"So pensions in Europe will remain sustainable. But will they remain adequate?"

An assessment of the consequences of the AWG-projections on the adequacy of social security pensions in Belgium, Italy and Germany

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Abstract

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Introduction

Europe faces important demographic changes in the coming decades. These will have profound consequences on both the sustainability and adequacy of social security, including pensions. In Europe, the focus was primarily on securing the financial sustainability. Indeed, the long-term sustainability of public finances was considered an important part of the Stability and Growth pact. Already in 1974, the European Council decided to set up the Economic Policy Committee (henceforth EPC) to contribute to the work of the Ecofin Council, by focussing on structural policies for improving growth potential and employment. The EPC established the Ageing Working Group (henceforth AWG), which was assigned among other things to assess the long-term sustainability of public finances. It does so by presenting a set of public expenditure projections for all Member States, including the spending on pensions. These projections are based on demographic forecasts provided by Eurostat and agreed assumptions on key economic variables. Table 1 presents public pension expenditures as a percentage of GDP in Belgium, Germany and Italy, as well as for the EU15 and EU25 as a whole.

Table 1: Gross public pension expenditures as a share of GDP between 2004 and 2050.

	2004	2010	2015	2020	2025	2030	2040	2050	Change 2004-2050(2)
Belgium	10.4	10.4	11.0	12.1	13.4	14.7	15.7	15.5	5.1
Germany	11.4	10.5	10.5	11.0	11.6	12.3	12.8	13.1	1.7
Italy	14.2	14.0	13.8	14.0	14.4	15.0	15.9	14.7	0.4
EU15(1)	10.6	10.4	10.5	10.8	11.4	12.1	12.9	12.9	2.3
EU25(1)	10.6	10.3	10.4	10.7	11.3	11.9	12.8	12.8	2.2

Source: EC (2006) Table 3.3, page 71.

(1) Excluding Greece.

(2) Percentage points GDP.

In 2004, public pension expenditures amount to 10.6% of GDP in the EU15 Member States. The share is lowest in Ireland (4.7%) and highest in Italy (14.2). Public pension spending in Belgium is roughly on the EU15 average, whereas spending in Germany is somewhat higher. In the EU15 Member States, the share of public pension expenditures of GDP is projected to increase by 2.3 p.p.. The strongest decrease is projected for Poland with 5.9 p.p. the strongest increase will be observed for Cyprus with 12.9 p.p. (EC, 2006, 71). In Italy, the increases are very small because of the introduction of an NDC scheme. Like many EU15 Member States, public pension spending in Germany show a relatively moderate increase. Projected increases are larger in Belgium (5.1 p.p.), but this is still far from the rates reported for the countries that face the largest challenges. This includes Portugal (9.7. p.p. GDP), Luxembourg (7.4 p.p. GDP) and Spain (7.1 p.p. GDP).

To date, the projections that Member States produce for the AWG include only a limited notion of adequacy, being the benefit ratio. However, the sustainability and adequacy of pensions are two sides of the same coin. The assessment of sustainability may not be very meaningful without considering current or prospective developments in adequacy, and vice versa. This paper aims to set a first step into integration by assessing the consequences of the AWG-projections and assumptions on the adequacy of social security pensions in Belgium, Germany and Italy.

The setup of this paper is as follows. The second paragraph of this paper will give a flavour of the MIDAS model, without however going too much into its nuts and bolts. The third paragraph will present and discuss some simulation results, insofar as they pertain to the adequacy of pensions. The fourth and final paragraph will conclude. For a more detailed discussion of this project, the model and a broad range of simulation results, the reader is invited to read the report of the project (Dekkers et al., 2009). We will refer to this report as the 'MIDAS report' in the remainder of the text.

1. The MIDAS model for Belgium, Germany and Italy

1.1. An overview of MIDAS

Lusardi et al. (2008, 8) define a pension system to be adequate when it provides means for individual consumption smoothing, and reduces inequality and poverty. To assess the adequacy of pensions, a model is needed that allows for the simulation of inequality, poverty and (re)distribution. A micro simulation model is the most obvious candidate for this, since it starts modelling at the level of the individual. As the conclusions of the AWG pertaining to sustainability are prospective, so should the model be dynamic. Finally, since the simulation of pension benefits and eligibility conditions, as well as the simulation of poverty and inequality require the modelling of households, the model needs to be a dynamic, closed, cross-sectional micro simulation model. These are the broad characteristics of the model MIDAS, (an acronym for 'Microsimulation for the Development of Adequacy and Sustainability'). This model is designed to simulate future developments of the adequacy of pensions in Italy, Germany and Belgium[2], following wherever possible the projections and assumptions of the AWG.

MIDAS starts from a cross-sectional dataset representing a population of all ages at a certain point in time, in this case the PSBH dataset for Belgium in 2002, the SOEP for Germany in 2002 and a compound dataset based on the ECHP, for Italy in 2001[3]. From that starting year up to 2050, the life spans of individuals in the dataset are simulated, together with their interactions. Events simulated include birth, receiving schooling, marriage or cohabitation, divorce or separation, entering the labour market, work, unemployment, disability, retirement and death. During their active years, individuals build up pension rights, which result in a pension benefit when they retire.

MIDAS is developed in the programming language LIAM (the Life-cycle Income Analysis Model). One of the strong points of LIAM is that it allows for extensive alignment, which ensures that aggregates from the micro model match AWG projections. Mortality and fertility as well as the labour market participation decision are aligned to AWG projections in each country model. Thus, for example, the activity rates that result from a behavioural equation are aligned with the AWG activity rate projections differentiated by age and gender. In MIDAS_IT, also the unemployment rates are aligned to AWG projections, while disability rates are aligned to national data. In MIDAS_BE, alignment is used for unemployment, disability, retirement, and conventional early leavers' scheme ("prépension conventionnelle", henceforth CELS). Besides via alignment, AWG assumptions and projections are also included through the development of aggregate earnings (assumed to follow the growth rate of productivity) and the social policy

2 In the remainder of this paper, the specific Belgian, German and Italian versions of the model will be denoted MIDAS_BE, MIDAS_GE and MIDAS_IT. The name MIDAS without the country-specific suffix is used for general descriptions of the model.

3 See Doutrelepont et al., 2004, Wagner et al., 2007, and Nicoletti, 2005, for a discussion of the PSBH, the SOEP, and the ECHP, respectively. Istat, 2002, describes specifically the Italian ECHP.

hypothesis pertaining to the relation between the growth rate of wages and of social security benefits.

MIDAS consists of different modules, the demographic module, the labour market module and the pension module. The structure of the demographic module is identical in the three country-specific versions of the model; the labour market modules are based on a common general setup, but take some country-specific characteristics into account, mostly depending on the information necessary to run the pension module. Finally, the three development teams had complete freedom in the development of the pension module.

1.2. Alignment.

A general definition of alignment is the procedure by which one imposes that an aggregate simulation result of the model be in line with a desired aggregate result, usually based on predictions of semi-aggregate models or social-policy scenarios. This 'aggregate simulation result' may be the average of an event probability or proportion, in which case we discuss the alignment of discrete (state) variables. This is the "classical" definition of alignment; what Morrison (2006) refers to as "event alignment". But if we define the 'aggregate simulation result' as an average or sum of a continuous variable (say, income), then the notion of alignment may pertain to the process of combining micro- and macro-sources of change to have a continuous monetary variable meet exogenous demands. We will start by discussing the first case, i.e. the event alignment of state variables.

1.2.1. Alignment of state-variables

Morrison (2006, 2) defines the alignment problem as choosing a subset of the prospective events for whom the model event will be deemed to occur, and this given an assumed event probability. This type of alignment is also extensively described in the paper by O'Donoghue and Kelly and this section is based on their description. A simple analogy about the relationship between alignment and the process modules is that the process modules such as logit models produce a ranking variable, while the alignment mechanism selects the number of transitions. Suppose that we have a logit regression that relates the probability of death to explanatory variables such as health, age, and gender.

$p^*_i = \text{logit}^{-1}(ßX)$

This probability consists of a deterministic element (as before), completed by a stochastic element, ε_i, a log-normally distributed random variable. Assuming that disabled people have a higher mortality rate, then given the same age and gender and distribution, as expressed by the stochastic component, the mortality distribution for disabled people will be higher. Likewise, given health condition, older people and males will have a proportionally higher mortality risk. The deterministic component of the model will result in those with a higher risk (a poorer health, a higher age, males) having a better chance of the event occurring, while the stochastic part will ensure that there is some variability (so that not only those with high risk are selected). This model therefore produces the risk of dying. In the simple Monte-Carlo simulation sketched above, the condition for the event occurring was $u_i < \text{logit}^{-1}(ßX_i)$, which is equivalent to $\text{logit}^{-1}(ßX_i) + u_i > 0$. But now we do not apply Monte Carlo simulation. Instead, suppose that we want the proportional occurrences of the event (i.e. the mortality risk) to be equal to an overall proportion X. For now, we do not specify X to age- or gender-categories. Then we use a related equation to rank individuals according to their mortality risk. This equation is $p^*_i = \text{logit}^{-1}(ßX_i+\varepsilon_i)$[4]. So p^*_i sets the rank of individual i.

So now we have two sources of information: we have a variable p^*_i that ranks N people according to the risk that the relevant event (in this case dying) will happen. Furthermore, we want the proportional number of deaths to be equal to X. Hence, the first X*N people in the ranking will have to die, why the remaining (1-X*N) survive.

Note that if the logit equation contains gender and age as explanatory variables, and exogenous proportions X are specified also to gender and age, then the regression coefficients of gender and age are irrelevant. Indeed, in order to select the number of people that die, we use the alignment probabilities. Hence, individuals are grouped into the appropriate age and gender groups. As everyone in the relevant group will have the same age, gender and occupation, they only differ by the other variables (in this case being disabled or not), and the stochastic component . The object then is to select to die, the people in the group with the highest probabilities of dying. As the estimator of being disabled is positive, proportionally more disabled will die than non-disabled. As a result we see that the output of the model equation is used to rank the individuals to whom the event occurs, but to leave the decision to the alignment process.

1.2.2. Alignment of aggregates (uprating)

Next, we turn to the simulation of aggregate continuous variables, usually aggregate monetary variables. For example, suppose the following log-earnings equation that is estimated on N individuals in the year 2002.

$\text{Ln(Earnings)}_{i2002} = ß_0 + ß_1 \ln(\text{age}_{i2002}) + ß_2 \ln(\text{age}_{i2002}^2) + ß_3 \ln(\text{gender}_{i2002}) + ß_4 \ln(\text{educational attainment level}_{i2002})$

A more condensed formulation is $y^{2002}_{2002}=ß_{2002}X_{2002}$. Here, y is the log of earnings in 2002, and X is the set of (logs of) explanatory variables, all in the observed year 2002. Simulation means applying simulated exogenous variables at *t* to this equation, resulting in $y^{2002}_t=ß_{2002}X_t$.

Denote $Y^{2002}_t=\sum_{i=1}^{N} y^{2002}_{i,t}$ the aggregate of individual earnings from the '2002-equation', but in period $t \geq 2002$. Since the above model does not include a trend variable, the growth rate of Y^{2002}_t, (denoted gY^{2002}_t, t>2002) is a weighted sum of the proportional changes of the number of work-

4 O'Donoghue and Kelly (section 5) show that this approach using a logistic distribution ε is superior over subtracting a uniform random variable u from the predicted probability p*.

ing individuals N, and changes of the distribution of X_t between periods (in this case the distribution of age, gender and educational attainment levels). However, the regression itself remains unchanged, so the simulated 2002-incomes y^{2002}_t must in some way be brought to the future year t (i.e. y^t_t), using exogenous information. In models with static ageing, this procedure is known as 'uprating'[5]. In the case of models with dynamic ageing, however, a complicating factor is that the model y^{2002}_t=$ß_{2002}X_t$ by itself produces a growth rate, gY^{2002}_t.

Suppose we want this growth rate gY^{2002}_t that the model produces to be equal to an exogenous time series gXY_t, for example one that comes from a (semi) aggregate model. We cannot just multiply the individual simulation results by gXY_t as we would do in 'classical uprating', since the total in-between growth rate would then be $(1+ gY^{2002}_t)(1+gXY_t)$.

We therefore need a corrected growth rate that must be applied to y^{2002}_t=$ß_{2002}X_t$, so that the resulting actual growth rate becomes gXY_t and not gY^{2002}_t. Obviously, this is

$$gXY_t^c = \frac{y_{t-1}^{t-1}\left(1+gXY_t\right)}{y_{t-1}^{t-1}\left(1+gY_t^{2002}\right)} = \frac{\left(1+gXY_t\right)}{\left(1+gY_t^{2002}\right)}.$$

and this aggregate correction is then applied to all individuals $1..N_t$.

A two-tier approach therefore does the trick. First, run the model with the original micro-level behavioural equation ln(earnings$_i$)=ßX_i+u_i, and derive the series of uncorrected growth rate of aggregated earnings gY_t. Next, the model is simulated again, wile applying the corrected growth rate, so that Y_{t-1} is corrected for each simulation year.

Finally, if there is no important change in the structure of the wage formation process of the aggregate model (the wage equation of the microsimulation model remains unchanged by definition), and if the microsimulation model follows changes in the distribution of age-categories, gender and labour market categories close enough (i.e. if event alignment works properly), then the aggregate correction by which monetary earnings variable must be corrected, should be small.

Let us consider an application for make this even clearer. Table 2 presents the projected growth rates of labour productivity that the AWG adopted in its 2005 projections.

Table 2: AWG projected growth rates of labour productivity

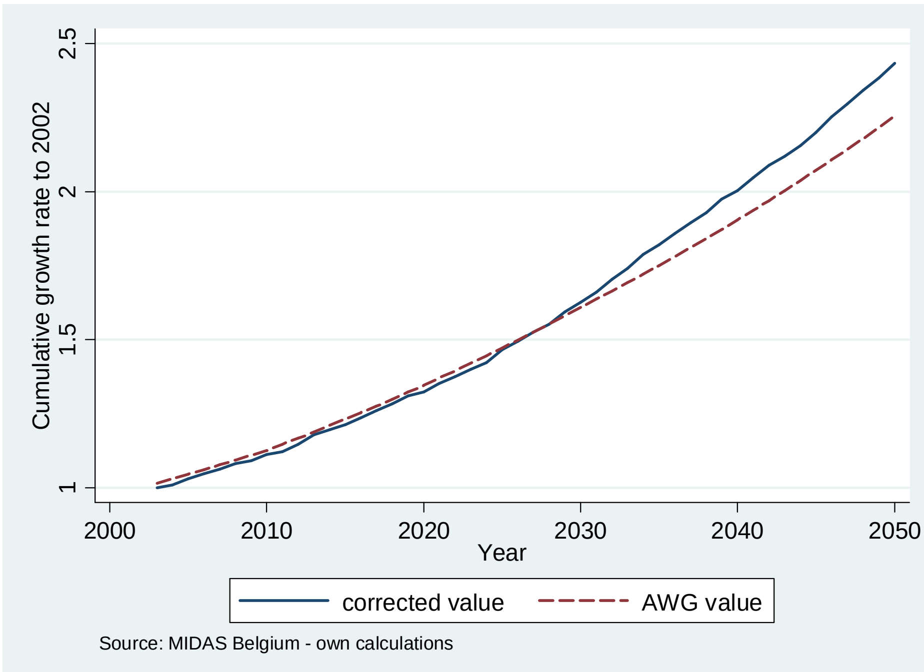
	2004-2010	2011-2030	2031-2050
Belgium	1.5	1.8	1.7
Germany	0.9	1.6	1.7
Italy	0.7	1.7	1.7

Source: EC(2005). In Dekkers et. al. (2009), table 88, page 284.

[5] Harding (1996, 3) defines uprating as "attempts to adjust monetary values within the original microdata to account for estimated movements since the time of the survey or anticipated future movements".

The AWG assumes that the annual growth rate of earnings is 0.015 between 2002 and 2010. The cumulative growth rate is then 1.015 between 2002 and 2003 and 1.015^2=1.030 between 2002 and 2004, and so forth for the years up to 2050. The dashed line in the below Figure 1 is this AWG cumulative growth rate with 2002 as the basis.

Figure 1: AWG and corrected cumulative growth rates for earnings - Belgium



The full line is the corrected growth rate. The two are quite alike up to about 2030, which means that the impact of the correction is small, as was expected. During the last two decades, the average age of the Belgian working population decreases somewhat. In the uncorrected 'static' wage-equation, this implies a relative lowering of the aggregate incomes y^{2002}_t. The actual growth rate of y^{2002}_t, if uncorrected, would end up lower than the 1.7% assumed by the AWG. The corrected growth rate therefore becomes higher than 1.7, so that the resulting aggregate earnings keep on growing at the pace assumed by the AWG.

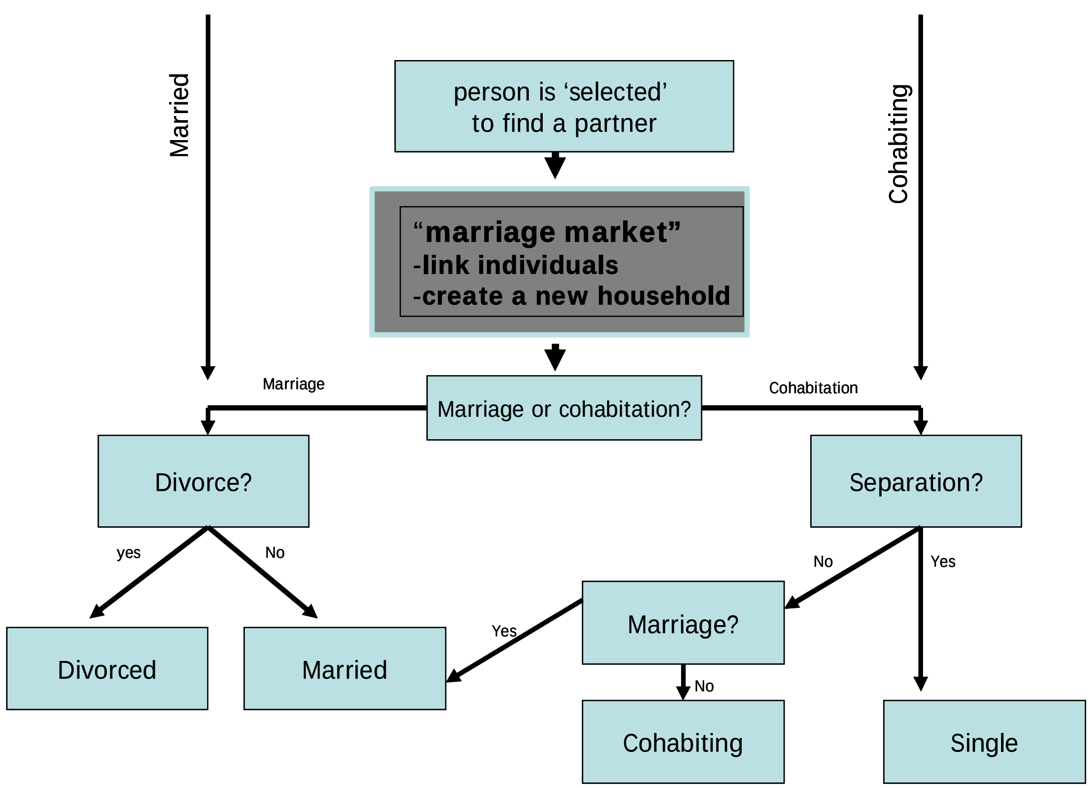
2. The demographic module

The demographic module consists of four different parts: The birth process, the survival process, the education process and the marriage market. The first two processes are essentially alignment-driven random selection processes, and are based on the 2004 demographic projections created by Eurostat and used by the AWG.

The education submodule consists of two serial steps. First, using observed education levels on data from the Labour Force Survey, OECD, every ten-year old individual is by chance 'assigned' a level of education. Given the assigned or observed level of education, the second step of the education submodule determines if an individual is still in education or not. This status will depend on the level of education. An age of education ending will be associated with each education level. The average age of education ending is computed on AWG participation rates for each level of education.

The third demographic sub module is the partnership formation process or "marriage market". The below Figure 2 describes this module.

Figure 2: the marriage market module



This process links candidates eligible to marriage as well as cohabitation. It is therefore better to speak of it as the ‘partnership formation process’. It is a three stage process, which starts with a simple random selection procedure selecting males and females in the population who are eligible for marriage or cohabitation. In the second step and for each of the selected females, a vector is constructed that contains the probability that she will become partner with any of the males eligible. These estimated probabilities are a function of the difference between the two potential partners with respect to several variables, such as age, education level, having a job, and so forth. The third step in this process is the selection procedure itself. This selects each female in turn, and matches her with a male. When a female is to be matched, the male with the highest probability calculated from the regression and still available, is selected to form a partnership. Links are then created between the new partners, and they receive the same household number.

Once two individuals are linked into a couple, a simple logit regression determines whether these individuals are married or cohabiting. Another logit regression is used to model the probability that cohabiting couples later decide to enter into marriage.

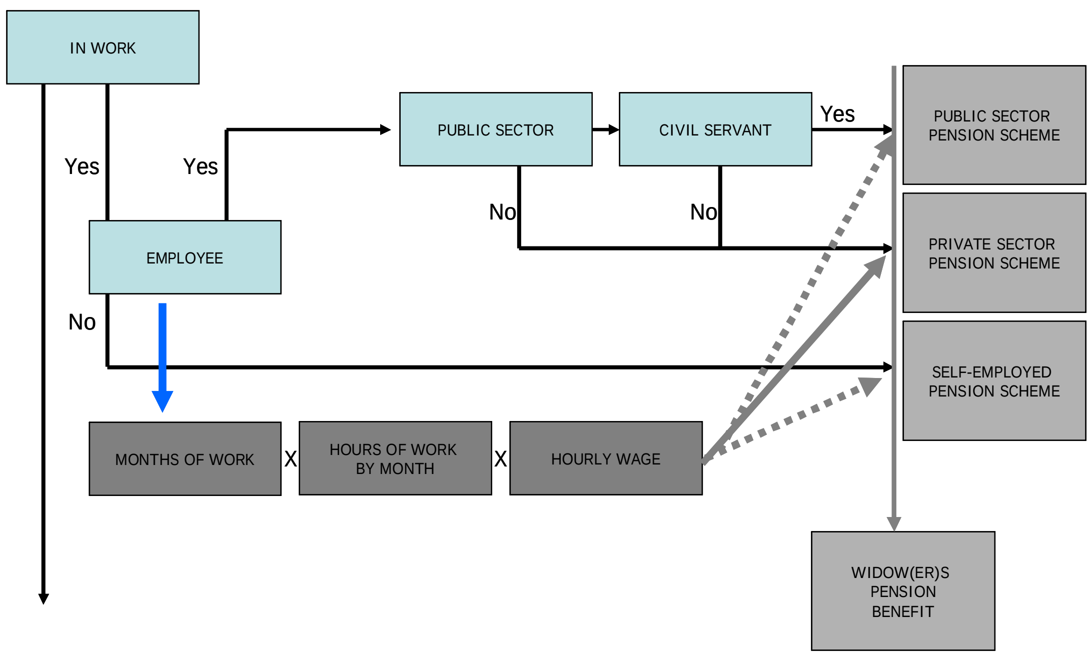
Note that marriage or cohabitation is just one way in which a new household can be formed. By default, individuals that reach the age of 24 without being married ‘leave the nest’ and start a new household of their own.

Any routines describing household formation obviously come with routines describing household dissolution. Indeed, all couples are subject to a certain risk of divorce (in case of marriage) or separation (in case of cohabitation). The probabilities of this happening are again the result of logits, with among other things the duration of the marriage or cohabitation as explanatory variable.

3. The labour market module

The general setup of the labour market module, and the relation with the pension module, is described by two figures. Figure 3, describes the labour market states of individuals that are 'selected' to be in work.

Figure 3: labour market module – working individuals

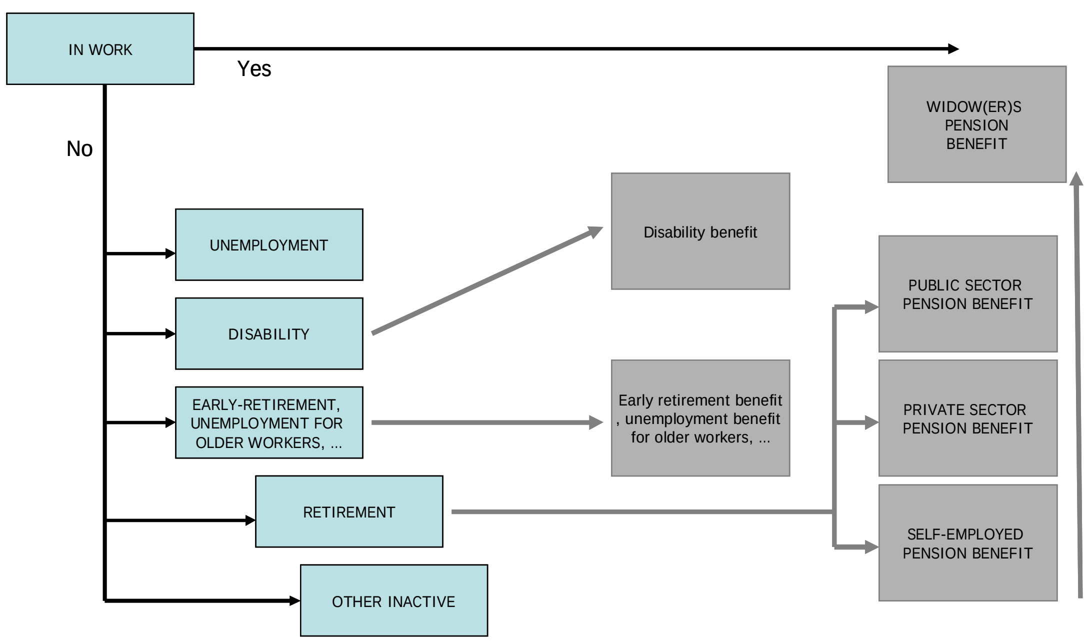


The process of being in work is modelled by a logit regression whose results are aligned to AWG prospective data. If an individual enters the active state, then the next decision is whether or not he or she is an employee or a self-employed. In the first case, the next decision is whether or not he or she works in the public sector, and –if so- whether he or she does so as a civil servant[6]. Given the labour market state one occupies in a certain period, logit regressions describe the probability that one moves to another labour market state, or leaves the labour market for one of the inactive states (see Figure 3). Figure 2 also shows that for wage-earners and civil servants, separate regressions are used to simulate months of work, hours of work per month (conditional on working full time) and the hourly wage. This results in the annual wage, which, together with annual increases of the length of career, is the information on which the future pension benefit is based. When working, individuals build up a virtual pension claim in the pension module, and they therefore become eligible to a pension benefit once they enter retire-

[6] In MIDAS_IT, this last decision does not occur, because there is a full overlap between civil servants and workers in the public sector.

ment. The pensions module includes wage-earners' pensions, self-employed pensions (not in MIDAS_GE) and civil servants' pensions, early retirement pensions, disability pensions and widow(er)s pensions. The below Figure 4 presents the decisions for those that are not active in the labour market.

Figure 4: labour market module – inactive individuals



Given that a person does not work in a given year, it is simulated sequentially whether the person is unemployed, retired or in a residual inactivity category which comprises all remaining inactive states. Else and specific to the Belgian case, one may be eligible for Conventional Early Retirement' Benefit (CELS). In MIDAS_BE, all of these states use age and gender to align to AWG labour market projections. In MIDAS_IT, unemployment and disability are aligned. In MIDAS_GE, only labour market participation is aligned.

In the inactive states, one can still build up a (virtual) pension claim, for example via a prolongation of the career. For example, in Belgium, unemployed build up an 'equivalent period' in the sense that the length of the career increases, and that the pertaining income is based on the income of the last year employed. For disabled persons and retirees (also CELS), MIDAS simulates the amount of social security pension benefits.

4. The pension module

Of the three modules of the model, the pension module is the most country-specific. It will therefore be described for each country separately. Given the scope of this paper, the description will be limited to social security pensions.

4.1. The Belgian pension module

As in most countries with a Bismarckian pension system, social security pension benefits in Belgium have an occupationally tied character that is toned down by diverse minimum provisions and ceilings. The first-pillar retirement system for wage-earners provides former private sector employees and public-sector employees that were no civil servants a pension benefit that essentially is a function of the past career. The mandatory age of retirement is 65 for males. For females it is gradually increasing from 61 years of age (1997) up to 65 (from 2009 on). However, one can become eligible for early retirement from the age of 60 on, if one has a career of minimum 35 years.

The pension benefit is calculated as

Benefit=(.60 or .75)*(length of career / length of career for full pension)*wage-base

The wage-base essentially is the average of past salaries, indexed on the development of prices and with additional discretionary adjustments for the development of wages between the years of receiving the salary and the year of retirement. This modified average of corrected salaries is then multiplied by the length of the career and divided by the length of the career needed for a full pension. The latter equals the age at which one becomes eligible to a full pension benefit minus 20. So, for males, it is 65-20=45 years. For females, it is gradually increasing to 45 years. This wage-base is then multiplied by either 60 or 75%. If the individual is single, the 60% is used. If (s)he is married to someone with a very low pension entitlement, the couple can opt for the 'family pension benefit' of 75% of the wage-base of the high-earning partner. If so, the low-earning partner loses his or her own pension entitlement[7].

Redistributive solidarity elements are embedded in the pension system in several ways. First of all, pensions are a function of lifetime earnings up to a ceiling. Inversely stated, the wage one earns in a certain year during ones career is taken into account only up to a certain limit or ceiling. Those earning a higher income therefore face a lower replacement rate. Moreover, there are two ways in which a minimum benefit is implemented in the pension benefit: the minimum right by career year and the minimum pension.

[7] Actually, the 'family pension benefit' is shared by the two partners. The high-earning partner receives 60% of the wage-base, so an amount equal to the individual pension benefit, and the low-earning partner receives 15% of the wage-base of the high-earning partner. Together, they get 75% of the wage-base.

The conventional early leavers' scheme (CELS) for employees is essentially an unemployment scheme for private-sector workers of 58 and older. Unlike the retirement benefit, the CELS benefit does not depend on the number of working years. Furthermore, when one enters the CELS, the career length, on which the future old-age pension will be based, continues to increase.

The disability scheme for wage earners is also considered as a pathway of withdrawal out of the labour market. Indeed, disability is in practice an absorbing state for workers aged 50 and older. The disability benefit is equal to 40% of the last wage when the individual is cohabiting and 50% of the last wage when he or she is not. This amount also is subjected to a minimum and maximum.

Civil servants are subject to a first-pillar pension system that is separate to that of the private sector. Retirement is compulsory as of age of 65 for both men and women. Early retirement is possible from the age of 60 if at least 5 years of work as civil servant is proved. Public sector pensions are based on the income earned by an individual during the last five years before retirement. Benefits are computed according to the following formula:

Benefit = n/N * reference earning,

where n is the number of eligible years spent in the public service, N is a benefit accrual factor and the reference earning is the average wage over the last five years. The benefit accrual factor N is in general equal to 60, but there are many exceptions.

Self employed retirement benefits are not modelled using exact regulation as it is done for civil servants and wage-earners. Data describing earnings of the self-employed are often missing or unreliable, so we assume that self-employed retirees receive the minimum pension for self-employed. This minimum is adjusted for those that do not have a full career. As 78% of "pure" self employed benefit from the minimum pension (Scholtus 2008), the error introduced by this simplification might be limited.

Summarizing, the Belgian pension module of MIDAS simulates first-pillar old-age pension benefits for private sector employees, civil servants and self employed. Furthermore, it simulates the Conventional Early Retirements (CELS) benefit, the disability pension benefit for private sector employees, and –finally- the widow(er)s' pension benefit, again for private sector employees, civil servants as well as self employed.

As said in the previous section, hourly wages increase with productivity over time, and the speed of this increase is the hourly productivity growth rate assumed by the AWG. Social policy hypotheses used in MIDAS for other pension systems are those used to produce the 2005 AWG projections for Belgium. These growth rates are defined as a difference relative to the productivity growth rate.

– Wage ceiling: difference of 0.5% with productivity growth
– Welfare adjustment: difference of 1.25% with productivity growth

– Welfare adjustment for civil servants: difference of 0.5% with productivity growth
– Lump-sum benefits: difference of 0.75% with productivity growth
– Minimum right by career year: difference of 0.5% with productivity growth

4.2. The German pension module

The vast majority of gainfully employed persons in Germany is compulsorily insured in the public pension scheme (PPS). The most important exceptions are civil servants and the majority of self-employed persons. These are not simulated by MIDAS_GE, so we will not discuss their pension systems in more detail. Furthermore, disability pensions exist and derived pensions such as surviving spouse pensions.

The PPS is a pay-as-you-go system of the Bismarck-type. Most of accumulated pension rights result from so called "earning points" which represent the relation of individual earnings to average earnings in a given year. Earnings points can also be derived from other sources, e.g. from childbearing, education, unemployment. A person becomes eligible to a pension if she has a minimum insurance record and if she reaches a threshold age (this depends on the birth cohort). At present, the regular retirement age (65) is equal for all individuals with the exception of handicapped persons[8]. Several groups are allowed to retire before the regular retirement age (up to 5 years). However, each month (year) of early retirement leads to a deduction of pensions of 0.3% (3.6%). Retirement before the age of 60 is only possible for disabled persons.

The old-age pension amount without deductions is given by the product of the sum of earnings points and the current pension value. The current pension value is identical for all persons and is adjusted, depending on the growth rate of the average gross wage, changes in the ratio of pensioners to employees, changes in the income share of subsidized private pension provisions, and changes in the PPS contribution rate.

The social security pension scheme also provides surviving spouse benefits. The amount of a surviving spouse benefit is a fraction of the pension of the deceased spouse. The pension is withdrawn to some extent if own income of the surviving spouse exceeds a threshold.

For the growth of gross wages, we use the assumptions of the AWG (1.6 % on average per year). We use a simulation of the current pension value of Buslei and Steiner (2006) to capture assumptions on the changes of all factors that enter the adjustment rule. The development of wages and current pension value are shown in the following Table 3.

8 The regular retirement age will gradually increase to 67 between 2012 and 2030. This reform is not modelled in MIDAS_GE.

Table 3: Assumptions on the development of wages and current pension value

	2010	2020	2030	2040	2050
% Increase of wage compared to 2002	4,6	21,4	43,7	70,0	101,3
% Increase of pension compared to 2002	2,9	15,7	27,9	48,0	73,4

While wages double up to the year 2050, the current pension value increases by about 73%. This lower growth rate of pensions is essentially driven by demographic ageing. Pension growth is linked to gross wages but the new adjustment formula for the current pension value takes into account changes in the ratio of pension benefit recipients and contributors. This ratio is likely to grow strongly up until 2030 which works like a discount factor and lowers the growth rate of pensions. Thus the difference between the increase of gross wages and pensions is maximized around 2030 when demographic ageing is expected to reach its peak. This adjustment mechanism is one of the core elements that are assumed to guarantee financial sustainability of the pension insurance in Germany.

4.3. The Italian pension module

The Italian public pension system has been subject to many reforms during the last 15 years, changing both the age at which one becomes eligible to seniority and old age pensions and the formula for computing benefits.

In Italy two different kinds of options for retirement are allowed. The first option is the old age pension. Workers can receive an old age pension benefit when they are aged 65 (males) or 60 (females) and their contribution years exceed a specific threshold. The mandatory retirement age is 65 so women can choose to take up an old age pension benefit between 60 and 65.

The second option for retirement is called the seniority pension. One becomes eligible to this when, before being aged 65 or 60, specific requirements concerning both age and seniority are satisfied (e.g. 40 years of seniority or, since 2008, at least 58 years old with at least 35 seniority years).

The 1995 reform introduces a NDC regime for those entering the labour market after that moment. For older workers with vested rights, the old scheme rests in place, and a transitory system applies to others. Three different public pension schemes therefore currently apply in Italy. Workers' enrolment to such schemes depends on their seniority in 1995 according to the following rules:

1. Individuals with a seniority of at least 18 years in 1995 receive a benefit that is fully earnings related (so called retributivo). This retributivo is compound of the "A quota" and "B quota". For private sector employees, the "A quota" is based on the average of wages earned during last five working years. For public sector employees, the "A quota" is based on the final wage. In the "A quota" wages are indexed only to inflation rate. The "B quota" is linked to

the average wage over the last 10 working years for both civil servants and private sector employees. In the “B quota”, pensions are indexed to inflation rate plus 1%.

2. Individuals entering the labour market on or after 1995 receive a benefit wholly based on the NDC scheme (so called contributivo). In the NDC regime the pension is based on contributions paid which are accumulated – receiving nominal GDP growth rate as rate of return – and are transformed in an annuity stream through transformation coefficients depending in an actuarially fair way on retirement age. Coefficients do not differ between males and females.
3. Individuals working in 1995 with less than 18 years of seniority receive a mixed benefit computed pro quota by a weighted average of pension benefits resulting in earnings related and NDC schemes, where weights are, respectively, years worked until and after 1995. The “B quota” of the earnings related part is now based on wages earned during the whole working life rather than only on last 10 working years.

In addition, for workers fulfilling the requirement concerning years of contributions for receiving an old age pension, in the earnings related (1) and mixed scheme (2), a means tested integration to a fixed minimum pension is guaranteed, taking into account income only. Individuals enrolled in the NDC scheme are eligible at 65 to a means tested social assistance benefit, amounting to less than the minimum pension. This however is not included in MIDAS_IT.

Until the 1992 reform, pension benefits were indexed to gross nominal wages. Since then, pension benefits are indexed only to prices.

The pension module simulates first pillar old age and early retirement pensions for private and public sector employees, as well as the minimum pension. In addition to “pure” pensions MIDAS_IT includes survivor pensions and disability pensions for wage earners and civil servants. Finally, like the Belgian version of the model, MIDAS_IT simulates pension benefits for the self-employed. Most self-employed in Italy pay the minimum contribution fixed by the law. As a consequence merely the minimum pension is imputed as pension benefit to self-employed enrolled (wholly or pro quota) to the earnings related scheme (and fulfilling requirements for receiving such pension). For self-employed enrolled to the NDC, the payment of the minimum contribution is instead accumulated into the model and the benefit is computed according to the usual rules of the NDC scheme.

5. Simulation results describing the prospective adequacy of pensions

This section presents and discusses the main simulation results pertaining to retirement and the adequacy of pension benefits, as projected by MIDAS. This presentation will be limited to the bare necessities for reaching the conclusions on adequacy. These are the replacement rate, the redistributive impact of pensions and the different risks of poverty pertaining to pension beneficiaries relative to wage-earners. We should emphasize that the definition of adequacy is necessarily limited: MIDAS simulates retirement benefits and earnings, and thus ignores other social security and welfare benefits for the non-elderly. Nor does it include second-pillar pensions, private savings and wealth. The notion of adequacy of pensions should therefore be interpreted strictly first-pillar and relative to earnings alone.

When analysing retirement income in MIDAS, two problems have to be dealt with. First of all, questions on pension income in the PSBH and ECHP starting dataset do not make a difference between benefits from the first, second or third pillar of the pension system. Neither does it make a difference between pension benefits coming from the pension systems for former employees, civil servants or self-employed. So, the pension income in the starting dataset (i.e. of those retired in the starting year 2002) is likely to be too high on average, and to much skewed to the right. Furthermore, it does not allow making a separate analysis of the systems for civil servants or employees.

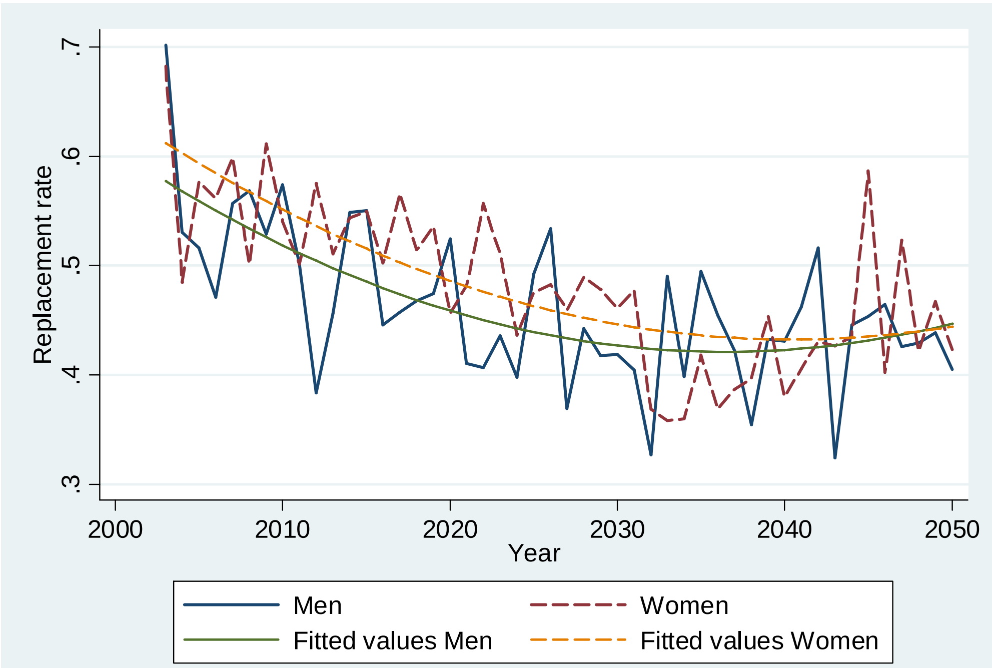
A second problem which is common to all three versions of MIDAS is that transitions within labour market states result in many low pension benefits. This does not necessarily mean that the individuals actually have a low retirement income, because a considerable share of individuals in MIDAS receives benefits from multiple systems. Consequently, studying the benefits from the pension systems of employees and civil servants separately might result in an overestimating of the inequality of pension income, while underestimating the average retirement level.

Both problems cannot be solved, but we can try to surface them as much as possible so that they become explicit in the analysis.

5.1. Adequacy of pensions in Belgium

Figure 4 shows the replacement rate for Belgium. Note that the development of the replacement rate is somewhat erratic, due to the sometimes low numbers of people actually making the transition into retirement. To clarify their development, quadratic trends have been estimated and the fitted values are added to the figure. In the largest part of the simulation period, the trend is decreasing. One important reason for this is that less and less pensions are allocated at the higher household rate. As it is most of the time the man who receive this family pension, it is not surprising to see the replacement rate of men decreasing. Furthermore, women that forego their own individual pension benefit in order to benefit from the household rate pension of their partner, are obviously not included in Figure 5. As the labour market participation of younger cohorts of women increases, proportionally more women with these low pension claims apply for their individual pension benefit and forego the household rate benefit, the replacement rate of women therefore decreases as well.

Figure 5: Replacement rates - Belgium



Source: MIDAS Belgium - own calculations

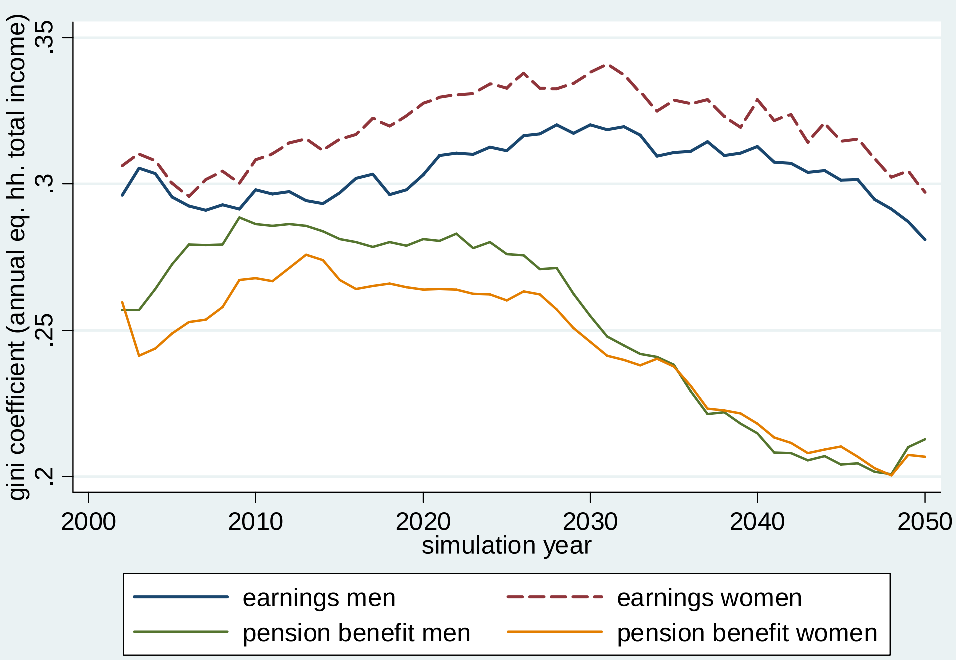
The growth rates of productivity that the AWG assumes for Belgium provide a second explanation of the trends in the replacement rate. As pensions of new retirees are based on past growth rates, the replacement rate will show an opposite development to the growth rate of productivity. The AWG assumes that the growth rate of productivity will increase from 1.5 (the years up to 2010) to 1.8 (from 2010 to 2030) and this implies a lowering of the replacement rate from 2010 on. From 2030 on, the assumed growth rate decreases somewhat, namely from 1.8 to 1.7, and the replacement rate hence starts to catch up from the mid-2030s on.

A third explanation pertains to the effect of the wage ceiling in the calculation of the pension benefit. This ceiling lags to the development of wages, and therefore depresses the growth of the pension benefit relative to wages. As a result, the replacement ratio decreases over time. However, following the social policy assumptions of the AWG, this lag of the development of the pension ceiling becomes smaller. As a result, the speed of decrease of the replacement rate will decline over time.

Figure 4 also shows that the replacement rate is generally higher for women than for men. This is because men have a higher wage than women. This implies that the annual wage of men more often than women exceeds the ceiling, thus resulting in a proportionally lower pension benefit. Furthermore, women more often than men see their pension being adjusted upwards to the minimum, which means that their pension increases proportionally to their wage. The replacement rates of men and women however converge, and this is mainly due to the increasing labour market participation of women, which results in an increasing length of their career.

The next Figure 6 specifies the redistributive impact of pensions to gender.

Figure 6: Inequality of gross earnings and retirement benefits - Belgium



Source: MIDAS Belgium - own calculations.

In general, the inequality of retirement benefits is considerably lower than that of earnings. This redistributive effect confirms the findings of Brown and Prus (2006). The above figure suggests that this redistribution increases after 2020.

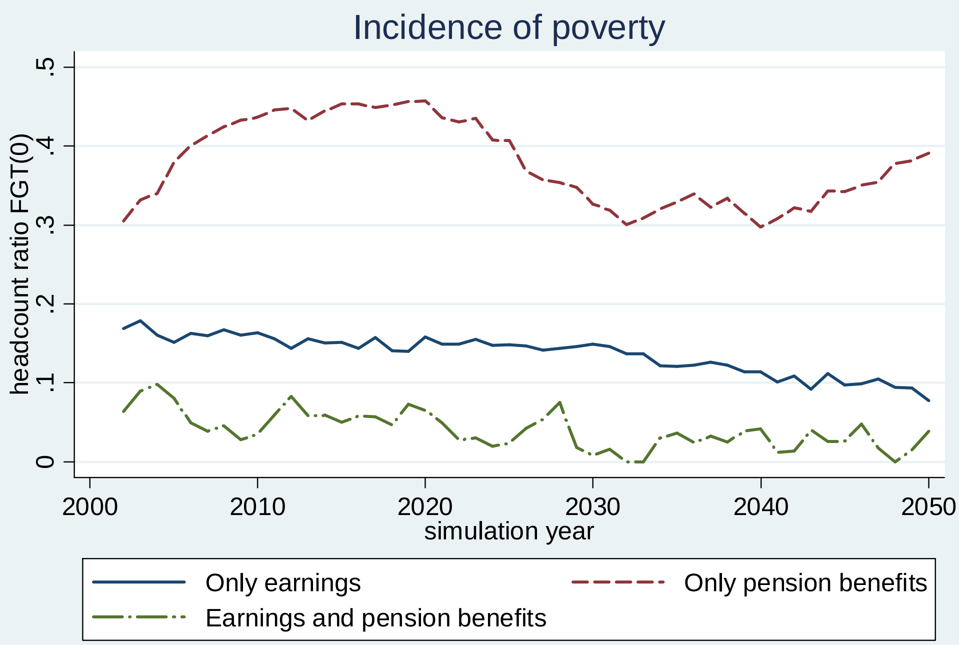
A first reason pertains to the comparison of the linkage between wages and benefits before and after the start of the simulation. Following the assumptions of the AWG, we assume that benefits lag behind the development of wages. The difference between the growth rate of pension benefits, for example, and that of wages is assumed 1.25 percent. Fasquelle et al. (2008: 2) show that this lag was on average 1.8 percent between 1956 and 2002. Thus, the assumptions used by the AWG –and hence by MIDAS_BE– imply a reinforcement of the link between wages and pension benefits. Hence, the relative decrease of the benefit of older retirees is slowed down, not only relative to workers but also relative to younger retirees (who retired later). As a result, the inequality of pension benefits will ceteris paribus decrease over time.

A second reason that explains this decreasing inequality starts by emphasizing that the model takes only earnings and pension benefits into account. Welfare benefits, unemployment benefits and all other kinds of replacement incomes are ignored. This not only means that the levels of inequality are most likely too high, but this omission may make the simulation results dependent on the structure of households. Indeed, the larger the household, the higher the probability of observing other types of income. Or, the more individuals in the household, the more the simulation results of MIDAS will overestimate actual inequality. Consequently, when the average number of individuals in the household decreases, then the overestimation would become smaller in size, and we therefore can expect inequality to decrease as well. Figure 11 in the MIDAS report indeed shows that the average number of individuals in households – restricted to households whose at least one individual is retired - is first slightly increasing until 2020 and therefore decreases a lot until the end of the period. This development coincides with the Gini index of pension benefits. Indeed, we see this inequality index increase until 2020 and decrease thereafter.

The inequality of earnings is higher for females than for males because the proportion of part time workers and workers that work only a limited number of months is higher for the former than for the latter. However, the inequality of pension benefits is lower for females than for males, and the redistributive effect of pensions is therefore stronger for the former than for the latter. As the average pension benefit is lower for women as well, these pensions more often are confronted with the various minimum benefits. As a result, the inequality is lower. Furthermore, retired men more often than women receive a pension benefit from the second or third pension pillar. Even though the effect of this is diminished by the fact that we use equivalent household income, we can expect this to increase the inequality of the pension benefit of men at least up to 2020.

Figure 7 shows the incidence of poverty among individuals with households that have only earnings, only retirement benefits, or both. The first conclusion from Figure 6 is that those who live in households that have both earnings and pension benefits, have a lower risk of poverty as compared to the other categories. These individuals have best of both worlds: they benefit from the high but unequal earnings, as well as the lower but highly redistributive pension benefits.

Figure 7: Incidence of poverty pertaining to individuals from working and retired households - Belgium



Source: MIDAS Belgium - own calculations.

The advantageous position of those having both earnings and pensions relative to others who live in households with only earnings can furthermore be explained by noticing that those that live in 'mixed households' often are older than those that live in households that have only earnings as income. This means that their income from work is usually higher, and their households are usually smaller in size to that welfare is ceteris paribus higher.

The lower risk of poverty of those that have household earnings relative to those that receive just pensions can be explained by the fact that one common poverty line has been used in all previous figures. The lower mean pension benefit compared to earnings (see the replacement rate in Figure 5) thus results in a higher poverty risk for those having only a pension benefit.

Next we consider the development of poverty risks and intensities over time in Figure 7. This shows a rather grim picture where both the risk and intensity of poverty of those having earnings remain more or less the same, while both the risk and intensity of poverty of those receiving only a pension benefit shows a development that can roughly be decomposed in five phases corresponding to the five decades. Poverty among pension recipients increases during the first decade. Next, it roughly stays constant between 2010 and 2020, decreases during the third decade, on average stays more or less constant between 2030 and 2040 and finally increases again during the 2040s. This evolution is mainly explained by the evolution of the household structure combined with the evolution of earnings composition into households. These are presented in Table 79 of the MIDAS report.

During the 2010s, the number of two-person households with two incomes goes down at the benefit of the three other categories. The two above-mentioned effects go in the same direction and combine each other to cause poverty to increase. A second effect, works though the 4% points increase of two-person households with only one income, and reinforces poverty growth: Figure 29 in the MIDAS report shows that the proportion of “household rate” pensions raises until about 2010. Couples benefiting from “household rate” pensions being worse off than couples benefiting from two pensions or even than single households with a single pension[9], this proportion increasing makes poverty rise.

The analysis of Table 79 in the MIDAS report reveals only minor changes into the composition of households between 2010 and 2020. Furthermore these changes have opposite impacts on poverty and cancel each other out.

The 2020s are characterized by an important decrease in poverty among pension recipients. The number of one-individual households stays constant during that period while the number of two-person households with two incomes increases considerably at the expense of households with 2 or more individuals and two-person households with one income. As explained above, a reduction in the average number of dependent individuals in households leads to a reduction of poverty. Moreover, because they receive more often two incomes, households consisting of two individuals become wealthier. The two effects joining together result in a considerable reduction of poverty.

The 2030s do not present a significant trend in poverty. The two opposite effects explained above cancel each other out.

Finally, the 2040s show an increase of the poverty level by 10 percentage points. The effect at work here is the first one explained above. The number of single-person households increases considerably, from 57% to 68%, and this at the expense of households consisting of two individuals with two incomes.

So, far, the development of poverty among pension-receiving households has been explained using developments in the structure and income composition of these households. These however are not the only factors influencing poverty. Several other important explanations will be discussed in what follows.

First of all, the poverty increase from 2002 to 2010 is also the result of a technical characteristic of the model that was discussed at length before. The observed pension benefits in the starting year 2002 indeed consist of benefits from not only the first, but also the second and third pillar

9 The proportional difference between the “household rate” and the “single rate” (being 25%) is lower than the increase of the equivalence scale (50%).

of the pension system. As new generations of individuals enter retirement, the observed retirement benefits become merged with fully simulated retirement benefits. The latter do not include benefits from the second and third pension pillar, and poverty therefore increases. This, obviously, is not necessarily a realistic development, but a technical characteristic.

Figure 38 of the MIDAS report shows that the average age of the recipients of pension benefits start to increase considerably from the early 2030s. Ongoing pension benefits are only partially linked to the development of wages – even though this linkage is stronger in projection than it was in the past- so a strong increase of the average age of recipients explains the increase of poverty among the recipients of pensions.

Ignoring the increase of poverty among the pensioners in the first decade of the simulation period, a contradiction between the poverty among pensioners and the replacement rate becomes visible. Between about 2020 and the first half of the 2030s, the position of retirees will meliorate relative to that of the other categories. This development seems in contradiction with the ongoing decrease of the replacement rate in Figure 4. Furthermore, poverty among pensioners in Figure 6 increases again from the 2030s on, which is just when the replacement rate has reached its minimum and is again increasing! So the development of the poverty position of the elderly seems somewhat in contradiction to the development of the replacement rate. An answer lies in realizing that the replacement rate represents 'only' the income fall at retirement. It hence represents only the youngest cohort of retirees and not all those that retired earlier. Indeed, the higher the average age of the pensioners, the lower the value of the replacement rate in explaining poverty among pension beneficiaries. This suggests that the age development of pensioners could explain the development of poverty.

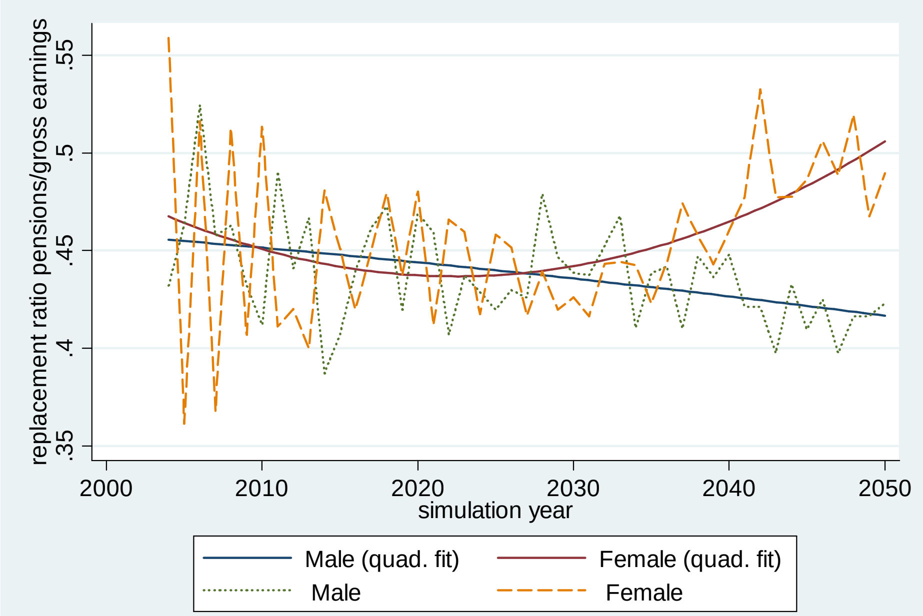
5.2. Adequacy of pensions in Germany

The replacement rate takes into account our growth scenarios in which pensions are assumed to grow slower than earnings (see prior section). Pensions will grow at a slower rate than gross wages which in turn implies that the replacement rate can increase only if supplied labour increases over the cohorts which are affected. For men, it turns out to result in a slightly decreasing average replacement rate. For women, on the other hand, the increase in labour supply over the lifetime of future cohorts of female retirees more than compensates the reduction in the current pension value.

The erratic movement is caused by low sample size since we only look at new transitions to retirement in each year. A quadratic trend was added to make it easier to identify the overall development of the replacement ratios of men and women. Replacement ratios decrease significantly for men from about 45% in 2003 to roughly 42% in 2050. The slight negative trend can be attributed to the lower growth rate of pensions compared to wages and increasing male labour force participation. The increase in the employment rates leads c.p. to higher pensions and compensates partly the slow growth of pensions. For women, the mechanisms apply but the employment effects – i.e. higher labour market attachment of women – even dominates the effect of the lower growth rate of pensions, at least after 2025. Furthermore, for children born after 1992, women earn generous child bonuses as part of their pension benefits. These bonuses will have an effect after around 2020 and this leads also to the simulated positive development.

However, it is important to keep in mind that a higher replacement ratio of women does not mean a higher pension, after all male pensions remain higher than those of females and the same holds true for wage income.

Figure 8: Replacement rates - Germany



Source: MIDAS Germany - own calculations.

This result resembles well the ageing process of the population because – somewhat simplified – pension growth is slower the higher the old age dependency ratio is. Around 2030 demographic ageing reaches its peak and the difference in growth rates of pension and earnings shrinks.

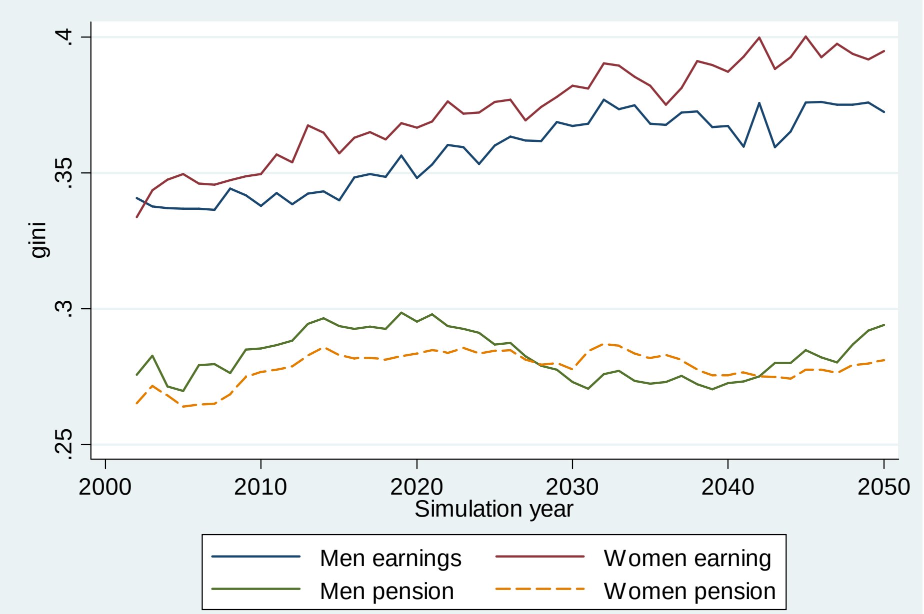
Figure 9 shows the development of the Gini of equivalized household earnings and pensions. Interestingly, the Gini of equivalized earnings develops like that of unweighted individual earnings[10]. This means that the household structure does not change its trend. The inequality increases up until the end of the simulation period for both men and women. For both, the Gini

[10] Figure 92 in the MIDAS report (p.222).

starts off from about 34 points and increases for men to a value of about 37 and for women to about 39. The household dimension leads to a lower difference between the Gini of men and women compared to the comparison based on individual earnings. This difference is obviously driven by single households since household income is equivalized.

A different development can be observed for households with pension benefit recipients. The Gini for male pensioners starts off with about 0.27 and increases until 2020 to about 0.3. After that it starts to decrease relatively fast until 2030 when it again starts to rise until 2050. But comparing 2002 and 2050 no large difference can be observed. The development for women is less volatile. Their Gini remains relatively stable with slight positive trend over the simulated period. That both measures do not develop as parallel as those for equivalized earnings can be attributed to a higher share of single households within the group of pension recipients. Here they even dominate the development of the Gini. And since the Gini of unweighted individual pensions develops differently for men and women, a similar development can be observed for equivalized pensions.

Figure 9: Gini of individual monthly earnings and pensions by gender (age 16-64, employees and retirees) - Germany



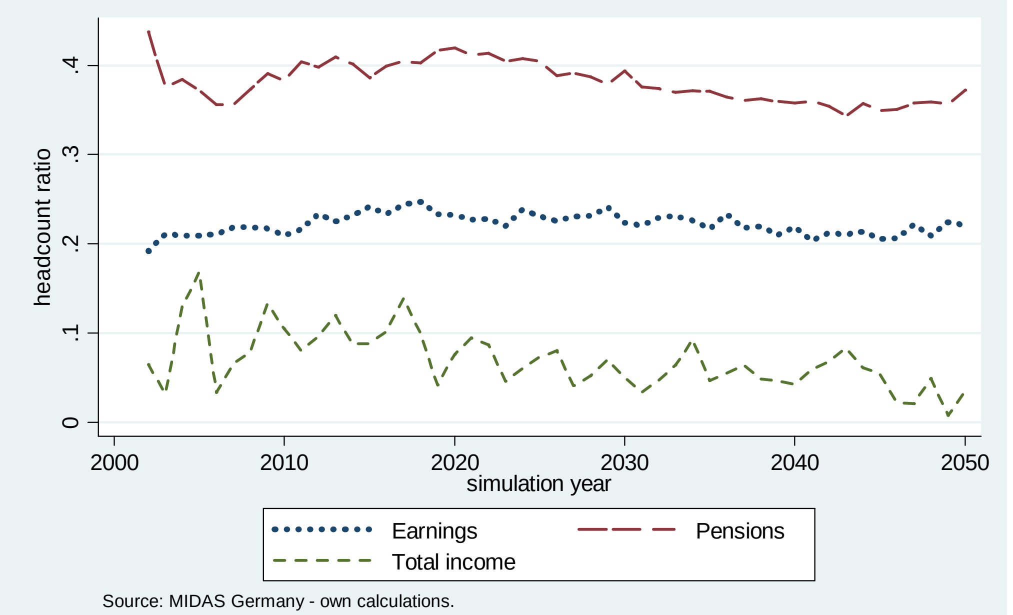
Source: MIDAS Germany - own calculations.

Figure 10 shows the incidence of poverty among individuals with households that have only earnings, only retirement benefits, or both.

Note that we analysis gross income components and do not take into account welfare, self-employed income, private pensions or income from other sources than dependent employment and public pensions. Typically retirees pay no or only low taxes, thus looking at gross income means that the income difference between workers and pensioner is higher than for net income components. A higher income difference implies in turn a higher poverty risk for retirees in this perspective. Concerning the missing household income components, it has to be kept in mind that we restrict this poverty analysis to simulated income components. This leads to a relatively high poverty rate for pensioners for three reasons. The first is mentioned above: the difference between pensions and gross earnings is higher than that between pensions and net earnings. The second reason is that households without earnings and pensions are not part of the analysis. However, we observe virtually no household without pension rights in the simulation but we do observe that households have no market income from time to time. These pension rights might be very small. This leads to the third reason for high poverty rates of pensioners: very low pensions are often associated with welfare recipience which we do not simulate. Taken all together, the following figures are not comparable to official poverty statistics. However, they show in a very pure way the relation of gross earnings and pensions before taxes and redistribution.

Receiving income from both sources, earnings and pensions, leads to a lower risk of poverty as compared to having only one source of income. Adding to the difference in levels, pensions show a negative trend in poverty risks over time. This trend is dominated by higher pension benefits for women and a stable or slightly negative growth for men. All households experience the aforementioned trends regardless of their sources of income. That explains the decrease in poverty risks over time for pensions and total income.

Figure 10: Incidence of poverty pertaining to individuals from working and retired households - Germany



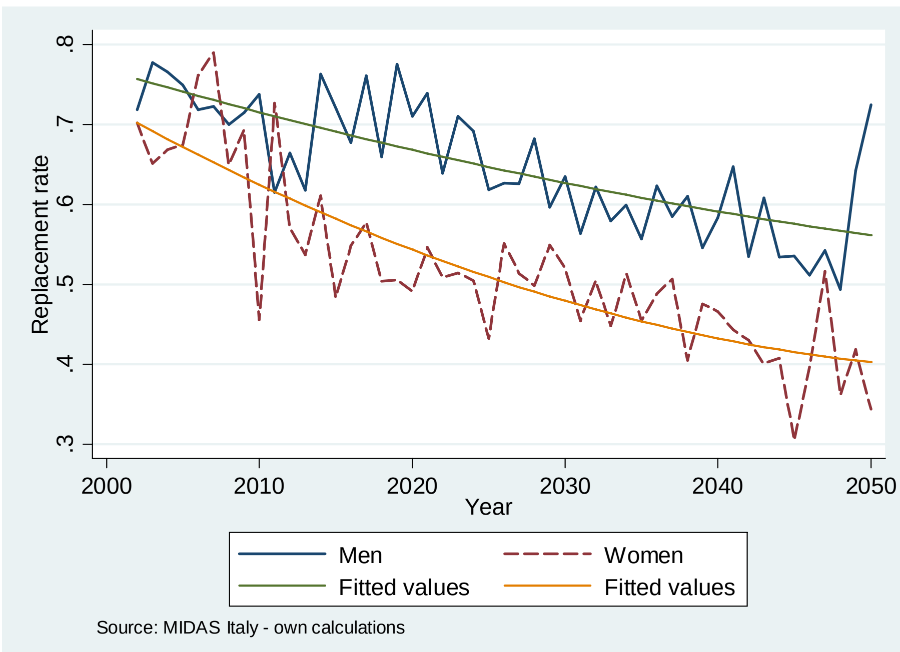
Source: MIDAS Germany - own calculations.

5.3. Adequacy of pensions in Italy

The development of the replacement rate in Figure 11 again is somewhat erratic, due to the sometimes low numbers of people making the actual transition into retirement. Hence, global trends emerging from these figures, rather than their punctual values, should be observed and assessed.

The increase of career length, assessed through seniority years, is lower than that of the average age of retirement (see Figure 117 in the MIDAS report). This is because of two factors that counteract an increase in the age of withdrawal from work: an increase in the average age of labour market entry (due to higher educational attainments) and the decrease of the seniority requirements for receiving an old age pension in the NDC system (amounting to 5 years, while it amounts to 15/20 years in earnings related and mixed schemes). Finally, over the whole simulation period, male average career length increases, while female one is quite constant, maybe due to the higher share of women getting an old age benefit after having worked for few years.

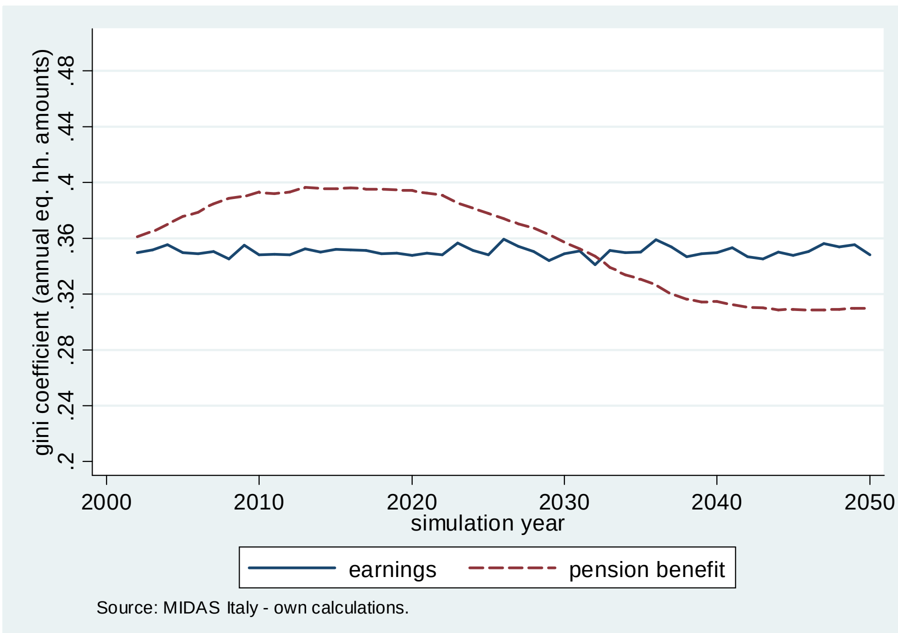
Figure 11: Average replacement rate of individuals entering into retirement - Italy



The counteracting effect played by 1) benefits remaining rather constant over time (see the discussion of the replacement rate in the MIDAS report) and 2) real wages that increase steadily with the productivity growth level, emerges in the development of the replacement rates (i.e. the ratio between the first pension received and the last wage earned) in Figure 11. The more benefits are based on the NDC formula, the more replacement rates decrease both for males and females. The increases in career length and in age of retirement shown before are not enough for compensating this decrease in replacement rate brought about by the change from the earnings related to the NDC formula.

Figure 12 shows the development of the inequality of (equivalent) earnings and pension benefits in Italy.

Figure 12: Gini coefficients of gross earnings and retirement benefits - Italy



In MIDAS-IT like in the other countries, earnings inequality remains fairly constant in the whole period. On the contrary, the trend of the Gini coefficient of pension benefits is much more diversified. It starts from a value slightly higher than the one pertaining to wages (about 0.36 vs. 0.35), but it steadily increases towards 0.40 in the mid-2010s. From 2020 onward, the Gini of pension benefits decreases, crosses the Gini of wages around 2035 and finally reaches a value around 0.31 in 2050. This trend of the Gini seems consistent with the evolution of the Italian pension system; at the beginning of the simulation the inequality of pension benefits increase because individuals with high pensions retire, then such increase is exacerbated by the coexistence of cohorts of retired belonging to different (and differently generous) schemes. After 2025, the death of the most of individuals fully belonging to the more generous earnings related scheme contributes to reduce the inequality of pension benefits.

Figure 13: Incidence of poverty by household's sources of income - Italy

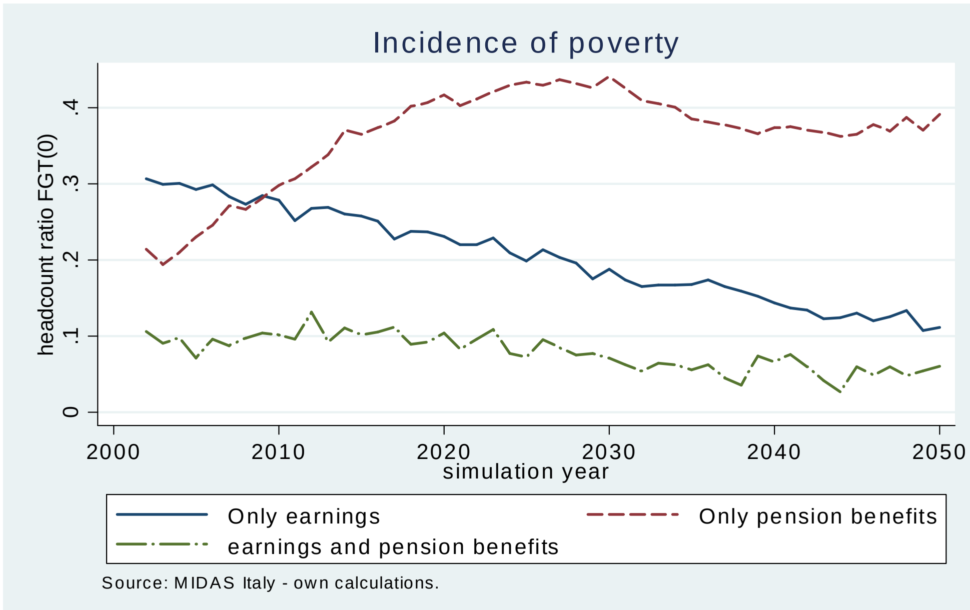


Figure 13 shows the spread of poverty risks among the different groups of the population. During the whole simulation period, the incidence of poverty among households receiving only pension benefits increases importantly, while it steadily reduces among households receiving earnings. After 2010, poverty risks are much higher for pensioners than for workers. This trend can be explained by the different evolution of wages, which steadily increases in line with productivity, raising then also the poverty threshold (the 60% of median income), while benefits, being not indexed according to the real wage growth, reduce their relative value compared to wages in all years of simulation.

Conclusions

The AWG projections of social security pensions in the European Member States are an important tool in the assessment of their sustainability. To date, the projections that Member States produce for the AWG include only a limited notion of adequacy, being the replacement rate. Other relevant aspects of pensions, specifically pertaining to the adequacy of pensions, are not considered. This paper aims to set a first step into integration by assessing the consequences of the AWG-projections and assumptions on the adequacy of pensions in Belgium, Germany and Italy.

The simulation results pertaining to the adequacy of pensions show that the Belgian replacement rate will gradually decrease until the beginning of the 2030s, after which it will recover. The level of the replacement rate is lower in Germany, but the development over time is comparable to Belgium. This is not so for Italy: here, the replacement rate starts off higher than in Belgium, but shows a continuous decrease as benefits from the earnings related system are gradually replaced by benefits from the NDC pension system. This larger impact in Italy than in Belgium and Germany seems to be consistent with the findings of Zaidi and Grech (2007, Table 1, page 305)

Also, the difference between men and women in terms of their replacement rates is smaller in Belgium and Germany than in Italy. Seeing that the difference between men and women seems to appear only in the second half of the 2010s, it seems to be caused by the NDC pension system as well.

In all three countries, and for Italy only in the first years of simulation, levels of income inequality decline from working to retirement ages, confirming the findings of Brown and Prus (2006).

Inequality of equivalent pension benefits in all three countries are roughly alike in their development, but not in their level. The inequality of pension benefits increases at first, reaches a maximum in the early 2010s (late 2020s for men in Germany) and then decreases again. The redistributive effect of pensions (measured by comparing the inequality of earnings with that of pension benefits) will increase from the late 2020s on in Italy and Belgium, and from the early 2020s on in Germany.

The forces causing this development in equality of pension benefits are quite different, at least between Belgium and Italy. Using the terminology of Zaidi and Grech (2007), the increasing redistributive impact of pensions in Belgium is caused by the parametric reform of reinforcing the link between pensions and earnings. In Italy, the effect is caused by the systemic changes of pension system. This also explains why the effect is stronger in Italy than in Belgium. Furthermore, inequality of pension benefits in Belgium is in all years well below that of earnings. In Italy, it is the opposite in the period up to the first half of the 2030s.

The paper also discusses the difference between workers and retirees in terms of their relative risk of poverty. Here the differences are more outspoken. In Belgium and Germany, the risk of poverty of those receiving only pension benefits is in all years higher than for those living in households receiving earnings (as well). In Italy, the poverty risk of those receiving a pension benefit starts of lower than those receiving earnings (as well), but increases very considerably until about 2030. This suggests that the systemic reform in Italy has a more profound impact on poverty than the parametric reform in Belgium and Germany.

Next, we consider the development of the incidence of poverty of those living in households that receive only pension benefits. The developments are roughly comparable between the three counties, as was the case with inequality, but the levels are not. Furthermore, the risk of poverty shows a rising trend in Italy, and the ‘common pattern’ therefore surfaces in the speed of this increase, rather than in the change itself.

In the three countries, the risk of poverty pertaining to pension benefit recipients increases at first, and then decreases. In Belgium and Germany, this turning point is early in the 2020s, whereas it is late in the 2020s in Italy. Furthermore, relative to the preceding increase, the decrease of both risk of poverty is considerably stronger in Belgium and Germany than in Italy. As a result, the poverty rate of Italian pension benefit recipients show a positive trend, which is absent in Belgium and Germany. About a decade later after the first turning point (i.e. early 2030s for Belgium, and early 2040s for Italy), poverty risks stabilize and then starts a modest increase again. This last change is again stronger in Belgium than in Italy and Germany. The explanations for these developments in both countries are comparable as well, namely the link between the development of wages and pension benefits. In Belgium, however, the impact of the average age of the elderly seems to play an important role in conjunction with this linkage. This is not reported in the Italian case. On the whole, poverty among the recipients of social security pension benefits increases more in Italy than in Belgium and Germany, which for the first two countries confirms the tentative results of Zaidi et al., 2006, Table 16, page 51.

An international comparison of the simulation results suggests that the impact of the parametric reform in Belgium and Germany and the systemic reform in Italy on (re)distribution and poverty should go into the same direction, but that the magnitudes would differ. Indeed, this impact is expected to be stronger in Italy than in Belgium and Germany.

Demographic ageing, in combination with projected growth rates of productivity and the assumed linkage between the development of earnings and pensions, has a profound impact on the future adequacy of pensions. Policies aiming to restore or improve sustainability therefore are bound to affect adequacy, and this makes it all the more important that both aspects of pension systems be assessed in unison.

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