Chapter 3
Last lessons learned from the Swedish public pension system

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Abstract

Retirement systems across the world are undergoing major reforms to adapt to continuously changing economic and demographic factors. Among these major changes are the so-called notional defined contribution pension schemes (NDCs), first developed about twenty years ago in countries such as Italy, Latvia, Poland and Sweden. These pension schemes attempt to reproduce the logic of a financial defined contribution pension plan within a pay-as-you-go framework.

Among the countries with NDCs, Sweden is the only one where an automatic balancing mechanism goes hand in hand with the prior calculation of a financial solvency indicator that emerges from an actuarial balance sheet. This chapter describes the Swedish pension experience over the 2007–2015 period through its accounting method, together with the problems faced by the system and the policy responses.

Keywords: accounting, balancing mechanism, public pensions, retirement, solvency, Sweden.

3.1 Introduction

Social security systems across the world are undergoing significant reforms to adapt their schemes to economic and demographic uncertainties.

In Europe, the common trend in the responses to the pension crisis is a wave of parametric adjustments that usually include changes in the contribution ceilings, increases in the retirement age or changes in the indexation of pensions[3]. Among the major changes carried out in pension reforms are the so-called notional defined contribution pension schemes (NDCs), first developed about two decades ago in

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[3] See Whitehouse (2009); Whitehouse *et al.* (2009) and Organisation for Economic Co-operation and Development (2012).

countries such as Italy, Latvia, Poland and Sweden. Other countries, including Egypt, China and Greece, are seriously considering the introduction of NDCs[4].

NDCs, also known as defined contribution unfunded pension schemes, are ruled by a common principle; they attempt to reproduce the logic of a defined contribution pension plan within a pay-as-you-go (PAYG) framework. The notional account is a virtual one that records individual contributions, together with the fictitious return that they generate throughout each contributor's working life. The return that contributions earn is calculated on the basis of a macroeconomic index that tries to reflect the financial health of the system (i.e. changes in salaries and GDP growth), not market returns. The account balance is called notional because it is only used for record keeping (i.e. the system does not invest funds as the scheme is based on PAYG financing). When an individual retires, his or her accumulated contributions (or the notional account) are converted into a life annuity according to standard actuarial practice. Therefore, the amount of the initial pension depends on the mortality of the retiring cohort, potential future pension indexations and the technical interest rate used to discount the cash flows.

The notional model has some positive features, such as facing the ageing population more or less automatically or improving the relationship between contributions and pensions paid. However, these schemes do not guarantee sustainability due to the PAYG nature[5]. Valdés-Prieto (2000) shows that NDCs cannot generally provide financial equilibrium over the short term unless they are in the realistic steady state and have a notional rate equal to the covered salary bill. Hence, NDCs also require other financial modification mechanisms, such as government guarantees and repeated recourse to legislation – to be imposed in the same way as traditional defined benefit (DB) systems – or special measures, such as automatic balancing mechanisms (ABMs).

Sweden has gone beyond the NDC system that it implemented in 2001, in the sense that an income statement and a balance sheet[6] are annually published with the aim of analysing the system's solvency. Even so, an automatic balancing system that reduces the growth of the liabilities is triggered if the plan is not fully solvent. Sweden is claimed to be the only NDC country whose pension is financially sustainable over the long term in the sense that it is not necessary to make changes to the contribution rate[7].

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[4] Interested readers can consult, for example, Lindbeck and Persson (2003); Williamson (2004); Börsch-Supan (2006); Holzmann and Palmer (2006); Vidal-Meliá *et al.* (2006); Auerbach and Lee (2009); Vidal-Meliá *et al.* (2010); Whitehouse (2010); Auerbach and Lee (2011); Chłoń-Domińczak *et al.* (2012); and Holzmann *et al.* (2012).

[5] See Valdés-Prieto (2000) and Palmer (2013).

[6] Also called an actuarial balance sheet.

[7] According to Diamond (2004), a well-structured NDC system, with a decent-sized buffer stock of assets, will have little probability of needing legislative intervention as long as the economic growth is large enough.

This chapter first presents and discusses the Swedish accounting method (income statements and balance sheets) over the 2007–2015 period, with special attention to changes in total assets and liabilities. Second, it describes and explains Sweden's policy responses to the negative effects of the financial and economic crisis on pension benefits and notional accounts, in combination with the effect of the new rules of automatic balancing.

The chapter is structured as follows. Section 2 describes the Swedish public pension system. Section 3 summarises the published balance sheets and income statements and analyses how they have evolved over the 2007–2015 period. Section 4 concludes with a discussion on the new responses to the economic crisis, which have been undertaken by the Swedish pension system since 2007.

3.2 Swedish public pension system[8]

The Swedish public pension system consists of two different earnings-related benefit schemes: an NDC pension (called the *inkomstpension*), on which this chapter focuses, and a fully funded financial defined contribution pension (the *premium pension*). A tax-financed guaranteed pension, annually adjusted according to the consumer price index, provides supplementary support for retirees with low NDC pensions.

Under the NDC scheme, both accounts and benefits are indexed by the change in the average income. When the initial pension is calculated – that is, when the notional account value is converted into an annuity – the pension is increased or front-loaded on the basis of an assumed annual real growth rate of 1.6 percent for the income index. This rate of advanced interest is then deducted every year from the increase in the income index. Thus, the NDC pension is indexed annually by the change in the income index reduced by 1.6 percent. In certain situations, exceptions to the regular income indexation of accounts and benefits apply. These exceptions are governed by the ratio of assets to liabilities (balance ratio[9]) as provided in the legislation on the balancing mechanism. The balance ratio is an indicator that emerges from the actuarial balance sheet of the NDC scheme (presented in Section 3), expressed as:

$$\text{Balance ratio} = \frac{\text{Assets (e.g. fund assets + contribution asset)}}{\text{Pension liability}}$$

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[8] For a more detailed description of the Swedish pension system, see the Swedish Social Insurance Agency (2007–2015) and Barr (2013). The latter paper also evaluates the pension system in Sweden against the goals established at the time of the reforms in the late 1990s.

[9] To indicate that the solvency ratio of a PAYG scheme is different from that of the *premium pension*, the *inkomstpension* system calls this ratio the balance ratio.

The balance ratio used in Sweden has a dual purpose – to measure whether the system can fulfil its obligations to its contributors and to decide whether an ABM should be applied.

Balancing mechanism

Following Settergren's (2001) work, if for some reason, the balance ratio is less than one, the ABM is triggered as shown in Figure 3.1. This process basically consists of reducing the growth in pension liability (i.e. the pensions in payment and the pension account balances of the economically active population). Thus, the balance index (Figure 3.1), rather than the change in the average income (expressed by an income or a salary index), is used to revalue the pensions in payment and the notional account of each contributor.

Figure 3.1: Illustration of the balancing mechanism
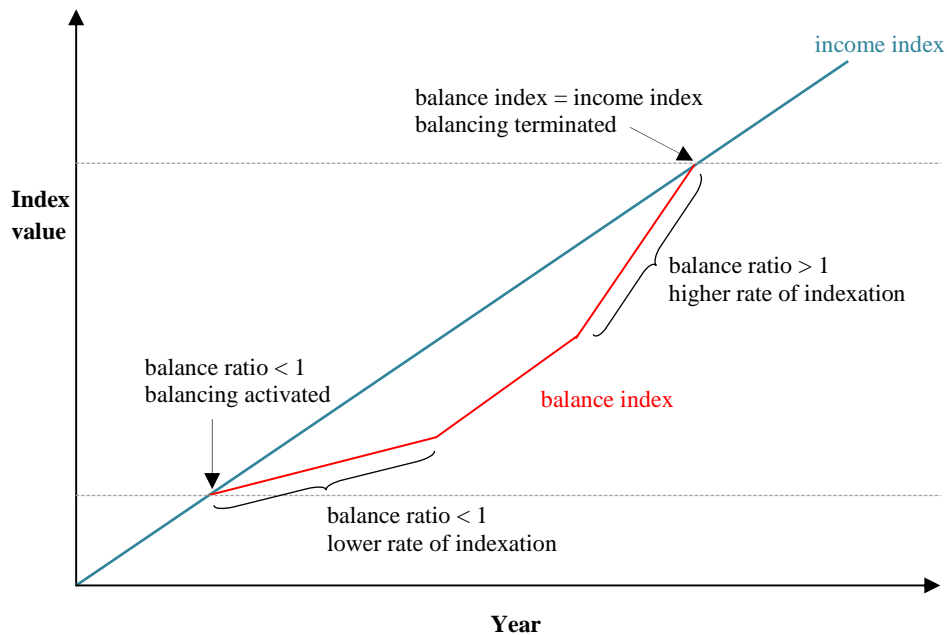
Source: The Swedish Social Insurance Agency (2015)

This ABM can be considered asymmetric as it is only triggered when the solvency ratio is lower than 1. However, the Swedish ABM allows for recovery.

After a period of low returns as a consequence of the mechanism, a period of higher-than-normal returns follows (Figure 3.1)[10].

3.3 Development of solvency: balance sheets for 2007–2015

Sweden developed the new accounting rules with an almost identical discipline of the double-entry bookkeeping. The country also produces an actuarial balance sheet and an income statement every year. Its annual report has presented an overall picture of the financial health of the Swedish NDC pension system since 2001.

The balance sheet for the Swedish NDC pension system is a financial statement listing the pension system's obligation to contributors and pensioners on a particular date (also referred to as liabilities), together with the amounts of the various assets (financial assets and contribution amounts) that back up these commitments. The actuarial balance sheet mainly aims to provide a true and fair view of the pension system's assets and liabilities in the beginning and at the end of each fiscal year; by comparing these figures, it intends to determine the change in the net worth. The balance sheet also contributes to the management and disclosure of financial information because it is useful not only for the authority governing the system but also for contributors and pensioners in general and for the body that guarantees payment (i.e. the state and the contributors it represents) (Boado-Penas *et al.*, 2008; Boado-Penas and Vidal-Meliá, 2013).

The system's assets comprise the value of future pension contributions, referred to as the contribution asset and the buffer fund. The first entry on the asset side is called the contribution asset, which is the turnover duration (TD) multiplied by the value of the contributions made in a specific period. The TD is the expected average length of time between the payment of a monetary unit of contribution into the system and the disbursement of the corresponding credit in the form of a pension. It thus reflects the difference between the weighted average age of pensioners and the weighted average age of contributors, assuming that economic, demographic and legal conditions are constant. The TD[11] is also the sum of the pay-in duration and the pay-out duration as shown in Table 3.1

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[10] For more detailed explanations, see Barr and Diamond (2011).

[11] After 2014, the disclosure about the TD has been calculated in terms of the difference between the weighted average ages of pensioners and contributors. See the Annual Report of the Swedish Pension System (2015), Appendix B, Formula B.3.1.

Table 3.1: Balance sheet of the Swedish NDC pension system on December 31, 2007–2015

Item	2007	2008	2009	2010	2011	2012	2013	2014	2015
Assets (% of GDP)									
Fund assets	27.2	20.9	25.1	25.4	23.9	26.0	28.1	30.1	29.4
Contribution asset	185.5	191.2	193.5	186.8	186.7	187.7	188.9	187.5	178.4
Total assets	212.7	212.1	218.6	212.2	210.6	213.7	217.0	217.6	207.8
Liabilities and results brought forward (% of GDP)									
Opening results brought forward	3.0	0.5	-7.4	-9.2	2.8	4.3	-2.1	3.2	10.1
Net income or loss for the year	-2.5	-7.7	-2.4	12.1	1.5	-6.4	5.5	7.5	-6.0
Closing results brought forward	0.5	-7.2	-9.8	2.9	4.3	-2.2	3.4	10.7	4.1
Pension liability	212.2	219.3	228.4	209.3	206.3	215.8	213.6	206.8	203.7
Total liabilities and results brought forward	212.7	212.1	218.6	212.2	210.6	213.7	217.0	217.6	207.8
Financial Indicators									
Balancing year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Balance ratio, original definition[a]	1.0026	0.9672	0.9570	1.0138	1.0208	0.9901	1.0158	1.0521	1.0201
Balance ratio, modified legislation[b]	n.a.	0.9826	0.9549	1.0024	1.0198	0.9837	1.0040	1.0375	1.0067[c]
Pay-in duration (years)	21.07	20.88	20.83	20.62	20.55	20.56	20.41	n.a	n.a
Pay-out duration (years)	10.69	10.79	10.83	10.88	10.89	10.92	10.99	n.a	n.a
Turnover duration (years)	31.76	31.67	31.66	31.51	31.44	31.48	31.40	30.37	n.a
Smoothed turnover duration (years)	31.93	31.76	31.76	31.67	31.66	31.51	31.48	31.44	30.38
Implicit discount rate (1/TD) (%)	3.13	3.15	3.15	3.16	3.16	3.17	3.18	3.18	3.29
Income (or Balance) index (%)	4.5	6.2	-1.4	-2.7	5.2	5.8	-1.1	2.5	5.9
GDP (SKr billions)	3,297	3,388	3,289	3,520	3,657	3,685	3,770	3,937	4,181

Source: Authors' compilation based on the data from the Swedish Social Insurance Agency (2007–2015)

Note: GDP = gross domestic product; n.a. = not applicable

[a] The balance ratio calculated according to the previous definition (2007). It is calculated solely on the basis of the buffer fund's market value as of December 31 of the corresponding year, formerly called the financial position.

[b] The balance ratio calculated according to the new definition (2008 onwards). It is calculated on the basis of a three-year average of the buffer fund's market value.

[c] The damped balance ratio is used instead of the balance ratio from 2015 onwards. It is equal to 1 plus one-third of the difference between the balance ratio fixed for that year and the number 1.

Additionally, the contribution asset is equivalent to the present value of the perpetual future flow of contributions discounted with the inverse of the TD, called the implicit discount rate. If the TD increases (decreases), the implicit discount rate decreases (increases), and the value of the contribution flow increases (decreases). The implicit discount rate varied between 3.13 and 3.29 (see Table 3.1). The rate can also be regarded as the system's discount rate for contributions because it is defined by the contribution flows' capacity to amortise the pension debt.

The buffer fund[12], also called the fund asset, aims to stabilise pension disbursements and/or pension contributions in relation to economic and demographic changes. The buffer fund of the Swedish NDC system consists of five separate national pension funds (also known as *Allmänna pensionsfonder* [AP] Funds): the First, Second, Third, Fourth and Sixth AP Funds. Pension contributions are deposited equally to the First to the Fourth AP Funds, which also equally finance the pension disbursements. In contrast, the Sixth[13] AP Fund is an evergreen one, which means that there are no contributions paid to and pension disbursements from the fund. The buffer fund's size is large, amounting to 20.9–30.1 percent of the GDP (see Table 3.1) and 9.5–14.5 percent as a share of the pension liability in 2007–2015.

In the balance sheet, the pension liability includes a liability to contributors and a liability to pensioners. The liability to contributors is the notional accumulated capital in the contributors' accounts. The liability to pensioners is the present value of the expected total of all pensions paid to current pensioners during their lifetimes, taking into account the current life expectancy and the real technical interest rate applied (1.6 percent) when the amount of the initial pension was calculated. The pension liability varies from 203.7 to 228.4 percent of the GDP (see Table 3.1).

Since the system was implemented in 2001, the contribution asset has always been less than the pension liability over time. For example, in 2015, the contribution asset accounted for SEK 7,457 billion, in contrast to SEK 8,517 billion in pension liability (see Table A1). The system would have been partially solvent. However, by including the buffer fund that absorbs the differences

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[12] Sweden is the only country using the NDC system that has created the buffer fund. Several countries with the PAYG state pension system (e.g. Canada, France, Ireland, Japan, Norway, Spain, etc.) have established the public reserve funds (Yermo, 2008).

[13] The Sixth National Pension Fund, known as the Sixth AP Fund, operates as a long-term investor in unlisted companies. Profits can be reinvested, and any losses must be covered by the fund capital. The owner (i.e. the Swedish Parliament) may, by changing the law, decide to allow funds to be paid into or withdrawn from the Sixth AP Fund. The Sixth AP Fund invests in the private equity market, while the First to the Fourth AP Funds had identical investment rules and were allocated the same amount of capital in connection with the reorganisation of the AP Funds in 2001.

between the inflow of contributions and the outflow of pensions, the total assets will likely exceed the pension liability.

Figure 3.2: Evolution of total assets, pension liability and balance ratio of the Swedish NDC pension system
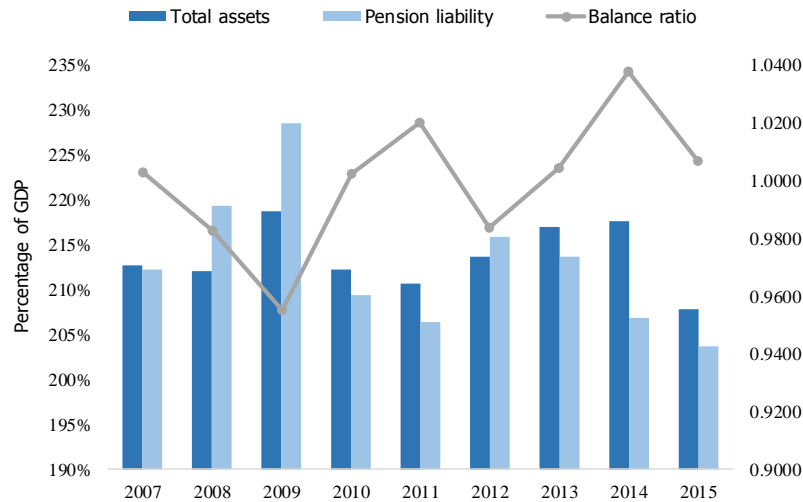
Source: Authors' compilation based on the data from the Swedish Social Insurance Agency (2007–2015)

Figure 3.2 shows the evolution of the total assets, the pension liability and the balance ratio for the 2007–2015 period. Before 2008, the system's balance ratio was greater than 1, and the total assets and the pension liability had risen in diversity, with a rather higher growth in liabilities than in total assets. In 2008, the financial position of the pension system substantially deteriorated. The balance ratio dropped below 1 for the first time, amounting to 0.9672 due to a huge net loss of SEK 261 billion, equivalent to 7.7 percent of the GDP (see Table 3.1). According to the original legislation, balancing was activated with a 3.28 percent reduction of the indexation of notional accounts and pensions in 2009/2010. However, in 2009, the parliament modified the new rule on the basis of the three-year average of the buffer fund for calculating the balance ratio. As a result, the modified balance ratio increased to 0.9826, and the balancing effect was reduced to 1.74 percent.

In 2009, the system still faced financial deficit, but the loss (2.4 percent of the GDP) was not as large as that of the previous year. The total assets were less than 4.3 percent of the pension liability, for the balance ratio of 0.9549. The pension liability was 228.4 percent of the GDP, the highest value during the period. The negative indexation of notional accounts and benefits in 2009 and 2010 forced a

significant drop in the value of the pension liability, and then, assets exceeded liabilities at the end of 2010. This surplus was equal to 0.0024 percent, for the balance ratio of 1.0024.

The pension system had been restored for a couple of years, and at the end of 2012, the pension liability exceeded the total assets again, for the balance ratio of 0.9837. Balancing was activated, and the indexation of pension balances and pension disbursements was decreased in 2013/2014. The pension liability has been revalued at a slower rate, and the pension system has been strengthened financially since 2013. The pension liability reached a value of 213.6 percent of the GDP in 2013 and 206.8 percent of the GDP in 2014, while the balance ratio increased to 1.004 in 2013 and 1.0375 in 2014. In 2015, with the aim of reducing the volatility caused by the indexation, the new form of smoothing the balance ratio (referred to as the damped balance ratio) was introduced and amounted to 1.0067. The damped balance ratio restricts balancing to one-third, resulting in less volatility in pension benefits when balancing is activated.

Figure 3.3 illustrates the relationship between the balance ratio and the income/balance index. When the balance ratio was less than 1, balancing was activated, and the income index was reduced in the next fiscal year. For example, in 2008 and 2009, the balance ratio was less than 1, and then, the income index was dropped in 2009 and 2010. After balancing was deactivated, the balance ratio was greater than 1, and the income index was increased. For instance, the balance ratio was higher than one in 2010 and 2011, and the income index rose in 2011 and 2012.

Figure 3.3: Balance ratio and income/balance index of the Swedish NDC pension system
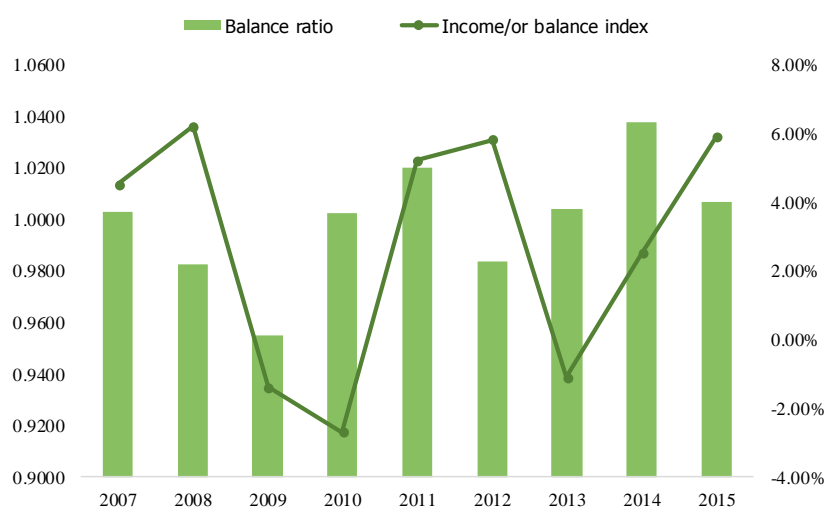
Income statements of the NDC scheme

A full explanation of the reasons for the changes in the NDC system's solvency is specified and quantified in the income statement. It is divided into three sections: change in fund assets, change in contribution asset and change in pension liability, each presented as a percentage of the GDP over the 2007–2015 period (Table 3.2).

- **Change in fund assets (buffer fund)**

The total annual pension contributions and disbursements have amounted to approximately 6 percent of the GDP since 2007. In the first eight years after the scheme was implemented, the net cash flow of the AP Funds (the difference between contributions and disbursements, commonly referred to as the buffer fund entry) was positive. However, since 2009, the pension disbursements have become greater than the pension contributions. One reason for the growth in pension benefits is the huge number of cohorts born in the 1940s, who have recently retired (Swedish Social Insurance Agency, 2010). The relatively substantial increase in the income index is another reason for the higher value of pension disbursements. For instance, in the beginning of 2009, the income index rose by 6.2 percent compared to 4.5 percent in the beginning of 2008, and then, the pension benefits grew by 9 percent in 2009, from SEK 199 billion in 2008 to SEK 217 billion in 2009.

However, the deficit of the net cash flow between pension contributions and benefits was offset by the returns on assets and capital in the buffer fund. From 2009 onwards, the positive return on capital has resulted in a relatively good overall change in fund assets; for example, the return on funded capital accounted for 3.76 and 1.60 percent of the GDP in 2014 and 2015, respectively. The variations in the returns on the buffer fund reflect the volatility in the assets' prices allocated in each AP Fund. The investment strategies for the funds are broadly proportioned to 60 percent of equities and 40 percent of bonds.

The administrative costs are deducted annually from the pension funds, only until a retiree begins to draw a pension. At the current cost level, the deduction for costs reduces the value of the funds by approximately 1 percent of the GDP. The administrative costs reported in the income statement contain the costs of insurance administration and the National Pension Funds' operating expenses. Asset management fees, performance-based fees and transaction costs, such as brokerage commissions, are not reported as direct costs by the funds but have a negative effect on the section of the return on funded capital.

Table 3.2: Income statement of the Swedish NDC pension system, 2007–2015

Item	2007	2008	2009	2010	2011	2012	2013	2014	2015
Change in fund assets (% of GDP)									
Pension contributions	5.76	5.99	6.17	5.82	5.91	6.02	6.02	5.99	5.88
Pension disbursements	-5.64	-5.87	-6.60	-6.25	-6.02	-6.40	-6.74	-6.48	-6.34
Return on funded capital	1.15	-5.73	4.14	2.41	-0.46	2.74	3.40	3.76	1.60
Administrative costs	-0.06	-0.03	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05
Total	1.24	-5.64	3.65	1.93	-0.60	2.31	2.65	3.23	1.10
Change in contribution assets (% of GDP)									
Value of change in contribution revenue	5.85	11.66	-3.50	6.59	6.97	3.26	5.70	6.76	7.96
Value of change in turnover duration	-0.67	-0.97	-0.03	-0.54	-0.05	-0.90	-0.16	-0.20	-6.12
Total	5.19	10.66	-3.50	6.05	6.92	2.36	5.52	6.53	1.84
Change in pension liability (% of GDP)									
New pension credits and ATP points	-5.88	-6.44	-6.51	-6.11	-5.66	-6.19	-6.42	-5.84	-5.88
Pension disbursements	5.64	5.87	6.60	6.25	6.02	6.40	6.74	6.48	6.34
Indexation or change in value	-8.13	-11.36	-1.95	4.69	-4.79	-10.94	-2.55	-2.34	-9.04
Value of change in life expectancy	-0.52	-0.80	-0.70	-0.71	-0.38	-0.35	-0.42	-0.51	-0.36
Inheritance gains arising	0.30	0.32	0.33	0.31	0.30	0.30	0.32	0.30	0.29
Inheritance gains distributed	-0.33	-0.35	-0.40	-0.37	-0.33	-0.35	-0.37	-0.36	-0.33
Deduction for administrative costs	0.06	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.02
Total	-8.89	-12.72	-2.55	4.12	-4.84	-11.10	-2.68	-2.24	-8.97
Net income or loss for the year (% of GDP)	-2.49	-7.70	-2.40	12.07	1.48	-6.43	5.49	7.52	-6.03

Source: Authors' compilation, based on the data from the Swedish Social Insurance Agency (2007–2015)

Note: GDP = gross domestic product; ATP = *Allmän tilläggspension*
A negative item (-) increases the pension liability, and a positive item decreases it (by the amount shown).

- **Change in contribution asset**

In the income statement, the change in the contribution asset is divided into the value of the change in the contribution revenue and the value of the change in the TD.

The value of the change in the contribution revenue, representing how much more (or less) the liability can be financed by a higher (or lower) level of contributions relative to the previous year, is the monetary value as expressed by the growth in the value of the contributions per capita multiplied by the growth of the labour force (Settergren, 2013). Due to a gradual increase in pension

contributions since the pension scheme was implemented, the value of the change in the contribution revenue has been positive and in 2008, reached the maximum value of 11.66 percent of the GDP. In 2009, the contribution asset fell to SEK 6,362 billion from SEK 6,477 billion in 2008, resulting in a negative value of the change in the contribution revenue (-3.50 percent of the GDP). This drop in contributions was one reason for the loss incurred in the pension system and worsened the balance ratio. During the 2010–2015 period, the contribution revenue had slightly grown again at 3.26–7.96 percent of the GDP.

The value of the change in the TD, which is the two-year average of the smoothed contribution revenue[14] multiplied by the change in the TD, had dropped since 2005 and amounted to -6.12 percent of the GDP in 2015. The smoothed TD was 31.44 years in 2014 and 30.38 in 2015 (see Table 3.1). Therefore, the change in the TD dropped by 1.06 years, resulting in a sizable negative value of the change in the TD in 2015.

Taking into account the inverse relationship between the TD and the implicit discount rate, the marginally lower TD represents a slight increase in the implicit discount rate for the contribution flow, from 3.13 percent in 2007 to 3.29 percent in 2015 (see Table 3.1). The decreased TD and the increased implicit discount rate have reduced the contribution flow's capacity to finance the pension liability.

The pay-in duration, reflecting the difference in the number of years between the expected average age of earning a pension credit and the expected average age of retirement, had decreased from 21.07 years to 20.41 years over the 2007–2013 period (see Table 3.1). This change represents an increase in the expected average age of contributors. However, the reasons for the negative trend have not been fully investigated[15] (Settergren, 2013).

On the other hand, the pay-out duration, which is the difference in the number of years between the expected average age of retirement and the expected average age of pension recipients, had risen from 10.69 years in 2007 to 10.99 years in 2013 (see Table 3.1). This means an increase in the expected money-weighted average age of retirees because of longevity. The net effect of the change in the expected ages leads to a moderate drop in the TD. Figure 3.4 also illustrates the evolution of the TD, which is the sum of the pay-in and the pay-out duration.

The improvement in life expectancy has a direct effect on the increased pension liability and also changes the pension liability's structure – the time profile of payments – in a way that does not need to be fully financed in a PAYG pension system. The increased TD implies that the same flow of contributions can finance a larger pension liability (Settergren, 2013). Besides, the net effect of the increase in life expectancy in a PAYG pension system, which is the difference of

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[14] As of the financial year 2015, a smoothed contribution revenue is no longer used.

[15] Settergren (2013) points out that the ages of entry to the labour force market have increased slightly, and the relative wages of younger employees seem to have decreased. This situation could be explained, at least partially, by the increase in immigration to Sweden. The adult immigrants might have pushed up the average age of entry to the labour market; thus, there has been a decrease in the TD.

the increased value between the pension liability and the contribution flow, is associated with the higher TD. Settergren and Mikula (2005) and Vidal-Meliá and Boado-Penas (2013) describe how cash flows, the stock of assets and liabilities of the PAYG pension system are affected by a shift in the mortality pattern.

Figure 3.4: Evolution of pay-in and pay-out duration of the NDC Swedish pension system
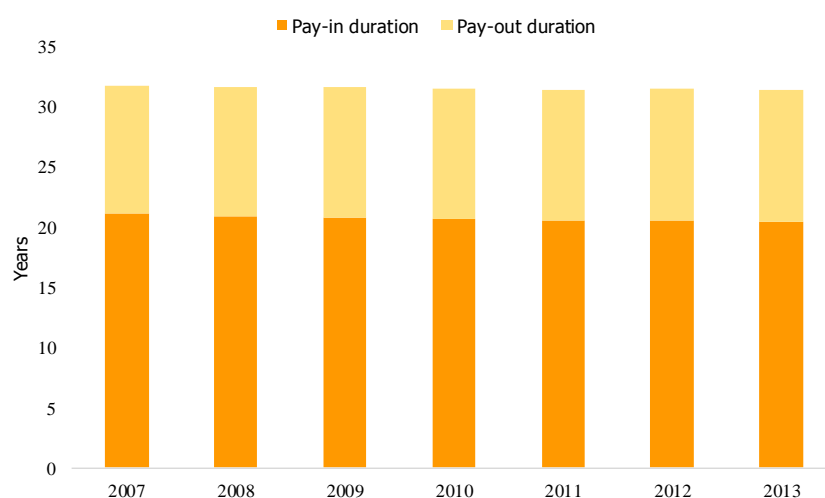
Source: Authors' compilation based on the data from the Swedish Social Insurance Agency (2007–2015)

- **Change in pension liability**

The changes in the size of the pension liability are caused by seven main items: new pension credits and *Allmän tilläggspension* (ATP) points, pension disbursements, indexation or change in value, value of change in life expectancy, inheritance gains arising, inheritance gains distributed and deduction of administrative costs as presented in the income statement (Table 3.2).

The new pension credits and the ATP points had risen by 5.66–6.51 percent of the GDP over the 2007–2015 period. The pension credits are accumulated in the notional account, whereas the ATP points corresponding to the estimated value of the new pension credits earned in the DB system are being phased out[16]. When the ATP points disappear completely, the value of this item will be identical with the pension contributions in the section of the change in fund assets. The equality

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[16] Currently, the value of new ATP points (that corresponding to the old defined benefit (DB) pension system) is very small and will no longer be earned after 2017.

between the contributions paid and the new pension credits earned is one common characteristic of an NDC or a defined contribution scheme (Settergren, 2013).

As pension benefits are paid out by the AP Funds and also constitute an amortisation of the pension liability, the amount of pension disbursements then reduces both the values of the fund assets and the pension liability. The value of the pension disbursements included in the change in the fund assets (Table 2) has the same value as the change in the pension liability.

The pension liability changes primarily with the annual indexation of pensions and pension account balances. The higher value of the indexation increases the pension liability. Indexation is determined by the change in the income index, in combination with the balance ratio in the years when balancing is activated, referred to as the balance index. In 2008, the indexation produced an increase in the pension liability, amounting to 11.36 percent of the GDP. Since balancing was activated in 2009 and 2010, the indexation was reduced. As a result, the pension liability decreased to approximately 4.69 percent of the GDP in 2010. In 2012, the pension liability increased to 10.94 percent of the GDP because of the high indexation, 5.8 percent of the income index, and the financial position of the system deteriorated with a negative balance ratio. The balancing mechanism was then activated, and the indexation was dropped to restore the system, which increased the pension liability by 2.55 and 2.34 percent of the GDP in 2013 and 2014, respectively.

Additionally, the pension liability is positively related to the change in the life expectancy. Life expectancy, as used in the income statement, refers to the assumed length of time for which an average pension amount is disbursed (the so-called economic life expectancy). For the NDC system, a higher life expectancy will increase only the pension liability to retirees. According to the projected negative impact on pensions of younger cohorts as presented in the 2010 Orange Report (Swedish Social Insurance Agency, 2010), the monthly pension will be lower for younger cohorts if they retire at a fixed age when life expectancy is improving. Therefore, the pension liability to active workers is unaffected by mortality changes. The value of the change in life expectancy (Table 2) is the difference between the pension liability calculated with the economic life expectancy used in the financial year and that used in the previous year. Over the 2007–2015 period, the value of the change in life expectancy had varied between -0.35 and -0.80 percent of the GDP.

The remaining accounting item in Table 3.2, inheritance gains, represents the notional account balances of participants who do not survive to retirement age, distributed to the survivors belonging to the same birth cohort. The items vary between 0.3 and 0.4 percent of the GDP. The inheritance gains distributed are not those actually arising but those expected to arise. Hence, both items are not offset perfectly.

The administrative costs are deducted from the notional accounts to finance the administrative and the fund management costs. On average, the deduction amount ranged between 0.02 and 0.06 percent of the GDP in 2007–2015 and did not

exactly match the cash withdrawals from the fund assets in the administrative cost item.

Eventually, the net income/loss for the year is the sum of the totals of three sections: change in fund assets, change in contribution asset and change in pension liability. However, regarding the double-entry accounting system, the net income/loss is equivalent to the difference between the change in assets (fund assets and contribution asset) and the change in liabilities. Figure 3.5 shows the evolution of the change in assets, the change in pension liability and the net income/loss of the Swedish NDC pension system. The value had been volatile, range from the loss of 7.70 percent of the GDP in 2008 and the gain of 12.07 percent of the GDP in 2010. The imbalance of the system's financial position is chiefly caused by the change in the indexation of the pension liability.

Figure 3.5: Evolution of change in assets, change in pension liability and net income/loss of the Swedish NDC pension system
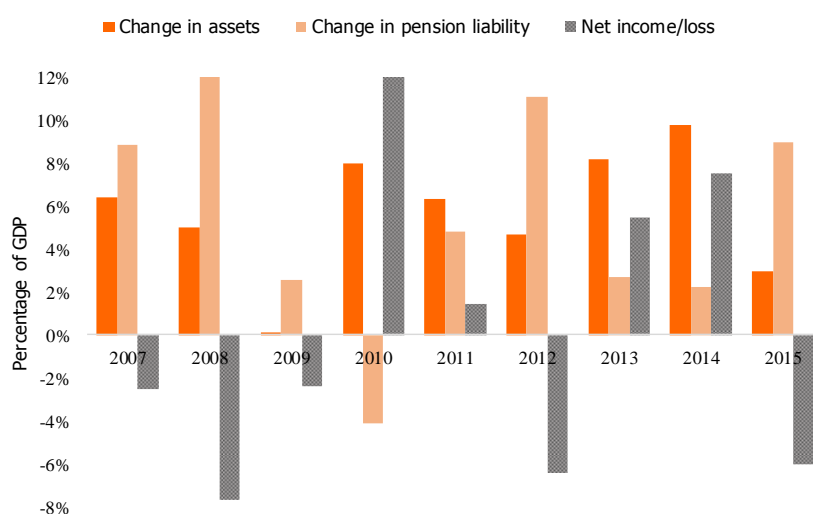
Source: Authors' compilation based on the data from the Swedish Social Insurance Agency (2007–2015)

3.4 Conclusions and new responses to economic crisis

This chapter has described the Swedish experience in its NDC pension system over the 2007–2015 period, with special attention to the balance ratio under economic and financial uncertainties. It has shown how in the post-2008 recession, the solvency of the Swedish NDC scheme dropped, and the balance

ratio fell significantly below the unity, triggering the automatic balance mechanism in 2010. Pensions were reduced in 2010, 2011 and 2014.

Three different policy responses had been carried out in this respect, as follows:

The first was to smooth the value of the buffer fund used in the balance ratio. Thus, instead of using the value of the buffer fund as of 31 December in a specific year, the average of the value of the buffer fund as of 31 December in the last three years was used. This change was legislated despite (the predecessor to) the Swedish Pensions Agency's objection about the measure's inefficiency. The agency proposed that rather than smoothing the value of the buffer fund, the solvency deficit's effect on the pensions should be smoothed. According to the agency, this solution would result in a more efficient smoothing, partly due to considering all sources of solvency volatility, not only the volatility resulting from the value of the buffer fund.

The second policy response to the reduced pensions under the notional model was to cut taxes on pensions so as to counteract the net effect of the negative indexation. The retirees were more or less completely compensated for their losses in *inkomstpension* by the reduced taxes. This policy response implies that one of the main objectives of the NDC design – to insulate government finances from the development of the public pension plan – was not achieved.

Third, the volatility of the solvency measure – the balance ratio – triggered the Swedish Pension Agency's analysis of the reasons for the unanticipated level of volatility. This work revealed that the three-year smoothing of the income index caused a delay relative to the development of the contributions to the plan. This situation caused a significant real volatility in the ratio of the contribution asset to the pension liabilities. For example, a shift downwards in the nominal earnings growth would immediately result in a lower growth in the contributions and the contribution asset. The income index would fully react to this outcome with a four-year delay, causing a *ceteris paribus* permanent negative gap between assets and liabilities. The result would also be observed in traditional actuarial projections of the NDC plan.

This pre-crisis (unidentified but obvious from the experience) source of solvency volatility triggered the legislative attempt to eliminate or at least reduce the volatility caused by the indexation itself. The Swedish Pension Agency proposed measures that would eliminate the volatility caused by the indexation. Its main component was to eliminate the smoothing in the indexation and to make it slightly forward looking. Rather than using the change in income in the current year relative to the previous one, the (projected) change in income in the coming year relative to the current one should be used. The difference between the projected and the actual income growth should affect the indexation the following year. The agency claimed that combined with some compensating adjustments, this solution would completely eliminate the avoidable solvency volatility caused by the delay in indexation relative to the contribution development. To further reduce volatility, the agency proposed that balancing should only come into effect if the balance ratio was below the unity for three years in a row, and that in

balancing, the indexation should yearly be reduced by only one-third of the adjustment necessary to achieve 100 percent solvency.

The Pensionsgroup (set up by the government to negotiate any changes to the political agreement on the pension reform in 1994) decided to propose to the parliament a simplified version of the technical adjustments recommended by the Swedish Pensions Agency. The smoothing of the income index was abolished, but the forward-looking design proposed by the agency was not enacted. The government/Pensionsgroup judged the forward-looking proposal (the increased use of projections in the indexation) as a risk and also disliked the technical changes forced by its design. Neither did the government/Pensionsgroup adopt the agency's proposed rule of only using the balance mechanism if the solvency was less than 100 percent for three consecutive years. However, the new form of smoothing (reducing the indexation by only one-third of the necessary reduction to achieve 100 percent solvency) was implemented. The new indexation was used for the first time in 2015, and the new balance ratio was applied in 2016.[17]

The volatility of the indexation of pensions caused by the balance mechanism has been criticised by various groups in Sweden. Perhaps the most vocal critique has come from groups representing retirees, but other groups have also expressed disapproval. The political parties supporting the pension agreement have not criticised the balance mechanism's goal to secure an automatic, financially stable pension scheme. As evident from their legislative actions, they have disliked the volatility and tried to reduce it while adhering to the principle of automatic financial stability.

Somewhat surprisingly, there has been almost no professional or popular debate on the relevance of the solvency measure used. Considering the positive projections of the pension plan (the actual and the projected sizes of the buffer fund) – indicating that the present solvency deficit will be overcome without reducing pensions – the lack of debate is even more astonishing. This situation can possibly be attributed to the human tendency to accept a number as a fact, more or less regardless of the underlying ambiguities of the calculation. Another or complementary interpretation of this absence of a more profound and philosophical critique is that the use of only factual transactions and events in estimating solvency, without any projections, has worked.

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[17] Another change in legislation addressed the inefficiency in the indexation/balance mechanism that implied that pension credits earned during a balancing period, and thus not subjected to a downward adjustment of the indexation, would still benefit from balancing the mechanisms upward. This inefficiency was already acknowledged by legislators when the balance mechanism was legislated in 2000, but at that time, no satisfactory solution to the problem was identified – partly due to time constraints. Barr and Diamond (2011) criticise this inefficiency.

Annex A: Balance sheets and income statements in Swedish kronor

The balance sheets and income statements from 2007–2015 are shown in Swedish kronor in Table A1 and A2, respectively.

Table A1: Balance sheets, December 31, 2007–2015

Item	2007	2008	2009	2010	2011	2012	2013	2014	2015
Assets (SKr billions)									
Fund assets	898	707	827	895	873	958	1,058	1,184	1,230
Contribution asset	6,116	6,477	6,362	6,575	6,828	6,915	7,123	7,380	7,457
Total assets	7,014	7,184	7,189	7,469	7,700	7,873	8,180	8,565	8,688
Liabilities and results brought forward (SKr billions)									
Opening results brought forward	100	18	-243	-323	103	157	-80	127	423
Net income or loss for the year	-82	-261	-79	425	54	-237	207	296	-252
Closing results brought forward	18	-243	-323	103	157	-80	127	423	171
Pension liability	6,996	7,428	7,512	7,367	7,543	7,952	8,053	8,141	8,517
Total liabilities and results brought forward[a]	7,014	7,184	7,189	7,469	7,700	7,873	8,180	8,565	8,688

Source: The Swedish Social Insurance Agency (2007–2015)

[a] Total liabilities and result brought forward is the summation of "Opening results brought forward", "Net income or loss for the year" and "Pension liability".

Table A2: Income statements, 2007–2015

Item	2007	2008	2009	2010	2011	2012	2013	2014	2015
Change in fund assets (SKr billions)									
Pension contributions	190	203	203	205	216	222	227	236	246
Pension disbursements	-186	-199	-217	-220	-220	-236	-254	-255	-265
Return on funded capital	38	-194	136	85	-17	101	128	148	67
Administrative costs	-2	-1	-2	-2	-2	-2	-2	-2	-2
Total	41	-191	120	68	-22	85	100	127	46
Change in contribution assets (SKr billions)									
Value of change in contribution revenue	193	395	-115	232	255	120	215	266	333
Value of change in turnover duration	-22	-33	-1	-19	-2	-33	-6	-8	-256
Total	171	361	-115	213	253	87	208	257	77
Change in pension liability[a] (SKr billions)									
New pension credits and ATP points	-194	-218	-214	-215	-207	-228	-242	-230	-246
Pension disbursements	186	199	217	220	220	236	254	255	265
Indexation or change in value	-268	-385	-64	165	-175	-403	-96	-92	-378
Value of change in life expectancy	-17	-27	-23	-25	-14	-13	-16	-20	-15
Inheritance gains arising	10	11	11	11	11	11	12	12	12
Inheritance gains distributed	-11	-12	-13	-13	-12	-13	-14	-14	-14
Deduction for administrative costs	2	1	1	1	1	1	1	2	1
Total	-293	-431	-84	145	-177	-409	-101	-88	-375
Net income or loss for the year (SKr billions)	-82	-261	-79	425	54	-237	207	296	-252

Source: The Swedish Social Insurance Agency (2007–2015)

Note: ATP = Allmän tilläggspension.
[a] A negative item (-) increases the pension liability, and a positive item () decreases it, by the amount shown.

References

Auerbach, A. J. and Lee, R. (2009) 'Notional defined contribution pension systems in a stochastic context : design and stability' in Brown, J. R., Liebman, J. B. and Wise, D. A., eds., *Social Security Policy in a Changing Environment*, Chicago: University of Chicago Press, 43-68.

Auerbach, A. J. and Lee, R. (2011) 'Welfare and generational equity in sustainable unfunded pension systems', *Journal of Public Economics*, 95(1–2), 16-27.

Barr, N. (2013) *The pension system in Sweden, Report to the Expert Group on Public Economics 2013:7*, Stockholm: Ministry of Finance.

Barr, N. and Diamond, P. (2011) 'Improving Sweden's automatic pension adjustment mechanism', *Center for Retirement Research at Boston College*, Issue in Brief 11-2.

Boado-Penas, M. d. C. and Vidal-Meliá, C. (2013) 'The actuarial balance of the PAYG pension system: the Swedish NDC model versus the DB-type model' in Holzmann, R., Palmer, E. and Robalino, D., eds., *Non-Financial Defined Contribution (NDC) Pension Systems, Volume 2: Gender, Politics, and Financial Stability*, Washington D.C.: World Bank, 443-480.

Boado-Penas, M. d. C., Vidal-Meliá, C. and Valdés-Prieto, S. (2008) 'The actuarial balance sheet for pay-as-you-go finance: Solvency indicators for Spain and Sweden', *Fiscal Studies*, 29(1), 89-134.

Börsch-Supan, A. H. (2006) 'What Are NDC Systems? What Do They Bring to Reform Strategies?' in Holzmann, R. and Palmer, E., eds., *Pension Reform: Issues and Prospects for Non-financial Defined Contribution (NDC) Schemes*, Washington, D.C.: World Bank, 35-55.

Chłoń-Domińczak, A., Franco, D. and Palmer, E. (2012) 'The First Wave of NDC Reforms: The Experiences of Italy, Latvia, Poland, and Sweden' in Holzmann, R., Palmer, E. and Robalino, D., eds., *Nonfinancial Defined Contribution Pension Schemes in a Changing Pension World, Volume 1: rogress, Lessons, and Implementation*, Washington, D.C.: World Bank, 31-84.

Diamond, P. (2004) 'Social Security', *American Economic Review*, 94(1), 1-24.

Holzmann, R. and Palmer, E. (2006) *Pension Reform : Issues and Prospects for Non-Financial Defined Contribution (NDC) Schemes*, Washington, D.C.: World Bank.

Holzmann, R., Palmer, E. and Robalino, D. (2012) *Nonfinancial Defined Contribution Pension Schemes in a Changing Pension World, Volume 1: Progress, Lessons, and Implementation*, Washington, D.C.: World Bank.

Lindbeck, A. and Persson, M. (2003) 'The Gains from Pension Reform', *Journal of Economic Literature*, 41(1), 74-112.

OECD (2012) 'Putting pensions on auto-pilot: automatic-adjustment mechanisms and financial sustainability of retirement-income systems' in *OECD Pensions Outlook 2012,* OECD Publishing.

Palmer, E. (2013) 'Generic NDC: Equilibrium,Valuation, and Risk Sharing with and without NDC Bonds' in Holzmann, R., Palmer, E. and Robalino, D., eds., *Nonfinancial Defined Contribution Pension Schemes in a Changing Pension World, Volume 2: Gender, Politics, and Financial Stability*, Washington, D.C.: World Bank, 309 - 333.

Settergren, O. (2001) 'The automatic balance mechanism of the Swedish pension system: a non-technical introduction', *Wirtschaftpolitische Blätter*, 48(4), 339-349.

Settergren, O. (2013) 'A decade of actuarial accounting for the NDC scheme in Sweden: Quantifying change in the financial position of a PAYG pension plan' in Holzmann, R., Palmer, E. and Robalino, D., eds., *Nonfinancial Defined*

Contribution Pension Schemes in a Changing Pension World, Volume 2: Gender, Politics, and Financial Stability, Washington D.C.: World Bank, 361 - 391.

Settergren, O. and Mikula, B. D. (2005) 'The rate of return of pay-as-you-go pension systems: a more exact consumption-loan model of interest', *Journal of Pension Economics and Finance*, 4(2), 115-138.

Swedish Social Insurance Agency (2007) *Orange Report: Annual Report of the Swedish Pension System 2007*, Stockholm: Swedish Social Insurance Agency.

————(2008) *Orange Report: Annual Report of the Swedish Pension System 2008*, Stockholm: Swedish Social Insurance Agency.

————(2009) *Orange Report: Annual Report of the Swedish Pension System 2009*, Stockholm: Swedish Social Insurance Agency.

————(2010) *Orange Report: Annual Report of the Swedish Pension System 2010*, Stockholm: Swedish Social Insurance Agency.

————(2011) *Orange Report: Annual Report of the Swedish Pension System 2011*, Stockholm: Swedish Social Insurance Agency.

————(2012) *Orange Report: Annual Report of the Swedish Pension System 2012*, Stockholm: Swedish Social Insurance Agency.

————(2013) *Orange Report: Annual Report of the Swedish Pension System 2013*, Stockholm: Swedish Social Insurance Agency.

————(2014) *Orange Report: Annual Report of the Swedish Pension System 2014*, Stockholm: Swedish Social Insurance Agency.

————(2015) *Orange Report: Annual Report of the Swedish Pension System 2015*, Stockholm: Swedish Social Insurance Agency.

Valdés-Prieto, S. (2000) 'The Financial Stability of Notional Account Pensions', *Scandinavian Journal of Economics*, 102(3), 395-417.

Vidal-Meliá, C. and Boado-Penas, M. d. C. (2013) 'Compiling the actuarial balance for pay-as-you-go pension systems. Is it better to use the hidden asset or the contribution asset?', *Applied Economics*, 45(10), 1303-1320.

Vidal-Meliá, C., Boado-Penas, M. d. C. and Settergren, O. (2010) 'Instruments for improving the equity, transparency and solvency of pay-as-you-go pension systems: NDCs, Abs and ABMs' in Micocci, M., Gregoriou, G. N. and Batista, M. G., eds., *Pension Fund Risk Management: Financial and Actuarial Modeling*Chapman & Hall/CRC Finance Series, 419-472.

Vidal-Meliá, C., Domínguez-Fabián, I. and Enrique Devesa-Carpio, J. (2006) 'Subjective Economic Risk to Beneficiaries in Notional Defined Contribution Accounts', *Journal of Risk and Insurance*, 73(3), 489-515.

Whitehouse, E. (2009) 'Pensions During the Crisis: Impact on Retirement Income Systems and Policy Responses', *The Geneva Papers on Risk and Insurance - Issues and Practice*, 34(4), 536-547.

Whitehouse, E., D'Addio, A., Chomik, R. and Reilly, A. (2009) 'Two Decades of Pension Reform: What has been Achieved and What Remains to be Done?', *The Geneva Papers on Risk and Insurance - Issues and Practice*, 34(4), 515-535.

Whitehouse, E. R. (2010) 'Decomposing notional defined-contribution pensions : experience of OECD countries' reforms', *OECD Social, Employment and Migration Working Papers*, No.109.

Williamson, J. B. (2004) 'Assessing the pension reform potential of a notional defined contribution pillar', *International Social Security Review*, 57(1), 47-64.

Yermo, J. (2008) 'Governance and investment of public pension reserve funds in selected OECD countries', *OECD Working Papers On Insurance And Private Pensions*.