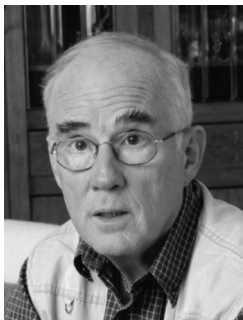# Replacement rates
in the new Swedish pension system

by KG Scherman[1]

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In this article the pensions that the new Swedish public pension system provides are studied. Replacement rates, relative pension levels and pension ages needed to obtain an adequate pension are discussed. The article argues that neither the replacement rates nor relative pension levels reach the targets formulated back in 1994.

Further, the expected development of the Swedish pension system according to official projections are compared with what could be expected using a formula for how a pure PAYG system functions. The conclusion is that NDC systems will face significant falls in pension levels as a consequence of deteriorating demographic conditions. This will occur either by openly reducing pensions by changed computation rules or by a more or less transparent balancing mechanism.

The author invites the Social Insurance Office to address the issues raised in this article.

Introduction

Sweden has implemented a new old-age pension system. Principles for the reform were decided in 1994, and the new system was successively implemented over 1999, when the main parts of the new law came into force, to 2003, when for the first time initial pensions were calculated with respect to this law. The reform, containing among other features a switch to a NDC scheme as part of the earnings related pension, has been widely recognised and stands at the centre of the international reform debate. In this article, we study the pensions that the new Swedish public pension system provides. Our focus is on replacement rates and relative pension levels. Based on public sources and articles by Swedish and international experts, we study the development over time of these indicators of pension adequacy and draw conclusions about the development of retirement ages necessary in order to obtain an adequate pension.

We find striking indications that neither the replacement rates nor relative pension levels reach the targets formulated back in 1994.

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Further, we study the mechanisms behind the development of the Swedish pension system over the period 2005 to 2050. We compare the expected development according to official projections with what could be expected using a formula for how a pure PAYG system functions. We find that the operation of the system over the whole period is dominated by the effects of far-reaching transitional rules. These rules cause a successive reduction in average pension levels which goes further than should follow from the so-called longevity effect alone, but also a significant increase of the effective contribution rate. From this discussion we draw the conclusion that NDC systems, based on the prerequisite of an unchanging contribution rate into the indefinite future, will result in significant falls in pension levels as a consequence of deteriorating demographic conditions. This will occur either by openly reducing pensions by changed computation rules or by the operation of a more or less transparent balancing mechanism.

A thorough reform in need of an in depth debate

The new pension system contains an earnings-related part and a minimum pension to those who have no or only a low earnings-related pension.

The *minimum pension* is financed by the state budget. The level of this pension was quite high when it was established in the 1990s, but it is indexed according to the cost of living, regardless of the development of wages.[2] In the long run, its relative value will diminish in the face of wage growth. It is the stated policy of the government that this should be allowed to happen.

The public *earnings-related pension* system is financed by contributions levied on earnings subject to a ceiling.[3] Contributions are also paid and pension rights are granted for periods when social security benefits are received and for certain other periods. The contribution rate is 17,21% and it is intended to be unchanged into the indefinite future. It is the contributions themselves that constitute pension rights. The contribution rate in relation to earnings less employees' contribution, which is 7%, becomes 18,5%. This is the rate used for establishing pension rights and it is the figure mostly used also when discussing contributions. It is split between a Premium Pension funded scheme (2.5 %) and a pay-as-you-go (PAYG) scheme (16%). The Premium Pension follows conventional private insurance principles. The PAYG scheme is completely rearranged compared to conventional PAYG schemes and is a notional defined contribution (NDC) scheme. The new rules for calculating initial pensions are gradually introduced over a 17 year period beginning in 2003.[4]

The PAYG scheme contains two important features which are intended to ensure its financial stability. The first is a special fund, the *buffer fund*. All contributions to the PAYG scheme are paid into this fund and all pensions are paid out of it. As a consequence, the buffer fund accumulates capital in certain periods, for example if large cohorts reach working age or if labour force participation increases. The surpluses generated during these periods are used to balance financial strains on the system in other periods. Such a strain will occur when the baby boom generation reaches pension age. At the outset of the new system, most of the pension fund that had been accumulated under the former ATP pension system was transferred to the buffer fund where it served as a sort of "start up capital". The second feature is an *automatic balancing mechanism* (ABM). Whatever happens, the ABM reduces current and future pensions by as much as is necessary in order to maintain the stability of the system's financing.

The automatic balancing mechanism involves a yearly calculation of a *balance number* which records the ratio of assets (measured as the value of contributions together with the assets in the buffer fund) to liabilities (valued as acquired pension rights and the value of pensions in payment). When the balance number falls below unity, the automatic balancing mechanism leads to a cut in pensions. For example, if the balance number *(balancing ratio)* is 0.99, then one percentage point is deducted from the index that would otherwise have been applied to pensions. After a year, a new calculation is made. If, in spite of the reductions made in the previous year, the balance number is again below unity, a reduction in the yearly revaluation is made in this year, too. This process continues as long as the successive yearly calculations of the balance number produce a result below unity.

For further details on the new pension system, see articles published in this periodical by Settergren (Issue 2/2003) and Scherman (Issue 4/2003).

Recently, much attention has been devoted in various international fora to establishing effective methods of making comparisons between pension systems. The result of one such effort can be found in the OECD publication *Pensions at a Glance*. Another is to be found in reports produced under the EU *Open Method of Coordination* (OMC) process. Since the OMC is an effort to influence policy making in Member States of the European Union, it has come under close scrutiny by governments and national politicians who, in making their reports, seek to avoid what they consider to be unfavourable comparisons. Hence, the need for nuanced and alternative indicators has come to the fore. The *Swedish National Strategy Report on Pensions*, submitted to EU June 2005, is an interesting example of how the method functions in practice. This report will be used to illustrate different aspects of the new pension system.

The concepts of the *replacement rate* (pension amount compared to an earnings measure for an individual) and the *relative pension level* (pensions for a group of pensioners compared to earnings for the same or another group of earners) are central to a study of the adequacy of pensions. Often, the way in which these concepts are applied indicates as much about the bias of those who make the calculations as about the pension system that is being measured. However, the concepts are important and they provide us with the basis to make evaluations of a scheme and to compare the way in which it performs with the objectives set by those who initially established it. Hence, the objectives formulated in 1994 are the starting point for our analysis.

Stated objectives

In the principles for the Swedish pension reform formulated back in 1994, pension levels and replacement rates were addressed. (Government bill 1993/94:250, pages 50 and 62-63)

The discussion was introduced by clearly stating that *there are no reasons why the pension levels in general should need to be reduced,* and continued by stating that *pensions from the reformed system shall, at today's life expectancy and generally speaking be approximately on the same level as in today's system.*

Further on this statement was qualified in the following way:

The public pension system shall give a pension at approximately the same replacement rate (old-age pension as percentage of final salary) as in today's system, i.e. somewhere between 55% and 65%, for a person who works to a normal extent, provided 2 % real growth in the national economy and under certain other conditions.

Moreover, it was clearly stated that the level of contributions was calculated and estab-

lished so as to make the above-cited replacement rates possible. The ambitions on the part of the politicians responsible for the reform can be traced to these formulations. Individual replacement rates should be at the target levels for those who work "to a normal extent". Unfortunately, the concept of "a normal extent" was not defined. From the wording of the bill, it is reasonable to assume that such a person at a life expectancy such as prevailed in 1994, was expected to work for 40 years with annual earnings equal to average wages.

It is instructive to find out how such a "normal person" will fare in the new system. We do this by studying the replacement rates that persons who work for 40 years or more can obtain, and we also discuss other career patterns. This makes it possible to discuss the concept of "work to a normal extent" and to highlight other aspects of the performance of the system.

In the following, we discuss data drawn from different sources. These different sources use slightly different assumptions about wage increases and real returns on investments of funds, but the differences do not significantly affect the analyses of the development, over time, of replacement rates, average pension levels and retirement ages.

Replacement rates

As it has been mentioned, the new public Swedish earnings related system consists of two parts, a NDC PAYG scheme with significant new rules, and a funded component, often called "individual accounts". Here we use a translation of the Swedish term, Premium Pension scheme (PPS). Both parts are defined contribution, and consequently, a person's whole working career is the basis for the earnings related pension. The former ATP system granted a full pension for a person who had worked 30 years, and the pension amount was based on the 15 years with the highest earnings. The change to the new pension system from the former ATP system is gradually introduced. Hence, the reduction in relative pension levels and replacement rates following from the new system emerges only gradually, as is described in note 4 and will be further discussed in the following, including notes 15 and 16.

In 2005 the Ministry of Health and Social Affaires produced calculations on the development of replacement rates, defined as the ratio of the initial pension to the last year's earnings. This work was published in the National Strategy Report on Pensions produced in the framework of the Open Method of Coordination, mentioned above.

Table 1 shows data from this Report which illustrates reductions in replacement rates between 2005 and 2050 for different career patterns.[5] Replacement rates for retirement in 2005 refer to initial pensions in that year which result from the combined effect of the new system and the ATP pension system

Table 1: Gross replacement rates from the public schemes (PAYG pension and Premium Pension combined) for persons retiring at age 65

Case	Retirement 2005	year 2050
2/3 of average earnings during 40 years	62.5%	40.4%
Broken career (30 years of seniority at retirement at average earnings)	49.6%	30.3%
"Model case" - Constant earnings for 40 years as an average production worker	53.0%	40.4%

Source: National Strategy Report on Pensions, Ministry of Health and Social Affaires, July 2005, pages 41-42

under the transitional arrangements. Replacement rates for retirement in 2050 illustrate pensions stemming solely from the new system.

In the case of an individual with 2/3 of average earnings over 40 years, there is a drop in the replacement rate from 62.5% in 2005 to 40.4% in 2050. A part of this fall is due to the phasing out of the minimum pension in the new system.

In the case of an individual with a 30 years working career, the replacement rate drops from 49.6 down to 30.3%. This is the result of the lifetime earnings perspective applied in the new scheme, as opposed to best 15 of 30 years applied under the ATP system. This case shows that the concept of "work to a normal extent" has a significant impact on replacement rates. The greater the difference between people's actual working career and 40 years, the greater the reduction in replacement rates and average pension levels in the new system.

The "model case" closely follows the case in the formulation of objectives for the 1994 reform. Between 2005 and 2050, the Minis-

try's calculations show the replacement rate for a "model worker" falling by around 13 percentage points. We analyze this particular case further in the following. We begin with a description of the influence of life expectancy on pension levels, as has been provided by the National Social Insurance Office (NSIO), formerly the National Social Insurance Board.

Work more and until a higher age

The NSIO is charged with evaluating and publishing information about the social effects and financing of the pension system. In its *Annual Reports*, it reports on its findings. Amongst other things, these reports have shown the effect of demographic change and of changing ages of retirement. Table 2 shows what the NSIO thinks these are.[6]

The NSIO has not published details of the calculations behind Table 2. A reasonable interpretation of Table 2 is the following:

• For retirement at age 65, those born in 1985 are expected to spend 21 years and 8 months in retirement compared to 18 years and 6 months for persons born in 1940. Persons

Table 2: Combined effect of demography and age of retirement

Average Life Expectancy and Retirement Age

Cohort born in	reaches 65 in	Forecast annutization divisor at 65	Effect of change in life expectancy on pension at 65	Retirement age to neutralize effect of life expectancy on pension	Remaining life expectancy at 65, women and men
1940	2005	15.7	–	65 years	18 years, 6 month
1945	2010	16.1	-2 %	+ 4 months	+ 6 months
1950	2015	16.4	-4 %	+ 8 months	+ 12 months
1955	2020	16.8	-6 %	+ 11 months	+ 17 months
1960	2025	17.0	-8 %	+ 14 months	+ 21 months
1965	2030	17.3	-9 %	+ 17 months	+ 25 months
1970	2035	17.5	-10 %	+ 19 months	+ 29 months
1975	2040	17.7	-12 %	+ 22 months	+ 33 months
1980	2045	17.9	-12 %	+ 24 months	+ 36 months
1985	2050	18.1	-13 %	+ 25 months	+ 38 months
1990	2055	18.1	-13 %	+ 26 months	+ 40 months

Source: NSIO 2003 Annual Report, page 46. A similar table is in the 2004 Annual Report, page 45.

born in 1985 will have pensions that are 13% lower than the pensions of those born in 1940.

- In order for persons born in 1985 to draw pensions at the same level as those born in 1940, they will have to work for an additional 25 months, with a remuneration at the same average level as before age 65**.** They will then spend 19 years and 7 months in retirement, so that their total time in retirement will increase by 13 months – i.e. of their increase in life expectancy of 38 months, 25 months will be accounted for by work and 13 by retirement.

This only addresses the issue about how much longer people must work in order to offset the effect of longer life expectancies compared to the 1940 birth year cohort and only as it follows from the rules in the new system. Questions remain about the starting point, the adequacy of the pension for a person born in 1940, and other mechanisms that may operate in the future besides increasing life expectancy. These questions can be addressed using the cases presented in table 1.

First, in the "model case", a person born in 1940 with 40 years of average earnings and retiring in 2005 at age 65 have a replacement rate of 53%. This is slightly below the lower level of the 55-65% range that was set out in the objectives formulated in 1994.

Second, according to the Ministry's calculations in the National Strategy Report (page 42), people born in 1985, who worked around two extra years with earnings equal to those of an average worker and retired at age 67 would increase their replacement rate from the 40.4%, that could be reached at 65, to around 46%. The two extra years would be what is needed in order to compensate for the longevity effect according to Table 2. But, this is not enough for an adequate pension. To reach the 53% replacement rate for persons retiring in 2005, around 7% must be regained. The National Strategy Report (page 16) shows that yet

another two years of work is needed to reach that level. In other words, a retirement age of 69 is necessary for people born in 1985 even if they had no interruption to their careers. Even then, they will not have achieved the 55% target. Clearly, the increase in retirement age needed for an adequate pension has gone beyond the 1994 intentions.

Some further insights can be gained from the OECD publication *Pensions at a Glance,* where pension systems in OECD member states are studied.[7] In the base scenario, a Swede starting work at age 20 in 2005, working for 45 years, and retiring at 65 in 2050 would have a gross replacement rate of 49.8% from the PAYG and Premium Pension schemes combined. In this case, even after 45 years of work, the replacement rate is under 50%. The OECD calculations illustrate that it is not enough to work a certain number of additional years. The additional years must be combined with a later retirement in order to have a sufficiently low annuity factor (divisor) to generate an appropriate pension.[8]

This analysis of replacement rates leads to an analysis of the pension system and how it functions.

Relative pension levels

The NSIO Annual Reports also look at relative pension levels. In those calculations the relative pension level is defined as the average initial pension granted in a given year as a proportion of the average wage in the same year. It is only earnings below the ceiling for pension carrying earnings that are taken into account. The population for which the calculation is made consists of all persons who have reported pensionable earnings for 30 years or more. Average wages are calculated over the whole range of possible working years, from 16 to 64. Obviously, this produces relatively low earnings levels in the denominator of the ratio.

According to the 2004 Annual Report (page 45), the base scenario replacement rates at age 65 are 68% for the 1940 birth year cohort and 51% for the 1990 cohort.[9] Of the 17 percentage points reduction in the replacement rate, seven are attributed to expected increased longevity. The balance of the decrease, 10 percentage points (15% of the 2005 replacement rate) is primarily due to the application of lifetime earnings in the pension calculation. The Annual Report states:

"The remaining decrease is partly due to the fact that the calculations are for persons with 30 or more years of work in Sweden. Compared to the new system, the ATP system is particularly generous toward persons who have worked only 30 years."

The explanation offered in the Annual Report indicates that the additional reduction above the longevity effect is the effect of the gradual phasing out of the former ATP system over the 17 years transition period.

The calculations reported by the NSIO can be compared to those of other commentators. Flood (2004) provides estimates based on a simulation model called SESIM.[10] He gives a comprehensive account of the development of a range of factors for assessing the situation for pensioners with different earning histories and different career patterns.[11] He considers a twenty year period, from 2005 to 2035. For a sample of individuals with earnings histories that generally place them above the level where additional benefits under the rules for minimum pension can be obtained but below the ceiling for earnings that are taken into account for pension purposes,[12] he finds replacement rates fall by some 19% compared to their 2005 level. Applying the techniques used by NSIO, it would seem as if the longevity effect accounts for six percentage point of the fall. Hence, the remaining 13 percentage points must be due to effects other than longevity.

A comparison between the findings of NSIO and those of Flood offers insights to important features of the pension reform. The additional reductions over and above the longevity effect, calculated by Flood and the NSIO (13% and 15% respectively) are similar in spite of the fact that Flood studied a 20 year period and the NSIO a 50 year period. Both sets of calculation indicate that a reduction that is greater than the longevity effect occurs over the coming twenty years as the ATP system is gradually phased out.

This helps us to understand what will happen. The transfer from the ATP to the new system is not without effect, and the assertion that *pension levels in general should not be reduced* does not hold. If the statement "people who work to a normal extent" is interpreted to mean "people who work for 40 years", this does not match the usual interpretation of "normal". Moreover, the assumption that "work to a normal extent" means "work for 40 years with earnings that develop as average earnings" is based not on reality but on political ambition.

What does a basic PAYG equation tell us?

Cichon (2005) studies the development of a PAYG system under steady state conditions using the latest UN medium demographic projections for Sweden. He analyzes the NDC model, as introduced in Sweden, using a practical example, a stylised case called Demoland. Starting with the balance equation for a pure PAYG pension scheme:

$$Ap = Cr * Aw / Dr$$

where

Ap = average pension

Cr = contribution rate

Aw = average wage

Dr = dependency ratio = number of pensioners/number of active workers.

Cichon finds (page 181) that, under certain assumptions about employment and at a con-

tribution rate of 16%, the average replacement level (i.e. average pension compared to average wage) will be 48.5% in 2005 and 28% in 2050. This is a reduction of 20.5 percentage points or 42% of the replacement rate in 2005. After deducting the effect of the automatic adjustment for longevity, estimated as about five percentage points, the conclusion becomes that a yearly balancing ratio of 0.99 is necessary over the whole 45 year period.

Turning to the actual Swedish case, including current official projections for its development over time, we observe that a substantial reduction in pensions from the two earnings-related systems combined occurs between 2005 and 2050. But the reduction is not as large as in Demoland, and it is brought about without the automatic balancing mechanism being activated. The reason for the difference between the Swedish case and the projections for Demoland is that the latter are based upon a stylised model that assumes the system is in a steady state during the period studied. This is not the case with respect to Sweden. In addition, in Sweden there is a buffer fund, whereas in Demoland there is not.

The differences between Demoland and Sweden are of interest in understanding the Swedish reform and in understanding NDC systems in general. Analysis of some essential features of a comparison between Demoland and the actual Swedish situation will show this. In order to establish a basis for the comparison we investigate the Swedish development by discussing the combined Swedish system, i.e. the old ATP scheme, the new PAYG NDC scheme and the Premium Pension scheme, as one unified fictitious PAYG system and trace the influences back to the sub-schemes.[13] In the following two paragraphs, beginning *"First"* and *"Second"* we can see how such a fictitious scheme fares over the period 2005 to 2050. Thereafter we discuss the situation as it becomes beyond this period.

First, we can see that the contribution to the Premium Pension scheme, from the point of view of the total replacement rate, effectively functions as an increase in contributions to the earnings related public pension. In 2005, the contribution from the Premium Pension scheme to an individual's pension is negligible. In 2050 the Premium Pension scheme contributes to "a full pension" with 2.5 percentage points out of a total contribution of 18.5%. This is equivalent to an increase of contributions of 2.5 percentage points to our fictitious PAYG scheme.[14]

Second, both the NSIO and Flood come to a reduction of around 14% of the 2005 replacement rate for initial pensions from the overall earnings related public pension (15% and 13% respectively) over and above the longevity effect. This reduction will already have reached its full effect around 2025. Both the NSIO and Flood make their calculations for subgroups that have a relatively high participation in the labour force. Hence, this reduction in the over all average is higher than 14%. Assume it is 15% of the 2005 replacement rate. The longevity effect for the period 2005 to 2050 is estimated to be 6-7 percentage points, which is equivalent to about 10% of the 2005 replacement rate. Together, these reductions are approximately 25% of the 2005 replacement rate. This reduction applies to pensions from the entire public system, including the former ATP and new NDC schemes and the funded Premium Pension scheme. In various years they affect the sub-schemes differently, but the overall impact is substantial.[15]

The conclusion of this discussion becomes that transitional developments occur, that their effects are far reaching and that these effects dominate the system over the years until 2050. Beyond 2050 the situation becomes different. Once the premium Pension scheme has matured the effect under *"First"* above vanishes. Without this effect we will have to find some

additional reduction of pensions, that goes beyond the reduction described in the paragraph under *"Second"* above, as the development described in that paragraph takes place in spite of the fact that our fictitious scheme faces an increase in the contribution rate. This additional reduction of pensions in our fictitious scheme can be described by what is happening in the actual PAYG system under the Swedish reform. This is a PAYG system with a constant contribution rate. By studying this system we can learn what will be the development of pensions in such a system under the demographic development projected for Sweden for the period 2005 to 2050, hence, what should have been the development, had the transitional processes not been in place.

Central to understanding of the development in the actual Swedish PAYG system is to observe that the contribution rate is established in order ultimately to provide 86% of a full pension in a steady state situation, not 100% which is what it provides at the beginning of the period studied. We refer to this as a *contraction effect*. The remaining 14% is meant to come from the funded Premium Pension scheme, described above for our fictitious system as following from an increase of the contribution rate. Hence the introduction of the Premium Pension scheme "allows" pensions in the PAYG system to be reduced accordingly, without reducing individual pensions. In practice, this reduction in pensions from the PAYG system is brought about through a combination of the transitional arrangements that phase out the former ATP system over a period of 17 years, and the shifting of responsibilities between the new NDC scheme and the Premium Pension scheme.[16] But once the Premium Pension scheme has come into full effect it can not help to allow the PAYG pension further to decrease without affecting the over all replacement rate. Put in other words: Once the Pre-

mium Pension scheme has matured the reductions described under *"Second"* and *the contraction effect* described here hit the over all replacement rate with full effect, should a further deterioration of the demographic situation occur and should the buffer fund not be big enough to offset the strain. And then, there are no other mechanisms but the reduction for longevity, and the automatic balancing mechanism left. This is Cichon's stylised case, this is Demoland.

In summary, in the actual Swedish earnings related system, considering the whole new system as one fictitious PAYG scheme, according to official projections what will happen is:

1. An automatic increase in retirement age (or decrease in pensions) follows from an increase in longevity.

2. Average pensions gradually decrease as the former ATP scheme (which applies the 15/30 rule for calculating pensions) is phased out over 17 years and replaced by the new scheme (which bases pensions on lifetime earnings).

3. Contributions are significantly increased, from 16% today to 18.5% in 2050.

4. Resources from the buffer fund are to be used to ease the strain from the baby boom cohort. A fairly high level of net immigration is assumed which further eases this strain.

From this discussion it follows that the only reason why Sweden could avoid using automatic balancing mechanism is because different measures to counter a deteriorating demographic situation are implemented. Steps 1 to 3 above are developments that also Cichon identifies in his article amongst possible alternatives to relying solely on the automatic balancing mechanism for upholding financial sustainability. The buffer fund eases the financial strain, but, as a matter of fact only to a limited extent. Sweden will face problems of

the kind and magnitude described in Cichon's stylized case as soon as the developments under 2 and 3 have come into full effect. These are transitional developments that temporarily ease the financial strain on the system. Once the scheme is fully implemented they cannot help to avoid the effect of subsequent further deterioration in the demographic situation.

Finally it is important to point out that in spite of the reductions in pensions that will be brought about due to the transitional rules and the increase in contributions over the transition period, it is most probable that the automatic balancing mechanism will be activated in the near future. As a matter of fact, the balance number has recently approached unity. In 2005 it was only an exceptional development of stock market values that boosted the buffer fund's assets and thereby prevented the balance number from falling below unity.

Even if the automatic balancing mechanism is activated during the transition period its effect will not be as far reaching as would have been the case without the transitional rules. But those effects will be in addition to all the other reductions. In 2004 the NSIO calculated the risk that the automatic balancing mechanism would be activated. From these calculations and further analysis in Scherman (2004) it follows that under a "pessimistic" scenario the effects might be serious indeed. This further highlights the kind of risks that are transferred to the individual by the NDC formula.[17]

Conclusions

The objective of this article has been to trace general tendencies in the development of pensions in the new Swedish pension system. As we have seen from available sources, for a person with a 40 years work career and average earnings, replacement rates and average pension levels decline over the period 2005 to 2050. The reduction is greater than results from the longevity effect alone. This outcome falls short of expectations and is lower than should have occurred based on the objectives formulated in 1994. The situation merits further investigation, and ultimately political action.

An in depth analyses of the Swedish case requires comprehensive actuarial calculations. The calculations that were the basis for the 1994 decisions must be reviewed in the light of demographic developments, and also with respect to changes in the rules since the establishment in 1994 of the principles for the reform — including the formulation of targets for replacement rates and relative pension levels. It is hoped that the Social Insurance Office will address the issues raised in this article. The present evidence suggests the following:

- The expectation that 40 years work on average earnings and an 18.5% contribution rate would produce the target replacement rate will not be fulfilled. Instead, 42 years or more of work were required already under the demographic conditions prevailing when the reform was adopted.

- The assumption that it is "normal" for a person to work 40 years at earnings that grow annually at the national average rate is unrealistic; and even more so when it comes to working 42 or 44 years.

- The belief that a NDC scheme would automatically be in approximate balance provided certain rules that were formulated in 1994 are followed is wrong. The automatic balancing mechanism, which was originally introduced as an "emergency brake" for exceptional situations, will be activated more frequently than expected.

Without far-reaching countermeasures, demographic developments and a constant contribution rate will cause the automatic balancing mechanism to be activated and reduce pensions significantly. That this could be avoided

in Sweden in the next few decades depends on pensions being reduced for other reasons, and since the contribution rate is effectively increased from 16% to 18.5%. However, at some point, when the benign effect on the pension system's finances of the special factors which operate during the transition period no longer apply, the automatic balancing mechanism will start to take effect. At this point, the strain of an aging population and an unchanged contribution rate will fall on the level of pensions and cause the replacement rate to fall further. Even during the transition period, with its reductions under the transitional rules, the automatic adjustment mechanism is likely to be activated, although not with the far reaching effects that would have been the case without the transitional rules.

It is important to realise that the results described in this article will apply to every pension scheme with a constant contribution rate and unchanged rules for calculating pensions. In NDC schemes indexed to the sum of wages this effect is not obvious, but this is only because such systems lack the transparency in the Swedish scheme with its combination of indexation to average wages and the automatic balancing mechanism. Decreasing replacement rates result not primarily from the balancing mechanism, but rather from the intention to keep the contribution rate unchanged whatever happens. This observation is of the utmost importance for Sweden and for countries that have introduced or consider introducing a NDC scheme. The Swedish example shows that a sincere desire to offer adequate pensions even when demographic conditions deteriorate requires the possibility of increases in the contribution rate as well as in the retirement age, and these elements should be indispensable components of any reform package. This is true today and it will be the case in the future.

Notes

[1] The author is indebted to Bernard Casey, Michael Cichon, Lennart Flood, Jan Hagberg, Warren McGillivray and Ellis Wohlner for valuable comments on a draft to this article. Any remaining factual errors or errors of judgement are the sole responsibility of the author.

[2] The *minimum pension* is a benefit compensating for the difference between a *guarantee level* and the actual earnings-related pension. For a single person without any earnings-related pension the minimum pension was 84 000 SEK in 2004 when average wages were around 270 000 SEK. The guarantee level is indexed to prices.

[3] The *ceiling for pension carrying earnings,* i.e. earnings which are subject to contributions and give rise to pension rights was 341 000 SEK in 2004. The ceiling is indexed to wages.

[4] The new pension system will be introduced successively over a 17 year-period for persons born from 1938 up to 1954. For those born in 1938, the pension will be the sum of 4/20 of what the rules in the new system should give and of 16/20 of what the rules in the old system should give. For a person born in 1939 the factor will be 5/20 in the new system and 15/20 in the old system. Persons born before 1938 will remain in the old system and persons born in 1954 and later will be entirely in the new system. A consequence of the transitional rules is that the financial behaviour of the pension system will be dominated by the rules governing the old system for a long time.

[5] The estimation on return on investments in these calculations is 3% and an increase in average wages of 1.8% is assumed. At a real rate of return of 2% around one percentage point should be deducted from all the figures in 2050.

[6] The effect presented in Table 2 refers to the PAYG part of the earnings related pension. But it is presented in Annual Reports as describing the performance of the two schemes, the PAYG scheme and the Premium Pension combined. Presumably, this follows from recognition that the PAYG and the funded systems function in

the same way when it comes to adaptation to increases in life expectancy.

[7] The base line case in the OECD calculations has the following characteristics

- Begin work at 20 years of age and work until normal pension age, in the Swedish case assumed to be 65 years.
- Real earnings growth 2%.
- Real rate of return on investments of pension funds 3.5%.
- Earnings equal to those of an average earner.
- Demographic development as 2002 UN demographic projections for the year 2040.

Based on these characteristics a replacement rate, the ratio of the initial pension to the last years salary is calculated. For a Swede working for 45 years under the new pension system a gross replacement rate of 64.8% is the result. This includes occupational pensions. For the occupational scheme used in this calculation a gross replacement rate of 15 percentage points is often assumed. Hence, public pension becomes 49.8%.

Differences in assumptions of rate of return and mortality tables between the OECD calculation and the NSIO calculations in Table 2 are negligible when it comes to interpreting the result in terms of working years needed for a certain pension.

[8] Both the new PAYG scheme and the Premium Pension scheme are defined contribution schemes. Following conventional computation rules, the initial pension is calculated by multiplying accumulated pension assets at the time of retirement by an annuity factor that reflects the remaining life expectancy of the retiree. In the Swedish case an imputed rate of return of 1.6%, called *the norm*, is included in the calculation of the initial pension in the PAYG scheme. The yearly revaluation of pensions in payment is based on increases in wages less the norm. The resulting index is called the *adjustment index*. The norm is established by law and is not intended to be changed in the future. In the Premium Pension scheme the corresponding imputed rate of return today is 2.7%. This factor is determined by the authority in charge of this scheme.

[9] In the base scenario 2% growth in average real wages and a 3.25% rate of return on pension fund investments are assumed.

[10] For a description of SESIM see Flood et. al. (2003).

[11] In Flood's calculations the base assumptions about the economy are a growth in real wages of 2% and a real rate of return on investments of 3%. For a subgroup that has worked all five years between 60 and 64 and draws a pension at 65 a replacement rate is calculated. The replacement rate is defined to be the ratio of average pensions for ages 65 to 69 to average wages for ages 60 to 64, with all figures revalued to the 1999 price level.

The table below is based on data for the subsample of persons on earnings above the lowest quartile and below the highest quartile of average wages between ages 60 and 64. Individuals in this sub-sample can reasonably be assumed to have earned pension rights that put most of them in earnings brackets above the level where minimum pensions are paid (see note 2), and below the ceiling for pension carrying earnings (see note 3).

Subsample replacement level

Birth cohort	Replacement rate 65-69
1940	54%
1950	46%
1960	44%

For the 1940 birth year cohort in the subsample above Flood finds a replacement level of 54% while the NSIO figure is 68%. There are a number of factors why the levels cannot be expected to be the same:

- The NSIO calculations are made spreading life time earnings over 49 years, between 16 years of age and 64 years. If the same calculation is made with the lifetime earnings instead spread over a 40 years work career, the replacement levels will be reduced significantly. For birth year cohort 1940 it drops to 56%, for birth year cohort 1985 to 42%. Such a recalculation brings the NSIO calculations closer to what seems generally be applied in calculations of this kind.

- The NSIO population includes all persons who have worked at least 30 years while Flood's population has worked all years between 60-64 years of age. Flood's population contains persons who have a more comprehensive work career that the one studied by NSIO.

- Flood uses as denominator average wages at ages 60-64. This way of calculating the average differs from the NSIO approach.

- Flood uses the average pension during the five years after 65. Those years contain five years of the adjustment index (see note 8) that reduces the average pension by some 4%, as compared to the development of wages.

What is of interest in the discussion here is the development over time of replacement rates, not the absolute level of them. It seems reasonable enough to assume that the methods used do not lead to significant differences in the development over time, even if a closer look at the absolute levels leaves some or even large differences behind.

For further information about the relationship between the NSIO calculations and Flood's see Flood et. al. (2006).

[12] About *minimum pension* see note 2, about the *ceiling for pension carrying earnings* see note 3.

[13] In this discussion no recalculation is done to meet differences between how pensions are established under the PAYG scheme and the funded scheme. Instead it is assumed that pensions from the funded scheme, once it has matured, are of the same magnitude compared to contributions as they are in the PAYG scheme. Nor is any recalculations made to meet differences between the corresponding assumptions applied by the different sources. The reason why is that the differences are so small that they do not influence to any significant extent the discussion here.

[14] As can be seen in the 2004 Annual Report, page 41, in a base scenario pension expenditure at the beginning of the period studied on a yearly basis is close to income in *the actual PAYG system* at a contribution rate of 16% (a surplus

of 7% can be identified from the diagram). The same goes for the end of the period in 2050 where there is approximately the same surplus (8%). The figures for the optimistic scenario are close to those in the base scenario. This follows since the same assumptions about demography are applied in these scenarios (pages 40-44). These demographic assumptions are also close to those used by Cichon. Hence for our *fictitious combined PAYG system* and in order to compare it to Cichon's Demoland, the financing of an additional pension stemming from the funded scheme is equivalent to an additional contribution. This conclusion is not contradicted by the fact that the figures in the pessimistic scenario are different. In this scenario the demographic assumptions differ significantly from Cichon's.

[15] While it is beyond the scope of this paper to calculate the combined effect on average pensions each year in the future, a general look at the development of each sub-scheme is of interest.

The gradual introduction of the new system means that there is a continuous change of rules for computation of pensions. The effects of the transition arrangements continue until 2050. By then the transitional process has effectively come to an end. The situation is as follows.

There are two financing systems with three sub-schemes. These are

A. The PAYG system, financed by a contribution of 16% of covered earnings and containing
   a. The old PAYG scheme — PAYG1
   b. The new PAYG scheme — PAYG2

B. The Premium Pension funded scheme, financed by a contribution of 2.5% of covered earnings — PPS scheme.

The way in which the contributions and contribution rates affect the level of pension of an individual differs among the three schemes, and also changes significantly over time. There are two reasons for this:

1. First, for persons borne between 1938 and 1953, the pension is calculated using part of what would have been the result of a continuation of the PAYG1 scheme, where there is no

explicit link between contributions and benefits, and part of what would have been the result of applying only the new system, i.e. the PAYG2 scheme and the PPS scheme, where benefits are both entirely based on contributions.

2. Second, in the new system the relative size of the pension from PAYG2 and PPS evolves over time.

Factor number one above affects the initial pension if drawn at 65 until the year 2018. Thereafter, it continues to affect the average pension as long as people from the birth year cohort 1954 are still alive. Hence, even in the 2030s it will have an impact. Factor number two does not affect the total replacement rate as long as the assumptions in note 13 are met. This factor will be discussed further in note 16.

[16] Factor 1 in note 15 deals with transitional provisions which influence the two earnings related systems, i.e. the PAYG and the funded systems, combined. Factor 2 stems from the fact that the relative size of the pension from PAYG2 and PPS respectively evolves over time; the share coming from the PAYG2 scheme will diminish, while the share from the PPS scheme will increase. In the PAYG2 scheme call this effect the "contraction effect". The development is as follows.

For earnings before 1995 the rate used for establishing *pension rights in the PAYG2* scheme is 18.5% while from 1995 until 1998 it is 16.5%, and thereafter it is 16%. Hence, for benefit calculations there is a substantial reduction in the rate at which pension rights are established in the PAYG2 scheme. For a person who has earned pension rights from age 21 and draws his/her initial pension at age 65, this transitional rule will have an effect in all years until 2038. The effect on the initial pension in 2038 will be very small, but for persons above age 65 in that year it will have had a more significant effect. Hence, even then it has a noticeable effect on average pensions. The effect of this development is a gradual decrease in the effective rate for calculating pension rights in the PAYG2 scheme, from 18.5% down to 16%. This is the contraction effect, and it amounts to 14% of what the

pension from the PAYG scheme would have been if calculated at the higher contribution.

Pension rights began to be accumulated in the PPS in 1995. Only in 40 to 45 years will the initial pension from the PPS reach its "full" value. Hence, for the same person as in the preceding paragraph (who has earned pension rights since age 21), it is also around 2038 when a "full" pension from the PPS scheme will be payable. This is equivalent to the PPS scheme "taking over" from the diminishing role of PAYG2 scheme for maintaining replacement rates.

[17] The NSIO has estimated the risk of activation of the automatic balancing mechanism. The table below shows the assumptions of the NSIO base and pessimistic scenarios.

Table: Assumptions applied to estimated performance of the PAYG scheme until 2079

Base scenario		
Factor	**2004-2010**	**2011-2079**
Fertility (children/woman)	1.80	1.86
Increase in life expectancy at age 65 (days/year)	36	23
Labour force (16-64) participation rate	77%	77%
Net immigration	31 000	24 000
Annual rate of growth in average real wages	2.0%	2.0%
Annual return on investments	3.25%	3.25%
Pessimistic scenario		
Factor	**2004-2010**	**2011-2079**
Fertility (children/woman)	1.53	1.50
Increase in life expectancy at age 65 (days/year)	36	23
Labour force (16-64) participation rate	77%	77%
Net immigration	22 000	12 000
Annual rate of growth in average real wages	1.8%	1.0%
Annual return on investments	1.00%	1.00%

Source: NSIO 2003 Annual Report, page 44.

The consequences of the pessimistic scenario have been analysed in Scherman (2004, pages 30-32). The consequences for replacement rates are:

- For a person born in 1990 the initial PAYG pension is 8.6% lower than it would have been had the balancing mechanism not been activated. The revaluation of the pension after retirement is reduced by 0.5% annually.

- For a person born in 1954 the initial PAYG pension is 3% lower than it would have been had the balancing mechanism not been activated. The revaluation of the pension after retirement is reduced by 0.5% annually.

The current value at the time of retirement of the reduction in the yearly revaluation of pensions in payment can, according to Scherman (2004), be estimated as ten times that reduction. Hence, the total reduction of the value of the PAYG pension for a person born in 1990 is 13.6% (8.6 + (10*0.5)) and for a person born in 1995 it is 8%.

The reductions under this pessimistic scenario can be applied to the "model case" in the Ministry's calculations in the National Strategy Report. The PAYG pension for the birth year cohort 1985 would be reduced by around 13%. To compensate for this effect, around two years more employment are needed, and the retirement age becomes 71 years.

This is indeed a problematic scenario for the pension system's finances. It highlights the risks that are transferred to individuals by the NDC formula and contributes to understanding this new type of pension scheme.

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The *Scandinavian Insurance Quarterly* has embarked on a series of articles aiming at improving knowledge of the Swedish pension reform by publishing articles written by Swedish and international experts. The articles mentioned are published in this series. Other articles in the series are written by Hagberg and Wohlner (4/2002), Könberg (1/2004), Casey (2/2004), Barr (3/2004), Lezner and Tipperman (4/2004), and McGillivray (3/2005).

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