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Estimating pension entitlements of public pension schemes in Latvia

Final Report

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1 Introduction

According to the recent update of the System of National Accounts (2008 SNA) implicit pension liabilities of government employer pension schemes (not recorded in core accounts) as well as social security pension schemes shall be recorded in a new supplementary table of the National Accounts.[1] Against this background researchers and policy advisors have paid increasing attention in recent years to the calculation and use of these pension entitlements. It has been outlined inter alia that such figures provide valuable information regarding the timing of accumulation of entitlements, the impact of pension reforms on entitlements as well as the effect of unfunded pension schemes on national savings.[2]

After the recent changes of international accounting standards, the European System of Accounts (ESA) as a counterpart of the SNA has been revised in the past years. Within the new framework of the ESA – which has been adopted in May 2013 – it has become mandatory for all European countries to record pension liabilities of government employer pension schemes (not recorded in core accounts) as well as social security pension schemes in a new supplementary table from 2017 onwards. To prepare for this new issue of national accounting the *Eurostat/ECB Task Force on the statistical measurement of the assets and liabilities of pension schemes in general government* (Task Force) was established in 2006. One of the main objectives of the Task Force was to model and estimate pension scheme data and to investigate arising methodological issues.[3] Within this context, benchmark calculations have been carried out by the Research Center for Generational Contracts of Freiburg University (RCG)[4] for 19 EU member states. Furthermore, the RCG assisted Eurostat to prepare a Technical Compilation Guide for the estimation and recording of pension liabilities in national accounts. On the basis of this experience the RCG developed a model to calculate pension entitlements for the public unfunded pension schemes in Latvia upon request of Statistics Latvia.

This report presents the outcomes and the calculation procedure of these estimations. The survey is organized as follows: Chapter 2 introduces the concept of pension entitlements, the new supplementary table of national accounts and the annual recording of pension entitlements in this new element of national statistics. The followings chapters 3 and 4 present the methodology developed at the RCG to calculate the accrued-to-date pension liabilities. The results of the estimations are presented in chapter 5. Finally, in chapter 6 a summary of

[1] For a short portrayal of the reasons to change the SNA, see Mink and Rother (2007), Semeraro (2007) or Dippelsman (2010).
[2] See e.g. Kaier and Müller (2013).
[3] See Task Force (2008), p. 46.
[4] The German name of the RCG is "*Forschungszentrum Generationenverträge*".

the main contents of the report is provided. This last chapter also entails an outlook on how to extent the model in coming years.

2 Recording of pension entitlements in the new supplementary table of National Accounts

Within the framework of the new supplementary table a complete and comparable picture of pension entitlements from a debtor`s (pension scheme) as well as from the creditor`s (household) perspective shall be provided. In Europe entitlements of unfunded pension schemes represent a significant share of overall pension entitlements. So far these figures have, generally, not been considered in national accounts. The new supplementary table bridges this gap by presenting additionally government-sponsored unfunded defined benefit schemes as well as social security pension schemes.

2.1 The figures of the supplementary table

In order to complete this new table of national accounts, it is important to make the following distinctions and definitions of pension schemes to be covered in the supplementary table:

- **The supplementary table covers only benefits of the type of a (gross) pension.**

Box 1: Definition of pensions

Social insurance benefits can be differentiated into those relating to pensions and those relating to all other forms of benefits, so called non-pension benefits.[5] Pension benefits generally consist to a large degree of old age pensions. However, also survivors' pensions – including widows' and orphans' pension benefits – as well as disability pensions fall under the term pension benefits.

Pensions are generally paid out in the form of a guaranteed annuity[6] and received under predetermined legal or contractual terms. It is important to stress that in the framework of the supplementary table pension benefits are recorded in gross terms. In other words no deductions are made for taxes, social contributions or the service charge associated with the respective pension scheme.

The distinction between pensions and non-pensions is important since the new SNA recognizes liabilities only for pensions whether there are actually assets set aside to meet

[5] See SNA 2008, 17.98.
[6] For a definition of annuities see SNA 2008, 17.66-17.75.

the entitlements or not but recognizes reserves for non-pension benefits only when these actually exist.[7] A definition of the term pension is given in Box 1.

- **The supplementary table only records pension schemes which are of the type of a social insurance scheme.**

Pensions can be provided to beneficiaries in the form of:

(i) social insurance pension schemes
(ii) social assistance and
(iii) individual insurance policies related to pensions.

Liabilities related to the type of social assistance or due to private savings are not to be recorded neither in the core nor in the supplementary table. The supplementary table only records pension schemes which are of the type of a social insurance scheme. *Social insurance* refers to a contractual insurance scheme where the beneficiaries are obliged or encouraged to insure against certain contingencies – such as the risk of old age – by the intervention of a third party. The key distinction between *social insurance* and *social assistance* lies in the eligibility to receive benefits. In comparison to social insurance, social assistance benefits are paid out irrespectively of qualifying contributions (whether actual or imputed) having been made. For a more detailed classification of pension schemes see Box 2.

In the context of social insurance pensions one can differentiate between benefits provided by the general government for a large section of the population so called *social security pensions* and pensions provided by employers to a selected group of employees, namely *employment related pensions* (*other than social security pensions*). The latter term also comprises government employee pensions.

[7] See SNA 2008, 17.99.

Box 2: Classification of pension schemes

(i) ***Social insurance*** refers to a contractual insurance scheme where the beneficiaries are obliged or encouraged to insure against certain contingencies by the intervention of a third party. According to the SNA (2008) a ***social insurance scheme shall fulfill the following two conditions***:

a) the benefits received are conditional on participation in the scheme and constitute social benefits as this term is used in the SNA; and
b) at least one of the three following conditions is met:

- Participation in the scheme is obligatory either by law or under the terms and conditions of employment of an employee, or a group of employees;
- The scheme is a collective one operated for the benefit of a designated group of workers, whether employed or non-employed, participation being restricted to members of that group;
- An employer makes a contribution (actual or imputed) to the scheme on behalf of an employee, regardless of whether or not the employee also makes a contribution.

In the context of social insurance pensions one can differentiate between benefits provided by the general government, so called ***social security pensions,*** and pensions provided by employers, namely ***employment related pensions*** (*other than social security pensions*). This distinction is applied in the supplementary table for pension schemes managed by general government.

Social security pension schemes are contractual insurance schemes where the beneficiaries as participants of a social insurance scheme are obliged or encouraged by general government to insure against old age. Social security pensions are provided to beneficiaries by general government.

Contributions towards a social security pension scheme are often compulsory for a large section of the population. Furthermore, social security schemes are generally unfunded and financed on a pay-as-you-go (PAYG) basis. That is the contributions receivable in a period are used to fund the benefits payable in the same period. There is no saving element involved, neither for general government operating the scheme nor for the beneficiaries participating in it.

The narrowest form of social security pension is very basic. The level may be fixed independently of the size of contributions. Such flat-rate pension schemes can be e.g. observed in the United Kingdom, Ireland or Denmark. The majority of countries in Europe show strong earnings-related social security pension schemes such as e.g. Hungary. In these systems the level of future pensions is dependent on the earnings history of contributors. No pension entitlements for a social security pension scheme are recognized in the standard accounts of the ESA or SNA. They only appear in the non-core accounts of the supplementary table described in section 2.2.

Employment-related pensions, other than the most basic form of social security, are seen as part of the compensation package and negotiations between employees and employers may focus on pension entitlements as much as on current conditions of service and pay scales.

The importance of social security relative to other social insurance schemes varies quite considerably across Europe. In some countries, almost all pension provision, including that accruing to employees in private enterprises, may be routed through social security. On the contrary, other countries restrict social security mainly to the provision of basic pensions and base on dominant *employment related pension schemes.* It is important to note that social insurance contributions – paid by or on behalf of employees – entitle these designated beneficiaries to receive social benefits (covered by the respective scheme).

Employment related pension schemes are recorded in the core accounts of the supplementary table. Only for government employee pension schemes the classification is not so straightforward. Depending on their institutional arrangements, they might have to be recorded in non-core accounts. For a detailed description of the division in core and non-core accounts see below.

(ii) The key distinction between ***social assistance*** *and* social security lies in the eligibility to receive social assistance benefits from general government. In comparison to social security, benefits are paid out irrespectively of qualifying contributions (whether actual or imputed) having been made.

Usually, all members of resident households are entitled to apply for social assistance but the conditions under which it is granted are often restrictive. Generally, benefits are means-tested including an assessment of available income and property. Sometimes it might not be feasible (or may not be sufficiently important) to separate elements of social assistance within pension schemes generally organized as social insurance. In such exceptional cases social assistance benefits would enter the supplementary table.

(iii) Individual insurance policies related to pensions base on contracts which are (generally) made with single individuals and which are not organized collectively.

- **The supplementary table only records pension liabilities accrued-to-date.**

In the relevant literature[8], three main definitions of (implicit) pension liabilities are well-established: *accrued-to-date liabilities (ADL), current workers and pensioners' liabilities* as well as *open-system liabilities* – for a detailed description of these concepts see Box 3.

For the supplementary table of national accounts the concept of ADL is applied. It includes the present value of pension entitlements arising from already accrued pension rights. These pension rights are due to already paid pension contributions by current workers and remaining pension entitlements of existing pensioners (also due to past contributions). Under the ADL concept no rights may be accrued after a given base year. In other words, only entitlements up to a certain base year are considered. In this sense an ex-post perspective is taken – as for all other national accounts data.

The appropriateness of the three alternative concepts of liabilities described in Box 3 depends on the specific purpose of the estimations. For e.g. in an assessment of fiscal sustainability of pay-as-you-go (PAYG) pension schemes naturally the widest possible time horizon should be applied. This translates into using the OSL concept for examinations of fiscal long-term stability. By contrast, policy questions concerning the possible termination of an operating PAYG pension system should be addressed on the basis of the first or the second concept, depending on the remaining time horizon of the system. For the purpose of the supplementary table which shall provide a broad picture of household pension entitlements the ADL concept is most appropriate. This approach correspondents to other figures of national accounts since it covers only the ex-post entitlements upon a certain base year. However, ADL cannot be used for assessing fiscal sustainability of PAYG schemes.

[8] See e.g. Franco (1995), p. 2.

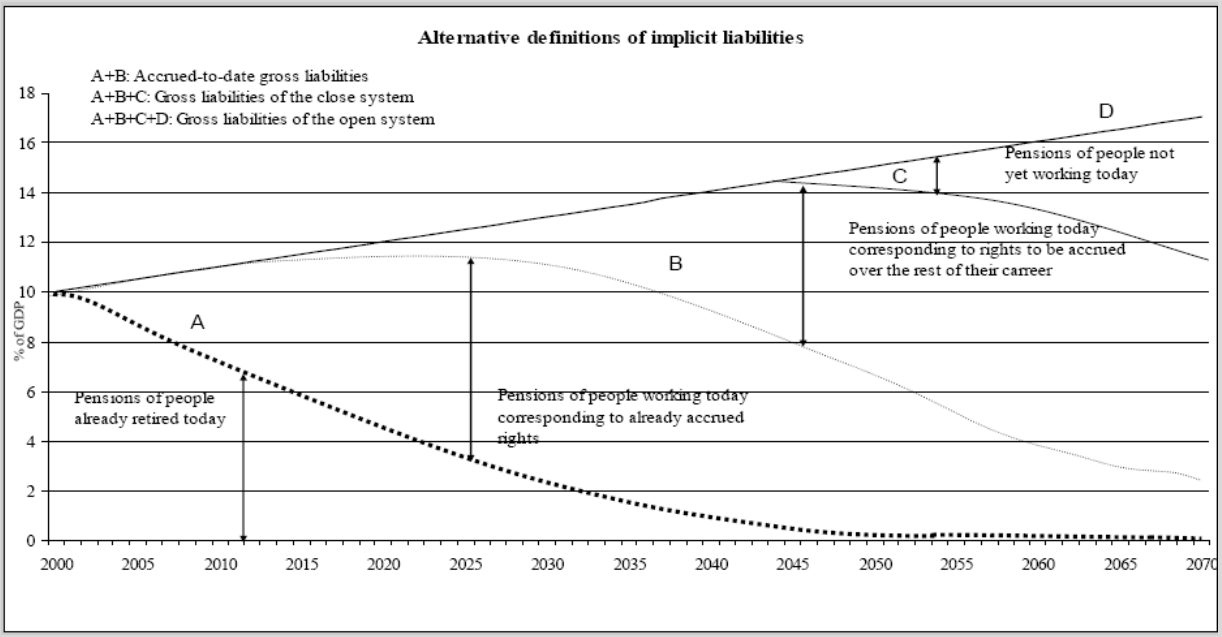
Box 3: Three concepts of pension liabilities

a) **Accrued-to-date liabilities (ADL)**: These liabilities contain the actual pension payments and the present value of pensions to be paid in the future on the basis of accrued rights. Accrued pension rights are due to already paid pension contributions by current workers and remaining pension entitlements of existing pensioners. No rights accrued after the base year – neither by present nor by future workers – are considered. The time horizon of this concept is, therefore, relatively limited. As shown in Figure 1, only the integral below line B (considering additionally a discount rate) is calculated in the case of ADL.

b) **Current workers and pensioners' liabilities (CWL):** In the case of CWL, allowance is made for the pension scheme to continue its existence until the last contributor of today dies. However, no new entrants are permitted. With this concept, therefore, not only ADL is covered but also the present value of pension entitlements that will be accrued by current contributors due to their future contributions. CWL correspondents to the integral below line C (considering additionally a discount rate) in Figure 1.

c) **Open-system liabilities (OSL):** In addition to CWL, this liability concept includes also the present value of pensions of new workers entering the respective pension scheme. In other words, it is assumed that the pension scheme will be continued under current rules for a relatively long time horizon. The present value of OSL may be compiled over an infinite time horizon. For practical reasons, however, often a shorter perspective, of e.g. 200 years, is chosen.

Figure 1: Alternative definitions of implicit liabilities



Source: European Commission Public Finance Report 2006.

The appropriateness of these three alternative liability concepts depends on the specific purpose of the estimations. For e.g. an assessment of fiscal sustainability of pay-as-you-go (PAYG) pension schemes naturally the widest possible time horizon should be applied. This translates into using the OSL concept for examinations of fiscal long-term stability. By contrast, policy questions concerning the possible termination of an operating PAYG pension system should be addressed on the basis of the first or the second concept, depending on the remaining time horizon of the system. For the purpose of the supplementary table which shall provide a broad picture of household pension entitlements the ADL concept is most appropriate. This approach correspondents to other figures of national accounts since it covers only the ex-post entitlements upon a certain base year.

2.2 The design of the supplementary table

As outlined, a new supplementary table on pension schemes in social insurance – illustrated in Table 1 – shall be included in national accounts in the framework of the revised ESA transmission programme. In the following section the design of this new element of national statistics is outlined in greater detail.

Table 1: The supplementary on pension schemes in social insurance

Relations	Row No	Recording	Core national accounts						Not in the core national accounts		Total pension schemes	Counterparts: pension entitlements of non-residents households - (4)
		Pension manager	Non-general government			General government						
			Defined contribution schemes	Defined benefit schemes and other - (1) non-defined contribution schemes	Total	Defined contribution schemes	Defined benefit schemes for general government employees (2)			Social security pension schemes		
							Classified in financial corporations	Classified in general government (3)	Classified in general government			
		Column number	A	B	C	D	E	F	G	H	I	J
		Changes in pension entitlements due to transactions										
Σ 2.1 to 2.4 − 2.5	2	Increase in pension entitlements due to social contributions										
	2.1	Employer actual social contributions										
	2.2	Employer imputed social contributions										
	2.3	Household actual social contributions										
	2.4	Household social contribution supplements (5)										
	2.5	Less: pension scheme service charges										
	3	Other (actuarial) change of pension entitlements in social security pension schemes										
	4	Reduction in pension entitlements due to payment of pension benefits										
2 + 3 − 4	5	Changes in pension entitlements due to social contributions and pension benefits										
	6	Transfers of pension entitlements between schemes										
	7	Change in entitlements due to negotiated changes in scheme structure										
		Changes in pension entitlements due to other flows										
	8	Changes in entitlements due to revaluations (6)										
	9	Changes in entitlements due to other changes in volume (6)										
		Closing balance sheet										
1 + Σ 5 to 9	10	Pension entitlements										
		Related indicators										
	11	Output										

2.2.1 The columns of the supplementary table

Rela-tions	Row No.	Recording	Standard national accounts						Not in the standard accounts		Total pension schemes	Counter-parts: Pension entitle-ments of non-resident house-holds[4]
		Pension manager	Non-general government			General government						
			Defined con-tribution schemes	Defined benefit schemes and other[1] non-defined contri-bution schemes	To-tal	Defined contri-bution schemes	Defined benefit schemes for general government employees[2]			Social security pension schemes		
							Classi-fied in finan-cial cor-pora-tions	Classi-fied in general govt 3)	Classi-fied in general govern-ment			
		Column number	A	B	C	D	E	F	G	H	I	J

Pension schemes are recorded in different categories via the columns of the supplementary table. The table distinguishes pension schemes by three criteria:

- By type of recording into pension schemes completely recorded in the standard accounts (columns A to F) and only recorded in the supplementary table (columns G and H). For a detailed distinction between pension schemes recorded in the core accounts and pension schemes only covered by the supplementary table see Box 4.

- By type of pension manager into non-general government (columns A to C) and general government pension schemes (columns D to H); pension schemes including social security classified in general government are shown in columns D, F, G and H; For a further discussion of the term manager see Box 5.

By type of pension scheme into defined contribution schemes (columns A and D) and defined benefit schemes (columns B and E to G). A definition of the terms defined contribution and defined benefit schemes is provided in Box 5.

Column I sums up all pension entitlements acquired by resident households. Generally, the highest proportion of beneficiaries of pension schemes represents resident households. In some countries, however, the number of non-resident households receiving pension benefits may be considerable. In this case, column J should be added indicating the amount of the total that concerns non-resident households.

Box 4: Core and non-core accounts

The aim of the updated SNA is to provide a clear and comprehensive picture of pension entitlements across countries. In this line a new supplementary table has been introduced into National Accounts illustrating besides pension entitlements of privately managed pension schemes also unfunded pension entitlements mostly occurring in social security pension schemes. Given the different institutional arrangements in countries, only some of these pension entitlements may be recorded within the main sequence of accounts also referred to as the "core accounts". To ensure comparability between country estimates, a clear distinction between schemes considered in the core and in non-core accounts is required:

i. In the **core accounts** all flows and stocks **provided by private schemes** shall be recorded.
ii. On the contrary, pension entitlements of **social security** schemes may only be shown in the **supplementary table**.
iii. The decision to record pension entitlements of **defined benefit schemes for general government-employees** within the standard national accounts **depends** on the nature of the respective scheme.

A guiding principle whether to include these pension schemes in the core accounts or not is the closeness of these schemes to the national social security pension scheme. Generally, one should follow the rule:

→ ***The closer a government employer pension scheme is to the prevailing social security scheme, the less likely it is to appear in the core accounts.***

A further definition of social security schemes – as for example provided by ESA – helps to identify the closeness to the national social security pension scheme. In this context the following main criteria are underlined by the SNA (2008) in order to distinguish between core and non-core accounts:

- the less the benefits are tailored to the specific characteristics of the individual and the more they cover a large part of the population, the less likely it is to appear in the core accounts;
- the greater the ability of government to alter the benefit formula, and thereby to partially default on its pension obligations, the less likely it is to appear in the core accounts.

Box 5: Distinction of defined contribution, defined benefit and other non-defined contribution pension schemes

In the supplementary table a differentiation is made between:

- *defined contribution* schemes (column A & D)
- *defined benefit schemes* (column E, F, G & B) as well as
- other non-defined contribution schemes (B).

In a ***defined contribution (DC)*** scheme, as the name implies, a certain proportion of income is assigned to a pension fund. Furthermore, DC plans are always based on a pension fund. The eventual level of pension benefits is exclusively determined by contributions over the employee's working life and the return on funds invested.[9] The risk of the scheme to secure an adequate retirement income is solely borne by the employees. Consequently, the issue of underfunding of a DC plan is by definition not arising. The measurement of entitlements of DC schemes is relatively straightforward since it is determined by the development of (explicit) assets of the fund.

Defined benefit (DB) schemes, on the contrary, are pension schemes where the benefits payable to the employee are determined by the use of a formula, either alone or in combination with a guaranteed minimum amount payable. Generally, the factors considered in the benefits formula refer to the years of service, the salary over a defined period of time, the age of retirement as well as indexation factors. Contrary to a DC plan, the risk to provide an adequate retirement income in DB schemes is borne by the administrator of the pension scheme. A DB plan can base on a pension fund but this is not a necessity. Unfunded DB plans can be observed in social security pension schemes which are, generally, based on a PAYG arrangement. Since in these schemes, in comparison to funded schemes, no actual account is accumulated pension entitlements need to be estimated using actuarial approaches – described in detail in section 3.

Other non-defined contribution schemes are often described as hybrid schemes. They combine characteristics of DC as well as DB schemes. In this line the risk to provide an adequate retirement income is shared between the administrator and the employee of the scheme. The most dominant form of such hybrid schemes represent notional defined contribution (NDC) schemes which are rather close to a DC scheme but with a guaranteed minimum amount payable. NDC systems are also characterized, as the name implies, by notional unfunded accounts reflecting the individual contribution history.

[9] A pension fund can be defined as a pool of assets that is used to pay pension benefits. It can be contrasted by the term "pension scheme" which represents a bundle of rules for paying pensions.

2.2.2 The rows of the supplementary table

The rows of the supplementary table entail a full reconciliation between the opening stock of pension entitlements at the beginning of a period and the closing stock at the end of a period. Within this framework all transactions and other economic flows which lead to a change of the opening and the closing stock within a given period are taken into account.

i. *Pension entitlements* – rows 1 & 10

Row 1 contains the opening stock of pension entitlements which is exactly equivalent to the closing stock of the previous year. The corresponding closing stock of pension entitlements at the end of the respective period is given in **row 10**.

ii. *Social contributions* – rows 2.1 to 2.4

Actual social contributions of employers and employees are recorded in **rows 2.1 and 2.3**, as in the standard accounts. In the case of some pension schemes (notably social security pension schemes) it is required to distinguish actual social contributions relating to pensions from social contributions relating to other social risks (such as unemployment). If such separation is not possible all social contributions would enter the supplementary table.

In column H and G the actual contributions made by both employers (row 2.1) and employees (row 2.3), appear in the standard accounts, even though the entitlements and changes in the entitlements do not. Other entries in these columns (G and H) are only shown in the supplementary table and are shaded in the table and explained below.

For DB pension schemes, employer imputed social contributions are generally measured as the balancing item. Any changes in entitlements throughout the year not included in other rows of the table are captured in **row 2.2**. In other words it is equal to the difference between current benefits payable and actual contributions payable (by both employees and employers).

This row covers also any "experience effects" where the observed outcome of pension modeling assumptions (real wage growth rate, discount rate, etc.) differs from the levels assumed.

It should be noted that for social security pension schemes such “experience effects” are not recorded in row 2.2 but in row 3. By definition, zeroes would be entered in this row for defined contribution schemes. Therefore, for these schemes row 2.2 is shaded black.

The imputed contribution by employers (row 2.2) for those government schemes for which entitlements appear in column G but not in the standard accounts requires special consideration. In the supplementary table, this row reflects the amount needed to ensure that total contributions, actual and imputed, by both employers and employees, cover both the increase in pension entitlements from current service and the costs of operating the scheme.

Row 2.4 relates to the property income earned, or imputed, on the schemes which is routed via the household (or the rest of the world) sector. It should be noted, that for all defined benefit schemes including social security, whether funded or unfunded, this property income would be equivalent to the unwinding of the discount rate. In other words, the value is equal to the nominal discount rate times the pension entitlements at the beginning of the accounting period.

***Other (actuarial) changes of pension entitlements in social security pension schemes* – row 3**

Given that the supplementary table provides a complete elaboration of the changes in pension entitlements over the accounting period, it is necessary to introduce a specific row to deal with the case in which actual social contributions to the social security pension scheme are not actuarially based. Such cases reflect an imputed contribution (which is not the responsibility of any employer). These imputed transactions of social security pension schemes (other (actuarial) increases of pension entitlements in social security pension schemes) are shown in **row 3**.

The entries in this row might be positive or negative. Negative cases can be observed in a social security pension scheme in which the discount rate is higher than the scheme's internal rate of return[10], e.g., where contributions have been raised above the actuarial required level in order to finance a short-run cash shortfall. On the contrary, positive values can occur when the discount rate is lower than the scheme's internal rate of return.

Row 3 does not represent cash transfers from tax revenues, which would be recorded in the standard accounts as current transfers between government units if they have no impact on pension entitlements. In some EU countries, however, governments make transfers to pension schemes which do increase pension entitlements (for example where transfers are made for specific social groups which are unable to contribute directly), which would indicate that the amounts should be implicitly included in this row figure calculated by difference.

[10] The internal rate of return of a pension scheme is the discount rate that equalizes the actual contributions paid and the discounted value of pension entitlements accrued through those contributions.

"Experience effects" observed for social security pension schemes where the observed outcome of pension modeling assumptions (real wage growth rate, discount rate) in any one year differs from the levels assumed are also recorded in row 3. For other types of pension schemes these experience effects are recorded in row 2.2 (employer´s imputed social contributions).

iii. *Pension benefits* – row 4

Row 4 is simply the pension benefits that are paid during the year. Payment of pension benefits has the effect of "settling" some of the pension entitlements included in the opening stock in row 1.

iv. *Changes in pension entitlements* – row 5

Row 5 presents the changes in pension entitlements due to contributions and benefits. It is equal to row 2 + row 3 – row 4 less the service charge. This balancing item measured from the non-financial account is conceptually equivalent to that measured from the financial account.

v. *Transferring pension entitlements* – row 6

With an increasing mobility of employees across Europe the portability of pension entitlements from one employer to the next was significantly facilitated in recent years. Such a change of the employer does not lead to an alteration of pension entitlements of the household concerned. However, there is a transaction between the two pension funds as the new one assumes the liability of the former. In such cases two transactions are recorded in row 6. First, there is a transfer of pension entitlements from the original manager to the new manager. Second, there may be a transfer in cash or other financial assets to compensate the new manager. It is possible that the value of the transfer of financial assets is not exactly equal to the value of the pension entitlements transferred. In that case a third entry is needed in transactions (capital transfers) to correctly reflect the changes in net worth of the two units concerned.

In case the government assumes the responsibility for pension provision for the employees of a non-government unit through an explicit transaction, a pension liability should be recorded in the balance sheet of the government. If the government does not receive matching assets in return, the difference between the increase in the government's liability and the assets received is shown as a capital transfer to the non-government employer.

vi. *Pension reforms* – row 7

Due to demographic and economic developments employers may reform the pension schemes they manage. Such reforms often take the form of parametric changes, e.g. a change of the retirement age, the indexation rules or the benefit formula. In some cases also systemic reforms can be observed, e.g. a shift from a PAYG to a funded pension scheme. It is important to underline, that not all reforms lead to a change of entitlements in the supplementary table.

First of all, only enacted pension reforms shall be recorded in the national accounts. They shall be considered in the estimates of pension entitlements in the year in which enactment takes place and subsequently in observed flows. An announcement by an employer pronouncing only the intention to undertake a pension reform is not a sufficient basis to introduce the effects of the reform into national accounts data.

Some reforms – though being formally enacted – may not lead to an (immediate) impact on current pension entitlements. This is the case when the employer chooses to leave the rights of existing members untouched and only applies the reformed arrangements to new entrants of the pension scheme. The impact of such reforms would be seen in future measures of pension entitlements, in line with the accrued-to-date concept described in Box 3.

In many cases reform measures affect not only future entrants into the pension scheme but also existing members. An example represents a general change of the pension indexation rules which has an impact on present pensioners as well as on present and future contributors. Such types of reforms lead to a change of the stock of pension entitlements during the year in which they are enacted. They must be accounted for as a flow in the supplementary table. The impact of reforms may be very large if they affect current and future pension benefits – i.e. present pensioners and present contributors – since in such cases the entire stock of existing entitlements is affected.

Pension reforms are treated differently in national accounts depending on whether they have been negotiated or whether they are imposed without negotiation.

Negotiated reforms are recorded as transactions in the following manner:

(a) If the entitlements of a pension scheme are included in the standard accounts, and the employer/manager agrees to a change in the terms of pension entitlements via negotiation with the affected employee, this change should be recorded as a transaction in the standard accounts (under row 2.2 imputed employer social contributions);

(b) If the entitlements of a pension scheme are not recorded in the standard accounts, and the employer/manager agrees to a change in the terms of pension entitlements via negotiation with the affected employees, this change should be recorded as a transaction in row 7 in the supplementary table;

(c) In the case of social security, if changes in pension entitlements are agreed in parliament, this is also recorded as if it is negotiated.

Changes in pension entitlements that are imposed without negotiation are recorded as other changes in the volume of assets (row 9).

Row 7 shows the impact of reforms of pension scheme structures on entitlements relating to past service.

vii. *Other flows* – rows 8 and 9

Rows 8 and 9 account for other flows as revaluations and other changes in volume associated with pension schemes in social insurance. Table 2 illustrates these other flows, divided into revaluations and other changes in volume.

Table 2: Other flows as revaluations and other changes in the volume of assets

Revaluations:
Changes in assumed discount rate
Changes in assumed wage developments
Changes in assumed price developments
Other changes in the volume of assets:
Changes in demographic assumptions
Other changes in the volume of assets

Revaluations are due to changes of key model assumptions in the actuarial calculations and are covered in **row 8**. These assumptions include the discount rate, the wage rate and if used in the model the inflation rate. Experience effects are not to be included here in principle, though in some circumstances it may not be possible to separate them.

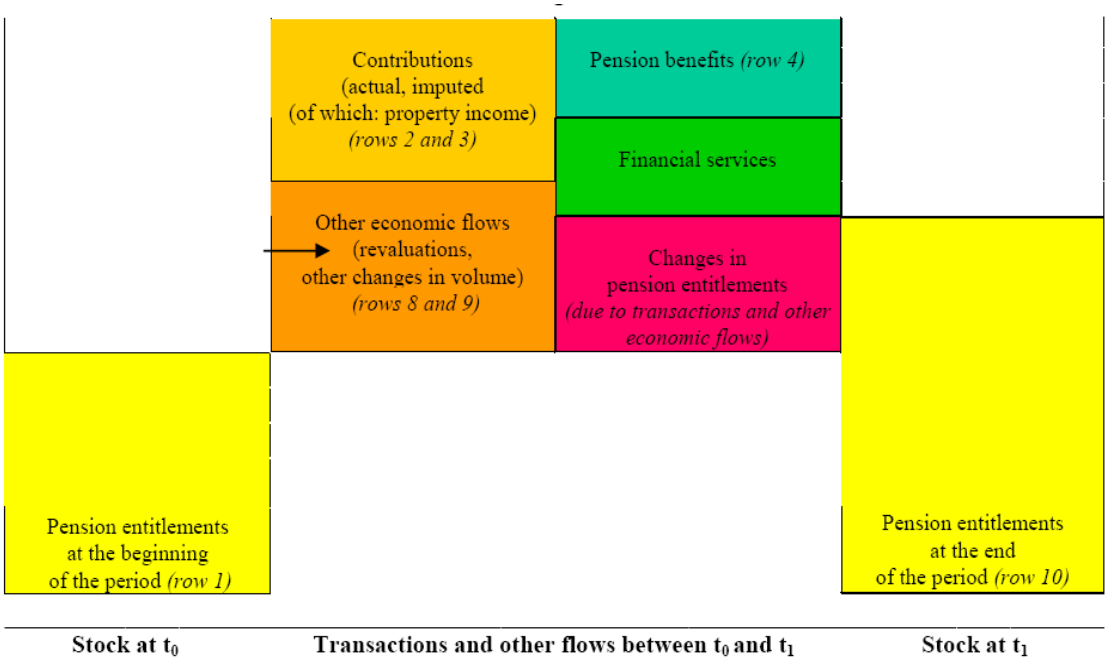
When the demographic assumptions used in the actuarial calculations are changed, they are recorded as other changes in the volume of assets (**row 9**) since these are not price effects.

Row 9 also covers changes in pension entitlements that are imposed without negotiation.

viii. *Financial services* – row 11

Financial services produced by all pension schemes are recorded as being paid by scheme members (thus the costs of pension schemes will never be recorded as intermediate consumption of the employer operating the scheme). Accordingly, Figure 2 shows financial services separately from social contributions. Presenting financial services in this way means the figures shown as contributions received by employees from their employers are exactly the same as that part of the contributions paid by the employees to the pension fund. Furthermore, it is not necessary to show which element of social contributions covers the service fee. It is the household contribution supplement for a defined contribution scheme and either the employers' or the households' contribution to a defined benefit scheme.

Figure 2: Pension entitlements and their changes



As output will be recorded for all employer pension schemes (which the scheme's members will consume), row 11 shows the output by type of scheme.

3 Microsimulation of future individual pension benefits accrued-to-date

Pension entitlements reflect the present value of all future pension benefits which have been accrued-to-date. Contrary to other figures of national accounts, accrued-to-date liabilities are calculated not solely on the basis of historic data. In fact, a projection of future pension payments is required. In the following sections this forward looking approach shall be discussed in further detail.

A microsimulation model is used for the estimation of individual and average age- and gender-specific total accounts at the end of 2010 and 2011. These total accounts consist of the initial capital as well as of NDC contributions paid since 1996. In the following section 3 we describe in detail the estimation of total accounts for each individual of the Latvian contributors' population. Based on this contribution history future pension benefits accrued-to-date are projected over the expected period of retirement– outlined in section 4. The sum of these future benefits accrued by current contributors represents a main share of the Latvian accrued-to-date liabilities (ADL).[11]

3.1 Contribution history – estimation of initial capital

The initial capital (IC) reflects the contribution career before 1996, if any. It depends on the length of insurance before the year 1996 (As) as well as on the average yearly wage subject to insurance contributions in the period 1996-1999 revaluated back to the year 1996 $(\mathrm{AC}_{1\mathrm{W}996})$ – see Eq. 1. Additionally, a factor of 0.2 is considered in the initial capital formula which represents the old age contribution rate.[12] The initial capital IC_{1996} shown in Eq. 1 below is revaluated to the year 1996. Its indexation to our base years 2010 and 2011 is outlined further below.

Eq. 1 $$IC_{1996} = ACW_{1996} * As * 0.2$$

For the estimation of initial capital we can base on a contribution database provided by the SSIA for the entire population of contributors in Latvia. This dataset covers the yearly wage subject to insurance contributions in the period 1996-1999. Hence, the variable ACW can be easily estimated for each individual. Furthermore, the SSIA database includes a variable on the insurance years before 1996 which reflects the variable As of the initial capital formula. The latter database variable, however, is limited as it covers only those individuals who applied for the estimation of contribution years before 1996. For the further discussion we

[11] Moreover, a significant share of ADL has been accrued by current retirees (see also description in section 4). But also civil servants have accrued pension entitlements.

[12] For a further background on the choice of the initial capital formula see Palmer et al. (2006).

refer to these individuals as *applicants*. In fact about 50 % of relevant contributors cohorts, i.e. of birth years 1950 to 1980, did not apply for an estimation of the pre-1996 contribution career. For the further discussion we refer to them as *non-applicants*. As shown in Table 1 the proportion of non-applicants is lower in older age groups, close to retirement, and significantly higher in younger age groups.

Table 1: Absolute and relative size of applicants and non-applicants

Birthyears	Number of observations		Relative proportion of non-applicants to overall observations
	Applicants	Non-applicants	
1945	16,702	394	0.02
1946	18,369	556	0.03
1947	20,987	717	0.03
1948	22,876	762	0.03
1949	24,791	1082	0.04
1950	23,435	1220	0.05
1951	22,385	3258	0.13
1952	19,038	6859	0.26
1953	16,491	8959	0.35
1954	16,838	10972	0.39
1955	17,085	11736	0.41
1956	16,380	12986	0.44
1957	16,863	14159	0.46
1958	17,141	15261	0.47
1959	17,023	15676	0.48
1960	17,091	16358	0.49
1961	16,971	16663	0.50
1962	16,449	16469	0.50
1963	15,531	16382	0.51
1964	14,861	16350	0.52
1965	13,982	15642	0.53
1966	14,131	16266	0.54
1967	13,918	16569	0.54
1968	13,793	16931	0.55
1969	13,677	17095	0.56
1970	13,598	18765	0.58
1971	13,318	19277	0.59
1972	12,316	19893	0.62
1973	11,099	20391	0.65
1974	9,646	22380	0.70
1975	7,907	24145	0.75
1976	5,639	26114	0.82
1977	3,197	28017	0.90
1978	1,306	29685	0.96
1979	511	30739	0.98
1980	116	31829	1.00

Source: own estimation based on SSIA database.[13]

[13] This data reflects the most recent information available on pension subsystems on 01.06.2013.

3.2 Solving the issue of missing data for initial capital

We had two options to tackle with the lack of pre-1996 data for the group of non-applicants:

1) Consideration of the group of applicants, only, or
2) Own approximation of service years for the group of non-applicants.

The first approach would be suitable if we can assume that no significant differences between the group of applicants and non-applicants are existent, in terms of contribution wage levels and number of contribution years. There are, however, strong indications that this is not the case and that approach 1 would lead to a selection bias. In fact, looking at the post-1996 contribution careers – which we can observe for both groups – it becomes clear that individuals of the applicant group accrued much higher insurance and contribution years than the group of non-applicants. The average of total contribution years accrued in the period 1996-2011 is about 2.5 years higher for the group of applicants, compared to the group of non-applicants – see Table 2 below. Also the average contribution wage levels of periods 1996-1999 are significantly lower for the group of non-applicants. Neglecting the group of non-applicants and basing solely on the contribution history of the group of applicants (approach 1) would therefore lead to an overestimation of the average pension rights.

Table 2: Differences in contribution history – applicants vs. non-applicants

Birth year	Mean of total contribution years (1996-2011)		Mean of individual average contribution wages (1996-1999) in LVL	
	Applicants	Non-Applicants	Applicants	Non-Applicants
1955	12.54	10.06	1045.81	840.38
1960	12.45	9.95	962.72	799.53
1965	12.29	9.71	916.94	727.06
1970	12.36	9.38	992.26	696.57

Source: own estimation based on SSIA database.

Against this background, we opted for approach 2 and approximated the pre-1996 contribution career for each participant of the non-applicant population. We assumed for this calculation that the non-applicant population shows the same pre-1996 contribution career patterns as the applicant population.[14]

[14] With this assumption we may overestimate the number of pre-1996 contribution years for the group of non-applicants. It is quite likely that the latter group also "underperformed", not only in terms of post-1996 but also in terms of pre-1996 contribution careers. However, due to data constraints our approach seems to be the only feasible.

As a first step of approach 2 we estimated the distribution of pre-1996 contribution years differentiated by gender and birth year for the group of applicants. This distribution provided us with the likeliness of an individual of birth year y and gender g to have accrued x contribution years until 1996 (see Table 3, column 2 for the example of 1960 birth years). In a second step we created a random variable for participants of the non-applicant group. In line with the latter stochastic variable and the gathered actual distribution of contribution years we attributed each individual of the non-applicant group of birth year y and gender g with x pre-1996 contribution years. The resulting distribution of contribution years for the group of non-applicants is outlined exemplarily for the male birth years of 1960 in Table 3 below. As shown in Table 3, column 3 our approximated distribution varies only slightly from the actual distribution of contribution years (see Table 3, column 2) and the mean of service years is equal for both groups, i.e. for applicants and non-applicants.

Table 3: Distribution of contribution years – actual data vs. own approximation (example of male birth years of 1960)

Number of contribution years accrued	Likeliness of having accrued a certain amount x of pre-1996 contribution years	
	Applicants (actual data)	**Non- applicants** (own approximation)
0	0.36%	0.34%
1	0.59%	0.63%
2	0.74%	0.77%
3	0.91%	0.84%
4	0.92%	0.84%
5	1.16%	1.36%
6	1.10%	1.16%
7	0.98%	0.97%
8	1.39%	1.36%
9	1.74%	1.83%
10	2.42%	2.15%
11	3.87%	3.97%
12	5.46%	5.10%
13	6.99%	7.56%
14	9.92%	9.92%
15	11.82%	11.65%
16	16.03%	15.73%
17	15.63%	15.76%
18	9.89%	9.92%
19	4.94%	5.32%
20	3.13%	2.82%
21	0.01%	0.01%
Mean of contribution years	**14.507**	**14.499**

Source: own calculations based on data provided by the SSIA.

3.3 Consideration of special rules for the initial capital calculation

Before estimating the final level of IC a number of special rules have to be considered which generally increase the level of IC for individuals with low contribution records in the period 1996-1999. More precisely one of the following three conditions needs to be fulfilled to benefit from these special rules:

- Condition 1: a scheme participant has not worked since the new NDC PAYG pension scheme came into force (since 1996),
- Condition 2: a scheme participant has paid contributions only starting from 2000
- Condition 3: the ACW of a scheme participant revaluated to the year prior of retirement is less than 40% of the average contribution wage in state in a year (ACWS), which ends in a year before the year, when pension is granted.

If one of these three conditions is fulfilled then the level of ACW is increased to reach 40% of the ACWS of the year two years before pension is granted.

Those individuals who fulfil condition 1 should also fulfil condition 2 as all individuals who did not work in the periods since 1996 (fulfilling condition 1) also did not work and contribute in the period 1996-1999 (fulfilling condition 1). In other words, the population fulfilling condition 1 represents a subset of the population fulfilling condition 2. According to our estimates about 0.5 % of the entire population who have accrued some initial capital and are not retired in 2011 fulfil condition 1.[15] The share of the population who fulfil condition 2 is significantly higher. About 12 % of the entire population who have accrued some initial capital and are not retired in 2011 have not contributed in the period 1996-99 (i.e. fulfil condition 2). These are mainly cohorts of birth years 1955-1975 which are not yet retired but have accrued service years before 1996. The analysis shows that males more often fulfil condition 2 than females. In fact about 15 % of males (born in years 1955-1975) can benefit from condition 2, while only 8 % of females did not work during the period 1996-1999.

The share of the population benefiting from condition 3 is much larger. Roughly every second person who has accrued service years before 1996 of birth years 1955-1975 fulfils condition 3. This share is relatively equal across genders. According to the logic of the ACW calculation each individual which fulfils condition 2 also fulfil condition 3.[16] In other words, the population fulfilling condition 2 represents a subset of the population fulfilling condition 3.

[15] Eligible to an initial capital calculation are only those cohorts which have accrued at least one contribution year before 1996 and which are not yet retired in 2011.

[16] If you have not accrued any service years in the period 1996-99 your ACW amounts to zero and is therefore smaller than 40 % of the ACWS.

Table 4: Absolute & relative numbers of participants who fulfill conditions 1, 2 and 3[17]

Birthyears	Absolute Numbers of Participants								Relative Numbers of Participants (in relation to Total)					
	Fulfilling Condition 1		Fulfilling Condition 2		Fulfilling Condition 3		Total (non-retired in 2011 & accrued IC)		Fulfilling Condition 1		Fulfilling Condition 2		Fulfilling Condition 3	
	male	female	male	female	male	female	male	female	male	female	male	female	male	female
1950	53	28	1029	824	2,582	1,961	4,071	2,986	1.30%	0.94%	25.28%	27.60%	63.42%	65.67%
1951	59	18	1200	1005	3,348	2,831	6,275	5,739	0.94%	0.31%	19.12%	17.51%	53.35%	49.33%
1952	80	21	1402	1200	4,562	4,583	10,202	13,171	0.78%	0.16%	13.74%	9.11%	44.72%	34.80%
1953	84	21	1348	1205	4,631	4,850	10,352	13,102	0.81%	0.16%	13.02%	9.20%	44.74%	37.02%
1954	86	28	1610	1407	5,373	5,775	11,442	14,611	0.75%	0.19%	14.07%	9.63%	46.96%	39.53%
1955	74	30	1572	1351	5,846	6,100	12,889	15,518	0.57%	0.19%	12.20%	8.71%	45.36%	39.31%
1956	84	31	1829	1471	6,324	6,407	13,269	15,734	0.63%	0.20%	13.78%	9.35%	47.66%	40.72%
1957	86	30	1902	1527	6,843	6,716	14,381	16,253	0.60%	0.18%	13.23%	9.40%	47.58%	41.32%
1958	112	31	2146	1573	7,359	7,270	15,187	16,994	0.74%	0.18%	14.13%	9.26%	48.46%	42.78%
1959	115	40	2206	1525	7,625	7,526	15,109	17,425	0.76%	0.23%	14.60%	8.75%	50.47%	43.19%
1960	103	37	2162	1556	7,771	7,863	15,634	17,649	0.66%	0.21%	13.83%	8.82%	49.71%	44.55%
1961	99	44	2331	1560	7,984	7,947	15,891	17,602	0.62%	0.25%	14.67%	8.86%	50.24%	45.15%
1962	130	20	2398	1553	7,974	7,985	15,644	17,138	0.83%	0.12%	15.33%	9.06%	50.97%	46.59%
1963	125	30	2351	1461	7,851	7,722	15,317	16,497	0.82%	0.18%	15.35%	8.86%	51.26%	46.81%
1964	135	35	2360	1404	7,735	7,786	14,975	16,104	0.90%	0.22%	15.76%	8.72%	51.65%	48.35%
1965	114	18	2260	1269	7,535	7,330	14,505	14,992	0.79%	0.12%	15.58%	8.46%	51.95%	48.89%
1966	124	27	2399	1262	7,775	7,716	14,704	15,560	0.84%	0.17%	16.32%	8.11%	52.88%	49.59%
1967	130	27	2382	1240	7,725	7,786	14,761	15,473	0.88%	0.17%	16.14%	8.01%	52.33%	50.32%
1968	112	36	2376	1217	7,982	8,028	15,038	15,384	0.74%	0.23%	15.80%	7.91%	53.08%	52.18%
1969	113	30	2379	1052	7,890	8,130	14,973	15,317	0.75%	0.20%	15.89%	6.87%	52.69%	53.08%
1970	141	44	2539	1095	8,371	8,528	15,719	15,870	0.90%	0.28%	16.15%	6.90%	53.25%	53.74%
1971	145	29	2358	998	8,239	8,625	15,591	15,733	0.93%	0.18%	15.12%	6.34%	52.84%	54.82%
1972	107	39	2227	827	8,019	8,099	15,178	14,725	0.70%	0.26%	14.67%	5.62%	52.83%	55.00%
1973	107	23	1945	731	7,326	7,609	14,043	13,432	0.76%	0.17%	13.85%	5.44%	52.17%	56.65%
1974	95	24	1855	706	7,447	7,421	13,333	12,605	0.71%	0.19%	13.91%	5.60%	55.85%	58.87%
1975	85	20	1666	656	7,006	6,948	11,626	10,875	0.73%	0.18%	14.33%	6.03%	60.26%	63.89%
1976	41	14	1233	588	5,710	5,798	8,805	8,148	0.47%	0.17%	14.00%	7.22%	64.85%	71.16%
1977	27	16	961	553	4,457	4,351	6,129	5,395	0.44%	0.30%	15.68%	10.25%	72.72%	80.65%
1978	27	6	981	854	4,058	4,136	4,937	4,700	0.55%	0.13%	19.87%	18.17%	82.20%	88.00%
1979	6	5	853	1465	2,773	4,238	3,055	4,446	0.20%	0.11%	27.92%	32.95%	90.77%	95.32%
1980	4	1	381	792	871	1,538	896	1,558	0.45%	0.06%	42.52%	50.83%	97.21%	98.72%

Source: own calculations based data provided by SSIA.

To evaluate whether condition 3 (Cond3) is fulfilled is relatively straightforward for an individual which is expected to retire in the year 2012. In this case, we revaluate his/her ACW of 1996 until the year of 2011, translate it into a monthly value and compare it to 40 % of the ACWS of the year 2010 (equal to 151.11 LVL) – see Eq. 2.

Eq. 2 $$Cond3 = 1 \quad if \quad ACW_{1996}/12 * \prod_{j=1996+1}^{f-1} (1 + i_j^{ACW}) < 0.4 * ACWS_{2010} * \prod_{j=2010+1}^{f-2} (1 + i_j^{ACWS})$$

For individuals who will retire in the further future, however, a number of assumptions have to be made to evaluate whether condition 3 is fulfilled. This includes assumptions on the future expected age r and year f of retirement as well as on the annual adjustment of ACW i^{ACW} and of ACWS i^{ACWS} until the future point of retirement.[18] As a proxy for the expected retirement age we apply future statutory retirement ages outlined in Table 5 below for each

[17] For the shown numbers on condition 3 a growth differential of the ACW and ACWS indexation is applied. For more details see discussion below.

[18] In fact, the ACW is only indexed to the year prior retirement and the ACWS only to two years prior retirement.

birth year separately. For individuals of the birth year of 1960, for example, we assume retirement at the age of 65 in the year 2025.

Table 5: Statutory and minimum retirement ages over time

Year	until 2014	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	From 2025 onwards
Statutory retirement age	62	62.25	62.5	62.75	63	63.25	63.5	63.8	64	64.25	64.5	64.75	65
Minimum retirement age[a] (if 30 service years accrued)	60	60.25	60.5	60.75	61	61.25	61.5	61.8	62	62.25	62.5	62.75	63

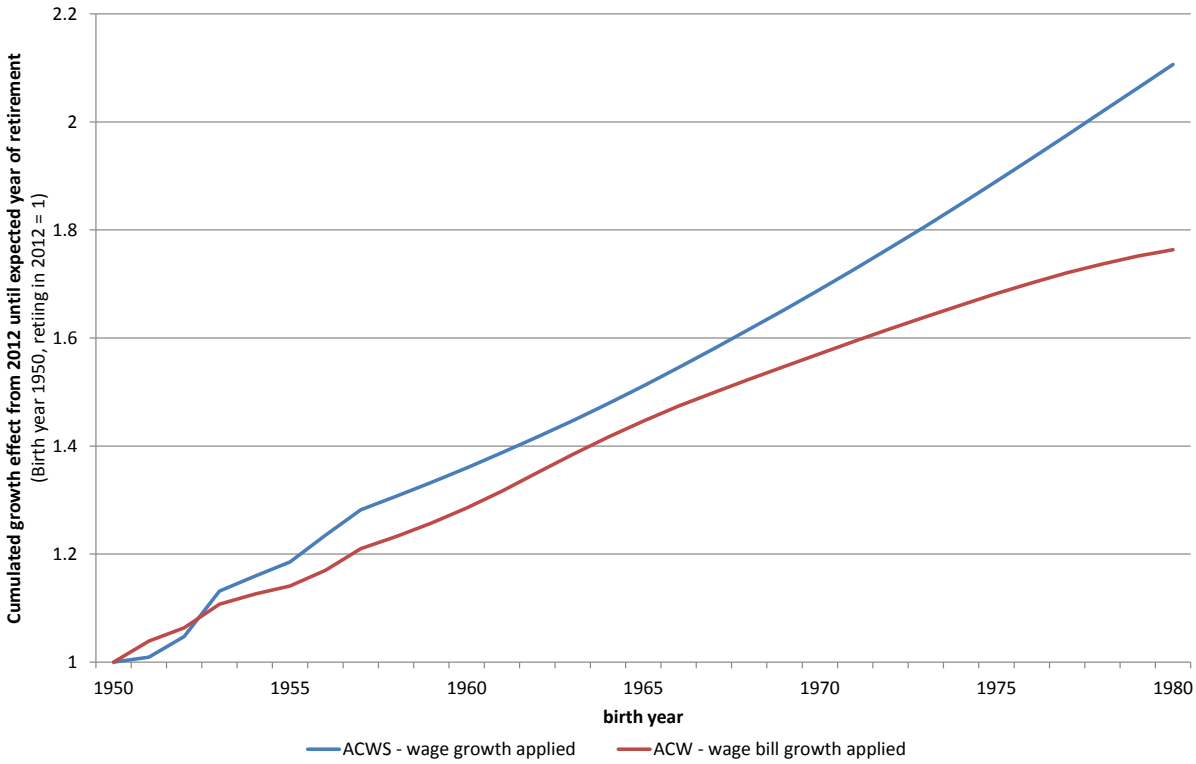
a Additionally parents who cared for 5 or more childern, or a child with disability as well as politically repressed and persons who suffered in Chernobyl can benefit from early retirement.

Source: own illustration based on information provided by Statistics Latvia.

Regarding indexation assumptions, we consider that the level of ACW until retirement is indexed with the wage bill growth. This assumption is chosen as the ACW reflects a part of past overall pension rights accrued by an individual. According to the benefit formula all past entitlements are indexed with the wage bill growth. For the ACWS, on the contrary, we assume an annual indexation with the wage growth.[19] With a predicted negative employment growth over the next decades the wage growth is expected to be higher than the wage bill growth. Accordingly, the value of ACWS will grow at a higher pace than the level of ACW. This aspect is shown in Figure 3 which illustrates the cumulated growth effects from 2012 until the expected point of retirement for each birth year. In other words, it shows the product of the wage bill growth rates (in case of ACW) and the product of the wage growth rates (in case of ACWS) until the expected point of retirement of each cohort. The cohort born in 1950 is e.g. expected to retire already in 2012. Consequently, future growth rates are not playing any role for them and the cumulated growth effect amounts to 1. As illustrated, in particular for younger birth years the growth differential between ACW and ACWS is substantial and the cumulated growth effect of ACW vs. ACWS differs widely for these birth years. If you look e.g. at the birth year 1970, you see that the ACWS applied for them at the future point of retirement will be about 1.69 times higher than the ACWS in 2012 due to wage growth indexation. The ACW of an individual of this cohort at the future expected point of retirement, on the contrary, will correspond to "only" 1.57 times of the ACW in 2012, i.e. the average indexation is lower for the ACW than for the ACWS.

[19] Our assumptions on the future growth rates are outlined further below.

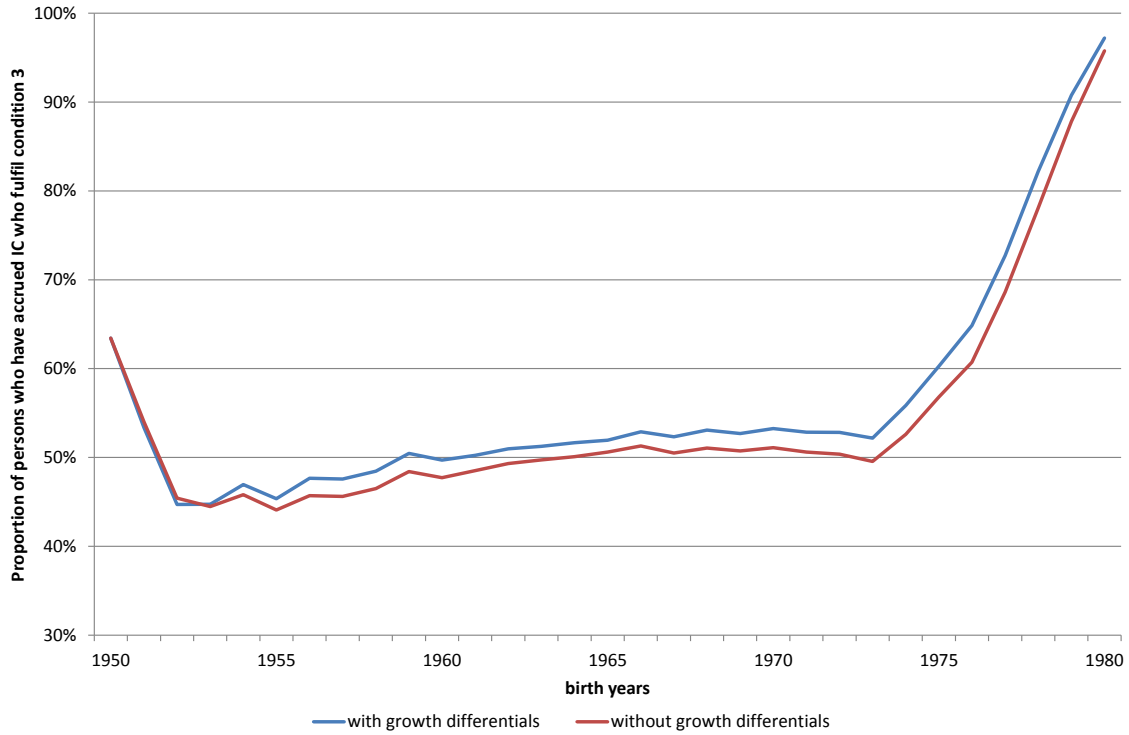
Figure 3: Cumulated growth effects – ACW vs. ACWS (for birth years 1950-80)



Source: own calculations based on AWG assumptions.

As a result of these growth differentials, it will become more likely – given the ceteris paribus condition – to fall under 40 % of the ACWS for younger cohorts. In other words, individuals with the same contribution history in 1996-99 who retire in the further future have a higher probability to fall under 40 % of the ACWS than individuals who retire in the closer future – as the benchmark, the ACWS, is expected to grow faster than the ACW. Figure 4 illustrates the resulting impact of these growth differentials on the likeliness to fulfil condition 3. If the wage growth and the wage bill growth are applied for the indexation of ACWS and ACW respectively (see blue line) then slightly more individuals can be expected to fulfil condition 3 than under a scenario with no growth differentials (see red line). The impact of these growth differentials on the likeliness to fulfil condition 3 is, however, not tremendous – as shown in Figure 4.

Figure 4: Proportion of persons who fulfill condition 3 under two growth scenarios



Source: own calculations based data provided by SSIA and AWG assumptions.

In addition to the three conditions discussed above, certain individuals who retire before the end of 2015 can benefit from a further increase of the initial capital. If certain conditions are fulfilled, which are referred to here as condition 4, their level of the ACW is increased to reach 100% of the ACWS in 1996-1999 revaluated to the year prior of retirement. The following condition needs to be fulfilled to benefit from this special rule:

- Condition 4: the ACW of a scheme participant is less than 100% of the ACWS in the period of 1996-1999[20] AND not less than 30 service years have been accrued until the future point of retirement AND the scheme participant retires before the end of the year 2015.

Condition 4 differs from condition 1-3 as it depends not only on the past contribution history until the end of our base year but also on the contribution career until the future point of retirement, namely on further service years accrued until 2015. In order to reflect this condition precisely a projection of future expected service years is required. In order to keep the model simple we chose to neglect such a projection. This approach seems feasible as condition 4 is only applied until the end of the year 2015.

[20] Both the ACW and the ACWS are revaluated to the same year for this comparison – which may be either 1996 or 2011.

According to our estimates about 70-90 % of individuals with accrued service years before 1996 show an ACW which is lower than the ACWS of the period 1996-1999. We refer to these individuals who fulfil a part of condition 4 as persons "Fulfilling Condition 4_01", see Table 6. Of those individuals only some have accrued not less than 30 service years. The latter group which fulfils two aspects of condition 4 is referred to as individuals "Fulfilling Condition 4_02" in Table 6. Finally, Condition 4 is only applicable to individuals who retire before the end of 2015, i.e. birth years born before 1954. After consideration of all these three parts of condition 4 we can derive the absolute and relative number of individuals who fulfil condition 4 – see Table 6 bold numbers. About 40 % of individuals who have accrued service years before 1996 and who can be expected to retire until the end of year 2015 fulfil condition 4.

Table 6: Absolute and relative numbers of participants who fulfill condition 4

Birthyears	Absolute Numbers of Participants								Relative Numbers of Participants (in relation to Total)					
	Fulfilling Condition 4_01		Fulfilling Condition 4_02		Fulfilling Condition 4		Total (non-retired in 2011 & accrued IC)		Fulfilling Condition 4_01		Fulfilling Condition 4_02		Fulfilling Condition 4	
	male	female	male	female	male	female	male	female	male	female	male	female	male	female
1950	3,422	2,646	1255	1,058	**1255**	**1058**	4,071	2,986	84.06%	88.61%	30.83%	35.43%	**30.83%**	**35.43%**
1951	4,956	4,625	2444	2,662	**2444**	**2662**	6,275	5,739	78.98%	80.59%	38.95%	46.38%	**38.95%**	**46.38%**
1952	7,463	9,601	4465	7,254	**4465**	**7254**	10,202	13,171	73.15%	72.89%	43.77%	55.08%	**43.77%**	**55.08%**
1953	7,563	9,718	4334	6,997	**4334**	**6997**	10,352	13,102	73.06%	74.17%	41.87%	53.40%	**41.87%**	**53.40%**
1954	8,472	11,002	4321	7,346	0	0	11,442	14,611	74.04%	75.30%	37.76%	50.28%	0	0
1955	9,352	11,622	4647	7,427	0	0	12,889	15,518	72.56%	74.89%	36.05%	47.86%	0	0
1956	9,747	11,753	4255	7,093	0	0	13,269	15,734	73.46%	74.70%	32.07%	45.08%	0	0
1957	10,628	12,326	4140	6,827	0	0	14,381	16,253	73.90%	75.84%	28.79%	42.00%	0	0
1958	11,427	12,963	3925	6,389	0	0	15,187	16,994	75.24%	76.28%	25.84%	37.60%	0	0
1959	11,397	13,504	3191	5,939	0	0	15,109	17,425	75.43%	77.50%	21.12%	34.08%	0	0
1960	11,728	13,786	2720	5,155	0	0	15,634	17,649	75.02%	78.11%	17.40%	29.21%	0	0
1961	12,200	13,849	2131	4,160	0	0	15,891	17,602	76.77%	78.68%	13.41%	23.63%	0	0
1962	12,050	13,696	1540	2,940	0	0	15,644	17,138	77.03%	79.92%	9.84%	17.15%	0	0
1963	11,792	13,203	922	1,741	0	0	15,317	16,497	76.99%	80.03%	6.02%	10.55%	0	0
1964	11,636	13,104	567	770	0	0	14,975	16,104	77.70%	81.37%	3.79%	4.78%	0	0
1965	11,301	12,217	285	343	0	0	14,505	14,992	77.91%	81.49%	1.96%	2.29%	0	0

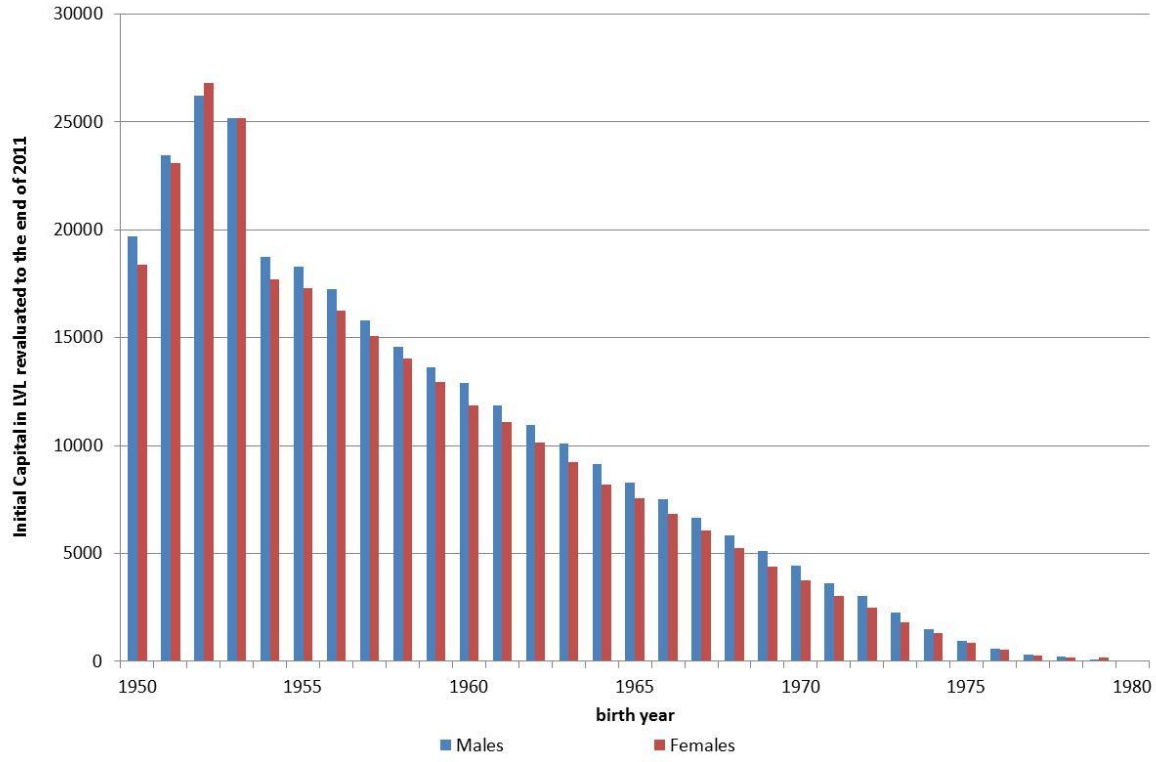
Source: own calculations based data provided by SSIA.

For the estimation of the IC we consider all four conditions discussed above – which increase the level of the IC.[21] The resulting distribution of the IC by birth year and gender is outlined in Figure 5 below. It shows the average value of IC by birth year indexed to the end of 2011. The revaluation of the IC to the year 2011 is outlined in the following section 3.4. It should be noted that the IC estimates shown in Figure 5 cover individuals which will retire in future years after 2011, only. It is important to underline that cohorts born in 1950 and 1951 are mostly already retired in 2011. Therefore, the estimates for these birth years shown in Figure 5 are based on a smaller number of observations. It is often observed that individuals with low contribution records tend to retire later. This aspect may explain the low levels of IC for birth years of 1950 and 1951 – compared to cohorts born in 1952. Remarkable is also the difference of IC between birth years born in 1953 and 1954 – illustrated in Figure 5. The

[21] As mentioned above we disregard from future contribution careers for the consideration of condition 4.

former group can benefit to a large extent from the 30 service year rule (i.e. they fulfil condition 4 outlined above), contrary to cohorts born in 1954 and later. The IC is therefore significantly higher for cohorts born in 1953 than for birth year born in 1954 (and later). Younger cohorts have in general accrued less contribution years before 1996. Consequently, the level of IC is shrinking in Figure 5 the later the individuals are born.

Figure 5: Initial capital of non-retired cohorts indexed to end of 2011



Source: own calculations based data provided by the SSIA.

3.4 Contribution history - NDC Pension contributions paid from 1996 onwards

The following passage will be devoted to the analyses of the amount of NDC contributions paid by contributors from 1996 onwards which finally sums up to the individual NDC account. The amount of contributions paid to the NDC account depends on the membership in the funded pillar (FDC). Individuals who participate in the mixed pillar system, i.e. in the NDC and FDC system, pay a lower proportion τ of their contribution base W to their NDC account than non-FDC members, i.e. than single pillar participants who only pay NDC contributions – see Table 7 below. Therefore, we differentiate the contribution rate τ by pillar membership p (single and mixed). Furthermore, we differentiate the contribution rate τ by the years s. Thus, we can reflect that the contribution rate was changing in recent years for mixed pillar members - as shown in Table 7.

Table 7: NDC contribution rates (1996-2012)

Years	1996-2000	2001-2006	2007	2008	2009-2012
NDC contribution rate - single pillar member	0.2	0.2	0.2	0.2	0.2
NDC contribution rate - mixed pillar member	0.2	0.18	0.16	0.12	0.18

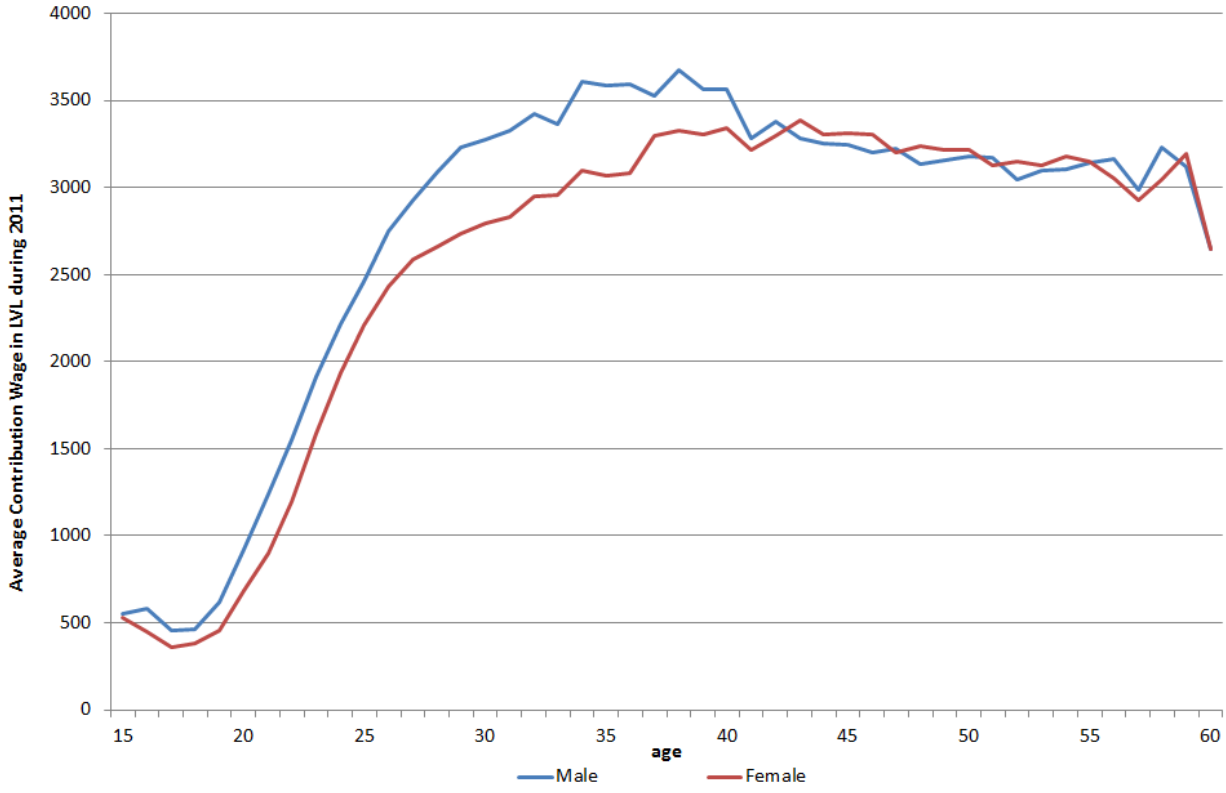
Source: own illustration based on information provided by Statistics Latvia.

The annual NDC contributions $C^{NDC}_{id,p,s}$ of an individual id of our dataset having the pillar membership p in a year s depends, however, not only on the NDC contribution rate $\tau_{s,p}$ but also on the contribution basis, or better the contribution wage $W_{id,s}$ (see Eq. 3).

Eq. 3
$$C^{NDC}_{id,p,s} = \tau_{id,p,s} * W_{id,s}$$

As shown in Figure 6 below, exemplarily for the year 2011, the contribution wage differs significantly by age and to some extent also by gender. In general, individuals below the age of 30 earn significantly lower contribution wages than individuals older than 30 years old.

Figure 6: Contribution wage in 2011



Source: own calculations based on data provided by SSIA.

3.5 Estimation of total accounts

The level of future pension benefits depends first of all on the pension rights accrued-to-date until the end of base year b, in our case the year 2010 and 2011. With the use of the individual SSIA data we can estimate these pension rights on the basis of data of actual contribution histories, described in the previous section. We divide the calculation of pension rights accrued until the end of base year b into the initial capital and into NDC contributions paid since 1996 as illustrated in the equation below.

Eq. 4 $$TA_{id,b}^{NDC,accrued} = IC_{id,1996} * \prod_{j=1997}^{b} \left(1 + i_j^{NDC,past}\right) + \sum_{s=1996}^{b} [\, C_{id,s}^{NDC} * \prod_{j=s+1}^{b} \left(1 + i_j^{NDC,past}\right)$$

The level of the total account accrued up to the end of a base year b ($TA_{id,b}^{NDC,accrued}$) of an individual id depends on the level of the initial capital ($IC_{id,1996}$) of the year 1996 as well as on the actual NDC contributions paid in years s – defined as the periods from 1996 until the end of the base year b $C_{id,s}^{NDC}$. All past contributions as well as the initial capital are revaluated to the end of the base year b. This is carried out via the valorisation factor – already described in the previous section. It reflects the product of past NDC rates of return ($i^{NDC,past}$) from the year s+1 after the contribution was made until the base year b.[22] Table 8 summarizes the applied valorisation factors for the base years 2010 and 2011. Additionally, the index factor is shown which reflects the annual cumulated rate of return of NDC and IC pension rights. To better understand Table 8 we want to provide an example. Let us look on a pension contribution of 100 LVL paid in the year 1997. This contribution is worth 4.09 (4.07) times more at the end of 2010 (2011) – after consideration of the respective valorisation factor. The value of 4.09 (4.07) sums up the product of the index factor over the period 1998 until 2010 (2011).

Table 8: Valorisation factor of the of NDC contributions & the initial capital

Years	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Index factor	1.0000	1.0300	1.1200	1.1170	1.0690	1.0835	1.0453	1.1645	1.1754	1.1712	1.2333	1.3593	1.3106	0.9622	0.7978	0.9945
Valorization factor for the year 2010	4.2182	4.0953	3.6565	3.2735	3.0622	2.8263	2.7038	2.3218	1.9754	1.6866	1.3676	1.0061	0.7676	0.7978	1.0000	0.0000
Valorization factor for the year 2011	4.1950	4.0728	3.6364	3.2555	3.0454	2.8107	2.6889	2.3091	1.9645	1.6773	1.3600	1.0005	0.7634	0.7934	0.9945	1.0000

Source: own estimation based on data provided by Statistics Latvia.

[22] Note that $i^{NDC,past}$ is equal to the parameter i^{ACW} mentioned in the previous section.

After the valorisation and summing up of past accrued pension rights we derive the total account earned until the end of the base years 2010 and 2011 for each individual. The average total accounts of males and females for birth years between 1950 and 1995 are shown in Figure 7 and Figure 8 below. The difference between genders is relatively small. Men tend to have earned slightly higher pension rights than women. Remarkable is the relative weight of the IC for the total account level. For all cohorts born before 1964 the IC is more substantial than the NDC account.

Figure 7: Total account by birth of male individuals, end of 2011

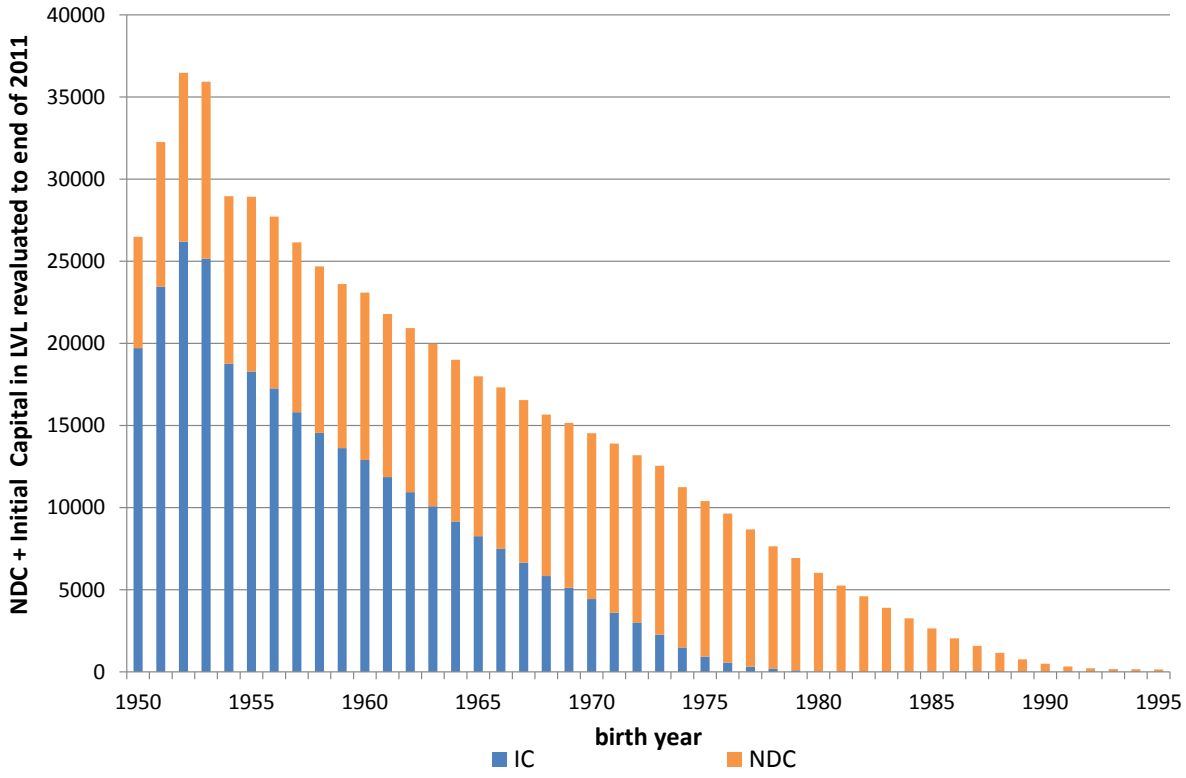
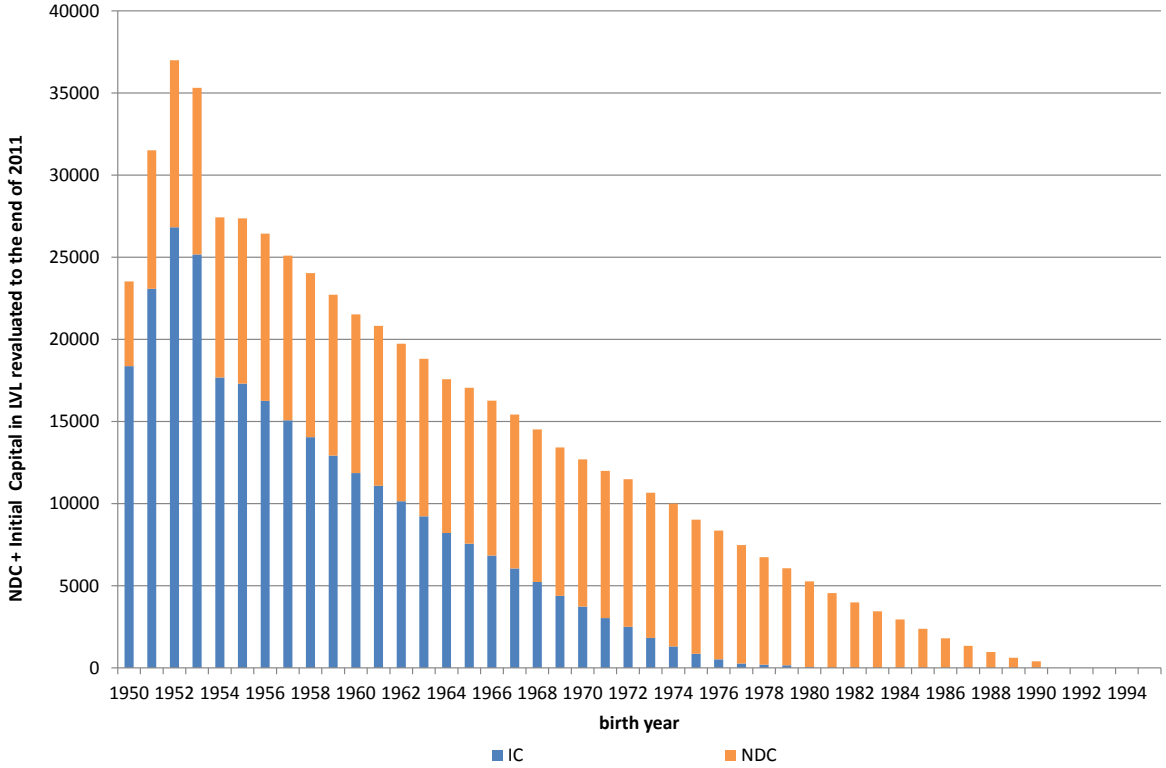


Figure 8: Total account by birth of female individuals, end of 2011



Source: own calculations based on data provided by SSIA.

3.6 Estimation of initial pension levels

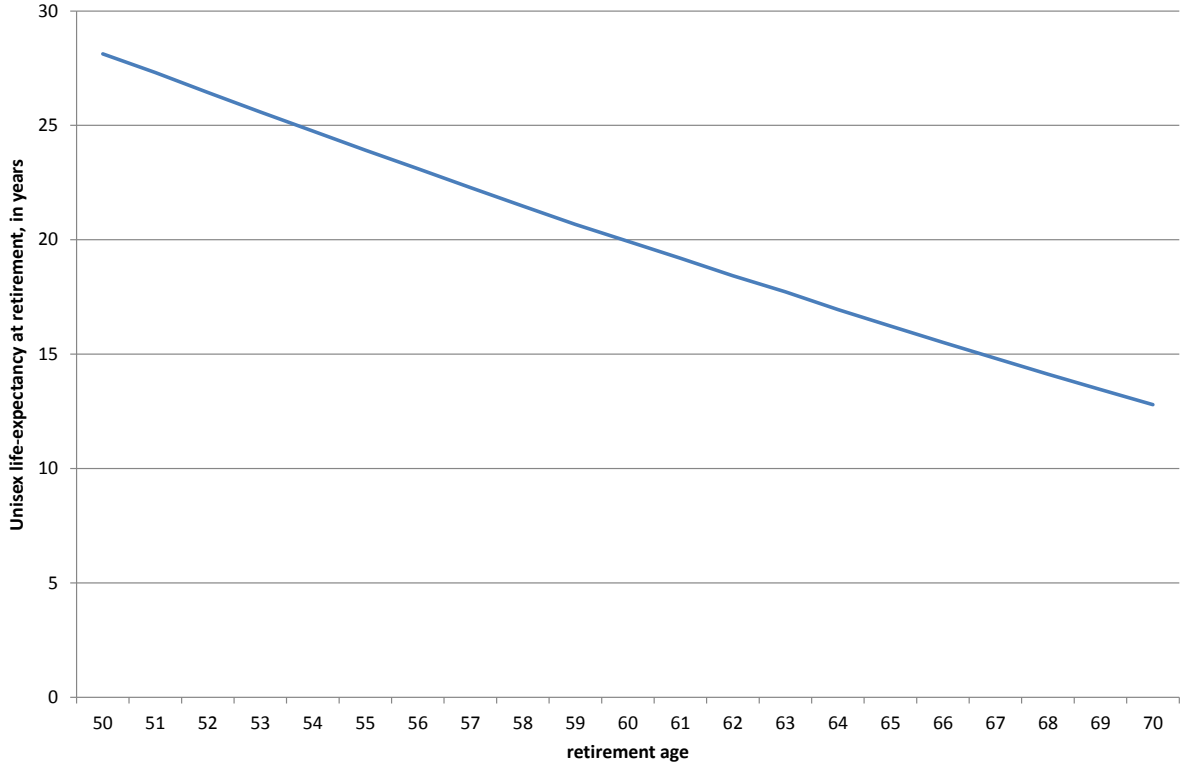
Total accounts, estimated in the previous section, can be easily translated into pension benefits accrued-to-date. In the following section we present our model estimates of pension benefits for retirement in 2012 on the micro level. The aim of this sub-chapter is mainly to assess the accuracy of our micro-simulation model and to compare our pension estimates with actual benefits paid out in 2012.

The annual initial pension benefit $B_{id,f,r}^{new}$ of an individual id which retires in a future year f at age r depends on his or her total account $TC_{id,f,r}$ – indexed to the future year f – and the unisex life-expectancy $LE_{f,r}^{unisex}$ at the age of retirement r in the future year f.

Eq. 5
$$B_{id,f,r}^{new} = \frac{TC_{id,f,r}}{LE_{f,r}^{unisex}}$$

For an example, we want to estimate the initial pension benefits of the year 2012. For this illustration we use the total accounts accrued until the end of 2011 and assume retirement in the year 2012. To estimate the annual initial pension benefit $B_{id,f,r}^{new}$ we apply the unisex life-expectancy actually applied in the benefit formula in the year 2012 – shown in Figure 9 below.

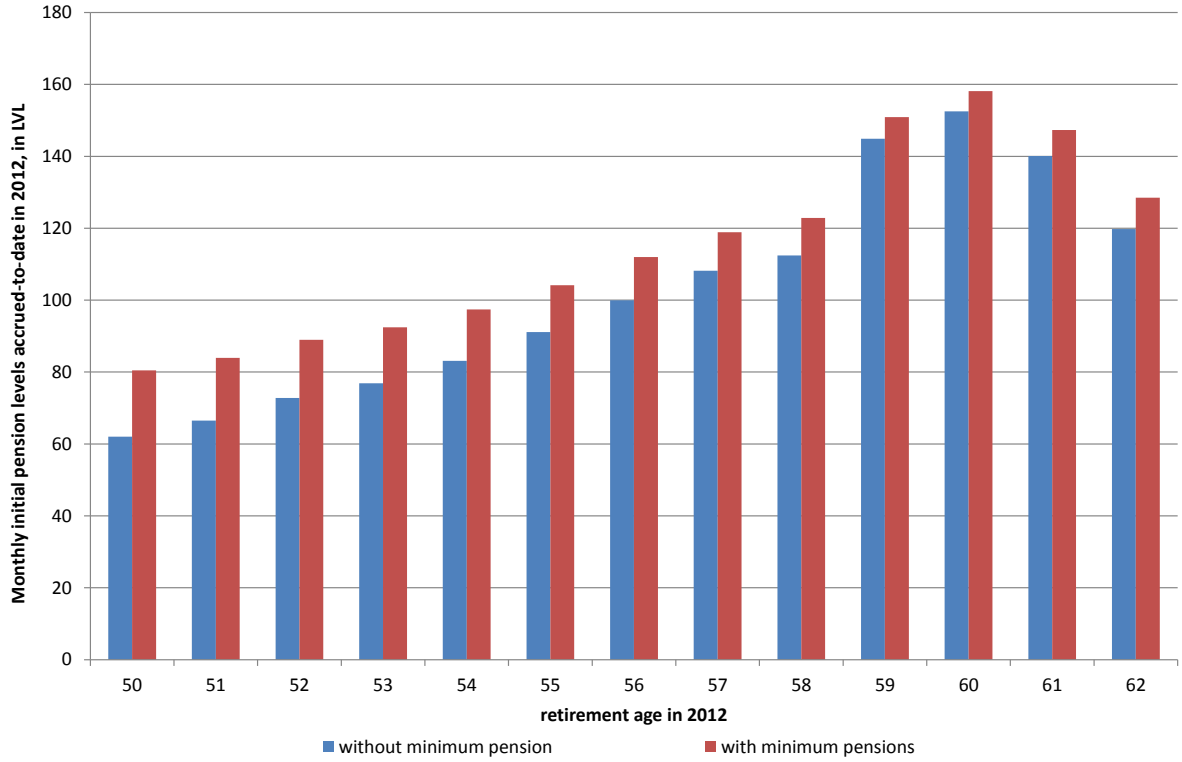
Figure 9: Unisex life-expectancy at retirement in 2012



Source: own illustration based on data provided by Statistics Latvia.

The resulting pension levels accrued-to-date until the end of 2011 for retirement in 2012 are outlined in Figure 10 below. The figures are presented in monthly pension values. The blue bars outline pension levels without the consideration of minimum pension rules, red bars include the minimum pension threshold (see description below). First of all, it has to be underlined that these estimates should be taken with cautiousness as they reflect pension levels for retirement in 2012. Most of the illustrated cohorts, in particular those aged 50-55 in 2012, cannot be expected to retire in the year 2012 – but thereafter. Therefore, these estimates should not be interpreted as future actual payments of the illustrated cohorts but only as theoretical values which reflect benefits accrued-to-date for potential retirement in 2012.

Figure 10: Average monthly pension levels accrued-to-date until end of 2011 and paid out in 2012 – for males



Source: own calculation based on data provided by SSIA.

For our calculations we had to consider that the minimum pension represents the lower margin of pension levels. In accordance with the individual insurance years accrued the minimum pension amounts to a multiple of the social security benefit (SSB) – see table below. Currently, the SSB amounts to 45 LVL. The lowest threshold of the minimum pension therefore amounts to 49.5 LVL and the highest minimum pension level adds up to 76.5 LVL.

Table 9: Minimum pension factor

Insurance years accrued	Minimum pension factor	Minimum pension (in LVL)
up to 20	1.1	49.5
21-30	1.3	58.5
31-40	1.5	67.5
more than 40	1.7	76.5

Source: own illustration based on information provided by Statistics Latvia.

After a consideration of the minimum pension threshold average pension levels increase. The proportion of individuals who fall under the minimum pension rule varies by age and ranges from around 20 to 50 % for cohorts around retirement age, i.e. aged 59-62. Women show slightly lower proportions of potential minimum pension recipients than men. Again, the proportions shown for cohorts younger than 60 should not be interpreted as the actual percentage of minimum pension recipients. In fact, this figure represents a thought experiment. We assume that all individuals of these age groups retire in 2012. As these age

groups can be expected to accrue further pension rights in future years and retire far after 2012, their likeliness to fall under the minimum pension threshold can be expected to be significantly lower.

Table 10: Proportion of potential minimum pension recipients

	Proportion of contributors who would fall under the minimum pension threshold if they entirely retired in 2012	
retirement age	Males	Females
50	68.30%	68.59%
51	66.72%	66.00%
52	63.69%	63.85%
53	63.13%	61.34%
54	61.03%	58.42%
55	58.19%	55.97%
56	56.20%	52.55%
57	52.94%	49.78%
58	53.27%	48.97%
59	**28.48%**	**19.31%**
60	**27.24%**	**16.85%**
61	**37.85%**	**32.86%**
62	**49.42%**	**50.20%**

Source: own calculation based on data provided by SSIA.

3.7 Comparison of own estimates with actual pension benefits

3.7.1 Comparison with pension benefits granted under 2012 rules

To evaluate the accuracy of our model we compare our estimates with the actual level of new pension benefits paid out in 2012. For this comparison we have to consider that a large proportion of new pensions in 2012 were not granted under 2012 rules but under 2010 or 2011 legislation and pension information. In our micro-simulation we reflect 2012 pension rules and information. Therefore, we compare our estimates first only with new retirees of the year 2012 who were granted pensions under legislation rules of this year 2012. Furthermore, we only compare to the main retirement ages of this group, namely to the retirement of age 60 and 62. The vast majority of the 5503 (5793) males (females) who retired newly in 2012 under 2012 rules did so at age 60 or 62 – see Table 11 below.

Table 11: Comparison own estimates vs. actual pension benefits (granted under 2012 rules)

Retirement age	Actual average pension benefits paid out in 2012 (in LVL)		Number of new pensioners		Estimated average pension benefits for 2012 (in LVL)		Number of non-retired observations		Deviation actual vs. estimated benefits	
	males	females	males	females	males	females	males	females	males	females
60	173	164	1410	2313	158	158	10218	13183	9%	4%
62	122	96	3439	2577	128	115	4081	2992	-5%	-16%

Source: own calculation based on data provided by SSIA.

Our own estimates of average new pension benefits in 2012 differ to some extent from actual benefits – see Table 11 above. For retirement age 60 they are lower, while for retirement age of 62 they are higher. This deviation seems reasonable as only a fraction of total active contributors do retire at the shown retirement ages. For example, only about 13 % (1410 observations) of all 59 year old male contributors in 2011 (10218 observations covered in our micro-database) chose to retire in 2012 at age 60. Additionally, we know that mostly individuals with higher pension entitlements retire early. Hence, the deviation of 9 % for males at this age is explainable. Additionally, deviations between own and actual pension estimates may be caused due to lacking information on the precise date of retirement in 2012.[23]

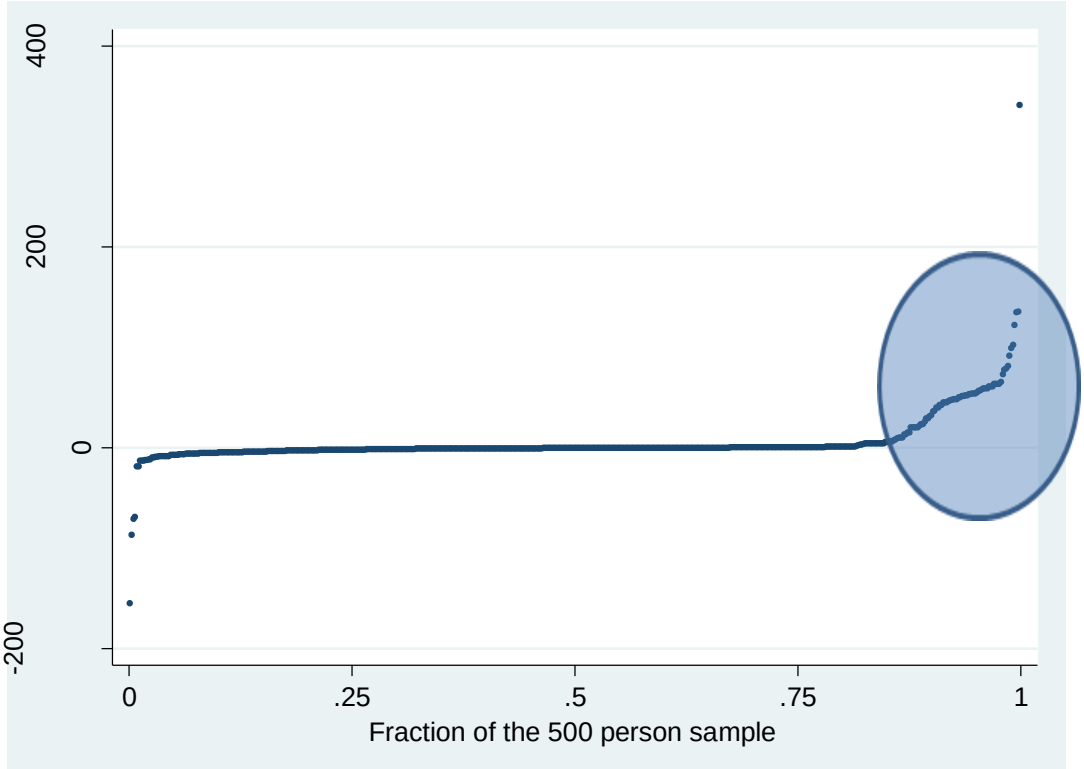
3.7.2 Comparison of own estimates with individual pension benefits of 500 person sample

To further cross-check whether our pension estimates are plausible we compare them on an individual basis for a sample of around 500 new retirees[24] in 2012. As outlined in Figure 11 we match the level of new pension benefits pretty much exactly for over 85 % of the 500 person sample. On average we underestimate pension benefits by about 5.74 LVL corresponding to 3.7% of average pensions in our sample. For roughly 15 % (see circle in Figure 11) the received pension values are significantly higher than the ones estimated by our micro-simulation model.

[23] Additionally, deviations between own and actual pension estimates may be caused due to lacking information on the precise date of retirement. Our data provides only information on the birth year but not on the age at retirement. Hence we assume, e.g. that an individual with birth year 1950 can potentially retire at age 62 in 2012. But in fact he may retire at the beginning of 2012 and be aged 61 or retire at the end of 2012 and be aged 63. Hence, without the exact date of retirement we are unable to match average pension level for a given retirement age absolutely accurately.

[24] In fact, the sample is slightly higher and amounts to 526 observation. To better memorize the size of the sample we name it the *500 observations sample*.

Figure 11: Individual comparison of own vs. actual pension estimates – 500 person sample



Source: own calculation based on data provided by SSIA.

A closer look reveals that special disability rules explain a lot of the deviation observed for 15 % of the 500 person sample. About 65 % of these observations with large discrepancies are individuals who have been disability pensioners. They receive a pension "in amount of previous disability pension" which is higher than their estimate old age pension.[25] This leads to an average pension increase of 60 % compared to our estimates.

Additionally, our estimates differ for some observations from actual benefits due to new or unobserved pension rights. Some individuals may earn further pension rights in 2012 before retirement. These additional pension entitlements after our base year 2011 are by definition not included in our estimations. Hence a small underestimation is natural. Interesting is that a number of individuals "jump" over the 30 service years in 2012, while in our dataset of end 2011 they fall under this threshold. As a result, they can benefit from the so called 30 service year rule (see condition 4, in the previous section 3.3) and are entitled to at least the average contribution wage (ACW) equal to the average contribution wage in state (ACWS). Such a "jump" over the 30 service years margin can be observed for 39 individuals or 7 % of the sample. For them the actual benefit increase tremendously, due to the generous 30 service year rule, by about 88% or 50 LVL – compared to our micro-simulation estimates.

[25] These are mainly men which may to some extent explain why the gender pension gap is not so large in our micro simulation, see e.g. Table 11, retirement age 60.

It should be underlined that our data on service years accrued until 1996 fits perfectly to the actual values observed for the 500 new retirees sample.[26] Insufficient service records till 1996, therefore, provide no explanation for the differences of results between our micro-simulation and the 500 persons sample.

Coming to an intermediary conclusion, we are able to match the actual benefit for about 85 % of the 500 person sample very accurately. For the remaining 15 % of observations, however, we significantly underestimate pension benefits. Two thirds of these 15 % are former disability pensioners which receive a higher old age pension in amount of their previous disability pension. The other third of the underestimated individuals "jump" in 2012 over the threshold of 30 service year and can therefore benefit from the generous 30 service year rule. Both these two features cannot be anticipated by our micro-simulation due to data constraints. Nevertheless, our micro-simulation underestimates average pension benefits for the entire 500 person sample by "only" 3.7 per cent.

3.7.3 Comparison of own estimates with actual data of all new retirees in 2012

Finally, we compare our pension estimates with average benefits of the entire group of new retirees in 2012 – including those who were granted pensions under 2010, 2011 and 2012 pension rules and information. Here the mismatch of our own and actual pension estimates is very substantial. We underestimate average pension levels (without supplements) at the main retirement age of 60 years by 67 (50) per cent for males (females). For higher retirement ages the mismatch is less significant – see Table 12 below.

Table 12: Comparison own vs. actual pension benefits, all new old age retirees in 2012

Retirement age	Average amount of old age pension with supplements (in LVL)		… and without supplements (in LVL)		Number of new retirees		Own estimates of average old age pension without supplements (in LVL)		Total observations		Deviation actual vs. estimated benefits (without supplements)	
	males	females	males	females	males	females	males	females	males	females	males	females
60	**265**	**238**	**250**	**224**	6419	11458	**158**	**158**	10218	13183	**67%**	**50%**
61	**195**	**174**	**182**	**158**	1085	1318	**147**	**143**	6294	5740	**32%**	**22%**
62	**130**	**105**	**129**	**103**	3565	2633	**128**	**115**	4081	2992	**1%**	**-9%**
63	133	131	117	116	74	71	113	115	898	693	18%	14%
64	129	149	118	130	57	54	127	125	613	454	2%	19%
65	175	150	159	130	51	40	153	133	596	381	15%	13%

Source: own calculation based on data provided by SSIA.

Various reasons may explain this significant differential between actual and own estimates for the entire group of new old age retirees in 2012. Two explanatory factors were already mentioned above: 1) Some individuals may have been former disability pensioners which receive a higher old age pension in amount of their previous disability pension. 2) Some

[26] We observe an average difference of 0.01 pre-1996 service years between the 500 persons sample and our micro-database.

other individuals may have reached the threshold of 30 service year just during the base year +1 and can therefore benefit from the generous 30 service year rule.

These two factors alone do, however, not explain the large discrepancy between actual and estimated pension amounts (outlined in Table 12). Therefore, a discussion of further factors is crucial. 3) A main reason for the discrepancy represent the differing pension rules applied. A large number of individuals who retired in 2012, in particular at age 60, were granted pensions under 2010 or 2011 pension rules and information. These old rules differ from 2012 rules and generally, lead to higher average benefits.[27] 4) Also other groups may benefit from special benefit rules. For example politically repressed obtain additional pension rights which are not covered in our micro-database. As this group is not too large – about 1 % of age groups born in 1945-1952 have the status of repressed – it should, however, not explain very much of the differences in pension estimates. 5) Additionally, selected civil servants receive a higher benefit than the NDC calculated old age benefits. This is the case for service pensions financed by social insurance.[28] But also this group is not very large[29] and, therefore, should not explain the substantial differences between own and actual pension estimates.

In conclusion, a number of factors lead to higher pension entitlements than in our own estimates. The main reason for the differences in results represents the fact that the majority of actually new granted pensions in 2012 were granted under generous pre-2012 rules.

3.8 Consideration of a rescale factor

Against this background, we considered the implementation of a rescale factor to fit pension rights estimated by our micro-simulation model to the pension entitlements observed in reality. We consider two rescale factors: One for cohorts at retirement ages (aged 60+) and one for younger cohorts (aged 15-59). For the former group the rescale factor can be simply estimated by comparing our pension estimates with the benefits of all new retirees in the base year +1. In other words, we adapt our estimates to fit to the actual payments of all new pensioners in 2012.

For younger cohorts, aged 15-59, however we have no representative proxy of pensions accrued as most of these age groups are not yet retired. The rescale factor for these cohorts

[27] For a comparison see Table 11 – which shows average actual pension amounts granted under 2012 – and Table 12 – outlining average pension amounts of all new pensioners in 2012.

[28] In this context it should be noted that the number of new service pensions financed by the social insurance will shrink in future years as civil servants of the employed at the Ministry of Interior are not any more participating in this scheme.

[29] In 2011 not even one per cent of the Latvian population aged 55 were belonging to the service pensioners financed by the social insurance budget. In total this group added up to 4515 retirees in 2011. This aspect alone shows that the impact of this group on average pension levels should be marginal.

is therefore estimated differently. Simply speaking we compare our estimate of 60 year old new pensioners (of base year +1) with the average benefit of new pensioners retiring under 2012 rules. On this basis we can estimate a rescale factor for 60 year olds. Then we assume that our estimates of accrued pension rights are more precise the younger are the cohorts we assess. Therefore, we linearly adapt the rescale factor of the 60 year old to a level of unity until the age of 30. For cohorts younger than 30 the rescale factor amounts to 1 assuming that their current pension account reflects the best proxy of their pension rights accrued. This age specific rescale factor is then applied for all younger cohorts aged 15-60. A more detailed and formal outline of this rescale factor estimation is outlined in the following passage.

For the estimation of the rescale factor applied for younger cohorts we first look on our pension estimate of new retirees aged 60, only – as for older cohorts our estimates are not precise enough.[30] This pension benefit is then compared to a benchmark pension. The question is which pension to choose as a representative benchmark pension? First of all we decided to opt for a benchmark pension which reflects average pensions granted under base year + 1 rules, here 2012 rules, only. Furthermore, we chose to compare not only to the pension level at one retirement age but at different retirement ages. To make benefit levels comparable, and to exclude the impact of the G-value, we translate benefits into pension accounts $TA_{b+1,r,g}^{new,actual}$. For this purpose, we multiply monthly pension benefits by 12 and by the G-value applied in the benefit formula $LE_{b+1,r}^{unisex}$ in the year b+1.

Eq. 6 $$TA_{b+1,r,g}^{new,actual} = B_{b+1,r,g}^{new,actual} * LE_{b+1,r}^{unisex}$$

Thereafter, we weight the pension accounts of retirement ages of 60 to 65 with the respective retirement probabilities. In other words, the benchmark account $TA_{b+1,g}^{benchmark}$ of gender g in base year+1 reflects the actual gender-specific total accounts of age groups 60 to 65 $TA_{b+1,r,g}^{new,actual}$ observed in this year weighted with retirement probabilities $i_{b+1,r,g}^{old}$. For this calculation, we rescale retirement probabilities to guarantee that they sum up to unity for age groups 60-65. This probability weighted approach has the advantage that it reflects automatically changing retirement patterns over time. The disadvantage is that we implicitly assume that 60 to 65 year old cohorts are comparable to "our" 60 year old new retiree – they may, however, have different contribution histories. This may lead to volatility of results across base years if our benchmark pensions are changing significantly between base years. For the estimation of the benchmark account we consider, furthermore, that current new pension benefits reflect partly funded pension rights. Therefore, we multiply with a gender

[30] Our estimate for older cohorts, aged 60+, is not precise enough as we can hardly predict the inflow and outflow of pension rights for these older age groups – see also section on total pension accounts in the guide.

and age specific factor $p_{b+1,r,g}^{unfunded}$ – which sums up the proportion to which new pensions consist of unfunded pension rights ($0 \leq p_{b+1,r,g}^{unfunded} \leq 1$).

Eq. 7
$$TA_{b+1,g}^{benchmark} = \sum_{r=60}^{65} TA_{b+1,r,g}^{new,actual} * p_{b+1,r,g}^{unfunded} * i_{b+1,r,g}^{old}$$

The rescale factor is then estimated by dividing the benchmark pension account $TA_{b+1,g}^{benchmark}$ by the own estimate of the pension account of a 60 year old $TA_{b+1,g,60}^{own\ estimate}$- see also Eq. 8 below.

Eq. 8
$$RF_{b+1,g,60} = \frac{TA_{b+1,g}^{benchmark}}{TA_{b+1,g,60}^{own\ estimate}}$$

To get a feeling of the numbers behind the estimation of this rescale factor, we show the total accounts of new pensioners retiring under 2012 rules in Table 13 below. In this table you can find the share of total new pensioners retiring under 2012 rules (aged 60-65). As you can see most of this group retire at age 60 or 62. Consequently, the benchmark account amounts to a value in between the total account of 60 and 62 year olds. For males the probability weighted benchmark account amounts to 29,698 LVL while for females it adds up to 28,315 LVL.[31] This benchmark account is much lower than our estimate of the account of a 60 year old new male retiree in 2012 adding up to 36396 LVL.[32] As a result, the rescale factor amounts to 0.82 and 0.78 for males and females for 60 years olds.

Table 13: Estimation of rescale factor

Retirement age	Total Account (in LVL) of new pensioners retiring under 2012 rules		Share of total new pensioners retiring under 2012 rules, aged 60-65		Total Accounts - own estimates in LVL		Resulting rescale Factor	
	male	female	male	female	male	female	male	female
60	**39410**	**37315**	**0.28**	**0.46**	36396	36400	-	-
61	27456	28976	0.02	0.01	-	-	-	-
62	**26346**	**20807**	**0.68**	**0.51**	-	-	-	-
63	13808	15350	0.01	0.01	-	-	-	-
64	10877	18122	0.01	0.01	-	-	-	-
65	13760	10358	0.01	0.01	-	-	-	-
Retirement probability weighted Benchmark Account:	**29698**	**28315**	**vs.**	**Own estimate:**	**36396**	**36400**	**0.82**	**0.78**

[31] Both these values consider only the unfunded share of accrued pension rights. Furthermore all figures in Table 13 are deflated, i.e. they are calculated in prices of 2011.

[32] Our estimate of total accounts of a 60 year old represents the average account of non-retired individuals in this age group. It is estimated by dividing the average account per capita of the population by the likeliness to be not yet retired at this age.

We assume that our estimates of total accounts are becoming more precise the younger are the cohorts we assess. Therefore, we linearly adapt the rescale factor to a level of unity until the age of 30 (x=30).

$$RF_{b+1,g,x} = 1 + \left(RF_{b+1,g,60} - 1\right) * \frac{x - 30}{30} \quad for\ 30 \leq x\ \leq 60$$

Eq. 9

$$RF_{b+1,g,x} = 1 \quad for\ x < 30$$

In other words, the male (female) rescale factor increases linearly from a value of 0.84 (0.81) for cohorts aged 60 to a level of 1 for cohorts aged 30 in the base year +1. At younger ages the rescale factor amounts to 1. A formal outline of the estimation of the age-specific rescale factor $RF_{b+1,g,x}$ is provided in Eq. 9. It is carried out for all age groups x (in the base year +1) in the range of $x\ \leq 60$ years.

The rescale factor is valuable to check whether our own estimates fit to actually observed pension benefits of the group of 60-65 year olds. We chose the group of 60-65 year olds as benchmark retirees to be flexible to future changing retirement behaviour. However, the rescale factor has a number of shortcomings. First, we may observe cohort effects. In fact, the pension benefit of e.g. a 62 year old may not be representative for cohorts aged 60 and below. This seems to be also the case in 2012 (see table above) where benefit levels diverge greatly between age groups. Our own estimates fit quite precisely to benefit levels of 60 year olds but not to benefit levels of 62 and younger year olds. Moreover, as mentioned above the rescale factor may lead to volatility of results across base years if the benchmark pensions change significantly across base years and/or between cohorts. Imagine e.g. a year in which only “rich” contributors of one birth year retire. In the next year then the “poorer” contributors of this base year leave into retirement. In such a case our benchmark pension, and with it the rescale factor, would be relatively high in the first and low in the second base year. As a consequence, we may observe high volatility of ADL results. This is the case if we apply benchmark pensions for the ADL estimations of base years 2010 and 2011. In fact, we see that benchmark pensions in 2011 (applied for base year 2010) are much higher than the benchmark pensions in 2012. This observation can only be partly explained by the low pension capital index factor of 2011. The main reason is that relatively “poor pensioners” retired in 2012. As a consequence we did not apply the rescale factor for cohorts below age 60 (in 2011), but left total accounts unchanged, in our calculations of the supplementary table in 2011. It has to be decided after applications for further base years whether to apply the rescale factor as a standard in future years or not. For now it seems unproblematic to neglect the rescale factor as we match actual pension benefits (granted under base year + 1 rules) quite well – see also previous section 3.7.

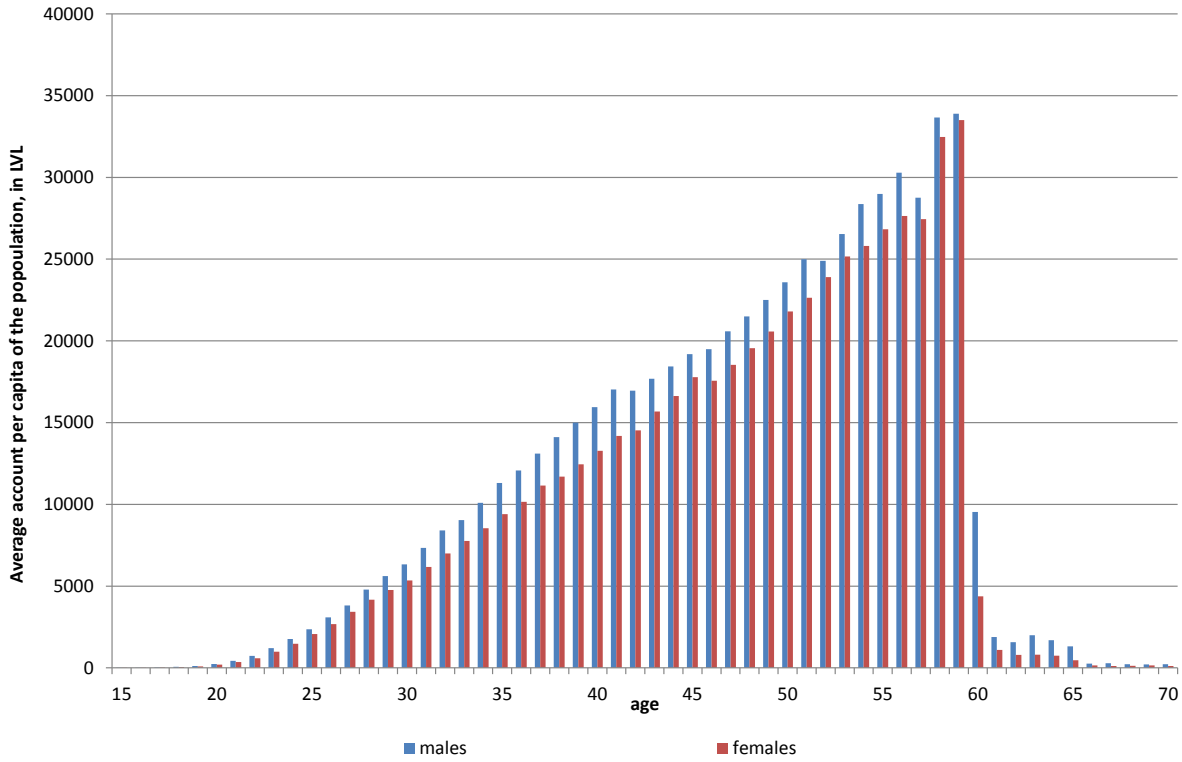
4 Dynamic cohort model for the estimation of aggregate pension entitlements accrued-to-date

For the estimation of aggregate pension entitlements of the entire Latvian population we apply a dynamic cohort model which bases on average pension data for one-year cohorts differentiated by gender. For this calculation pension rights accrued in the past have to be taken into account. For the group of current retirees these pension rights accrued-to-date are reflected in actual pension payment paid out. For the group of current contributors pension entitlements are recorded on individual accounts which have been estimated in the previous section by age and gender (see Figure 7 and Figure 8). The following section describes in more detail how we derive the aggregate figure of accrued-to-date liabilities (ADL) reflecting the pension rights of current retirees and contributors.[33]

For the estimation of current contributors' entitlements we first translate individual accounts of current contributors into per-capita of the population values. For this purpose we estimate the aggregate accounts for an entire age group and divide this amount by the respective cohort sizes of this age group. The resulting average accounts per capita of the population are outlined in Figure 12 below. In line with retirement patterns these accounts shrink after the age of 59 as a higher share of the population has left into retirement.

[33] This description focuses on the estimation of old age entitlements classified under social security. The estimation of disability and survivors' benefits is not covered in this section but described shortly in the appendix. Also the estimation of government employee pension scheme is addressed in the appendix, only.

Figure 12: Average accounts per capita of the population, in LVL in 2011



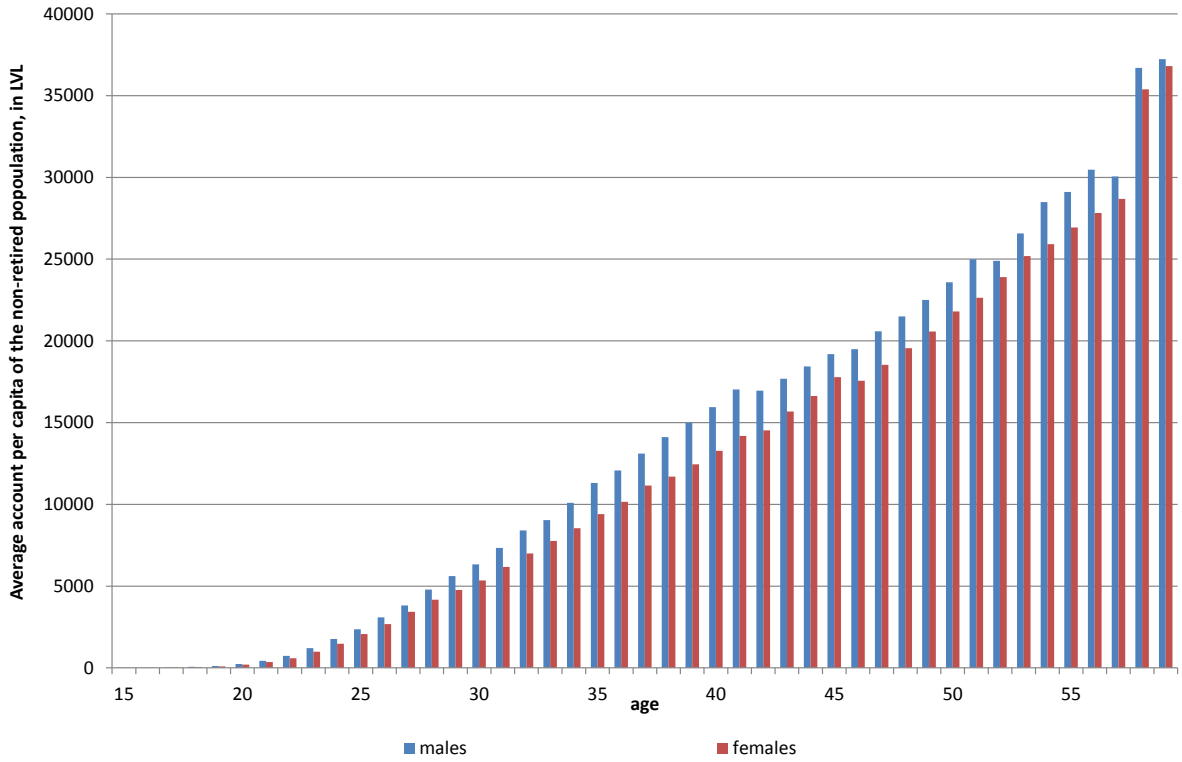
Source: own calculation based on data provided by SSIA.

For cohorts aged 60 and older in the base year +1 (here 2012) we do not estimate pension benefits newly. In fact, we apply the pension payments of new retirees actually observed in this year. Therefore, own estimates of total accounts for these older cohorts, aged 60+, are not required. Only for younger cohorts we base on own estimates of pension accounts.

In a next step we derive the average pension accounts per non-retired citizen ($TC_{x,g,b}^{av,pop}$). For this purpose we divide the average per capita account by the likeliness to be already retired in the base year (reflected in the retirement rate shown e.g. in Figure 15).[34] The resulting average pension accounts per non-retired citizen look similar to Figure 12, only for older cohorts aged 55-59 (which are partly retired in 2011) differences appear – see Figure 13 below.

[34] This step is necessary to avoid double counting of retirement probabilities. In fact, retirement behaviour is considered in the following passages.

Figure 13: Average accounts per capita of the non-retired population, in LVL in 2011



Source: own calculation based on data provided by SSIA.

As outlined in section 3.7 the model is flexible to apply a rescale factor. If this factor is applied the average accounts per capita of the non-retired population $TC^{av,pop}_{x,g,b+1}$ of the base year +1 are rescaled in line with the age-specific rescale factor $RF_{b+1,g,x}$estimated in the previous section – as shown in Eq. 10 below.

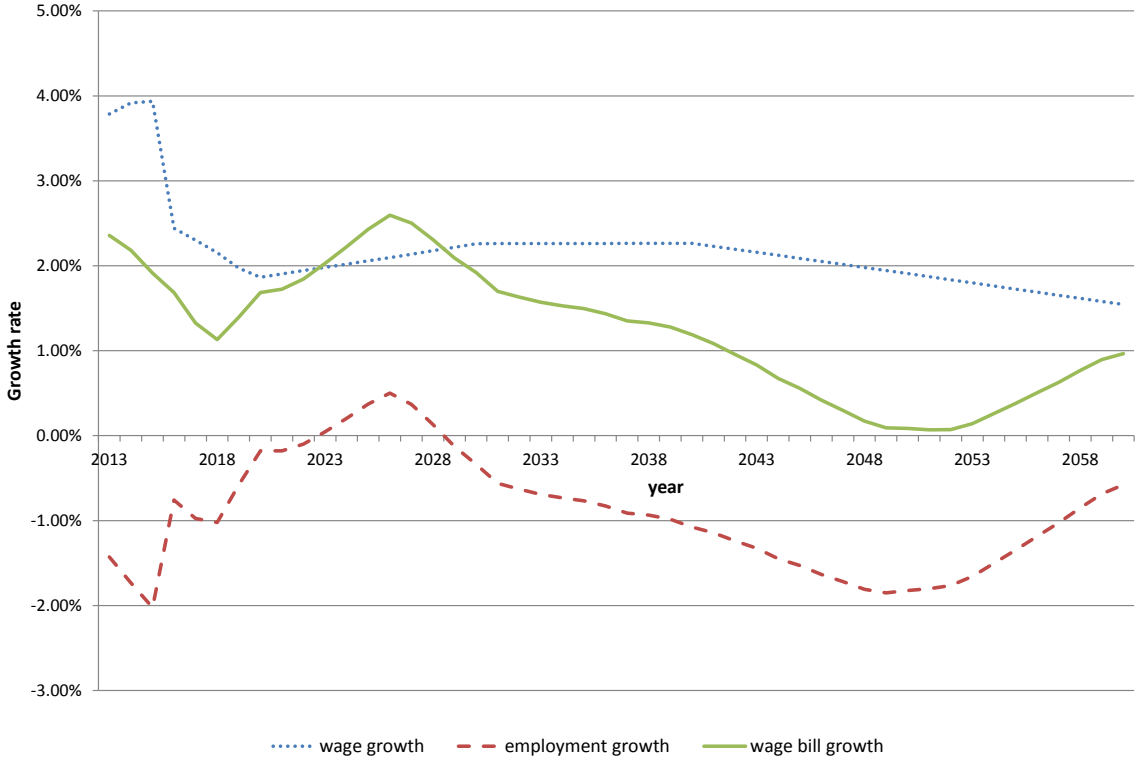
Eq. 10 $$TC^{av,pop,rescaled}_{x,g,b+1} = RF_{x,g,b+1} * TC^{av,pop}_{x,g,b+1}$$

The amount of accounts in future years depends on the indexation of pension entitlements i – see Eq. 11 below.

Eq. 11 $$TC^{av,pop,rescaled}_{x,g,f} = TC^{av,pop,rescaled}_{x-1,g,f-1} * i^{NDC}_{f-1}$$

In Latvia the account is annually adjusted by the wage bill growth i^{NDC}. The latter growth parameter depends on the wage and employment growth. For our projection we base on AWG estimates of these parameters which are outlined in Figure 14 below. We apply AWG assumptions from the year 2013 onwards. For years before we apply actual growth rates observed.

Figure 14: Future growth rates applied – based on AWG



Source: own illustration based on AWG assumptions.

The initial old-age pension benefit (per capita of the non-retired population) b^{new} at age x is estimated on the basis of the benefit formula below. The account TC of an average non-retired citizen of age x and gender g is divided by the expected unisex life expectancy LE^{unisex} at this age x in a future year f. In this context it should be noted that the value of LE^{unisex} is expected to increase over the coming decades which will lead to a significant drop of benefit levels.[35]

Eq. 12

$$b^{new}_{x,g,f} = \frac{TC^{av,pop,rescaled}_{x,g,f}}{LE^{unisex}_{x,f}}$$

In the next step these initial pension benefits are weighted with the respective gender and age specific old-age retirement probabilities $i^{old}_{x,g,f}$ of a future year f.

Eq. 13

$$b^{new,retprob}_{x,g,f} = i^{old}_{x,g,f} * b^{new}_{x,g,f}$$

The starting point for the estimation of retirement probabilities i^{old} is provided by the retirement behaviour observed in the base year b+1. It is measured by dividing the number of

[35] In our calculations the level of LE^{unisex} is increased in line with EUROPOP2010 life expectancy assumptions until the year of 2060.

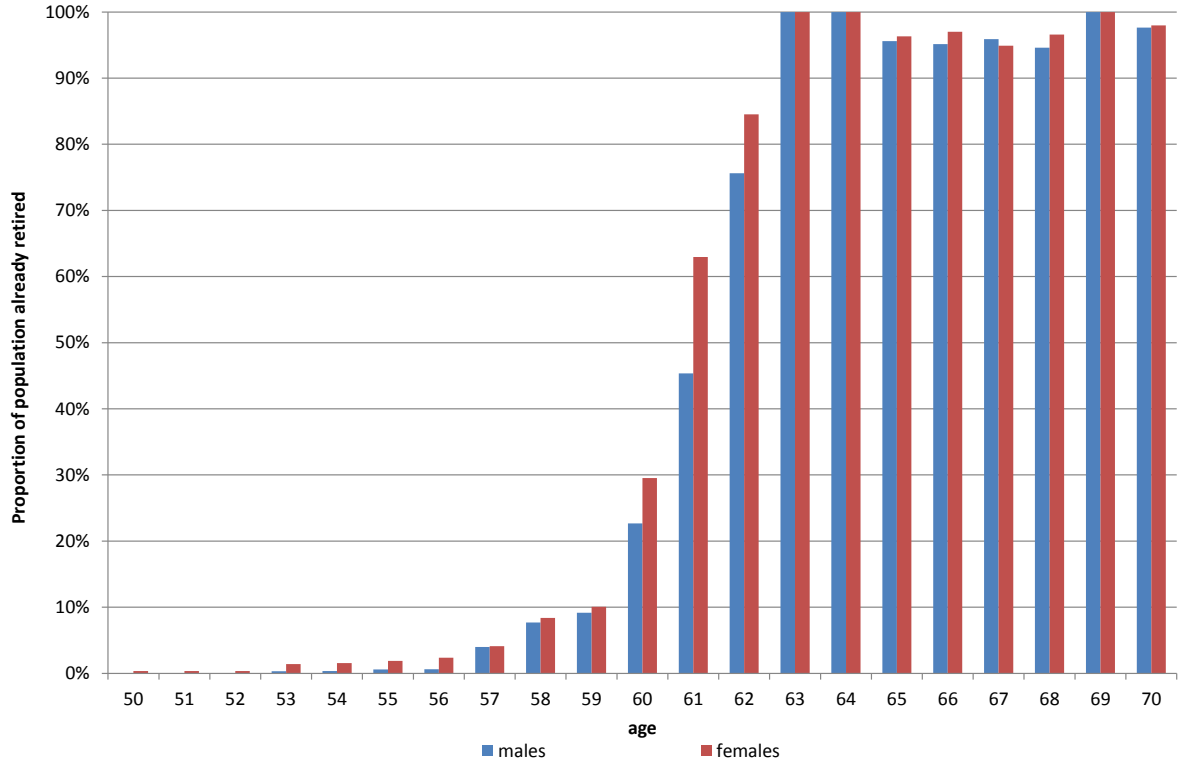
new retirees $R^{new}_{x,g,b+1}$ by the number of citizens in this age and gender group. We base on the retirement behaviour in the base year +1.

Eq. 14
$$i^{old}_{x,g,b+1} = \frac{R^{new}_{x,g,b+1}}{P_{x,g,b+1}}$$

Eq. 15
$$i^{old,initial}_{x,g,f} = i^{old}_{x,g,b+1}$$

However, future retirement behaviour is also determined by the retirement history which is reflected in the age and gender specific retirement rates r – defined as the number of total old-age retirees R to the population P at age x and gender g – see Figure 15 for the retirement rate of 2010.

Figure 15: Retirement rates in 2010



Source: own calculations based on data provided by SSIA.

Eq. 16
$$r_{x,g,b} = \frac{R_{x,g,b}}{P_{x,g,b}}$$

Each cohort being of age x and gender g in the base year is with a certain probability already retired or will retire in a future year f at age i (i>x). We assume that the accumulated life cycle retirement probabilities (LCRP) – shown in Eq. 17 – should sum up to one for each cohort. In

other words, the sum of the retirement rate $r_{x,g,b}$ in the base year b and the accumulated future old-age retirement probabilities ($\sum_{i=x+1}^{100} i_{x,g,f,i}^{old}$), i.e. the sum of probabilities of an x year old in the base year to retire at a future age i, should amount to one.

Eq. 17
$$LCRP_{x,g,b} = r_{x,g,b} + \sum_{i=x+1}^{100} i_{i,g,f}^{old} = 1$$

If we base our assumptions on future retirement behaviour solely on the retirement decisions observed in the base year ($i_{x,gb}^{old}$), this condition does not necessarily have to be fulfilled and the parameter $\vartheta_{x+(f-b),g,f}$ – shown in Eq. 18 below – may be different from one.

Eq. 18
$$\vartheta_{x+(f-b),g,f} = \frac{1 - r_{x,g,b}}{\sum_{i=x+1}^{100} i_{i,g,f}^{old,initial}}$$

Therefore, we correct the derived retirement probabilities $i_{x,g,\mathrm{f,i}}^{old,initial}$ with the cohort and gender specific parameter $\vartheta_{x,g,b}$ – see Eq. 19 below – to ensure that the LCRP of each birth year is equal to one.[36]

Eq. 19
$$\mathrm{i}_{\mathrm{x+(f-b),g,f}}^{\mathrm{old}} = \mathrm{i}_{\mathrm{x+(f-b),g,f}}^{\mathrm{old,initial}} * \vartheta_{x+(f-b),g,f}$$

In our estimation of retirement probabilities we consider that minimum retirement ages gradually increase by three years for both genders to 63 in line with increases in statutory retirement ages (see Table 14 below).

Table 14: Legal retirement ages increases

Year	until 2014	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	From 2025 onwards
Statutory retirement age	62	62.25	62.5	62.75	63	63.25	63.5	63.8	64	64.25	64.5	64.75	65
Minimum retirement age[a] (if 30 service years accrued)	60	60.25	60.5	60.75	61	61.25	61.5	61.8	62	62.25	62.5	62.75	63

a Additionally parents who cared for 5 or more childern, or a child with disability as well as politically repressed and persons who suffered in Chernobyl can benefit from early retirement.

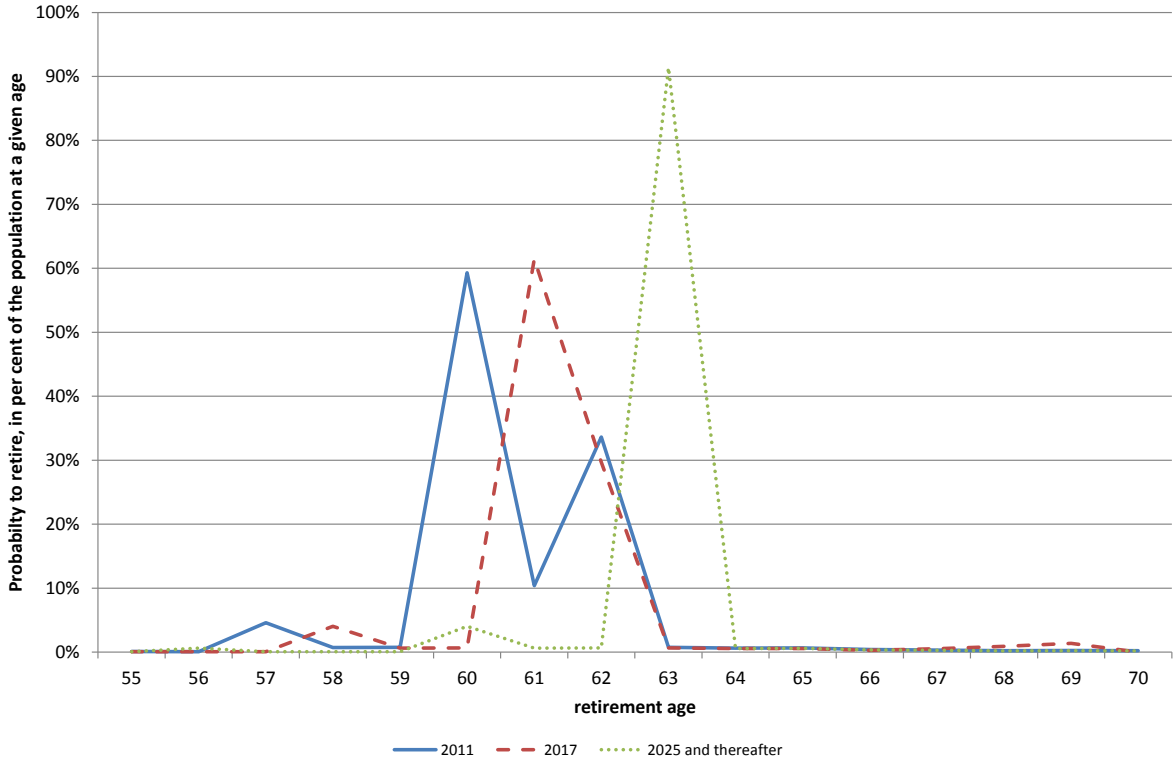
Source: own illustration based on information provided by Statistics Latvia.

As a final outcome we derive cohort and gender specific retirement probabilities which reflect possible changes of retirement behaviour due to 1) legal changes and 2) cohort specific retirement histories (i.e., corrected by ϑ). An example of these final retirement probabilities is provided in Figure 16 for male and female individuals in the year 2011, for which we have actual data, and for the future years 2017 and 2025. As can be seen, retirement probabilities

[36] Please note that this correction is only applied after the base year +1. For the base year+1 we apply the actual retirement probabilities observed in this year.

are shifting – in line with the increases in minimum retirement ages – to higher age groups over the long-term.[37] Remarkable are the relatively high retirement probabilities in the base year +1, i.e. in the year 2011. These high probabilities are not prolonged in future years as the life-cycle retirement probabilities would other ways sum up to a value bigger than one.

Figure 16: Probability to retire in future years, of males



Source: own calculations based on SSIA data.

Finally, these expected initial pension benefits $b_{x,g,f}^{new,retprob}$ are accumulated over the individual life cycle considering pension indexation rules pi^{pen}. We apply a price indexation, i.e. benefits are not increasing in real terms. On this basis we estimate the accumulated pension benefit of each cohort $b_{x,g,f}^{new,cohort}$.

Eq. 20 $$b_{x,g,f}^{new,cohort} = b_{x-1,g,f-1}^{new,cohort} * \left(1 + pi_{x-1,g,f-1}^{pen}\right) + b_{x,g,f}^{new,retprob}$$

So far the focus of the description lied on the estimation of future new pension benefits. For our projection of future expenditures pension payments for current retirees are crucial.

[37] A crucial question is how individuals will react to the legal changes increasing retirement ages. For an answer one should look at the increase of 1) the early retirement ages and 2) the statutory retirement ages separately. Assumptions on early retirement behavior are less arguable. For most individuals the (increasing) early retirement age represents the lower boundary to retire. It is, therefore, relatively straightforward to presume that age groups up to the early retirement age in a future year f will postpone their retirement in line with the increase of early retirement ages. Retirement probabilities above this boundary are, however, more difficult to predict. Therefore, we assume that retirement probabilities change up to the (rising) minimum retirement age, only. Above the minimum retirement age probabilities stay constant over time.

Therefore, we first calculate analogously age and gender specific benefit levels of current pensioners per capita of the population $b_{x,g,b}^{old,cohort}$ in the base year b. This figure can be simply measured by multiplying average actual benefits of current retirees AP by the respective number of pensioners R. Thereafter, these aggregated age and gender specific expenditures are divided by the respective population sizes P.

Eq. 21 $$b_{x,g,b}^{old,cohort} = \frac{AP_{x,g,b}R_{x,g,b}}{P_{x,g,b}}$$

Also for current retirees of the base year we project their benefits into the future considering pension adjustment rules ($pi_{x-1,g,f-1}^{pen}$). [38]

Eq. 22 $$b_{x,g,f}^{old,cohort} = b_{x-1,g,f-1}^{old,cohort} * \left(1 + pi_{x-1,g,f-1}^{pen}\right)$$

Finally, we derive two indicators: 1) the total expenditures accrued-to-date (TE) in a respective future year f and 2) the total of accrued-to-date liabiliies (ADL) of a base year b. TE is estimated by multiplying the cohort specific accumulated benefits of base year ($b_{c,f}^{old,cohort}$) and future new retirees ($b_{c,f}^{new,cohort}$) by cohort sizes P in future years. The cohort sizes P in future years f are derived from our population projection which is based on EUROPOP2010 assumptions.[39] This is done for every age-group, beginning with the ones born in the year $c = b - D$, which goes back 100 years prior to the base year, i.e. the parameter D denotes the maximum life expectancy considered, being 100 years in our model. For the ease of understanding we drop the gender differentiation in the notations below.

Eq. 23 $$TE_f = \sum_{c=b-D}^{b} (b_{c,f}^{old,cohort} + b_{c,f}^{new,cohort}) * P_{c,f})$$

The total of accrued-to-date liabiliies (ADL) of a base year b are calculated by discounting and summing up the above projected TE. For the real discount rate a value of 3 per cent has been applied. Thus, the ADL_b (accrued-to-date liabilities of the baseyear *b*) can be expressed like the following:

Eq. 24 $$ADL_b = \sum_{f=b+1}^{b+D} \frac{TE_f}{(1+r)^{f-b}}$$

[38] Our data on pension accounts of current contributors does not cover pension rights accrued by working pensioners. These pension rights are, however, reflected (with a time lack) in current retirees' data once working pensioners ask for a re-calculation of their benefits.

[39] The population projection bases on a program initially developed by Bonin (2001).

5 Outcomes – the supplementary table for 2011

The following chapter presents the results of the calculations of entitlements for unfunded public pension schemes in Latvia. These outcomes of the model are filled in the new supplementary table of national accounts.[40]

The number we are looking at, namely ADL, consists of all pension entitlements which have been accrued by living generations. These entitlements result in respective future pension payments. As a starting point we want to take a look at the present pension payments in the base years 2010-2011 illustrated in Table 15 below.

Table 15: Aggregate pension expenditures (in million LVL)

Type of pension	Pension payments	
	2010	**2011**
Old age pensions – general system	1091.98	1045.57
Service pensions	32.48	32.37
Disability pensions	113.76	116.00
Survivor pensions	27.03	25.77
Total	**1265.25**	**1219.71**

Source: own calculations based on data provided by SSIA.

Old age pension payments make up the biggest part of the pension expenditures in both applied base years 2010 and 2011 – see Table 15. Overall expenditures sum up to 1265 million LVL in 2010 and 1219 million LVL in 2011. Expressed as a fraction of the GDP, pension payments add up to 8.5 per cent in 2011. Compared to other European countries total pension expenditures are relatively small in Latvia. This aspect explains to some extent that overall pension entitlements – presented below – are relatively small in Latvia.

For the base year of 2010 ADL amount to 24.072 bn. LVL or about 188 % of GDP in 2010. This value represents the opening stock of the supplementary table for 2011 – shown in Table 16. Please note that we apply as a standard a (real) discount rate of three per cent as well as the AWG wage growth and employment growth – described in chapter 4. For Latvia not only column H – covering social security pension schemes – is relevant. We also record pension entitlements of government employee pension schemes separately in column G.

[40] This table is described in detail in chapter 2.2.

Table 16: Supplementary table of Latvia for 2011 (PBO, in bn. LVL)

			Non-core national accounts	
			General Government	Social Security
			G	*H*
		Opening Balance Sheet		
	1	Pension entitlements	**858.39**	**23 214.55**
		Changes in pension entitlements due to transactions		
Sum 2.1 to 2.4 - 2.5	**2**	**Increase in pension entitlements due to social contributions**	34.09	2 906.35
	2.1	Employer actual social contributions	0.00	798.84
	2.2	Employer imputed social contributions	-29.33	
	2.3	Household actual social contributions	0.00	394.66
	2.4	Household social contribution supplements	63.52	1 717.88
	2.5	Less: pension scheme service charges	0.11	5.03
	3	Other (actuarial) increase of pension entitlements		-1 183.21
	4	Reduction in pension entitlements due to payment of pension benefits	31.80	1 188.37
2 + 3 - 4	**5**	**Change in pension entitlements due to social contributions and pension benefits**	2.29	534.77
	6	Transfers of entitlements between schemes	0.00	1.84
	7	Changes in pension entitlements due to other transactions	0.00	0.00
		Changes in pension entitlements due to other economic flows		
	8	Changes in entitlements due to revaluations	0.00	0.00
	9	Changes in entitlements due to other changes in volume	0.00	0.00
		Closing Balance Sheet		
	10	Pension entitlements	**860.68**	**23 751.16**
		Pension entitlements (% of GDP 2011)	**6.03**	**166.38**
	11	Output	0.11	5.03

= calculated figures (Freiburg model)
= nothing to be filled in
= taken from National Accounts supplied by Statistics Latvia

Source: Contribution, service charges and expenditure data provided by Statistics Latvia, all other figures base on estimations of the Freiburg Model.

To better understand the supplementary table we want to look first on column H covering pension entitlement of the social security pension schemes. At the beginning of this column H (in row 1) the entitlements of the previous year (here 2010) are recorded – as outlined (in chapter 2.2). They amount to 23.21 bn. LVL. During the year 2011 pension entitlements are increased by actual social contributions from households (0.395 bn. LVL) and actual social contributions from emploter (0.799 bn. LVL). The value in row 2.4 reflects the unwinding of the discount rate. In practice, it is equal to the nominal discount rate[41] times the pension entitlements at the beginning of the respective base year. In other words, it reflects that over the year of 2010 the payment of pension entitlements is coming one period closer. Therefore, entitlements are less discounted. Furthermore, it translates entitlements of the last base year into prices of the new base year. We always estimate the stock of entitlements in real terms, in other words in prices of the base year. With the nominal discount rate we consider then

[41] This nominal discount rate reflects a real discount rate of 3 per cent and the inflation observed during the base year, here 4.4 % in 2011.

the price changes between two base year calculations. The resulting increase in pension entitlements covered in row 2.4 amounts to 1.717 bn. LVL. The overall increase in pension entitlements due to social contributions (row 2) – reflecting the sum of row 2.1 till row 2.4 – sums up to 2.906 bn. LVL.– minus service charges for operating the scheme (row 2.5). "Experience effects" are covered in row 3. Different development (than initially expected) of demographics, the wage and employment growth as well as inaccuracies of the data inputs between the base years 2010 and 2011 can explain this value. One major data inaccurracy concerns 2010 input data. It covered some additional benefits which were paid out in 2010 only (reflecting pay backs of 2009 pension cuts). We could not isolate these benefits and projected them also in the future in our 2010 base year estimates. In 2011 calculations such additional one off benefits were not covered. This aspect may partly explain the negative value of row 3.

Additionally, pension entitlements are reduced by social security pension payments paid out in 2011 summing up to 1.19 bn. LVL. This figure – as the values in rows 2.1 and 2.3 – is recorded in the standard accounts. The change in entitlements (row 5) amounts to 0.535 bn. LVL in 2011. It is calculated by subtracting row 4 from row 2 and adding row 3.

Changes of pension entitlements due to pension reforms are covered in row 7. During the year of 2011 no major pension reform has been legislated. Therefore, zeros are entered in these cells. However, transfers of entitlements between schemes (row 6) have been observed in 2011, namely, transfers of 2nd pillar capital to the 1st pillar (amounting to 2.895 mln. LVL) and transfers from the NDC accounts to EU pension schemes (adding up to 1.055 mln. LVL). In total these transfers add up to 1.84 mln. LVL. Row 8 (changes in entitlements due to revaluations) and row 9 (changes in entitlements due to other changes in volume) are disregared here because key assumptions have not been changed in the actuarial model. The last row 11 covers the output, i.e. the costs of running the pension scheme for a given period.

As a result, pension entitlements of the Latvian social security pension schemes add up to 23.75 bn. LVL at the end of 2011. This value corresponds to about 166 per cent of GDP in 2011.[42]

Column G represents the liabilities for the civil servants. It shows opening pension entitlements to the amount of 0.858 bn. LVL This value is not increased by any household actual social contributions (row 2.3) nor employer imputed social contributions (row 2.1). Entitlements increase due the unwinding of the discount rate reflected in row 2.4. Row 2.2 covers any

[42] Please note that the rescale factor has been only applied for cohorts older than 59. It has not been applied for cohorts aged 59 and younger due to the shortcomings described in section 3.8. With the application of the rescale factor for cohorts 59 and younger 2011 social security entitlements would be roughly 5 % lower.

changes in entitlements throughout the year which are not included in other rows of the table. In other words, this row covers again experience effects. In this context it should be underlined our estimations for government employee pension schemes are relatively rough due to a low qualitly of the input data. In fact, we have no micro-data to estimate these schemes. Pension benefits paid in 2011 add up to 0.032 bn. LVL, thus the change in pension entitlements amounts to 0.093 bn. LVL. The closing balance of pension entitlements comes up to 0.860 bn. EUR, equivalent to 6.03 per cent of GDP in 2011.

The total amount of public pension entitlements including government employee and social security pension schemes add up to 172.41 per cent of GDP in 2011. In other words, the Latvian government would have to set aside this stock of capital today to finance all pension rights accrued-to-date in the future. At first sight this number might seem very voluminous. Two important issues should, therefore, be underlined when looking at the level of pension entitlements.

First of all, it has to be stressed once again that this number of pension entitlements on its own does not indicate whether the assessed pension schemes are in any “good” or “bad” financial shape. In other words: The level of pension liabilities is not related to the fiscal sustainability of the pension scheme. Even if a pension scheme features considerable high liabilities, these can be compensated by future contributions (both from current and future contributors). But as future contributions are not taken into account when estimating ADL, no statement can be made concerning sustainability or necessary reforms of the pension system. For a further discussion on this issue see Box 6. This box also presents how to extent the approach of ADL to assess fiscal sustainability.

Secondly, the value of pension obligations greatly depends on the assumptions taken, namely the wage growth and the discount rate.[43]

Looking at the value of pension entitlements in Latvia, the question might arise whether other European countries show similar levels of pension obligations. The answer – a comparison of public unfunded pension entitlements with other EU countries – is given in Box 7.

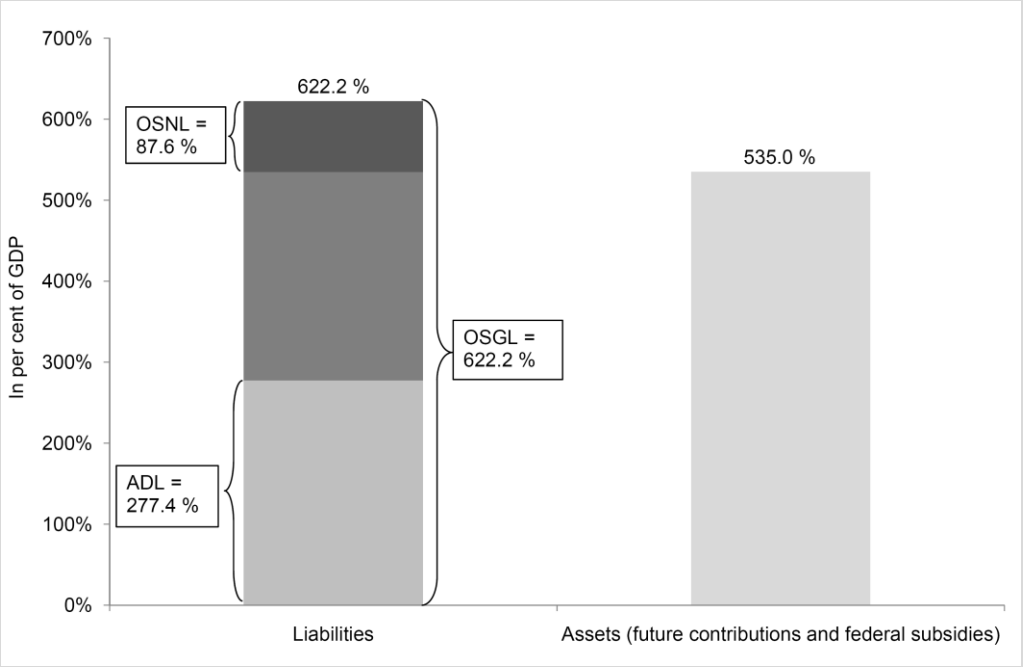
[43] See also ECB (2010).

Box 6: Pension entitlements are not sustainability indicators

Measures of pension entitlements accrued-to-date will be useful for economic analyses. They can provide an estimate of the cost of a hypothetical termination of a pension scheme without reneging on accrued entitlements. As measures of the households' implicit wealth, they are also valuable to understand changes and differences in the saving and consumption behaviour of households. Furthermore, ADL may help to assess pension reforms of various kinds such as the setting up of a new system for new contributions or new contributors, while maintaining the current system for already accrued entitlements.

However, as the following discussion shall outline, pension entitlements are not an appropriate indicator of fiscal sustainability. ADL can be interpreted as the amount of resources which have to be set aside today in order to finance all pension rights which have been earned until a certain base year. Entitlements that will be accrued after the base year are not included. In comparison to other liability concepts such as open system liabilities (OSL), therefore, the time horizon of ADL is relatively limited. This relatively short perspective is one reason why ADL is not applicable for the assessment of long term fiscal stability. In fact, as illustrated in Figure 17 for the example of the German statutory pension scheme ADL represents only a part of OSL. Another argument against the use of ADL as a sustainability indicator concerns the neglecting of the revenue side. ADL is based on a gross concept, i.e. present or future assets of the respective pension scheme are disregarded. However, in order to assess fiscal sustainability it is crucial to confront liabilities by the respective assets.

Figure 17: Liabilities and assets of pension schemes



Source: Müller et al. (2010), p. 117.

Figure 17 outlines the difference between ADL and sustainability indicators for the example of the German statutory pension scheme. As shown, considerable ADL of about 280 per cent of GDP are accumulated in this scheme. If future entitlements are also considered – applying the open system gross liability concept (OSGL) – pension entitlements add up to six times the base year GDP. However, only when confronting these long term pension liabilities with the respective asset side one can draw conclusions about the sustainability of a pension scheme. The resulting residual of liabilities and assets represents the open-system net liabilities (OSNL) also known as the sustainability or fiscal gap. In contrast to ADL it represents the stock which has to be set aside today in order to sustain the present pension system (and its legal status quo) in the long term. While ADL only take into account a fraction of the future demographic development, which is the numerical change of retirees, OSNL consider the long term development of the overall population. Figure 17 also illustrates that ADL estimations can be well extended in order to measure open system gross and respectively net liabilities if a longer time horizon and respectively the asset side are considered.[44]

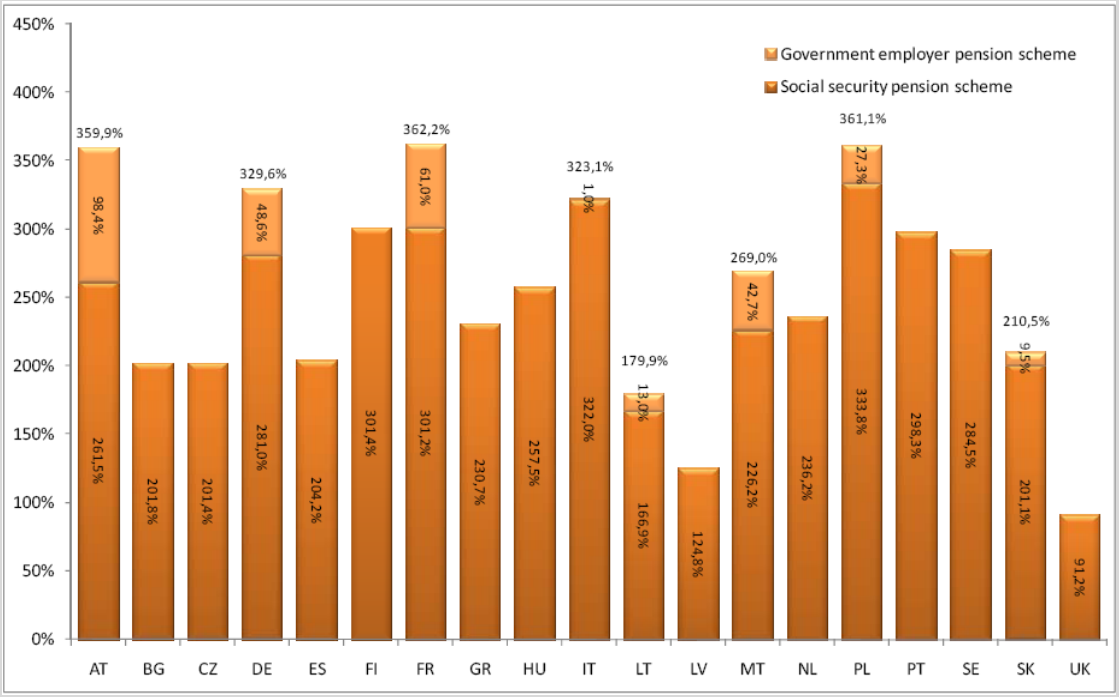
[44] For a description of such an extension of the ADL approach see Müller et al. (2010).

Box 7: International comparison of pension entitlements

The question might arise whether other European countries show similar levels of pension obligations as Latvia? Therefore, following a short overview of the pension liabilities of 19 countries is outlined. To assure comparability, all pension liabilities shown have been calculated on the same basis, which is PBO. Furthermore a constant discount (3%) and wage growth rate (1.5%) is applied for all countries. Figure 18 displays the cross-country comparison of pension liabilities in 2006 related to the respective countries' GDP. In case the country features a government employer pension scheme and a social security pension scheme, both schemes are added to a total of pension liabilities.

First of all, it must be underlined that the value of pension entitlements is not necessarily connected to the financial shape of the country's pension scheme(s). In other words: The level of pension liabilities is not related to the sustainability of the pension scheme.[45] Even if a pension scheme features considerable high liabilities, these could possibly be compensated by future contributions. But as future contributions are not taken into account when estimating ADL, no statement can be made concerning sustainability or necessary reforms of the pension system.

Figure 18: Cross-country comparison of pension liabilities 2006 (in per cent of GDP 2006, PBO)



Source: Müller et al. (2009), p. 165.

As shown above, the largest pension liabilities in per cent of GDP can be found in France (362.2), Poland (361.1) and Austria (359.9), followed by Germany (329.6) and Italy (323.1). It might be a coincidence that all these countries possess a special pension scheme for civil servants but even without these schemes they are among the highest figures observed. Most of the other countries show pension liabilities in the range of 200 to about 300 per cent of GDP. The lowest liabilities have been calculated for Lithuania (179.9) and Latvia (124.8) and the UK (91.2).

The difference between the results shown for Latvia above - in Müller et al.(2009) - to the estimates of this study may be striking. In fact, the new estimates are significantly higher. Which factors can explain this considerable difference between the results? Three factors are important to mention in this context: 1) Pension expenditures and pension rights declined less in recent years when the GDP (i.e. than the denominator), 2) The expected wage growth of the current exercise is higher on average than the 1.5 % assumed in Müller et al. (2009) and 3) the assumed increase in life expectancy (latest Europop2010) of the current study is higher than in Müller et al. (2009).

[45] In general, a pension scheme is considered sustainable, if neither future contributions nor benefits have to be adjusted to generate financial balance, taking into account future demographic and economic circumstances. For a detailed description of fiscal sustainability, see Bonin (2001).

6 Summary and outlook

With the current revision of the ESA pension entitlements of unfunded public pension schemes have to be newly recorded in national accounts on an annual basis from 2017 onwards. The aim of this report was, therefore, to present the estimations of these accrued-to-date liabilities for Latvia applying the so called Freiburg model.

After a short introduction, we provided an outline of the new supplementary table (chapter 2) – describing in detail the design of this new element of national accounts. In chapter 3 the methodology of the Freiburg model to estimate ADL was described. The results of the estimations, pension entitlements of unfunded public pension schemes were presented for the base years 2010 and 2011 in chapter 5. Overall pension entitlements of public unfunded pension schemes summed up to about 172 per cent of GDP in 2011. This value can be interpreted as the stock which has to be set aside today to finance all pension rights accrued-to-date.

At this point we would like to draw the reader's attention once more to an important item: The reader shall not judge either the need for reforming a certain pension scheme or the impact of a pension reform already enacted by the level of its ADL. Thus, the extent of public pension liabilities of a certain country is not connected to any kind of good or bad state of fiscal affairs. As outlined in Box 6, the value of ADL should not be interpreted as a sustainability indicator. In fact, it displays the cost of terminating a PAYG pension scheme. Moreover, measuring ADL of unfunded public pension schemes provides a comprehensive picture of households' pension entitlements.[46] It reveals that a rather large proportion of households' pension entitlements, especially in European countries, are held in government managed PAYG pension schemes.[47]

The Freiburg model may be extended in a number of directions. One field of application concerns the individual estimation of households' wealth. The model is applicable to estimate unfunded public old age pension entitlements of each single scheme participant of the general pension system. Furthermore, the calculations can be extended to assess the fiscal sustainability of pension schemes – as shown in Müller et al. (2010). But also other fiscal systems such as the health care or the long term care system can be assessed by an extension of the Freiburg model.[48] Additionally, the model provides a valuable starting point for

[46] The predecessor of the 2008 SNA, the 1993 SNA, generated considerable differences in the accounts due to the institutional variety in the countries' pension schemes. While the majority of future pension rights in countries with comprehensive government-managed pay-as-you-go schemes (like in France, Germany or Italy) were not recorded in the national accounts, the bulk of pension entitlements in countries with mainly capitalized systems were considered as household wealth in the national accounts.
[47] For a further discussion see ECB (2010).
[48] For an example see Jablonowski et al. (2010) who extended the Freiburg model to identify the main drivers of unsustainability in the overall Polish public finances. Furthermore, they applied the model in

an analysis of the adequacy of future pension benefits. We have estimated the pension rights accrued-to-date for (nearly) each member of the Latvian workforce. It requires only a projection of the future contribution careers to evaluate on this basis the adequacy of future pension levels.

Jablonowski and Müller (2013) to assess the sustainability, adequacy and intergenerational redistribution of the pension system in isolation.

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Appendix

Estimation of survivors' and disability pension entitlements

For the estimation of smaller pension schemes, such as survivors' and disability pension schemes, we applied a less data demanding estimation approach. For the estimation of these pension entitlements we applied age- and gender-specific benefit profiles which were calculated on the basis of current pensioners' data. A more detailed outline of this estimation approach can be found in the Eurostat (2012) technical compilation guide, see section 8. For disability pensions it should be noted that we consider the impact of increasing minimum retirement ages. We allow inflows into and payments of disability pensions until the increasing minimum retirement ages.

Estimation of government employee pension entitlements

The approach to estimate pension entitlements of government employee pensions is simplified – as we were lacking micro data. We spread the aggregate payments observed for these schemes equally across those age groups of the population which are eligible to civil servants benefits. For government employee pension schemes financed by social insurance, e.g., we distribute the aggregate expenditures to the age groups 58 (the average entrance age) to 61 (the latest possible age to receive a benefit). Furthermore, we consider that the latest possible age to receive this benefit will rise in line with increases of statutory retirement ages. For government employee pension schemes financed by state budget, on the contrary, the average entrance age applied amounts to 52 years. These benefits are then paid out until the future expected point of death. On this basis we can produce standard age and gender specific profiles for government employee pension schemes. This provides the basis to apply the homogenous contribution career approach of the Freiburg Model – described in greater detail in the Eurostat (2012) technical compilation guide, see section 8.