highest daily wage.

- The information from the source files is aggregated to information on an annual basis, and then divided by 12 to obtain information on a monthly basis. The number of months in receipt of social benefits has been constructed on the basis of start dates and end dates.
- The naming differs greatly between sources, this needs to be converted to the EUROMOD naming conventions.
- Besides variable naming, the EUROMOD Modelling Conventions should (ideally) be followed regarding the absence of missing values, monetary amounts in gross terms and on a (average) monthly basis, and presence of compulsory variables.

3.3 Disadvantages of administrative data

Working with administrative datasets also implies some disadvantages.

The main shortcoming is the untimeliness of the data. For some income components there is a large time lag (e.g. incomes of self-employment are only known with a time lag of three years). In addition, it is both administratively and technically cumbersome to link the different datasets, given the many source files involved. To process and combine the many source files a thorough knowledge of the different baselines is required. As a result an update of the input data is only realistic every 4 or 5 years. The BELMOD model runs on 2015 data. By December 2022 a new dataset, including 2019 income information, will be available. Both the time lag in certain income components and the time consuming effort of updating the input data emphasise the need of nowcasting when using an administrative dataset for policy analysis.

Another limitation is the lack of the availability of some basic EUROMOD variables that are important for poverty and inequality analysis. In the 2015 BELMOD dataset the education level (both current status and highest ISCED level attended) is not available; the highest ISCED level attended will be available in the 2019 dataset. Also certain indicators, such as material deprivation, are missing when working with administrative data. The presence of the indicator of material deprivation and the comparability with other countries is an advantage of EU-SILC data.

Also important variables needed to simulate benefit entitlements are sometimes missing, despite the overall richness of the dataset. For example, the admin data do not include information on someone's willingness to work or if a resignation was voluntary or not. An

important gap is information on the actual family composition. The national register defines households on the basis of the domicile address, this does not always reflects the actual family situation. Moreover, based on limited information on the mutual relationships, it is not always possible to identify partners, children and other family members. The limitation of the Belgian register data is that it only includes the relationship of one person to the reference person of the household. Because not just the relation to the reference member, but also to other members in the household is essential to correctly build an assessment unit in EUROMOD, additional assumptions were made to define households. The limited household information affects the baseline results of the BELMOD model, but also limits its simulation options (e.g. to simulate policy changes in the household definition that is used in a benefit system).

4 BELMOD MODEL BUILDING

The new microsimulation model BELMOD was developed in cooperation between the main actors of static microsimulation in Belgium (i.e. the Federal Planning Bureau, the Catholic University of Leuven and the University of Antwerp), with the help of the core EUROMOD team at the University of Essex (until 2020) and supported by the Employment and Social Innovation (EaSI) programme of the European Commission (DG EMPL)[6]. BELMOD uses the EUROMOD infrastructure and, where possible, tries to integrate existing Belgian EUROMOD policies. The EUROMOD model for Belgium is currently developed and maintained by the University of Antwerp, the Catholic University of Leuven and the Joint Research Centre of the European Commission. To fully use the expertise in the different domains of social and fiscal policies all partners were involved in developing the model. They were all already experienced with the EUROMOD infrastructure and modelling language. Each partner was responsible for one or more policies.

The first section below describes how the experience from different existing microsimulation models helped to build a new and broader microsimulation model. In the second section we list the challenges when building a EUROMOD based microsimulation model.

4.1 Building BELMOD

The technical development of BELMOD could build on the experience of constructing and maintaining MIMOSIS, the existing/previous model of the FPS Social Security, the experience of building and updating the Belgian EUROMOD model and the experience of the EXPEDITION model, developed by the Federal Planning Bureau for assessing the election programs of the 2019 federal elections in Belgium. Both MIMOSIS and EXPEDITION run on administrative data and are very detailed but not very transparent or user friendly microsimulation models.

[6] See grant agreement number VS/2018/0340.

EUROMOD (as argued before) is not only a software engine but also a modelling language. Learning EUROMOD is an investment but regular improvements of the model, new features, centralised guidelines and the regular basic and more advanced courses allow interested users to become familiar with the modelling language and open a library of tax-benefit systems. MIMOSIS, EXPEDITION and the Belgian EUROMOD version running on SILC data have been used as a basis or an inspiration when developing new policies. The level of detail included in administrative data also allowed new or much more detailed policies to be included in the model. An advantage of using EUROMOD is that BELMOD could built on some of the existing Belgian EUROMOD policies. Experience on more detailed policy implementations came from MIMOSIS and EXPEDITION. The more detailed policy implementations included in BELMOD could also trigger the improvement of certain basic EUROMOD policies or EU-SILC based variables. One disadvantage of the EXPEDITION model, that formed the basis of the BELMOD unemployment and sickness policies, is that eligibility is not simulated, but taken from the input data[7]. In 2022-2023 we will improve the model so that eligibility conditions can also be simulated based on labour history. This will allow us to simulate transitions into these benefits and create 'newly unemployed' individuals. A similar exercise will be done for sickness benefits.

The base year when developing BELMOD was the 2015 policy year, consistent with the year of the input data. The first version of BELMOD includes social security contributions, personal incomes taxes, income support (including the specific support for the elderly and the disabled), child benefits, unemployment insurance benefits and sickness and disability insurance benefits. It also models eligibility to cost reducing measures such as the increased reimbursement of medical costs and a heating allowance.

In order to run EUROMOD with and without the BELMOD input dataset an ADMIN extension has been created. The extension allows to easily switch from using EU-SILC in combination with running (basic) EUROMOD policies to using BELMOD input data and running BELMOD-policies or integrated policies in which only part of the functions is switched on or off. Currently, only a few policies are integrated, meaning that the policies can be used both when running SILC data and BELMOD data. Most of the policies are added specifically for BELMOD and will be switched off when running SILC data. In the case of integrated policies, only part of the functions of a policy is switched off when using the ADMIN extension or when running the model using SILC data. In the long term we aim to make all policies as integrated as possible in order to make the model more efficient. In BELMOD we added an additional layer by creating an extension to run income guarantee models based on simulated taxes and social insurance contributions, but taking the information on the benefit from the input data. A full

[7] In the EUROMOD country report this type of simulation would be called 'partly simulated' because the eligibility itself is not simulated but taken from the input data.

simulation in BELMOD includes the simulation of all benefits (not just income guarantee, but also sickness and unemployment benefits).

Apart from adapting or splitting policies to the use of SILC data or ADMIN data, also income lists and tax units needed to be updated consistently. Income lists based on administrative input data include more or more detailed components compared to income lists based on SILC input data (see Section 3.1 for the details available on the yem-variable). The variables in income lists or full income lists that are only relevant when running BELMOD/administrative data are added to the ADMIN extension so no redundant variables need to be added to the model when using SILC as input data. New variables and income lists needed to be created in order to correctly simulate taxes and social contributions and the total disposable income because BELMOD includes information on benefits that is not included in SILC, e.g. activation allowances.

Another building block in EUROMOD simulations are the assessment units or tax units. The assessment unit can differ from individual to the whole household. Some policy instruments require a specific household definition. This can be generated when setting the assessment unit. The head of the unit, the dependent child definition, etc. can differ across the units and at some points the admin data allow for a more accurate simulation of the assessment unit than SILC data. This degree of detail is an advantage for the policy simulations, but it hampers integration of the assessment units.

Another important task when developing and updating a model that runs on administrative data is defining additional uprating indices. Much more detailed indices are needed compared to EU-SILC and given that the administrative input dataset is (in general) less up to date, having good uprating indices is essential.

4.2 Challenges when building BELMOD

The detailed input data and the flexibility of EUROMOD allow us to build a model that includes both policies to run on administrative data (BELMOD) and on SILC data (EUROMOD). However these advantages also provide us with new challenges. In contrast to the preparation of the input data, the BELMOD model is a combination of policy measures implemented in the model by microsimulation experts with different backgrounds, experience in the model and modelling styles.

Summary of the challenges that this caused:

- Importance of agreeing on common modelling conventions.
- Sharing the most recent version of the model and integrating updates of different people is not self-evident, the existing EUROMOD merging tool is too limited.

- Integration in the master version is important to secure continuity and consistency in the model.
- The complexity and slowness of the model due to many expansions.

As with starting a project or writing a paper, it is important to agree on the main language. The EUROMOD infrastructure offers an interface with functions that form the building blocks of the EUROMOD language. When implementing new policies these building blocks can be used in various ways. The EUROMOD Modelling Conventions is a document developed for the annual update of EUROMOD country model. It describes guidelines for the model development and harmonization of all EU country models. It includes conventions on the naming of variables, policies and input datasets, but also on the type of information used for the uprating factors or the simulation of certain benefits. These guidelines are developed on the basis of models running on survey data, but similar guidelines should be used when developing a model based on administrative data. Lack of this type of conventions leads to inconsistencies in the model and a lack of overview. Unfortunately, because of lack of a proper use of EUROMOD conventions, a process of streamlining and harmonization is still ongoing for BELMOD.

In addition, building the same model with many partners requires a proper method for version control. An integrated EUROMOD version control is available for the yearly EUROMOD update (for EU-SILC country models), but it is not available for other EUROMOD projects. The software does include a 'merge country' and 'merge configuration files' button. Using these functionalities, we tried to create our own version control in order to keep track of the changes and version of BELMOD. Bigger merges, such as a merge with the new version of the Belgian EUROMOD version, or changing the order of policies and functions, changing characteristics of variables were not always clearly visible or understandable in the merge-menu. It is therefore necessary to double check important changes after merging, making it a very time consuming process. Additionally using the integrated version control tool in the model (and not the Version Control application), there is no 'online' version of the model in which small changes can be immediately included. In order to keep an overview of the changes, we filled in a log file after each merge.

The BELMOD policies and expansions of already existing policies are currently not saved in the EUROMOD master maintained by the Joint Research Centre, hereby causing the models to be developed in parallel. To avoid having to maintain two models, we would aim at a full integration of BELMOD in the EUROMOD master version. The integration of BELMOD in EUROMOD includes work in both the basic EUROMOD policies and BELMOD policies. In an efficient model the policies used in both models would be as integrated as possible. A full integration of BELMOD in the EUROMOD master version will make the yearly update and the collaboration between microsimulation experts more efficient and will secure continuity. For this, streamlining in both the basic EUROMOD as well as in BELMOD is needed. This

streamlining and harmonisation between the policies running with SILC data and running with administrative data is also important for the use of additional EUROMOD features (Statistics Presenter, the In-depth Analysis Tool, the Hypothetical Household tool (HHoT), etc). Updating the settings of certain addons and plugins is needed in order for BELMOD to make use of its functionality.

For the purpose of full integration in the master version unused SILC policies are kept in the model. In order to keep an overview, we indicated which policies are intended for using the model with administrative data. Following this large expansion of the model, some performance issues – such as a longer load time of the model and a less responsive user interface – impact the user-friendliness of BELMOD. Improving the performance of the software would therefore increase the possibilities for models using administrative data that allow more complex and refined policies.

5 TIPS AND TRICKS TO BUILD A (EUROMOD-BASED) MICROSIMULATION MODEL

Our model was built in collaboration with many partners with varying levels of experience with EUROMOD. Based on this collaboration and the process of building BELMOD, we share some tips and tricks that can be useful in the development of a new microsimulation model based on EUROMOD.

The EUROMOD Modelling Conventions is a document used for the annual EUROMOD updating. It includes compulsory guidelines on variable naming, the input dataset, uprating of monetary variables, the scope, structure and order of policies, the use of policy switches and standard assumptions for specific policies. For a EUROMOD user outside of the annual updating process it is not mandatory to follow these guidelines. However, we recommend using these conventions also when designing a new model.

EUROMOD was not developed to run on large administrative datasets, so we encountered some technical issues when developing BELMOD. A good collaboration between the EUROMOD developers/EUROMOD software developers can help to remove existing limitations of the EUROMOD model, both in terms of infrastructure and more policy wise. Another gain of collaboration with the EUROMOD developers (specifically with JRC), is to integrate the new policies/new model in the existing country model. Starting from the master version of the model saves many complex merges and assures continuity. At the same time it avoids that two models evolve in parallel. To avoid having to maintain two models, we would aim for a full integration of BELMOD in the EUROMOD master version. A full integration would also imply a sustainable commitment between the involved parties to update BELMOD and EUROMOD as one joined and interrelated model. Apart from the efficiency gain in the updating process, integration in all parts of the model would allow us to make use of the

existing EUROMOD technology and the extended EUROMOD functionalities. Specifically, a full integration would allow us to make use of the Hypothetical Household Tool (HHoT), a EUROMOD plugin designing hypothetical households, and other extended functionalities (e.g. the Labour Market Addon (LMA), de Marginal Tax Rate add-on (MTR), the Policy Effects Tool (PET) and the Net Replacement Rate add-on (NRR)) of EUROMOD.

Lastly, a thorough knowledge of the administrative data is needed, not only to develop the input dataset but also to guarantee detailed and realistic simulations.

6 SHARING THE MODEL: ACCESS TO BELMOD

Due to privacy issues it is not easy to share a microsimulation model that runs on administrative data. By Autumn 2022, the validated version of BELMOD will be made available to a wider audience by means of a remote access tool. The FPS Social Security organises hands-on trainings for people interested to start using the model themselves. Interested researchers or policy makers can contact the BELMOD team[8].

[8] Contact BELMOD: Belmod@minsoc.fed.be

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