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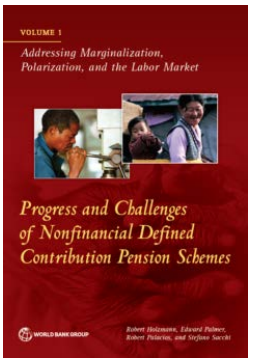

The Swedish NDC Scheme: Success on Track with Room for Reflection

Edward Palmer and Bo Könberg

Introduction

In a series of steps beginning in the summer of 1992, Sweden transformed its three-pillar, universal defined benefit (DB) pension scheme into a three-pillar defined contribution (DC) scheme, with a DB minimum income guarantee at its foundation. The original reform proposal (Departementsserien 1992:89) was translated into English in 2017 ("A Reformed Pension System—Background, Principles, and Sketch"; see Swedish Ministry of Health and Social Affairs 2017).

A nonfinancial defined contribution (NDC) scheme is the centerpiece of Sweden's two plus zero-pillar universal public old-age pension commitment. Since 1999, the public component of the overall pension system has consisted of a tax-financed guarantee minimum pension as the zero pillar, an NDC[1] first pillar, and a financial defined contribution (FDC) second pillar. The guarantee minimum pension together with a means-tested housing supplement provide a basic income guarantee in old age for persons whose combined NDC and FDC pensions are too low to live on. The guarantee is means tested vis-à-vis the public NDC and FDC schemes. It is a fixed amount up to a ceiling and then gradually tapers off as the size of the overall pension benefit earned through the combined NDC and FDC components increases.

The public schemes are universal, which means that everyone in the workforce—employees, regardless of occupation or sector of employment, and the self-employed including farmers—is mandated to pay contributions into both public NDC and FDC schemes, the two first pillars of Sweden's overall pension system.[2] Contributions are paid on earnings throughout the working life without an age limit. In both schemes, individuals' contributions constitute their own account values, which are annuitized at retirement. In the FDC component of the public pension schemes, contributions are paid directly into FDC individual accounts for investment in financial market investment funds; in the NDC scheme they are noted on individual accounts and are the revenues that finance the pensions of current pensioners.

The one-to-one DC link between individual contributions and individual benefits creates fairness—in the sense that participants get what they pay for, with "interest." The DC construct is economically efficient because the contribution is not perceived as a tax—it is a contribution to one's own future pension. The use of life expectancy in computing

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the benefit is economically efficient at the micro level because it creates incentives to work and pay contributions and at the end of the working career for younger generations to postpone retirement as life expectancy increases. It also contributes to efficiency at the macro level because the aggregate of all individual labor supply responses creates gross domestic product (GDP) growth.

The NDC revenues finance payment of benefits of current pensioners, while the contributions constitute individual "savings" noted on individual accounts (with "interest" through indexation). Individuals' contributions to NDC are individual contributions to longevity insurance. That becomes evident at retirement when individuals' account balances, divided by their life expectancy at retirement, create the flow of income to them for the rest of their lives. The money itself is transferred to the individual's birth cohort's aggregate sum of all individual account balances at retirement. This sum of money is intended to cover the payments to all individuals in the birth cohort throughout their remaining lives. This means that the remaining balance on the accounts of those who die earlier than the average retirement age finances the benefits of those who live longer than average.

Finally, note that the NDC framework ensures financial balance in the nonfinancial pension world. It does this through its basic construction, through indexation of accounts of workers and benefits based on the rate of growth of wages and the labor force. In Sweden, financial balance is ensured through a solvency ratio, wherein liabilities are adjusted for an estimated future solvency outcome of less than zero.

The final component of the overall pension landscape creates a complete picture of Sweden's pension system. In addition to the public NDC and FDC schemes, more than 90 percent of employees (80 percent of all workers) in Sweden have a quasi-mandatory[3] occupational (predominantly) FDC supplement that enhances the public NDC and FDC schemes under the ceiling on income for the public schemes, while the worker's occupational pension constitutes the entire pension for the portion of earnings above the ceiling for the public NDC and FDC schemes. Individuals can top up this three-pillar scheme with individual private insurance. Although earlier premiums paid up to a ceiling were tax deductible in the year in which they were paid and taxed when paid out, the tax deduction was recently abolished.

No redistribution occurs within the NDC or FDC collectives. Instead, the public mandatory NDC and FDC schemes are supplemented with redistributive components: nominal contributions are added for periods insured by other public (social) insurance programs—for unemployment, sickness, disability, care of sick children under 12 years of age, and compensated parental leave. Also, noncontributory credits are granted to parents (one at a time) for up to four years in conjunction with the birth of a child. Rights of this kind (which include rights for higher education) are financed with general tax revenues that are paid into the NDC fund(s) and directly into individual financial accounts in the public FDC scheme. Together with the guarantee, these social policy add-ons constitute the distributional components of the Swedish public pension system.[4]

This chapter has two goals. The first is to explain how the NDC works in the context of the Swedish NDC framework. The second is to identify and discuss issues arising in the context of the overall Swedish pension system after two decades of experience, focusing on the NDC component. The chapter begins with a brief history and overview of the Swedish pension reform.

Overview of Sweden's Pension System

The Swedish pension reform began with a sketch published in 1992 by the government-appointed Working Group on Pensions. The sketch outlined a proposal for the new pension scheme; the first legislation for the universal NDC[5] and FDC schemes was passed by Parliament in June 1994.

The first contributions to the individual accounts for the FDC scheme were made in 1995,[6] accompanied by the creation of personal NDC and FDC accounts, which were implemented in January 1999. The contribution rates are 16 percent and 2.5 percent, respectively. During the period 1996–98, NDC accounts were created for persons born in 1938 and later, based on contributions paid historically for the financing of the current DB scheme for the period 1960–98. Palmer (2006b) describes in detail the model used to create retroactive accounts on the basis of computerized individual wage and contribution information and retroactive child-care rights for the period 1960–98, together with other models of conversion to NDC accounts.

The watershed year for introduction of the Swedish NDC and FDC schemes was 1999. Starting in 2000, participants began to have electronic access to information on their personal NDC and FDC accounts. By logging into the system they can receive a personal dashboard picture, access structured information for all participating funds, and make their FDC fund choices.

Successively from 2000, the third major component of the overall Swedish pension system, individuals' occupational benefits, was integrated into this electronic personal information system (*Min Pension*). This step completed the process of making all components of individuals' pension portfolios transparent. The design of the information system enables individual calculations of expected total benefits based individually on chosen assumptions about earnings, rates of indexation and financial returns, and chosen retirement ages. It is hoped that this has increased the importance of individuals' choices in determining their pension outcomes.

THE TRANSITION FROM THE PREVIOUS REGIME INTO PUBLIC NDC AND FDC[7]

Personal NDC accounts were, as mentioned, created for persons born in 1938 and later, retroactively beginning with earnings data (already in the system's database). For the period 1960–94 individual accounts were created by applying a contribution rate of 18.5 percent. For the period 1995–98 a contribution rate of 16.5 percent was used. Since implementation of accounts in 1999 the contribution rate has been 16 percent. Personal FDC accounts began in 1995, with a contribution rate of 2.0 percent, which changed to 2.5 percent as of 1999.

The reform was introduced gradually, with a transition rule for cohorts born between 1938 and 1953. Participants in these cohorts receive benefits calculated on a pro rata basis (with changing weights of 1/20 per year, successively giving more weight to the new scheme over 20 years) based on the benefits they would have received from the old and new schemes.[8] The first pensions according to the new rules were paid out in 2001. The first birth cohort to reach age 65 in the new system was that born in 1938, whose members turned 65 in 2003. On January 1, 2020, the "transition" period will have come to an end.

The guarantee benefit, which can be claimed at age 65, was introduced in 2003 when the first of the transition cohorts turned 65. At the same time, the accounts of

disability recipients (based on actual accounts before being granted disability status, and then a rule for calculating imputed earnings through age 64) received their new public pensions.

RULE-BASED NDC WITH IDENTIFIED SOURCES OF FINANCE AS THE GUIDING PRINCIPLE—INCLUDING FOR POLICY-MOTIVATED ACCOUNT "ADD-INS"

The principle behind the Swedish NDC and FDC schemes is that they should be completely rule-based and independent of ad hoc government interventions. Contributions are paid from government tax revenues to cover pension entitlements credited for earnings replacement in conjunction with unemployment, sickness and disability insurance, taking care of sick children under age 12, and statutory parental leave. In addition, the general budget finances contributions with a low amount per year for higher education, more for military conscription (when it existed), and, most importantly, for rights attached to the birth and early childhood of children (a maximum of four years per child).

HOW THE OCCUPATIONAL SCHEMES ENTER INTO THE OVERALL SWEDISH PENSION FRAMEWORK

At the time the reform was conceived, Sweden already had occupational supplements to the then universal public scheme (*Allmän tilläggspension*, or ATP) that was replaced by the reform. These supplements remained after the reform but their design was changed from DB to DC to coordinate them with the new public NDC and FDC schemes.

About 90 percent of all public and private sector employees are covered by quasi-mandatory occupational pension plans based on collective agreements between the unions and employers' confederations. These pension schemes, which are financed through employers' contributions, supplement the public NDC and FDC schemes. On average, the contribution rate is 4.5 percent on earnings below the ceiling—in addition to the 18.5 percent going to the public system, and 30 percent on earnings above the ceiling (up to a new ceiling—depending on the scheme). The occupational schemes also provide the entire benefit, based on contributions from earnings above the ceiling. Consistent with the public NDC and FDC schemes, these are also prefunded DC schemes, with a few small exceptions. The four major occupational plans are for blue-collar workers in the private sector, white-collar workers in the private sector, central government employees, and local government employees.

NO REQUIRED RETIREMENT AGE EXISTS—ONLY A MINIMUM AGE FOR CLAIMING A BENEFIT

The Swedish public pension scheme has no required retirement age. The rationale is that an economically efficient pension scheme is one that is neutral about individual decisions between work and "leisure," while at the same time the DC construction with the annuity grows as projected remaining life expectancy (for a given birth cohort) declines, yielding a higher benefit per year. This provides a "carrot" for postponing claiming the benefit.

Nevertheless, 61 is the minimum age at which public NDC and FDC pensions can be claimed. The guaranteed minimum pension benefit, however, cannot be claimed until age 65, which is also the age at which a disability benefit is replaced by an old-age

pension benefit. The next age of importance is 67, at which time the employer has the right to discontinue a contract with an employee based only on age.

In December 2017, the six parties in the Pension Group (representing some 80 percent of members of parliament) reached a political agreement on revising these pension ages. This revision includes increasing in three steps the minimum age at which a pension can be claimed from age 61 to age 64 (2020–26). When the reform was legislated the age of the right to claim a guarantee pension was 65. This will be raised to 66.[2] The proposal also includes raising from age 67 to age 69 (2020–23), in two steps, the age at which employers have the legal right to lay off older workers or recontract them. The agreement also provides that after the changes, these ages will be indexed to life expectancy.

RETIREMENT BEHAVIOR OF SWEDES

At the beginning of the reform, about 90 percent of pensions were claimed before or at age 65. In 2015, the figure was still about 80 percent, but the distribution was around the mean age of 65. For example, 50 percent of persons born in 1950 who reached age 65 in 2015 claimed a benefit at age of 65, whereas 28 percent of persons ages 61–64 claimed it, and 22 percent claimed it when older than 65. The average de facto pension age hovered around 65 (the highest in the European Union [EU]) for the entire 15-year period with NDC, while the distribution around the average spread out in both directions after 2000.

For those who choose to retire at ages 61–64 (28 percent in 2017), it is possible, and not uncommon, to claim an "early retirement" occupational pension, also with, for example, a 25 percent public income component of the full early retirement pension. About 20 percent of workers retire after age 65.

The personal decision of when to claim NDC and FDC benefits can be an expression of rational behavior (Diamond 2003). Among the many individual circumstances that can influence decisions about retirement are those associated with the known life expectancy of the subgroups of the universal insurance pool. Zhao de Gosson de Varennes (2016) finds that 50 percent of Swedish exits from the labor force with an old-age pension follow the rule of thumb that people postpone claiming a pension or make an early claim if they have a group-based or "culturally conditioned" reason to do so.

In the context of Swedish pensions, the culture from 1960 of Swedes became "retirement at age 65"—in accordance with the then cultural norm of 65, which was viewed as the full pension age in the ATP (introduced in 1960), the forerunner to the NDC and FDC schemes. In practice this means that men, people with lower levels of education, and singles retire earlier. As it turns out, this may be a rational decision given that persons in these groups also have shorter life expectancies (Palmer and Zhao de Gosson de Varennes 2019). Another result of Zhao de Gosson de Varennes (2016) is that no strong empirical difference exists in the retirement age choices of foreign and native-born persons.

HAS THE DC DESIGN INFLUENCED OLDER WORKERS' EXIT FROM THE LABOR FORCE?

The nonfinancial DB scheme that Sweden's NDC replaced already had a schedule of decrements to benefits claimed before age 65 and increments for claims thereafter. Similar schedules are reflected in the anthology of countries examined in Gruber and Wise (1999).

As early as the 1990s, the Swedish tax and transfer rules pertaining to older workers supported decisions in the direction of working longer.

The question then is what happened to the pension age as the first NDC pensioners (born in 1938) turned 65 in 2003? Figure 2.1 shows the age of exit of men and women from the labor force with a pension from 1970 to 2013 for six European peers (excluding persons already on disability benefits).

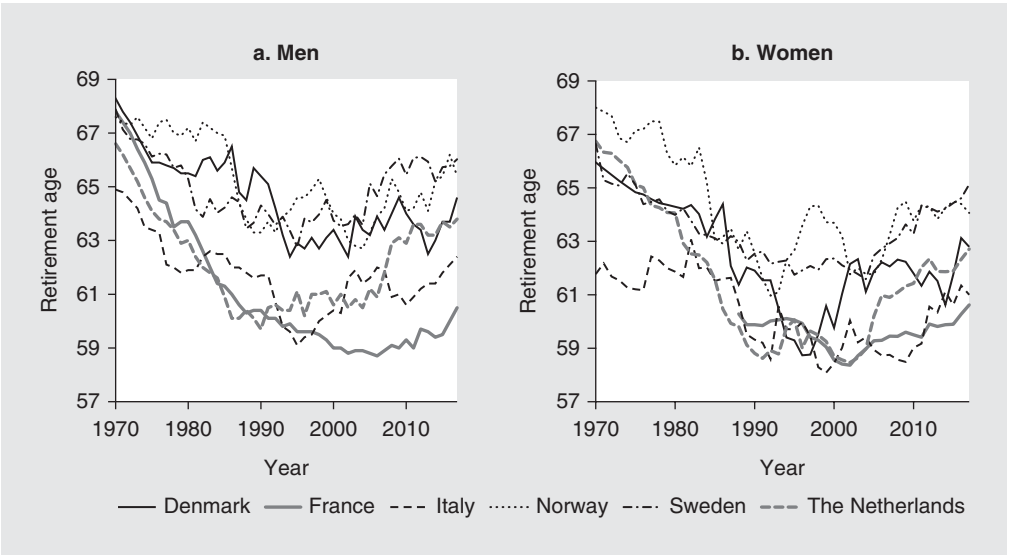
Note the pronounced decline beginning in 1970 in the age at which workers claimed retirement benefits into the mid-1990s, including in Sweden. In the mid-2000s the trend reversed and the retirement age generally increased across Western Europe.

The announcement in 1994 in Sweden of the new NDC pension scheme legislation was accompanied by the launch of a new public narrative on what was reasonable to expect in the future. By 2003, when the first 65-year-olds covered by NDC claimed their pensions, the principle that healthy aging would require working longer was fairly well established, which became a part of the story.

Remarkable in figure 2.1 is that despite a good mark in the Gruber and Wise anthology regarding the overall economic "tax force" for retirement even before introduction of the NDC scheme, Sweden has remained at the top of the six countries since the first NDC benefits were granted in 2003. This could be ascribed to the introduction of the NDC—and the narrative developed around its introduction.

More generally, since 2000, when comparable statistics were first gathered by the EU, Sweden has had the highest labor force participation of all EU countries (EC 2018); about 85 percent of persons age 20–64 work, largely because of the high rates of labor-force participation of women and older workers (figure 2.1). Certainly, the evidence to date supports the contention that the NDC's introduction helped Sweden retain its leadership among the EU28 with respect to the continuous increase in older workers' labor force participation.[10]

FIGURE 2.1 **Average retirement age, select countries, 1970–2013**



SOURCE: OECD Global Pension Statistics. Ageing and Employment Policies - Statistics on Average Effective Age of Retirement.

Long-Term Financial Sustainability

THE DESIGN OF NDC INHERENTLY WORKS TOWARD DYNAMIC SUSTAINABILITY

The foundation of an NDC's design can be expressed with reference to a simple formula summarizing the determinants of the financial status of a pension scheme. C is the contribution rate resulting from the ratio of expenditures to the revenue base, which for a pension scheme is the contribution base. The growth of the contribution base—which is the growth of per capita wages, w, multiplied by the number of contributors, L—is the pension scheme's "budget constraint." At the same time the total cost of pension payments is determined by the average pension per recipient, $\underline{p}$, and the number of persons receiving benefits, R. For the scheme as a whole this can be expressed by the following equation[11]:

$$C = \frac{\underline{p}}{\underline{w}} \times \frac{R}{L}. \tag{2.1}$$

A basic feature of NDC is that the contribution rate is the same for all persons within any specific birth cohort and over all future birth cohorts. This is also a precondition for long-term financial stability in the NDC framework. The macroeconomic contribution rate C was calibrated from the outset to a microeconomic counterpart that relates the average number of years of work of individuals—with the average wage—to the average number of years with a retirement benefit (Palmer 2013). Equation (2.1) can also be written in terms of nominal values. This means that the rate of inflation occurs in both the denominator as a component of nominal per capita wage growth and in the numerator as a component of the indexation of pension benefits.

The links to the economy and demography embodied in this simple relationship determine the dynamics of the ratio. All else equal, beginning in equilibrium, long-term financial stability in the system is maintained by indexing accounts and benefits to changes in both the per capita wage of contributors and their number, that is, $\Delta \underline{w} L$. The equilibrium setting of the system means that the contribution rate C is set for a specific outcome of R/L (which at the level of the average individual is the expected number of years with a benefit relative to the expected number of years in the labor force). What remains for a country starting an NDC scheme is the demographic starting "position" of the labor force resulting from the dynamics of the fertility rate and net migration.

From the point of view of long-term equilibrium, the ideal situation is that births fluctuate randomly around the population fertility rate of 2.1. If the fertility rate is systematically lower, so that the working-age population is declining, then compensation over time must come from net migration to the country. If net migration does not occur, the shortfall is corrected for by indexing the accounts of workers and the pensions of pensioners, through indexation that reflects the negative change in L. On the other hand, a rate higher than that necessary to reproduce the population leads to a "demographic dividend," which is passed on through indexation of personal accounts and pensions. In the Swedish scheme this component of the index (the dynamic development of the labor force) was left out. Instead, this process is regulated through the use of a solvency ratio and a balancing mechanism, explained in "The Suspenders of NDC—Sweden's Solvency Ratio and Balancing Index."

THE SUSPENDERS OF NDC—SWEDEN'S SOLVENCY RATIO AND BALANCING INDEX

Important in the context of the Swedish NDC scheme is that the rate of return is based solely on the growth of contributions (earnings) per capita, leaving out the impact of either positive or negative growth in the labor force, that is, in the factor L in equation (2.1). The risk of ignoring these impacts is that the labor force will decline, thereby shrinking the payment base, with no correction in the system's liabilities, which creates financial imbalance.

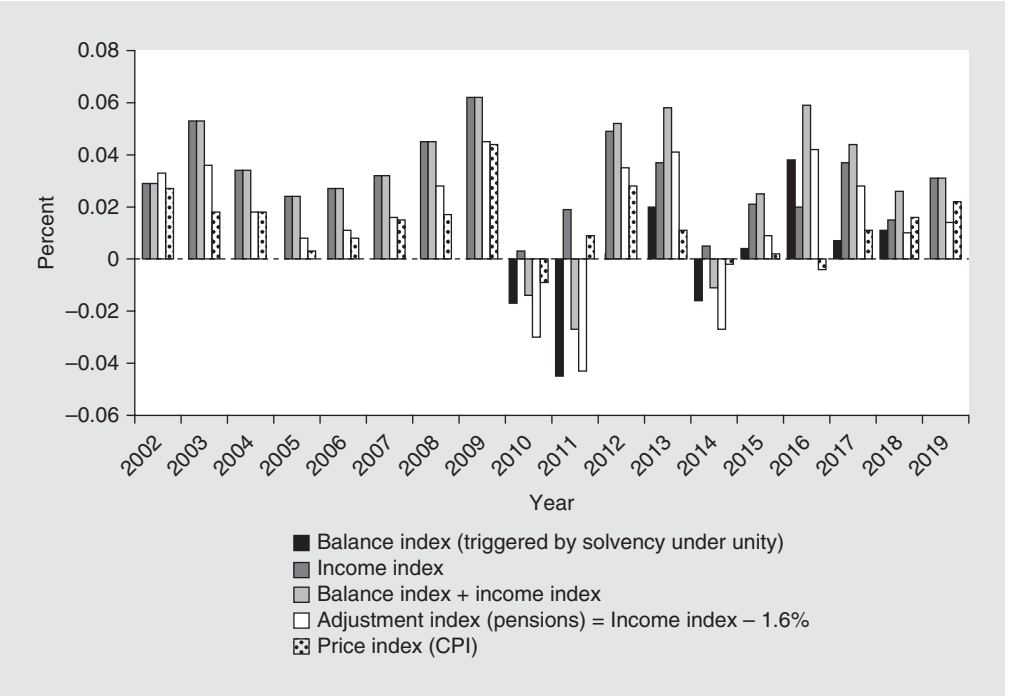
Sweden has been in the fortunate position of having maintained a fertility rate close to the 2.1 needed to reproduce the population—and hence the working-age population and labor force. The gap was filled for the last half-century through positive net migration to the country. The Swedish NDC scheme maintains financial balance without including changes in the labor force in its indexation. However, because a risk remains that Sweden may not always experience labor force growth, the Swedish NDC scheme is equipped with a solvency ratio—that is, the ratio of estimated assets to liabilities—that triggers a balancing index that reduces the valorization of liabilities when it falls below unity, until solvency is once again attained.[12]

System liabilities at any time are the accounts of contributors and the annuities granted pensioners. The system's contribution assets are estimated using the time a unit of money is in the system from the average time it was paid in until the average time it is expected to be paid out (the average life expectancy of all pensioners in the pension pool)—called turnover time. If there is a fund, as in the Swedish NDC scheme, then the fund's asset value at time t becomes an additional component of the total sum of the stock of assets. When the solvency ratio falls below unity, liabilities are adjusted downward by the resulting change in the balancing index,[13] which continues until balance is achieved again (Palmer 2013; Settergren 2001, 2013). Note that the solvency ratio calculated in this way also picks up other uncovered financial risks, such as possible systematic errors in the projection of life expectancy. Given this way of calculating assets, an increase in the average longevity of the entire pension pool increases the time a unit of contributions is in the overall pension pool at a given rate of return. This increases the liquidity (the time expected to pass before the unit of money is to be paid out), which given this rule for calculating assets also increases total assets.

The balancing index was triggered to effect on three occasions—2010, 2014, and 2015; figure 2.2 illustrates the development of the index used to valorize accounts of workers and benefits of pensioners, broken down into individual components. The income index is the rate of growth of per capita income (both below and above the ceiling on contribution-based earnings). In nominal terms then (that is, including the rate of growth of inflation), this is the rate of return on individual accounts, as long as the solvency ratio is greater than unity. If it falls below unity, then it is the balancing index that applies instead of the income index, which is reduced by the balancing index until solvency is once again achieved. Pensions are indexed (in the absence of balancing) with the income index, minus the 1.6 percent discount rate (an assumed rate of growth of productivity) that is factored into the calculation of the annuity. This means that pensions are indexed by the income index minus 1.6 percent plus the rate of inflation.

During 2002–17 real income per capita[14] grew at an average rate of 2.1 percent, leading to an average increment to the valuation of pensions of 0.5 percent per year above

FIGURE 2.2 **Indexation of NDC and transition benefits**



SOURCE: Data provided by the Department of Analysis, Swedish Pensions Agency.

NOTE: CPI = consumer price index; NDC = nonfinancial defined contribution.

the 1.6 percent already factored into the computation of the initial life annuity. In addition, during the same period, pensions were adjusted with the rate of inflation (consumer price index, or CPI), which was 1.2 percent per year.

CONSTRUCTION OF THE SWEDISH NDC ANNUITY

The Swedish NDC annuity is calculated based on the capital balance in the individual's NDC account at retirement, the individual's cohort life expectancy at the chosen age of retirement, and an assumed real rate of return of 1.6 percent per year, which front-loads the benefit. The rate of return of 1.6 percent derives from an assumed long-term rate of growth of productivity, and, consequently, real wage growth per capita. Going forward from the time of retirement, pensions are then revalued with a positive or negative indexation component based on the difference between 1.6 percent growth and the actual outcome, plus the rate of inflation. This results in a yearly supplement to indexation when real growth is greater than 1.6 percent, and a reduction in total indexation if real growth falls below this.

This calculation method shifts a portion of a given amount of pension capital forward to the beginning of the retirement period; that is, it front-loads the annuity. The overall result is that real indexation of Swedish NDC pensions is based on the rate of growth of per capita wage income after deducting the "norm" of 1.6 percent (which is already included in the formulation of the initial annuity). The difference between the actual

per capita wage income index and 1.6 percent leads to a revaluation of the current year's annuity.

THE DEMOGRAPHICS OF FERTILITY AND MIGRATION—HOW SWEDEN ACHIEVED A CONSTANT RISE IN THE LABOR SUPPLY OVER MANY DECADES

The Swedish solvency ratio constantly counteracts financial insolvency. Nevertheless, the development of the fertility rate and net migration together determine the working-age population and the underlying demographics of a country's labor supply, and thus the dynamics of growth, together with the rate of labor productivity growth.

The two important demographic determinants of the labor force are the fertility rate and net migration. Migration into Sweden increased from the mid-1980s and grew strongly thereafter. Together, the relatively high fertility rate augmented by net immigration resulted in an increasing working-age population from the 1980s. The calculations performed for the European Commission's 2018 *Ageing Report* (EC 2018) assume the fertility rate will remain about 1.9 children per woman through 2060. Net migration is a policy parameter regulated since the 1960s to more than cover the remaining gap between the 2.1 children per woman needed to create positive growth in the working-age population, and hence, the labor force.

WORLD WAR II BABY BOOMERS AND THE DEMOGRAPHIC RIPPLES THEREAFTER

Sweden's first postwar baby boom occurred in 1943–49. With a fertility rate of 1.9, a little under the 2.1 rate needed to reproduce the population, the "deficit" compared with a historical fertility rate of 2.1 turned into a "surplus" through net migration to Sweden. Also, importantly, the original baby boom led to a second baby boom (the children of the first boomers) in 1965–75, and a third largely in 1989–93 (when their grandchildren were born). As the original baby boomers left the labor force in 2008–14 at age 65,[15] the overall labor force had absorbed two new generations of "offspring" baby boomers, thus maintaining an intergenerational demographic equilibrium. In fact, for several decades the labor force has grown thanks to the contribution of positive net migration to the country.

It is generally believed that Sweden maintained its long-term high fertility rate due to its generous family policy including highly subsidized preschool daycare and after-school activity centers and transfers to parents. The latter take the form of job security and paid leave with childbirth, reimbursed leave for care of sick children, and a general child allowance. In fact, the relatively high (ocular) correlation between the EU's top 10 countries with respect to fertility and (public and private) expenditures on preschool child care (table 2.1) suggests the importance of family policy for a country's fertility rates.

In summary, it is important to stress that the example of Sweden illustrates two points that can easily be missed in the baby boom discussions. A first baby boom can give rise to a succession of succeeding baby booms at 20–25-year intervals. In the context of Sweden, this, together with positive immigration to Sweden, has been sufficient to fill the dip between historical fertility gaps and to create overall dynamic long-run demographic equilibrium. In Sweden this has meant continuous growth in the labor force during the past half century. A final note in this context is the availability of

TABLE 2.1 **Fertility rates and spending on child-care services and early education**

Country	Fertility rate in 2020	Spending on child care and early education (% of GDP), 2011
France	2.0	4
Ireland	2.0	2
Sweden	1.9	6
United Kingdom	1.8	3
Norway	1.7	5
Finland	1.7	7
Belgium	1.7	14
Denmark	1.7	1
Netherlands	1.7	10

SOURCE: Fertility rate: ED 2016; Spending: OECD Family Database.

NOTE: GDP = gross domestic product.

child-care services (where families pay an amount that is subsidized, with a decreasing subsidy based on a means test) since the end of the 1960s. This has played a key role in supporting working parents, particularly mothers, and is easily linked to Sweden's successively high fertility rate. This policy has put Sweden among the leaders in the Organisation for Economic Co-operation and Development (OECD) in women's labor force participation, as illustrated in the previous discussion.

THE BOTTOM LINE ON FINANCIAL STABILITY IN THE SWEDISH NDC SCHEME—THE SOLVENCY RATIO AND BALANCING INDEX

Financial stability in the Swedish system is maintained through indexation, reflecting the degree of solvency. A solvency ratio of less than unity leads to a negative adjustment in the system's liabilities, and solvency ratio values greater than or equal to unity yield no adjustment. The balancing approach used in Sweden covers the risk of a declining labor force, but presently no rule exists for distributing excess liquidity. This issue is addressed in detail later, but the financial status of the Swedish NDC pension scheme is first reviewed.

In the Swedish NDC context the estimate of assets, called the contribution asset, is based on contributions paid in the nearest accounting period multiplied by the amount of time they are expected to remain in the scheme from the period of payment until the period in which they are to be paid out, called turnover time (Palmer 2013; Settergren 2001; Settergren and Mikula 2006; the Swedish Pensions Agency's annual report, *The Orange Report*, any year).

"Balancing"—that is, the process of bringing the value of liabilities back into line with the estimated value of assets—is triggered when the solvency ratio falls to less than unity. Liabilities are then devalued until a solvency ratio of unity is achieved. In years subsequent to the devaluation of liabilities (pension rights), after the circumstances that created a ratio of assets to liabilities less than unity corrects itself, an upside adjustment brings the system back on track with the per capita income index.[16]

The "risk" in the Swedish NDC balancing model is that no rule covers the circumstance for, for example, continuous strong positive growth in the labor force, all

else equal, leading to an undistributed surplus that goes well beyond what can be considered a sufficient level of reserves. As Auerbach and Lee (2011) point out in a paper applying the Swedish model to U.S. data, an undistributed surplus, beyond what might be regarded to be a prudent reserve fund, leads to a decrease in welfare from funds not used for private consumption, as is the intention of the scheme.

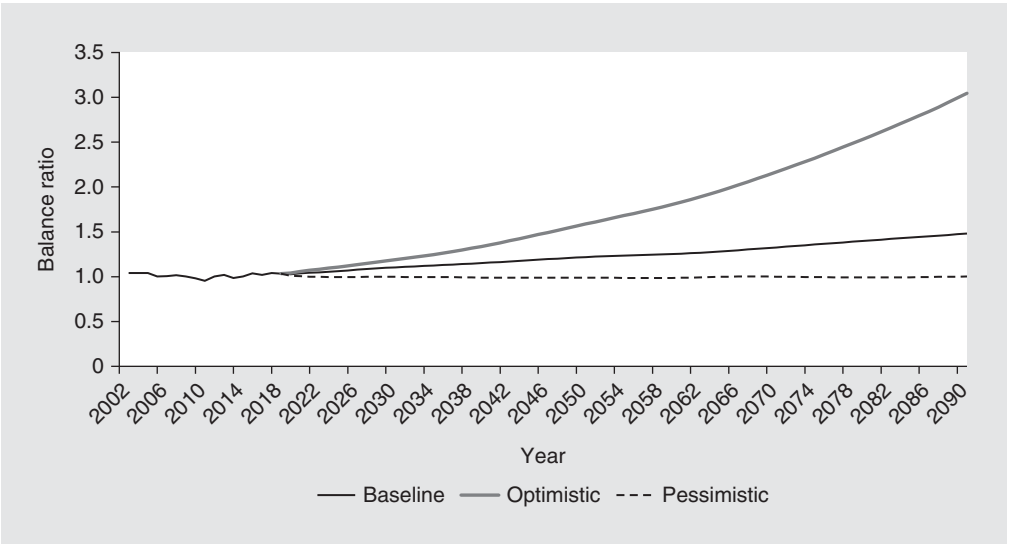
Even with a basic scenario for growth of the labor force, the surplus in the Swedish NDC scheme can become very large. This is in fact what might currently be happening, as illustrated by the development of the solvency (balance) ratio (figure 2.3).

Figure 2.4 shows that the lowest "fund strength" in the base scenario—that is, the number of years of full pension payments the fund can cover—is expected to remain more or less steady at a value of about 4.5 until 2035 (Swedish Pensions Agency 2017, 52). Thereafter, according to both the baseline and optimistic scenarios, it "takes off." This is when the postwar baby boomers reach age 85 and older. Moreover, it continues upward, despite the entrance of children born to the postwar birth cohorts into the pension collective. Also note that the level of reserves of more than 4.5 is more than nine times greater than the lowest acceptable level mentioned in the 1994 proposal to Parliament.

According to the Swedish Pensions Agency (2017), revenues from contributions alone have not been sufficient to cover pension expenditures since 2008. Instead, a portion of the annual returns on the fund have been drawn upon to cover the flow deficit. However, this has still left a small but increasing yearly surplus that further enhances the size of the fund.

In summary, the most important macro issue for Sweden's NDC pension scheme is that no legislated procedure exists for dealing with the increase in the NDC fund if its growth exceeds the present baseline calculation (Figure 2.4), which the financial calculations of the Swedish Pensions Agency suggest is more or less inevitable. The question of the size of the fund was, in fact, examined by a committee in 2004, but no decision was taken on the basis of the committee's report.

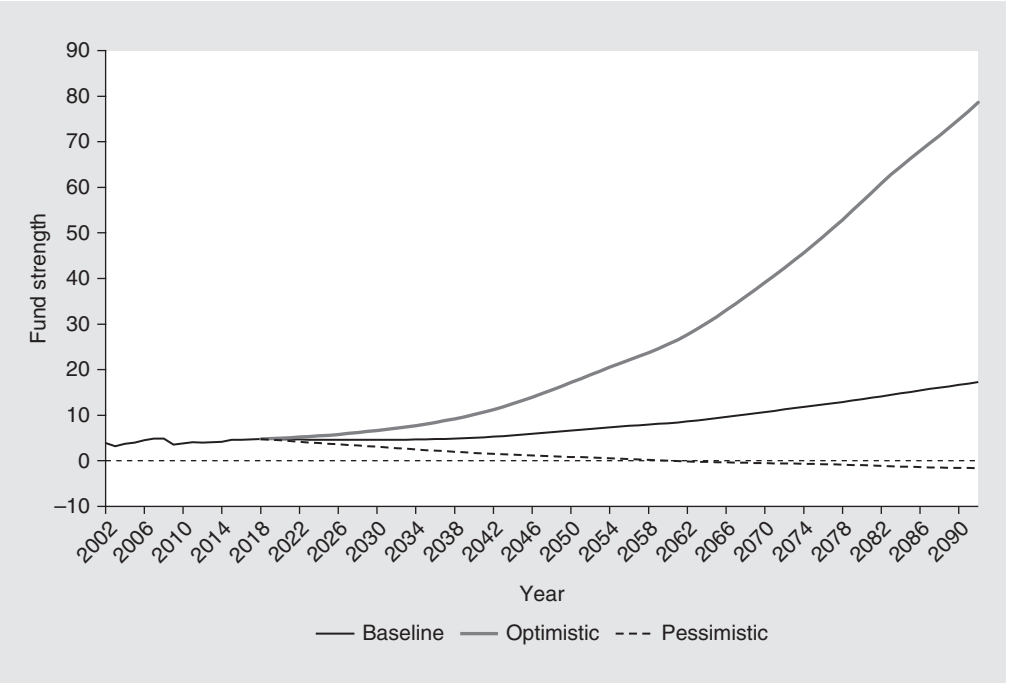
FIGURE 2.3 **Sweden's balance (solvency) ratio under three scenarios, 2002–90**



SOURCE: Data provided by the Department of Analysis, Swedish Pensions Agency.

NOTE: The balance ratio is defined as (contribution asset + buffer fund)/pension liability.

FIGURE 2.4 **Historical and projected size of the NDC reserve fund under three scenarios, 2002–90**



SOURCE: Data provided by the Department of Analysis, Swedish Pensions Agency.

NOTE: The size of the reserve fund (the y-axis) is the number of years of current pension payments that the reserve fund can cover at the specified time (the x-axis). NDC = nonfinancial defined contribution.

Three open issues regarding funding of the Swedish pension reform need to be resolved. The first is the absence of a rule to determine a prudent maximum size for a reserve fund surplus. The second the need for a rule to guide the Pensions Agency in determining how to distribute an unnecessarily large surplus to current and future retirees. The third issue, given the likely perspective of financial balance, with an increasing surplus in the funds, is that a modification of the balancing rule should be considered that allows the solvency ratio to fall to less than unity in recessions. In other words, why not allow the fund to act as a reserve to bridge over temporary recessions (which all recessions seen in modern times have been)?

A NOTE ON THE ORIGIN OF THE SWEDISH NDC RESERVE FUND

The assets held by the NDC reserve in 2016 were sufficient to cover four years of payments to current pensioners in that year. This came about because a decision was made in the 1950s to overfund the ATP scheme introduced in 1960. The following citation from the Parliamentary Bill from 1958 explains the motive (Parliamentary Bill No. 1958:55):

> The fund to be created in accordance with the proposed legislation of ATP would facilitate an equalization over time of the costs … so that future contributions needed to cover the benefit payments could be less than they would otherwise be if contributions were not made to a fund.[17]

From the outset in 1960 until the 1990s, the ATP scheme was consciously "overfinanced." The goal was to build up a reserve fund to help finance the pensions of the Swedish World War II baby boom generation, born in 1943–49, for the period 2010–40. As a result of this decision, at the time of the introduction of the NDC scheme in 1999, the existing fund value was sufficient to cover four years and eight months of pension payments.

In conjunction with the introduction of the reform, about one-third of the total ATP fund was transferred to the state in 1999–2001 to cover the costs of transferring the financing of survivors' and disability insurance from the pension system to the state budget.

A SYSTEMATIC PROJECTION BIAS MAY UNDERESTIMATE NEW RETIREES' LIFE EXPECTANCY

Basing the NDC annuity on life expectancy at retirement is one of the important contributions to the financial stability and sustainability of pay-as-you-go NDC individual account schemes. In the Swedish NDC scheme, life expectancy is calculated from the average of observed age-related period mortality rates for persons 65 and older during the five years preceding the calculation period. The rationale for using this simple method is that it relates to published information. The measure is in fact legislated, to divorce the calculation from risk of political intervention.

Recent work for Sweden and nine other countries shows that a systematic demographic risk occurs in the state-of-the-art projections of life expectancy at the country level (Alho, Bravo, and Palmer 2013; Palmer, Alho, and Zhao de Gosson de Varennes 2018). Palmer and Zhao de Gosson de Varennes (2019) show that the simple method followed by the Swedish Pensions Agency to base the projection on a moving average of the preceding five years' period mortality statistics creates an even greater systematic underestimate.

The systematic bias in the projections is due to the accelerating rate of decline in the mortality of persons age 70 and older. The systematic bias arises because the period model used is a simple linear extrapolation method, whereas Swedish life expectancy is rising at an increasing rate. This was first documented in Alho, Bravo, and Palmer (2013) and explored in greater depth in Palmer, Alho, and Zhao de Gosson de Varennes (2018), who apply a new method developed, documented, and tested on 2,400 cohorts from eight countries,[18] including Sweden, beginning with cohorts born in the early 1900s and continuing until these cohorts have died out. The method was also tested based on still-living cohorts of persons who have become pensioners in present times.

The analysis shows that the Swedish life expectancy procedure increasingly underestimates the actual outcomes as the data examined approach current times. The estimation error is in fact 8 percent for birth cohorts that expired in the late 1970s, with evidence from still-living birth cohorts that the systematic error is continuing to increase in scale (Palmer and Zhao de Gosson de Varennes 2019).

This systematic deficit will be gradually absorbed through its negative effect on the balancing index. Palmer and Zhao de Gosson de Varennes (2019) estimate the effect on the pension fund to be close to 50 billion kronor for the recently pensioned cohorts born from 1937 to 1946. In addition, because the definition of assets includes life expectancy, the solvency ratio is affected. The estimate of the duration of time from the average age at which a krona is contributed is actually longer than that presently used. This implies that the value of the contribution asset—that is, the Swedish NDC pension system's total assets—is also underestimated. In summary, a new method that does not yield a systematic deficit should be adopted.

Adequacy

THE OVERALL PICTURE

The discussion of adequacy begins by taking a look at the OECD Pension Model for Sweden. The model is built up to see the replacement rates expressed as lifetime benefit payments as a percentage of lifetime earnings.

Table 2.2 shows the decomposition of how the individual components of the overall Swedish system contribute to the outcome. In OECD's *Pensions at a Glance 2015,* the average pretax pension replacement rate for mandatory public and mandatory private schemes for an average wage earner for the 34 OECD members is 52.7 percent. Table 2.2 is based on the same set of assumptions: the worker was born in 1950, entered into the labor force at age 20 in 1970, worked 45 years, and retired at age 65 in 2014. According to table 2.2, for these assumptions, the average Swedish wage earner's after-tax replacement rate is 64 percent. Of course, as life expectancy increases in the future, it will be important for individuals to work past age 65 to receive the same replacement rate. Note that the strong increase for higher wage and salary earners results from the higher contribution rate in the occupational based top-up for contribution-based earnings above the ceiling in the public NDC and FDC component of the overall system. (The "blip" is discussed in more detail below.)

According to forthcoming Swedish legislation (agreed on at the time of this writing), the minimum age at which a pension can be claimed will first be increased from the present age of 61–64 in steps during the period 2020–25. Beginning in 2026, the minimum age will be indexed to life expectancy, and is anticipated to result in a minimum pension age of 70 or more in 2060 if life expectancy continues to increase at the rate of about one year every ten years. This adds approximately four years for the average person's participation in the labor force before exiting with a pension. Assuming the occupational benefits follow the public pension schemes, the table in 2060 should yield a higher replacement rate than that in table 2.2 also because of the increase in the average age of exit.

TABLE 2.2 **Generic compensation rates for the overall Swedish pension system**
benefits compared to wage base for alternative wage levels

Ratios						
					All components together	
Wage	Guarantee benefit	NDC benefit	FDC benefit	Occupational benefit (ITP)	Before tax	After tax
0.30	0.43	0.38	0.09	0.15	1.05	1.04
0.50	0.15	0.38	0.09	0.15	0.77	0.79
0.75	0.03	0.38	0.09	0.15	0.65	0.67
1.00	0	0.38	0.09	0.15	0.62	0.64
1.50	0	0.28	0.07	0.41	0.76	0.81
2.50	0	0.17	0.04	0.64	0.85	0.88

SOURCE: Based on the OECD model for Sweden. Originally published in Chloń-Domińczak, Franco, and Palmer 2012.

NOTE: The first column is the ratio of alternative wage levels to the average wage. The remaining columns are the ratio of benefits to the contribution wage base. FDC = financial defined contribution; ITP = Swediish acronym for the collective pension agreement for private white-collar workers; NDC = nonfinancial defined contribution.

THE GUARANTEE BENEFIT LEVEL

The Swedish guarantee begins with a floor, above which it tapers off as it is means tested against the public NDC and FDC pensions. This is apparent in table 2.2. For a person with no earned pension rights from working, the guarantee is the entire benefit. For a person whose earnings are 30 percent of the average worker's earnings, the total compensation rate of 1.05 (the ratio of lifetime pension payments to lifetime earnings) is comprised of four components: a guarantee benefit constituting 43 percentage points, an NDC benefit constituting 38 percentage points, an FDC benefit constituting 9 percentage points, and an occupational benefit constituting 15 percentage points. For a person with earned pension rights from the equivalent of 50 percent of average earnings, the guarantee constitutes 15 percentage points, the total replacement rate from all sources. And it constitutes 3 percentage points of the replacement rate for a person with a combined public pension based on 75 percent of average lifetime earnings.

In 2003, when the first birth cohort of the reform (born in 1938) turned 65, almost 55 percent of pensioners had some amount of a guarantee pension supplement. In 2016, only 1 in 18 new pensioners (about 5 percent) had no public contribution–based NDC pension whatsoever, and 32 percent of all pensioners had a partial guarantee benefit at the bottom, according to statistics from the Swedish Pensions Agency. In the DC framework, the gender distribution of pension income reflects the distribution of earnings before retirement. This is reflected in turn in the fact that almost one-half of all retired women (48 percent) have a guarantee component in their overall benefit, whereas only 14 percent of retired men do.

Because the relative importance of the guarantee tapers off with increasing NDC and FDC benefits, although there are many recipients, the guarantee benefits account for a small share (4 percent) of total benefit payments to pensioners (table 2.3).

Both the guarantee and the housing allowance are tax-financed and paid through the government budget, as a component of social policy for persons age 65 and older. The discussion of the housing allowance is revisited in greater depth in "The Crucial Role of the Swedish Housing Allowance for the Relatively Poor Elderly."

THE "BLIP" IN THE OVERALL REPLACEMENT RATES

Returning to table 2.2, first note that the ceiling on earnings that generate contributions to the NDC (contribution rate of 16 percent), FDC (contribution rate of 2.5 percent), and typical occupational supplement below the ceiling (contribution rate of 4.5 percent)

TABLE 2.3 **Distribution of Sweden's total public pension expenditures in 2016**

	Billions of SKr	% of total
NDC, including transition pensions	282.3	91
FDC pensions	7.0	2
Guarantee benefits	13.4	4
Housing allowances	8.4	3
Total	311.1	100

SOURCE: Swedish Pensions Agency 2016; *Ekonomisk trygghet vid ålderdom*, Proposition 2016/17:1, Swedish Government Publication 2017 (http://www.regeringen.se/4a6b4d/contentassets/e926a751d9eb4c978c4d892c659ebc8e/utgiftsomrade-11-ekonomisk-trygghet-vid-alderdom).

NOTE: FDC = financial defined contribution; NDC = nonfinancial defined contribution; SKr = Swedish kronor.

is relatively low. Above the ceiling the occupational scheme constitutes the entire supplementary pension, typically financed by a contribution rate of up to 30 percent. In the theoretical replacement rate calculations performed by the OECD, FDC schemes are assumed to earn a real rate of return of 3 percent and the NDC scheme a rate of 2 percent.

Second, the average income earner has a replacement rate of 64 percent after tax, generated totally by contributions on earnings below the ceiling. However, the replacement rate increases as larger segments of an individual's earnings (and, thus contribution to the FDC scheme) rise above the ceiling for contributions to the public NDC and FDC schemes. This explains the "blip" in the overall result in table 2.2.

A clear way to reduce the scale of this blip would be to require the occupational schemes to adhere to the same overall contribution rate of some 23 percent, which is the contribution rate below the ceiling, to the same percentage both below and above the ceiling. Beyond this, it is nevertheless the case that the result is driven by the difference in the basic fundamentals, that is, the underlying differences between the rates of return.

Finally, why 30 percent instead of 23 percent? Apparently, people with higher earnings are willing to contribute a higher percentage of their earnings to their pension savings for the future—otherwise this rate would not have been negotiated, as in the end it is paid with forgone in-pocket earnings and current consumption. One can also argue that the outcome of FDC schemes depends on a much more volatile outcome for returns, with cyclical troughs that can last up to a decade (for example, the 1970s)—and who knows what the financial market will deliver in 40 years? And, finally, this chosen construction supports the premise that risk aversion decreases with increasing income.

Finally, the blip in table 2.2 is an unintentional design "accident," given that the transition of the occupational schemes from largely DB to largely DC occurred following the 1994 reform legislation—not at the same time. In fact, the last major occupational scheme to join the FDC club was that for private white-collar workers, about 10 years after the reform of public pensions. Clearly, this "kink" in the replacement rates for the overall pension system ought to be addressed by policy makers.

THE GENDER GAP IN PENSIONS

In 2014, the average pension for women was 77 percent of the average for men. If rights earned by women in conjunction with childbirth are added, the average pensionable income of women was 84 percent of the average pensionable income of men (Departementsserien 2016:19 p. 283ff). And the discrepancy is believed to remain well into the future (Swedish Social Insurance Inspectorate 2017). According to calculations in the latter report, persons working in municipal services—for example, care services for the elderly and functionally impaired, education, and social services—will continue to have the lowest pensions. This is, of course, a direct reflection of the generally low wages of persons (mostly women) working with care services provided by the municipalities.

Women's lifetime earnings from formal work are lower than men's for three reasons. The first is wage discrimination—that is, lower wages and salaries for the same work as performed by men. The second factor is that jobs in which women dominate the labor force—health care, child care outside the home, care of the aged and persons with functional disabilities, and education—generally have a lower average wage level than men's low-wage occupations. The third factor is that women choose to work part-time to a significant extent. Hence, although women work almost as many years as men, they work fewer hours per week over the whole working career.

The drivers can be viewed as "structural" factors associated with the traditional division of child care and work in the home, where women still perform more of these tasks than men according to time use studies performed by Statistics Sweden. The bottom line is that it is not, then, the pension system that is at fault. Instead it is a combination of discriminatory labor market structures and individual behavior, discussed in greater detail in Klerby, Larsson, and Palmer (2013, 2019).[19]

The results of Klerby, Larsson, and Palmer (2013, 2019) demonstrate that one or more of three possible policy reforms could satisfactorily address this issue: (a) enabling joint annuities—with the joint annuity as the default—for married and cohabiting couples in the public NDC and FDC schemes (Klerby, Larsson, and Palmer 2013); (b) sharing of accounts during a succession (up to 10–12 child-care years—or over a whole life [Klerby, Larsson, and Palmer 2019]); and (c) providing child-care-right account add-ons past the present age of four up until the youngest child reaches 10 or 12 years of age. The first two studies cited here calculate that both of the first proposals would replace a considerable cost for the tax-financed guarantee benefit and housing allowance. Last, but most importantly, these would considerably reduce the relative poverty of divorced women and those women who become single households in old age following the death of a spouse. The joint annuity is the obvious measure in the latter circumstance.

THE ECONOMIC STANDARD OF PENSIONERS

Regardless of which measure is chosen, only about 1 percent of persons age 65 and older live in "absolute poverty" (data last available for 2013). If the definition chosen for the low economic standard is 60 percent instead of 50 percent of the median disposable weighted household income, about 11.4 percent of those age 65 and older met this standard (in 2013). About 20 percent of single-person households age 65 and older (predominantly women) had a relative standard below 60 percent of the median disposable income of all persons, compared with only about 4 percent of households with two adults with at least one household member age 65 and older (Swedish Ministry of Finance 2015).[20]

In conclusion, note that the deterioration of the relative standard of persons age 65 and older compared with adult households under age 65 can be wholly attributed to a lower real rate of growth in pension income compared with wage income. This in turn reflects the fact discussed separately above that the Swedish NDC annuity is front-loaded with a rate of real wage indexation of 1.6 percent per year, and then supplemented with inflation indexation (which is neutral for the replacement rate) and the difference between the front-loading factor of 1.6 percent and the actual rate of change in the average wage rate. In addition, the guarantee and housing minimum benefits are indexed to the CPI, but real changes require ad hoc political decisions.

THE ROLE OF INDEXATION

"Overview of Sweden's Pension System" explains the indexation of accounts and benefits, including when the solvency ratio is negative and the balancing index is triggered. What is important here is that the method of creating the Swedish NDC[21] gives a constant annuity value throughout life, adjusted in the Swedish construction by (a) the actual difference on a yearly basis between the income index and assumed real rate of return of 1.6 percent, and (b) the rate of inflation.

Sweden's method of front-loading the NDC annuity with an assumption about the future rate of change in productivity and, thus, long-term real wage growth, redistributes individual capital balances to the initial years of a pensioner's life. This resonates well with the assumption that people would rather have more resources now and discount the future (that is, their time preference is biased toward present time). It is also an implicit redistribution from persons who live longer to those who have shorter lives, who generally speaking have lower lifetime income and pension balances when they become pensioners. This is discussed in greater depth in Palmer and Zhao de Gossson de Varennes (2019).

In closing, note that the Swedish guarantee granted initially to public pensions—which is means tested against the original public NDC and FDC benefits together—is price indexed. This means that, generally speaking, the Swedish pensioner's income is adjusted for inflation (with the CPI) through the NDC and guarantee benefits, but relative to the income of a contemporary wage earner, the pensioner's standard declines steadily throughout his or her life.

THE CRUCIAL ROLE OF THE SWEDISH HOUSING ALLOWANCE FOR THE RELATIVELY POOR ELDERLY

The Swedish means-tested housing allowance for pensioners, presented in the "Introduction," is designed to provide a sufficient income supplement to pensioners with a low-income standard—in early as well as later years.

According to information from the Swedish Pensions Agency, about 13 percent of all pensioners live in households receiving the means-tested housing supplement, attesting to its important role. This is especially the case for elderly singles, usually women, who are often younger than their male partners and live longer. A principal factor underlying the decline in the income standard of elderly single women was that neither the level of the guarantee nor the ceiling on the housing allowance was increased significantly, aside from a yearly CPI adjustment, during the period 2003–17. In this period the average rate of growth of real wages was well over 2 percent per year. This fact alone contributed to an increasing relative gap between low-income pensioners and the median income of the population (Nelsson, Nieuwenhuis, and Alm 2019).

Conclusions and Recommendations for Improvement

Several general conclusions emerge from this review of the Swedish NDC public pension system, encompassing the NDC scheme, the public FDC scheme, and the minimum income guarantee, as follows.

Financial stability. The Swedish NDC scheme is financially very healthy. The Swedish fertility rate is now (and has historically been) high, at about 1.8–1.9 children per woman. With positive net immigration, continuous growth in the working-age population has occurred, and Sweden's employment rates of both men and women are the highest in the EU (EC 2018), as is the average age of exit from the labor force with retirement.

Two caveats arise, however. The first is that it is difficult for immigrants to establish themselves in the Swedish labor market. The second is that women's average lifetime earnings—the basis for pension capital in DC schemes—is about 75 percent of men's,

which is reflected in similar inequality in pensions. This reflects the gender gap in sharing of home care responsibilities and structurally determined gender wage discrimination—primarily in the difference in the average wage for women working in care and education compared with the average wage in male-dominated jobs.

Adequacy. The replacement rate in the NDC scheme for the career worker born in 1950 (age 65 in 2015) based expected lifetime benefits in relation to lifetime income at 64–65 percent. It increases to about 70 percent by working until age 68. This said, wage discrimination combined with women's decisions to work part-time while children are growing up risks them ending their lives in relative poverty with the death of a spouse or cohabiting partner. The pension system cannot make right all the wrongs of the labor market. Given this, one obvious recommendation for Sweden is to expand the scope of child-care pension supplements to an even higher age and introduce rules making it possible to share pension rights before and at retirement. In addition, Swedish politicians could improve the coverage and amount of the component of the overall minimum income, which constitutes the most important supplement to the income of elderly women who become single toward the end of life: this entails increasing the means-tested housing allowance that tops up the guarantee pension.

Minimum pension age. According to the agreement between six political parties, representing about 80 percent of the votes in Parliament in December 2017, the minimum pension age will be increased gradually from age 61 to age 64 during 2020–26; the age to claim a guarantee benefit from age 65 to 66 (2023); and the age at which employers have the right to lay off workers only because of age from 67 to 69 (starting with 68 in 2020). These ages will then be indexed to life expectancy. This provides a strong incentive for people to earn higher benefits by working longer, which yields a higher benefit at retirement.

Life expectancy projections. Research shows that the method presently used by the Swedish Pensions Agency—as well as pension administrations in many other countries—systematically underestimates the increase in life expectancy. A strategy must be developed to deal with this issue.

The NDC fund. Three rules need to be considered:

- Determination of the maximum fund size
- Given a maximum fund size, how the "surplus" should be distributed among participants
- Determination of a procedure to bridge over economic recessions and stock market drops, given that economic and financial market recovery is inevitable.

The FDC (premium pension) funds. The rules for participating funds need to become stricter and safer, to tighten practices and supervision to prevent fraud and misuse of pension savers' capital. This also means that the number of participating companies and the overall number of individual funds offered by companies will certainly be reduced.

Contribution rate. The de facto contribution rate to the combined public NDC and FDC schemes is not the original 18.5 percent, but slightly lower as a result of the use of pre- and post-tax adjustments. Increasing it to 18.5 percent would be to the advantage of all future participants, while creating medium-term liquidity, which could be taken into the picture if or when a correction in the life expectancy factor in computing annuities is considered.

Better coordination of public and occupational schemes. Better coordination would be accomplished in cooperation with labor market partners representing labor and management interests. The aims would be as follows:

- Straighten out the kink in the replacement rates (illustrated in table 2.2)
- Offer only single individual and joint life annuities, eliminating phased withdrawals (where they exist, that is, in the FDC scheme)
- Introduce the same contribution rate across occupational schemes for all levels of earnings.

This list is long and the numerous issues identified based on more than 20 years of experience can provide food for thought for countries introducing or improving their existing NDC (and FDC) public pension schemes.

Notes

1. Könberg, Palmer, and Sundén (2006) discuss the important enabling political backdrop of the Swedish pension reform. Many references to the specifics of the Swedish NDC pension scheme now exist, including Palmer (1999a, 1999b, 2002, 2006b, 2013); Settergren (2001, 2013); Könberg (2008) (which addresses the contention of the time that NDC is "old wine in new bottles"); Chloń-Domińczak, Franco, and Palmer (2012) (which compares NDCs in Italy, Latvia, Poland, and Sweden); and Palmer (2013) (which discusses the equilibrium properties of a generic NDC).
2. This also includes people living in other countries commuting to work in Sweden or with previous earnings from work in Sweden, with significant numbers coming from adjoining Scandinavian countries, the Baltic states, and Poland.
3. Almost all employees in Sweden are covered by one of four major (and some minor) labor management agreements and, thereby, are covered by occupational supplements to the universal public commitment.
4. Note that contributions have an employee and an employer component, explained in more detail in "Overview of Sweden's Pension System."
5. At the time, Swedish pension experts had access to a 40-year-old report of the Swedish Pension Commission that advocated something similar to what has become NDC (Åkesson 1950), with individual accounts but only partially prefunded. Instead, the DB ATP scheme emerged and was introduced in 1960—tailor-made with a more generous and politically more attractive DB profile.
6. The money itself was invested in government bonds during the transition before 1999.
7. See Palmer (2006a) for a more detailed presentation of the Swedish transition procedure, as well as other alternatives, including those used in Latvia and Poland.
8. The ratio for persons born in 1954 was 100 percent; that is, they received the entire pension solely based on their individual account values. Persons born in 1953 received 95 percent of the NDC pension and 5 percent of the old system pension; those born in 1944 got 50 percent, and so on.
9. The agreement also encompasses an increase in the age for receipt of disability and unemployment insurance from 65 to 66 (2023).

10. A recent econometric study finds a significant effect of the reform on the retirement choice of men born in 1944, who reached age 65 in 2009 (Qi 2016).
11. See Palmer (2013) for a more exact mathematical presentation of NDC and its dynamics.
12. The technique legislated and employed is presented in the Technical Appendix to any annual *Orange Report* of the Swedish Pensions Agency.
13. In practice, the balancing index becomes an extra component of indexation when the mechanism is triggered.
14. Where the underlying income base for contributions from individuals and employers on their behalf is the NDC scheme's income base, which can differ from the national accounts' definition.
15. This is the age at which disability benefits are converted into old-age pension benefits and at which people can qualify to receive a guarantee benefit. In addition, because 65 was seen as a "normal" pension age before the introduction of the NDC and FDC account schemes, this norm was hard to erase from people's thoughts. In fact, despite clear information in the *Orange Letter*, many people (couples especially) choose to forgo the considerably higher pension they could receive by staying in the labor force another one or two years.
16. A similar effect can be achieved by indexing directly with the rate of change in the contribution database, but the adjustment process is likely to be much longer. See, for example, the simulations in Chloń-Domińczak, Franco, and Palmer (2012).
17. The initial contribution rate was set so as to exceed the necessary financing of yearly pension payments. This overfunding continued into the 1990s. A study of the combined effects on private and public financial saving, by Markowski and Palmer (1979), found that the overfunding of the ATP scheme from 1960 to 1975 led to a 4 percent decline in private savings with an equivalent increase in public saving during the initial years. Note that in this way the baby boomers funded savings to cover their extra cost to the next generation.
18. Denmark, France, Italy, the Netherlands, Norway, Sweden, the United Kingdom, and the United States.
19. These factors are discussed for Sweden in greater depth in Klerby, Larsson, and Palmer (2019).
20. Table 3.1 from *Fördelningspolitisk redogörelse* is a yearly publication of the Swedish Ministry of Finance, presented regularly in conjunction with the government's spring budget.
21. Italy and Norway adopted the same model, albeit with a lower discount rate than Sweden's 1.6 percent.

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