



SOCIAL PROTECTION & JOBS

DISCUSSION PAPER

No. 1908 | April 2019

The ABCs of NDCs

Robert Holzmann

© 2019 International Bank for Reconstruction and Development / The World Bank

1818 H Street NW
Washington DC 20433
Telephone: +1 (202) 473 1000
Internet: www.worldbank.org

This work is a product of the staff of The World Bank with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent.

The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

RIGHTS AND PERMISSIONS

The material in this work is subject to copyright. Because The World Bank encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for noncommercial purposes as long as full attribution to this work is given.

Any queries on rights and licenses, including subsidiary rights, should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; fax: +1 (202) 522 2625; e-mail: pubrights@worldbank.org.

Abstract: Nonfinancial defined contribution (NDC) pension schemes have been successfully implemented since the mid-1990s in a number of European countries (Sweden, Italy, Latvia, Poland, and Norway). The NDC approach features the lifelong contribution–benefit link of a financial defined contribution scheme, but is based on the pay-as-you-go format. An NDC approach implemented by the rulebook can manage the economic and demographic risks inherent to a pension scheme and by design creates financial sustainability. This paper offers a nontechnical introduction to NDC schemes, their basic elements and advantages over nonfinancial defined benefit schemes, the key technical frontiers of the approach, and the experiences of countries with NDC schemes.

Key words: Systemic Pension Reform, Unfunded, Individual Accounts, Labor Market Incentives, Sweden

JEL codes: H55, J11, J26

Acknowledgments

This paper is written for *Progress and Challenges of Nonfinancial Defined Contribution Pension Schemes, Volume 1: Addressing Marginalization, Polarization, and the Labor Market*, edited by Robert Holzmann, Edward Palmer, Robert Palacios, and Stefano Sacchi, to be published by the World Bank in autumn 2019. I am grateful to Mercedes Ayuso-Gutierrez, Nick Barr, Maria del Carmen Boado-Penas, Elisa Chulia, Mark Dorfman, Elsa Fornero, José Antonio Herce, Sergio Nisticò, Edward Palmer, and John Piggott for comments and suggestions and to Amy Gautam for first-rate copy editing. A prior version of the paper was published in the *International Social Security Review* in 2017. The views expressed herein are those of the author and do not necessarily reflect the views of the institutions he is associated with or the views of the World Bank.

Abbreviations and Acronyms

DB	Defined Benefit
DC	Defined Contribution
EU	European Union
FDC	Financial Defined Contribution
GDP	Gross Domestic Product
NDB	Nonfinancial Defined Benefit
NDC	Nonfinancial Defined Contribution
OECD	Organisation for Economic Co-operation and Development
PAYG	Pay-As-You-Go

Table of Contents

1. Introduction: How NDC emerged in the pension reform process	7
2. The basics of an NDC scheme	10
3. What can NDC schemes do better than NDB schemes?	12
3.1. Financial logic.....	13
3.2. Automatic adjustments to parameters	13
3.3. Minimum retirement age	15
3.4. Separating income replacement from redistributive considerations	16
3.5. Heterogeneity in longevity	16
3.6. Survivors' and disability benefits	17
3.7. Harmonization of schemes	19
3.8. Portability.....	20
3.9. Taxation of cross-border pensions	21
3.10. NDC, NDB, and FDC: Select issues	22
4. Key frontiers in design and implementation of NDC schemes.....	23
4.1. How best to proxy the nonfinancial rate of return?.....	23
4.2. A balancing mechanism: Is it needed and what should it look like?	24
4.3. How best to deal with the legacy cost in NDC introduction?	25
4.4. How to share the longevity risk with and without NDC bonds?	26
4.5. How to address marginalization on the labor market with an NDC scheme?	27
4.6. How to market the advantages of NDC schemes to policy makers and the general public?.....	28
5. Country experiences with NDC reforms.....	29

5.1. Countries with NDC reform experience or interest.....	30
5.2. Reform lessons from NDC countries.....	31
6. Conclusions and way forward	33
References	35

1. Introduction: How NDC emerged in the pension reform process

The need for public pension reform is not a new issue. It emerged in Organisation for Economic Co-operation and Development (OECD) countries after the heydays of pension schemes' introduction in the 1950s and their expansion in the 1960s; the post-World War II economic boom was halted by the first oil-price shock in the 1970s and the change in the demographic foundation of pension schemes became visible then. The 1980s were characterized by the search for internal solutions to address pension schemes' perceived short-term financing gaps and longer-term demographic challenges, given the transition to lower fertility levels and increasing life expectancy. Then the "reform" discourse was limited to interventions around adjustments to scheme parameters, such as: reductions of the accrual rate; extension of the contribution-wage assessment period from the last few years to a longer period; changes in benefit indexation from wages toward prices; and increases in the contribution rate or budgetary transfers (Holzmann 1988). Little discussion at that time considered a continued increase in life expectancy and below-replacement fertility rates (and hence population aging without end in sight). The focus was largely on the search for fixes to a one-time problem within the then almost universal nonfinancial (unfunded) defined benefit (NDB) scheme. Funded supplementary schemes emerged in a few (mostly Anglo-Saxon) countries as voluntary occupational and personal schemes. Parametric adjustments to NDB schemes were typically implemented in a string of minor reforms that reduced the funding gap and economic distortions somewhat but did not lead to sustainability; i.e., a state that does not require major future changes to keep the scheme financially afloat.

The vision of a more systemic reform approach was triggered internationally in 1981 by Chile. Chile's systemic reform of its universal pension system was the first worldwide to move from a traditional NDB scheme to a fully funded (financial) defined contribution (FDC) scheme. It introduced two major changes concurrently.

First, the reform moved from a defined benefit (DB) scheme in which the benefit is well defined and the financing (contribution rate) is, in principle, the residual, to a defined contribution (DC) scheme in which the contribution rate is well-defined (fixed) and the benefit level depends on contributions paid, returns received, and life expectancy at retirement. The tight relationship between contributions and benefits was expected to offer much better incentives for labor supply decisions, including for formal labor market participation and retirement age selection. Such improved labor participation incentives depend not only on the design of public pension schemes but also on occupational and voluntary pension schemes and on noncontributory social assistance. These needed to be appropriately (re-)designed to support the expected lower labor market distortions (Holzmann, Robalino, and Winkler 2019).

Second, the Chilean reform moved from an unfunded scheme in which current revenues were used to finance current pension benefits to a fully funded scheme in which benefit obligations were to be fully backed by marketable financial assets. As such a transition makes the implicit debt of an unfunded scheme explicit, realizing the expected results requires repayment of this implicit-turned-explicit debt by the current and future generations. The economic double burden of a repayment for current and future generations may potentially be prevented if such a pension reform creates reform externalities, including endogenous economic growth effects that go beyond those of higher saving and labor supply and may compensate for the additional taxes/lower public expenditure (Holzmann 1999). Empirical work suggests that such growth effects were created in Chile (Holzmann 1997).

This systemic reform and the move from NDB to FDC schemes created a reform dynamic that swept in the 1990s from Latin America over to the former transition economies in Central, Eastern, and Southern Europe and beyond. This move was substantially influenced by a seminal publication of the World Bank (1994). By 2011, 29 countries across the world had at least partially moved from NDB to FDC schemes in expectation that their financial and other pension problems (such as low contribution density and benefit coverage) would

be solved (Holzmann 2013). As it turned out, many systemic reform countries underestimated the challenges of such a reform: at the level of creating an enabling financial market environment; at the level of expected financial market returns; and perhaps most importantly, at the level of financing the transition through a long-term tighter public budget with only temporarily higher explicit financial debt. As a result, a number of countries reversed their funding reform and abolished (e.g., Argentina, Hungary) or substantially reduced (e.g., Poland, Latvia) their funded pillar. Of course, the fallout of the 2008 financial crisis did not help.

Given the attraction of a DC approach but the challenges of funding change, two countries in Europe (Italy, Sweden) independently developed a systemic reform concept that moved from DB to DC but remained essentially unfunded: the nonfinancial (or notional) defined contribution (NDC) scheme. The vision of NDC began with Swedish legislation in 1994 that charted the map for a full-scale transition from the country's underfinanced NDB scheme to NDC, as discussed in Palmer (1999, 2000, 2002) and Könberg, Palmer, and Sundén (2006). As the Italian NDC reform of 1994 was implemented with long transition periods and was essentially only finished by 2012, the concept of NDC moved from Sweden to implementation in Latvia (Fox and Palmer 1999; Palmer et al. 2006) and Poland (Chłoń-Domińczak and Gora 2006), and later to Norway (Christensen et al. 2012). A few other countries attempted to introduce NDC schemes but failed in their efforts for diverse reasons (Egypt, Mongolia, Kyrgyz Republic, the Russian Federation) (Guardiancich et al. 2019). Other countries are still discussing an NDC reform (China, Greece, Kazakhstan).

For a long time it was thought that an unfunded DC scheme could not work, conceptually or operationally. But implementation in Sweden, Italy, Latvia, Norway, and Poland since the mid-1990s – and successful operations ever since– have proved to the contrary. Thus a systemic reform option emerged that promises financial sustainability under an unfunded scheme and a fixed contribution rate with incentives to address population aging through a concomitant self-determined increase in the retirement age in line with rising life expectancy. All NDB schemes have to do likewise to remain financially afloat, but an NDC

scheme claims to offer better incentives and higher transparency. The emphasis on the labor market as a solution to population aging in the NDC approach is only on the surface a difference from FDC schemes. Fully funded schemes also need to build on this labor market mechanism to remain financially sustainable (unless they invest most of their assets internationally).

This paper introduces the basics and key intricacies of NDC schemes. The target audience is not NDC experts but individuals knowledgeable about pensions who want to understand the key mechanisms and challenges of NDC schemes. Drawing heavily on Holzmann (2017b), the paper uses simple technical language to convey the main concepts, issues, and possible solutions. Many of the intricacies around the NDC approach are addressed in two prior anthologies on the topic (Holzmann and Palmer 2006; Holzmann, Palmer, and Robalino 2012, 2013) and in this NDC III publication.

Section 2 sketches the basic features of NDC schemes that make them attractive and explains how they work. Section 3 compares the working of the NDC approach to typical (traditional and reformed) NDB schemes. Section 4 outlines where more technical work is needed. Section 5 briefly reviews the international experience with NDC schemes or reform attempts in this direction while section 6 concludes.

2. The basics of an NDC scheme

The basic conceptual structure of any NDC scheme is the consistent link between the individual level of its design, which promises a direct contribution–benefit link,¹ and the macroeconomic level, which promises financial sustainability while remaining essentially unfunded. Simply put, an NDC scheme is an individual savings account scheme in which individuals receive a common rate of return consistent with the financial sustainability of

¹ The scheme is (pseudo-)actuarial as the derived and applied nonfinancial (notional) interest rate will differ from the one expected to be delivered by the financial market. Theoretically, in a dynamically efficient economy the financial market interest rate should be above the internal rate of return delivered by an NDC scheme; in reality this may not be the case.

the scheme; at retirement they receive a benefit consistent with the remaining cohort life expectancy and anticipated interest and wage growth rates during their expected life.

At the individual level, an NDC scheme promises income smoothing and intragenerational equity as it creates a strong contribution–benefit link through the following characteristics:

- Individual accounts exist into which contributions of each individual (and those of his/her employer) are recorded based on a fixed contribution rate and the individual contribution wage.
- The individual account receives an annual rate of return established in the design.
- The initial benefit is based on an annuity calculation that itself is based on the account accumulation and life expectancy at retirement.
- During disbursement, annual indexation is the same notional interest rate.²

This (pseudo-)actuarial structure is appealing because:

- The strict link between contributions and benefits creates transparency and possibly strong ownership of the approach: what you pay in you get out.
- It is thus broadly actuarially fair, so it offers incentives for formal labor market participation and delayed retirement.
- Despite this individual character, an NDC remains a social insurance scheme (i.e., it pools risk across cohorts and generations) as it offers in any given year one rate of return for all and insurance against the uncertainty of death.
- By design, NDC schemes do not redistribute income across individuals, for example from lifetime-poorer to lifetime-richer individuals in society.³ Such redistribution can easily be added but needs to come from outside the scheme and external resources.

² In the general approach, in both annuity calculation and annuity indexation an imputed interest is used that needs to be deducted from the applied interest rate.

³ However, the NDC scheme tends to pay much higher replacement rates to lower-income groups with a flat earnings profile than to fast-rising career patterns; see Nisticò and Bevilacqua (2013).

At the macro level, an NDC scheme promises intergenerational equity and financial sustainability through:

- A fixed contribution rate that broadly keeps the share of retirement income in gross domestic product (GDP) constant across generations.
- Application of a rate of return consistent with the financial sustainability of the scheme.
- Linking initial benefit level to remaining cohort life expectancy at retirement, thus adjusting benefit levels when relevant life expectancy changes.
- A strong economic incentive to postpone retirement to address increasing longevity (and as an alternative and more precise mechanism to exogenously raising the legal standard retirement age).

These basic design features and implied qualities are based on a number of assumptions that are broadened and the challenges addressed in section 4. The underlying assumptions are, however, the same as in the analysis of a typical NDB scheme. The latter serves as a benchmark to explore the qualities of an NDC scheme, discussed next.⁴

3. What can NDC schemes do better than NDB schemes?

NDC and NDB schemes share much in common, such as their unfunded character and that for solvency their liabilities need to be smaller or at most equal to their unfunded (pay-as-you-go/PAYG) assets. These notional assets are the difference between the present values of future contributions over future benefits derived from these contributions. Beyond their commonalities, NDC and NDB schemes have a number of differences. This section presents NDC scheme features that dominate those of traditional and reformed NDB schemes (including point systems such as used in France and Germany).

A traditional NDB scheme exhibits a range of distortive features such as final salary benefits, no actuarial adjustment for advanced or delayed retirement start, and no adjustment for

⁴ For a technical presentation of a generic NDC scheme, see Palmer (2013).

rising life expectancy. Parametric reforms of NDC schemes in recent years have tried to address such distortions and failings. A number of recently reformed NDB schemes emulate several of the features of NDC schemes, in particular lifetime averaging of income, indexing the standard retirement age to life expectancy, and actuarially motivated decrements and increments for earlier and later retirement. As discussed below, these aspects go some way but by themselves are insufficient to establish financial sustainability in an aging world. An NDB reform that fully mimics an NDC scheme is conceptually possible yet never done given the complexity and the need for repeated, complicated political decisions, rather than operating on “autopilot”.

3.1. Financial logic

The financial logic of an NDC scheme also applies to NDB schemes but is much easier and more transparently established under individual accounts. An NDC scheme’s liability is immediately visible or easily calculated: the liability toward the working generation is the sum of individual accounts; the liability toward retirees is broadly the sum of individual annual pension amounts times remaining life expectancy (similar to an NDB scheme). In an NDB scheme, establishing the full public pension liabilities (i.e., implicit debt, in particular for the working generation) is a complex task that only a few OECD countries are truly able to master. In an NDB scheme, the PAYG asset side is hardly ever considered.⁵ As a result the solvency assessment of NDB schemes – traditional and reformed – remains with very few exceptions focused on short- to medium-term cash-flow deficits. The relevant policy angles for pension schemes to assess sustainability are, however, liability and assets.

3.2. Automatic adjustments to parameters

An NDC scheme implemented by the rulebook offers many automatic adjustments to parameters that under NDB schemes require difficult discretionary political decisions. Key examples include:

⁵ Sweden developed a method to estimate the PAYG asset amount from cross-sectional data and compares this annually with the liability to determine solvency (Settergren and Mikula 2006).

- Legal changes in the standard and minimum retirement age are among the most difficult decisions for policy makers; for this reason, they happen mostly too little and too late. Various countries succeeded in indexing the retirement age with changes in a measure of life expectancy. This major accomplishment still falls quite short of the technically correct solution, as in all cases some projected period life expectancy (instead of the correct cohort life expectancy) is applied (Ayusa, Bravo, and Holzmann 2018), and in no instance does the indexed standard retirement age reflect the age at which the scheme would be sustainable. Furthermore, both with and without retirement age indexation, increases in retirement age face political resistance and implementation delays (even in the NDC country, Italy).
- In NDB schemes, earlier or later departure for retirement measured from the standard retirement age is (or should be) corrected with actuarial decrements/increments; otherwise, this creates major incentives for an early departure and significant redistribution and inequity among individuals. Many NDB schemes have increased their decrements and increments but only in a few instances do they reflect actuarially correct values; in no country are they revised when life expectancy changes.

In NDC schemes, these increments/decrements are implicit in the way the benefit is calculated and need no political decision. As the benefit is calculated by dividing the accumulation at retirement (broadly) by the remaining cohort life expectancy of this age, any early retirement has both lower accumulation and a higher divisor, leading to a lower benefit level that includes the decrement. Delays in retirement work similarly, but in the opposite direction.

- In NDB schemes, increases in retirement age in line with life expectancy are an important necessary but not sufficient step. With an unchanged annual accrual rate, individuals increase their benefit beyond what actuarial calculations would suggest

for financial solvency; i.e., retirement age increases need to be accompanied by reductions in the accrual rate. This creates another political decision that is hardly ever done on time and to the correct level.

In NDC schemes, such a reduction is again done automatically as part of the benefit calculation and does not require a separate political decision.

3.3. Minimum retirement age

Incentives for working after the minimum retirement age in NDB and NDC schemes are likely to be different.

Full benefits in NDB schemes of the not-so-distant past were typically based on a specified maximum number of years of participating with contributions (e.g., 30 or 40 years) and sometimes based on a highest income formula, or perhaps the last years of an earning career. This rewarded shorter careers and persons with steeper earnings curves. Others embodied redistributive features favoring lower-income groups. Both of these designs create incentives for earlier retirement. Even after a reform most NDB schemes do not impose truly actuarially fair decrements/increments for early/late retirement measured from the standard retirement age, thus favoring an early exit.⁶

An NDC scheme does not provide this incentive or distortion (as the intertemporal budget constraint remains linear across the lifecycle). In NDC every incremental contribution leads to a proportional increase in the retirement benefit for everyone in the same birth cohort. Of course, some bunching of retirement decisions around the minimum retirement age in NDC schemes may still take place, possibly related to a signaling effect of the minimum retirement age to individuals, pressures by the employer, or people waiting to retire.

⁶ The OECD's annual publications of *Pensions at a Glance* (PaG) offer information about countries' status and reforms, including on increments and decrements for advanced and delayed retirement. The 2017 PaG publication (OECD 2017) addresses earlier retirement policy changes and Table 2.2 of the OECD publication details the decrements and increments for each country. While the number of NDB countries that introduced adjustments has increased, only a few countries have them close to their actuarial level; most are two-thirds or less. A comprehensive study to compare and assess countries' actual actuarial fairness is lacking.

3.4. Separating income replacement from redistributive considerations

This is an important aspect for transparency. The schemes' approaches differ in this regard. NDB schemes traditionally had strong redistributive features toward lower-income groups, albeit the outcome was often a reverse (regressive) redistribution. The redistributive objectives and outcomes are often opaque and special analysis is required to reveal the effects. In addition, redistributive features that are decided now, such as special supplements for women with children, have financial implications that are only incurred in the future (e.g., when these women retire).

An NDC scheme is designed to be free of redistribution but allows for redistributive measures and social policy interventions. However, those interventions have to be explicitly introduced into the scheme and resources have to be provided when these liabilities are created, not when they are disbursed. The logic of the NDC scheme demands this up-front payment as only the contribution-based benefits are matched by the PAYG asset. Additional noncontributory commitments need to be financed now and kept in a reserve fund until disbursement. This avoids the creation of unfunded promises.

Possible social policy interventions may comprise the contribution payments to the NDC scheme on behalf of the individual during, for example, paid unemployment, maternity leave, and disability by the corresponding other social security funds. Redistribution efforts may include a targeted or universal lump-sum contribution payment to individual accounts financed by general government revenues.

3.5. Heterogeneity in longevity

Both NDB and NDC schemes are challenged by heterogeneity in longevity among socioeconomic groups. This phenomenon is increasingly documented among OECD countries – with regard to gender, lifetime income, education, and other characteristics (Ayuso, Bravo, and Holzmann 2016a).

In NDB schemes, a positive relationship between lifetime income and remaining life expectancy at retirement may be somewhat corrected by a progressive benefit structure (such as in the United States) but the correction is only approximate and inflexible; i.e., as heterogeneity changes over time, the concomitant change in benefit structure is difficult to undertake.

In (N and F) DC schemes, a positive relationship between lifetime income and remaining life expectancy at retirement translates into a straight tax/subsidy mechanism with tax rates for the lowest income groups reaching 20 or even 30 percent in some countries, and subsidy rates for the highest income group reaching similar levels. To correct such tax/subsidies and their distortionary effects, DC schemes may apply corrections at the time of annuitization by individualized life expectancy estimates, or during the accumulation phase through differentiated contribution rates according to income level (Ayuso, Bravo, and Holzmann 2016b).

In an NDC scheme a simple way to correct for the positive relationship between lifetime income and life expectancy at retirement is a two-tier contribution structure: one share of the total contribution rate is applied to the average period income, while the remaining share is applied – as normally done – to the individual period income. With a total contribution rate of 20 percent, 2 to 5 percentage points when applied to the average income but recorded at the individual account seem sufficient to correct heterogeneity effects in most OECD countries. Any future change in heterogeneity can be reflected in periodic reestimations of the required contribution split while the overall contribution rate remains constant. Gender inequality in heterogeneity can be addressed by applying gender-specific life expectancies at retirement, an economically correct approach but likely politically difficult (Ayuso, Bravo, and Holzmann 2016b; Holzmann et al. 2019).

3.6. Survivors' and disability benefits

Reforming (partner) survivors' and disability benefits is an important aspect of any pension reform. NDC schemes offer better prospects for accommodating this than NDB schemes,

however reformed. The need for these programs' reform emerges as (i) women's labor force participation is approaching that of men's, and (ii) disability has for decades been a separate risk from old age and thus should be addressed and priced separately (Holzmann and Hinz 2005).

Under an NDC approach, the separation of survivors' benefits is conceptually straightforward. For (partner) survivors' benefits, some transitional and time-limited DBs are needed, particularly if small children are concerned. As accounts for one or both partners exist, the rights involved allow for splitting the amounts in a variety of ways, including on a mandatory or voluntary basis. For example, in the case of divorce, joint accumulations during the partnership/marriage may be simply split, and the process can be repeated under a new marriage and divorce. In case of survivorship, the surviving spouse may get some share of the deceased's accumulation that is added to her own account. In the presence of children, a time-limited DB may be paid that is dependent on the age and number of children. If both spouses opted for a joint annuity at retirement, the surviving spouse may be offered an actuarially adjusted annuity.

As the disability risk is nowadays fully separated from the old-age risk(s), it can and should be separately priced and managed. The separate disability insurance becomes responsible for continuing to pay the full contributions to the NDC scheme if a disability risk (with and without rehabilitation) emerges. At a determined retirement age (for example, an indexed age somewhere between a minimum and a notional standard retirement age), the responsibility of the disability insurance stops and the (old-age) NDC scheme takes over.

Many variations of these approaches can be developed that treat survivors' and disability benefits separately from old-age benefits but seek an integration that minimizes distortions while delivering on social policy objectives.

3.7. Harmonization of schemes

Harmonization of national sector pension schemes within the private sector and also between a private and a public sector scheme is on the reform agenda in many countries to reduce inequalities, to increase labor mobility, and to take care of unsustainable schemes. This is challenging among NDB schemes but conceptually and practically easy under an NDC personal account approach, where the liabilities are transparent and easy to calculate.

To harmonize national NDB schemes typically requires one (sector) scheme to take over the design of another (general) scheme. For new entrants to the labor market, the common rules apply while for all others, transitional arrangements are constructed. This can lead to transition periods of several decades, to which the complexity of smaller and larger follow-up reforms is added. This is often a technical and political challenge to design, implement, and sustain, as inequalities are bound to surface.

The move from an NDB scheme and the harmonization of different NDB schemes into a single one may not take more than a year or so if individual records and the corresponding data management infrastructure are available. The approach essentially consists of: (i) keeping benefits in disbursement untouched; (ii) translating the acquired individual rights of insured workers into initial individual capital for the NDC accounts; and (iii) starting the new common scheme with this initial capital, to which future contributions are added (Palmer 2006). To calculate the initial capital, assumptions about the applied discount rate need to be made, but thereafter the calculation and verification are a matter of days or weeks. This approach allows a smooth transition for everyone, from a person one day from retirement (hardly influenced by the new rules) to a two-week entrant to the labor market (hardly influenced by the old rules). Of course, without individual records and insufficient data management infrastructure, the calculations are more difficult and time-consuming and the development of the required infrastructure may take years. But this also applies to a NDB reform that aims to emulate (imperfectly) an NDC scheme.

3.8. Portability

Portability of pensions across professions, sectors, and international borders is increasingly demanded in a world of rising labor mobility within and between countries.

For NDB schemes, portability arrangements have been established between countries in bilateral social security agreements (or directives within the European Union (EU) for all member states). They seem to work reasonably well where they exist between countries as they do not create mobility obstacles or financial advantages of one country over another, and are not too administratively cumbersome (Holzmann 2016a). However, bilateral agreements between NDB countries still create challenges due to differences in benefit calculations and retirement ages between jurisdictions. Absent such agreements, major portability issues will emerge in the case of long waiting periods (before becoming eligible) as individuals may not become eligible for any benefit in any country he or she works in as the insurance periods are not totalized (i.e., all insurance periods counted together).

Under an NDC approach, a waiting period is, in principle, not needed as one only gets out what one pays in (and if a waiting period exists, it is for administrative purposes and typically limited to one year or less). Thus even in the absence of bilateral social security agreements, the right of exportability of benefits in the social security law is sufficient to establish portability for NDC benefits.

Within the European context, a common NDC approach would be analogue to the introduction of a value-added tax (which the predecessor of the EU spearheaded for Europe and is implemented worldwide). The NDC approach would be a common concept that allows for country-specific NDC contribution rates (and thus differentiated room for funded and basic provisions) while facilitating portability across multiple borders within the EU. It would create a coordinated pan-European pension system without harmonization pressure (Holzmann 2006).

3.9. Taxation of cross-border pensions

This remains an unaddressed issue of fiscal sustainability. The current OECD guidance on cross-border taxation of (private sector) pensions allocates the taxation rights to the residence country. This is also the basis for most double-taxation treaties between countries across the world. In view of the expenditure-type treatment of public pensions in most countries, the working country exempts contributions from taxation while taxing benefits during disbursement. Thus the working country has to bear the tax expenditure of untaxed contributions while the residence country profits from the taxation of benefits. This creates fiscal disequilibria between countries, invites tax arbitrage, and is not sustainable in a world of rising labor mobility (Holzmann 2016b).

Addressing the cross-border taxation issue with NDB schemes under the existing international taxation rules is not impossible, but economists have given very little consideration to this question, to date the domain of tax lawyers. A conceptually simple solution is to move from a backloaded taxation approach (at disbursement) to a frontloaded approach (at contribution payment and return receipt). This move would go against the general taxation direction over the last decades, but would be in line with recent policy changes in Australia and the United Kingdom.

A proposed alternative taxation approach exists that distinguishes between creation of the tax liability in a frontloaded system and its three main payment options: immediately when the liability is created; delayed (when leaving the country or receiving the pension); and equally phased across the three stages of contribution payment, return receipt, and benefit disbursement (Genser and Holzmann 2016, 2018). These payment options can be implemented under both NDB and NDC schemes but a review suggests that all three payment options are more easily implemented under an NDC approach (Genser and Holzmann 2019).

3.10. NDC, NDB, and FDC: Select issues

Distribution of survivors' dividend: In NDC schemes the question emerges, to whom does the accumulation of a deceased prior to retirement belong? Accumulations can be kept (without discussion) by the NDC scheme as is typically done by NDB schemes; they can be distributed among the same cohort survivors as is done in the Swedish NDC scheme; they can be used to finance mortality improvements (as proposed by Arnold-Gaille et al. 2016); they can help finance the legacy costs; or they can simply be used to fill any reserve fund that exists. Whatever the approach, public discussion and a government position are called for.

Rationale for a reserve fund: As an NDC scheme is unfunded, it cannot guarantee liquidity at all times, which calls for a liquidity fund (else nominal benefits may need to be cut, public transfers received, or temporary credits taken). A reserve fund may also be advisable to smooth some limited and foreseeable shocks such as short-term demographic blips or expected economic shocks to avoid stark fluctuations of the rate of return within a generation. Large reserve funds to address large and protracted shocks may not be advisable (Holzmann, Palmer, and Robalino 2013). In any case, the hosting of redistributive measures and their upfront financing calls for creation of a reserve fund that may accommodate all three rationales concurrently. Such considerations may also motivate a reserve fund for NDB schemes but there it is not part of the system logic and the experience with such funds has not been convincing.

Establishing the individual account logic: NDC and FDC schemes can complement each other. A NDC reform establishes a sustainable yet unfunded pension scheme and exposes individuals to the logic of a savings-type retirement benefit approach and a close contribution–benefit link. Once the enabling environment for funded provisions (such as financial infrastructure) and the budgetary provisions for the transition costs are established, an FDC scheme can be easily added to an NDC scheme or replace it, at least partially.

Risk diversification: Furthermore, as much as the rates of return of NDC (one rate that is closely linked to GDP growth) and FDC schemes (different rates by schemes) are not highly or even negatively correlated, splitting retirement provisions along NDC and FDC diversifies risk. The selection of the split will be codetermined by the much lower operating costs of an NDC scheme compared to typical FDC schemes.

4. Key frontiers in design and implementation of NDC schemes

While a lot of thinking has gone into the development of NDC schemes, and academic research across the world has reduced the knowledge gaps, not all issues have been solved and new ones continue to be discovered. This section summarizes key issues and some proposed potential solutions.

4.1. How best to proxy the nonfinancial rate of return?

In an economic and demographic steady state environment (i.e., when all variables grow at a constant but not necessarily equal rate), a proxy for the nonfinancial rate of return is not needed, as the key variables all offer the same value for the implicit rate of return of an unfunded scheme: the growth rate of the labor force plus the rate of productivity growth. In such a setting this rate equals the growth rate of contribution payment or the growth rate of GDP, and the per capita growth rates of each of these aggregate variables are also equal.

Given the reality of economic and demographic shocks and measurement issues associated with each of these variables, it is not as easy to decide which variable is the best proxy for the rate that is expected to best guarantee financial sustainability (i.e., the nonfinancial (notional) rate of return). Countries that established NDC schemes selected different rates, for different reasons: Italy chose the GDP growth rate, which may be on the generous side; Sweden selected the per capita wage growth to offer some cushioning in front of an aging and perhaps shrinking workforce; Latvia, Norway, and Poland selected the growth rate of the contribution wage sum – the covered wage bill but with variance in scope (ceiling) and

definition. The covered wage bill is the most consistent with the NDC model but has weaknesses in expanding and contracting environments of contribution coverage.

The rate of return that guarantees financial solvency can be theoretically calculated (when starting from equilibrium) from the growth rate of the PAYG asset⁷ and the rate(s) of return of the financial assets/ the reserve fund. But how best to estimate the PAYG asset and its change is still under research, and the realized rates of return on the financial market may not express equilibrium values but reflect stochastic or biased outcomes in a highly complex market. Hence the theoretical construct is not very helpful in choosing an operational proxy.

4.2. A balancing mechanism: Is it needed and what should it look like?

Neither an empirical variable (such as the growth rate of the contribution-based wage sum) nor any model-based estimate can claim to achieve financial sustainability of a NDC scheme without the need of any future corrections. The basic mechanism of NDC consists of indexing accounts and pensions with the rate of growth of the nominal contribution wage base (i.e., the base for contributions collected). This provides a steady adjustment that reflects three fundamentals: (i) growth of the real per capita wage; (ii) growth of the contributing labor force; and (iii) the rate of inflation. This generic NDC indexation, combined with the use of cohort life expectancy at retirement in computing the benefit, go a long way in keeping the NDC scheme in long-term balance, not the least in the face of substantial long-run chronic declines in the labor force and low fertility. This is illustrated for Latvia in Palmer and Stabina (2019).

Nevertheless, any NDC scheme is well-advised to consider a balancing mechanism that corrects the annual adjustment of accounts and pensions if a relevant difference between liabilities and assets of the scheme is detected. This is how the Swedish balancing mechanism works (Settergren 2013). Such a balancing mechanism should be designed to be

⁷ The PAYG asset is the difference between the present value of contributions and related liabilities.

automatic to remove the politics out of the mechanism and thus it has to determine when the mechanism is triggered, over how many years the correction is phased, and whether it applies symmetrically in both directions. Furthermore, a reserve fund (discussed below) may act as a mechanism to drag out an adjustment as the estimation of assets is still surrounded by conceptual uncertainties.

Interestingly only one country – Sweden – has established an automatic balancing mechanism (ABM), with issues of its own (Barr and Diamond 2011; Palmer 2013). Norway relies essentially on its huge national wealth fund to guarantee sustainability (which some claim makes it germane to a substantial “reserve”-funded system). The alternative is to rely on the general budget as a buffer reserve for temporary fluctuations, where again Latvia is an example, with a budgeted reserve. Italy made a further correction in 2012 – but only because the scheme was poorly designed from the outset – a lesson in itself. A key requirement for an operationally relevant ABM is a good estimate of the assets that for NDC schemes comprise predominantly contribution (or PAYG) assets. The estimate used by Sweden based on cross-section data is the best approach available to date.

Academic research has produced a number of proposals on how best to select the account and benefit indexation variables to achieve sustainability and/or liquidity of an NDC scheme, or to correct through ABM approaches (e.g., Gronchi and Nistico 2008; Robalino and Bodor 2009; Boado-Penas and Vidal-Meliá 2013; Alonso-Garcia and Devolder 2017). The translation into country practices is still to be done.

4.3. How best to deal with the legacy cost in NDC introduction?

A reform that moves from an NDB to an NDC scheme typically fixes the long-term contribution rate below the prior cost-covering rate of the unsustainable NDB scheme. The difference between the short-term financing needs inherited from the old system and the long-term rate under the new system creates a transitory, albeit falling, revenue shortfall or legacy cost of, perhaps, decades, that needs to be financed. These legacy costs are

conceptually similar to the transition costs of moving from an NDB and FDC scheme but smaller, as only the unsustainable part of the implicit pension liabilities is made explicit.

These legacy costs could be financed by levying a cost-covering contribution rate but allocating only the revenues from the long-term rate to the individual accounts; the rest would be an explicit tax. Such an approach risks undermining the credibility of the new scheme and the promise that one gets back what one contributed. Using an existing national wealth or reserve fund that can be tapped would be an option for countries that had such a fund prior to the reform (such as Sweden and Norway). In most OECD countries, one would have to use government transfers generated through reduced public expenditure or higher revenues to finance the transition. In emerging economies such as China, the expansion in coverage may be able to cover the estimated legacy costs (Holzmann and Jousten 2013).

4.4. How to share the longevity risk with and without NDC bonds?

Using cohort life expectancy compared to period (cross-section) life expectancy is already a major contribution toward a sustainable NDC scheme. As cohort life expectancy is based not only on estimations but also on projections of how age-specific mortality rates change over time, a higher level of uncertainty surrounds the estimated life expectancy value. Yet these estimates cover only the “known unknown.” Breakthroughs in medical science may lead to major reductions in mortality at higher ages; most changes will happen in the future at these ages when pensions are already in disbursement. How can the longevity risk in both cases be best shared among retirees and with the active population?

A distribution of the longevity risk within the NDC pool occurs through adjustments in the allocated rate of return and annual indexation of the pension benefits when different. The difference may happen with a frontloaded benefit scheme that assumes a rate of return and offers higher initial benefits and only, for example, price indexation thereafter. But many other possibilities and arrangements exist on how to share the longevity risk among retirees and contributors. These should be studied further.

One suggested way to share the longevity risk with the population at large is for the government to issue NDC bonds (Palmer 2013). An NDC bond transfers the residual risk (the risk of under- or overestimating cohort longevity) to the insurer—that is, the government. The NDC bond proposed is a nontradable instrument; i.e., not for sale on the financial market. It is a contract between the government and NDC scheme participants that emulates the market contract underlying bond financing of government debt. The rate of return of the NDC bond is the NDC internal rate of return. Similar ideas about tradable longevity bonds for the risk management of occupational FDC and FDB schemes were little successful, as their failed introduction in a few countries has demonstrated (Holzmann 2017a).

4.5. How to address marginalization on the labor market with an NDC scheme?

NDC schemes are a perfect consumption-smoothing instrument for fulltime workers with few gaps in their working years; they may furthermore be covered by contributions from unemployment, sickness, or disability insurance programs. However, developments over the recent decade in OECD countries were often characterized by: an increase in part-time employment, of which only part is voluntary and often applies to women; long spells of unpaid internships; a succession of temporary and lower-paid contracts; and an increase in the number and spells of unemployment.⁸ During these periods, no or low contribution amounts are added to the individual account. Others may join the domestic labor market only late in their career as recognized refugees, economic migrants, or undocumented workers. For all these and other marginalized groups, an NDC scheme offers only modest benefits; and in the case of a public income guarantee for retirees, incentives are limited to contribute to the scheme.

How best to include marginalized groups in the NDC scheme while offering some income guarantee in old age is a key challenge. Should the government offer some ex post income

⁸ For simulations of the impact of unemployment spells on pension benefits in the Portuguese and Spanish pension schemes, see Bravo and Herce (2017).

guarantee with only limited and phased-in claw-back as own NDC accumulations exist? Or should the incentives for more contributions be created through ex ante interventions such as matching contribution payments by the government? Are two-tier contribution schemes – discussed above – an approach not only to address heterogeneity in longevity but also to address marginalization? Or should it be a mix of interventions to deal with related but different objectives and individual situations?

Various papers in this Discussion Paper series address issues and policy suggestions on how best to link the NDC approach and social policy interventions. NDC individual accounts provide an ideal basic building block for public policy regarding provision of pension rights in conjunction with public policy interventions that provide income and contribution support (e.g., during periods of childbirth; retraining/re-education in conjunction with disrupted careers or career changes; granting disability; and sharing rights between partners). NDC's advantage is that it provides the framework for transparent distributional policy as the resources have to be provided when committed. This compares well with similar attempts in NDB schemes where financing happens only at the time of disbursement while the effects on pension benefits at the time of decision are more difficult to determine.

4.6. How to market the advantages of NDC schemes to policy makers and the general public?

Despite the advantages of an NDC scheme compared to an NDB scheme, only a limited number of countries have introduced an NDC scheme with variations, while a few more countries have introduced elements but not the full approach (discussed next). What could be the reason for this hesitation and the expressed preference for a sequence of late, insufficient, and parametric reforms of NDB schemes? And what can be done about it?

NDC schemes are poorly understood and communicated, while the basic understanding of economic and financial affairs of the population at large is limited. Significant improvements in these areas are critical for furthering better-designed pension schemes (Fornero 2015; Fornero and Prete 2017). The work on Sweden suggests that it is difficult to reach

participants with NDC messages (Sunden 2013), and the messages provided may still be too complicated. Recent communication work under the voluntary and funded UK scheme NEST is very innovative and promising (NEST 2017; Sandbrook and Ravi-Burslem 2019); the results may be useful for NDC schemes.

Many reasons may be raised to advance the advantages and desirability of NDC schemes. The fundamental one is that introducing an NDC scheme takes the politics out of pensions, an important achievement since policy makers usually do not want to be “lashed to the mast” (Brooks and Weaver 2006). If properly designed, an NDC scheme makes unsustainability fully visible and precludes postponement of the politically dicey adjustment. However, it should be made clear and publicly explained that an NDC scheme that disregards heterogeneity of longevity and marginalization is not a good deal for lower-income groups and that higher-income groups may lose compared to the status quo.

Various observers claim that recent NDB reforms in many OECD countries broadly achieved what an NDC scheme promises to do by introducing actuarially fair adjustments, automatic adjustments in retirement age based on life expectancy, and lifetime valorized career average wage bases. Such a claim, if often repeated and supported by recognized organizations, will reduce interest in an NDC reform. While the claim of establishing financial sustainability through parametric reforms has undoubtedly reduced the attractiveness of a systemic NDC reform, it is doubtful these reforms have actually achieved their goals.

5. Country experiences with NDC reforms

While conceptual considerations are relevant for the assessment and comparison of pension schemes, the experiences of countries with NDC reforms offer the actual proof. This section provides a brief overview of countries that implemented an NDC reform of a prior NDB scheme. It also highlights countries with near or lesser NDC reforms or those exploring this reform option. Several papers in this Discussion Paper series offer details.

5.1. Countries with NDC reform experience or interest

To date, five European OECD countries have implemented a full NDC reform, albeit with some variation:⁹ Sweden (legislated in 1994, implemented gradually beginning in 1996, with full implementation in 1999); Italy (legislated in 1995, implemented in 1996, with reform measures and accelerated implementation in 2012); Latvia (legislated in 1995, implemented in 1996); Poland (legislated in 1998, implemented in 1999); and Norway (legislated in 2009, implemented in 2011). The variations across countries include the choice of proxy for the sustainable internal rate of return, the presence or absence of a balancing mechanism, the speed of transition, and the addition of a smaller funded pillar.

In the 1990s and 2000s, a few middle-income countries (such as Azerbaijan, the Kyrgyz Republic, Mongolia, the Russian Federation, Tajikistan, and Turkmenistan) adopted some NDC features in their pension schemes, but information on and assessment of the outcomes remain scant. Egypt legislated an NDC scheme in 2010 but the legislation was rescinded during the Arab Spring (Guardiancich et al. 2019). Implementing an NDC scheme in a middle-income country is bound to raise new conceptual and operational issues about which the understanding and knowledge are currently very limited (Palacios 2019 and Lu, Piggott, and Sheng 2019 offer some insights). From Russia, it is known that the government moved to a point system, by some accounts because authorities could exercise more influence over pension benefits through valuation of points than they could under an NDC scheme.

A number of countries (or groups therein) across the world have expressed interest in the NDC approach to reform their NDB scheme: Argentina (which reversed an FDC approach) and Uruguay in Latin America; various European countries such as Greece, Portugal, and Spain; and several countries in Asia, in particular Iran and China (Lu, Piggott, and Zheng, 2019). China has a two-tier contribution structure with province-specific attempts to fund

⁹ For detailed information on NDC schemes in these countries since their start, see Chłoń-Domińczak, Franco, and Palmer (2012); Christensen et al. (2012); Palmer and Könberg (2019); Palmer and Stabina (2019); Gronchi, Nisticò, and Bevilacqua (2019); and Buchholtz, Chłoń-Domińczak, and Góra (2019).

individual contributions. As this attempt has proven little successful, the move from “empty accounts” to a formal NDC scheme is still under discussion in some parts of government.

5.2. Reform lessons from NDC countries

Overall, the lessons from the five European OECD countries with an NDC reform are positive. The four early adopters of the reform weathered the 2008 financial crisis and following years well, and no reform reversals were ever discussed. However, both Latvia and Poland, with their large pre-reform commitments, retrenched their funded ambitions as the transition costs of NDC and FDC proved to be too heavy a strain on the public budget. And Sweden and Latvia had to address the political challenge of negative account indexation during the early years of the crisis.

A review of the first 15 years of reform in the four early adopters (Italy, Latvia, Poland, and Sweden) suggested seven lessons (Holzmann and Palmer 2012). Six years later and with additional country information, the lessons remain broadly unchanged, but this NDC III publication adds three more lessons. NDC schemes broadly work pretty well, but room remains to make them even better if policy makers:

- Follow the rulebook in design and implement fast transition options.
- Do not underestimate the technical requirements for NDC implementation, including individualized accounts and estimates for cohort life expectancies at retirement ages.
- If logistically possible, transition immediately to NDC accounts and avoid parallel schemes and delayed implementation. The recommendation is to go “cold turkey” and move straight from NDB to NDC schemes without transitional arrangements.
- Identify and finance the legacy costs in an explicit manner as they emerge, as they will have to be faced sooner or later. Ignoring such costs does not work and not foreseeing an appropriate financing mechanism can be dangerous if unexpected shocks hit.

- Establish an explicit balancing mechanism to guarantee solvency in a transparent manner. Only Sweden implemented an automatic mechanism; all other countries have no explicit process. This is not good for the credibility of the scheme and risks leading to significant government financial burden.
- Establish a reserve fund to cushion temporary shocks. This helps to provide liquidity and avoids too strong fluctuations of the rate of return within a generation. For larger and protracted shocks, a larger fund may not work and a better response may be to accept some differences in the notional interest rate within and across generations.
- Develop an explicit mechanism for sharing the systemic longevity risk. Such a mechanism can be simply an ex-ante agreed split of burden among retirees and with the contributor. It may also include more sophisticated approaches once their conceptual dominance and operational implementation are established.
- Address the implications of NDC schemes for subgroups such as women, marginalized individuals, and marginal labor market participants head-on through analysis and political discourse, and explore social policy options to address issues through an enhanced design and external financing that broadly keeps the advantages of the scheme approach while taking care of these groups' needs.
- Explore, design, and implement early on reforms of benefit schemes that are closely linked with old-age income provisions, i.e., survivorship, disability and, perhaps, long-term care. Keeping the prior structure of these programs misses an opportunity for their needed reform and does not play to the advantages of NDC schemes.
- Explore early on in design and implementation the integration of other pension pillars with the NDC scheme; i.e., a zero pillar to take care of poverty concerns; a second-pillar provision of mandated and funded design; a third pillar of voluntary occupational and personal retirement saving efforts; and a fourth pillar that offers income support and services for the elderly.

- Explore early on the communication needs to explain the NDC approach and the communication means to keep individuals updated on their accounts, and invest in special education programs and tools.

6. Conclusions and way forward

The NDC pension scheme approach is the newest entrant to the small set of systemic pension reform proposals. Although just 25 years old, with even fewer years of implementation, the approach is doing well. The schemes in the five OECD countries that implemented the basic NDC approach in full are doing well overall by key criteria of a pension scheme – adequacy, affordability, and sustainability. All of these schemes weathered the recent financial crisis relatively well, albeit this demonstrated the importance of a complete design, including a balancing mechanism, reserve fund, and preparation for the legacy costs of the reform.

The NDC scheme serves as a benchmark for other OECD countries that are undertaking (only) a parametric reform of their NDB scheme, as policy makers have started to understand that the NDC logic and constraints also apply to NDB schemes. The approach inspired a number of emerging economies to implement elements of the NDC design but little is known about the reported failings of such mixed schemes. The implementation of an NDC scheme has a number of institutional requirements that are not easily met by emerging economies.

Despite the many advantages of the NDC approach compared to any NDB approach, few countries in the world are actively preparing an NDC reform. This may be because the recent NDB reforms could broadly stabilize the short-term financing needs of the scheme while the longer-term financial unsustainability is beyond the time horizon of policy makers. It could be that the proponents of NDCs overestimated the ring of the efficiency and sustainability promises of the scheme while underestimating the importance of explicit features to take care of marginalized groups. It may also be that communication of the NDC

concept and its actual working was insufficient to create a reform dynamic similar to that of the Chilean reform in the 1990s and 2000s.

References

Alonso-Garcia, Jennifer, and Pierre Devolder. 2017. "Sustainable Design of Notional Defined Contribution Scheme in a Continuous OLG Model." CEPAR (UNSW), Mimeo, May 31.

Arnold-Gaille, Séverine, Maria del Carmen Boado-Penas, and Humberto Godínez-Olivares. 2016. "Longevity Risk in Notional Defined Contribution Pension Schemes: a Solution." *Geneva Papers on Risk and Insurance* 41(1): 24-52.

Ayuso, Mercedes, Jorge M. Bravo, and Robert Holzmann. 2017a. "On the Heterogeneity of Longevity among Socio-economic Groups: Scope, Trends and Implications for Earnings-Related Pension Programs." *Global Journal of Human Social Sciences-Economics* 17(1): 33–58.

_____. 2017b. "Addressing Longevity Heterogeneity in Pension Scheme Design and Reform." *Journal of Finance and Economics* 6(10):1-21.

_____. 2018. "Getting Life Expectancy Estimates Right for Pension Policy: Period versus Cohort Approach." IZA Discussion Papers No. 11512, April.

Barr, Nicholas, and Peter Diamond. 2011. "Improving Sweden's Automatic Pension Adjustment Mechanism". *Issue Brief* Number 11-2, January 2011, Chestnut Hill, MA: Center for Retirement at Boston College, http://crr.bc.edu/wp-content/uploads/2011/01/IB_11-2-508.pdf

Boado-Penas, Maria del Carmen, and Carlos Vidal-Meliá. 2013. "The Actuarial Balance of the Pay-As-You-Go Pension System: The Swedish NDC Model Versus the US DB model." In Holzmann, Robert, Edward Palmer, and David Robalino, eds. Op. cit. Chapter 23: 443–480.

Bravo, Jorge, and José A. Herce. 2017. "Acerca de la influencia de las interrupciones en el empleo sobre las prestaciones por jubilación." Documento de Trabajo: Nº 19/2017. Lisboa / Madrid: Instituto BBVA de pensiones.

Brooks, Sarah M., and Kent Weaver. 2006. "Lashed to the Mast? The Politics of NDC Pension Reform." In Robert Holzmann and Edward Palmer, eds. Op. cit. Chapter 14: 345-385.

Buchholtz, Sonia, Agnieszka Chłoń-Domińczak, and Marek Góra. 2019. "The Polish NDC Scheme: Success in the Face of Adversity." Social Protection and Jobs Discussion Paper, No. 1904. Washington, D.C.: World Bank Group.

Chłoń-Domińczak, Agnieszka, and Marek Gora. 2006. "The NDC System in Poland: Assessment after Five Years." In Robert Holzmann and Edward Palmer, eds. Op. cit. Chapter 16: 425–448.

Chłoń-Domińczak, Agnieszka, Daniele Franco, and Edward Palmer. 2012. "The First Wave of NDC Reforms: The Experiences of Italy, Latvia, Poland, and Sweden." In Robert Holzmann, Edward Palmer, and David Robalino, eds. Op. cit. Chapter 2: 31-84.

Christensen, Arne Magnus, Dennis Fredriksen, Ole Christian Lien, and Nils Martin Stølen. 2012. "Pension Reform in Norway: Combining an NDC Approach and Distributional Goals." In Robert Holzmann, Edward Palmer, and David Robalino, eds. Op. cit. Chapter 4: 149-174.

Fornero, Elsa. 2015. "Reform, Inform, Educate: A New Paradigm for Pension Systems". In *The Future of Welfare in a Global Europe*, ed. Bernd Marin, pp. 297-324. Farnham, UK: Ashgate.

Fornero, Elsa, and Anna Lo Prete. 2017. "Voting in the Aftermath of a Pension Reform: The Role of Financial Literacy." CeRP WP 171/17. Torino: CePR.

Fox, Louise, and Edward Palmer. 1999. "Latvian Pension Reform." Social Protection Discussion Paper 9922, World Bank, Washington, DC.

Genser, Bernd, and Robert Holzmann. 2016. "The Taxation of Internationally Portable Pensions: An Introduction to Fiscal Issues and Policy Options." CESifo DICE Report, 1/2016. CESifo, Munich.

_____. 2018. "The Taxation of Internationally Portable Pensions – Fiscal Issues and Policy Options." In *The Taxation of Pensions*, ed. Robert Holzmann and John Piggott, pp. 443-479. Cambridge, MA: MIT Press.

_____. 2019. "Pensions in a Globalizing World: How Do (N)DC and (N)DB Schemes Fare and Compare on Portability and Taxation?" Social Protection and Jobs Discussion Paper, No. 1928. Washington, D.C.: World Bank Group.

Gronchi, Sandro, and Sergio Nisticò. 2008. "The Theoretical Foundations of NDC Pension Schemes." *Metroeconomica* 58(2): 131-159.

Gronchi, Sandro, Sergio Nisticò, and Mirko Bevilacqua. 2019. "The Italian NDC Scheme: Evolution and Remaining Potholes." Social Protection and Jobs Discussion Paper, No. 1903. Washington, D.C.: World Bank Group.

Guardiancich, Igor, R. Kent Weaver, Gustavo Demarco, and Mark C. Dorfman. 2019. "The Politics of NDC Pension Scheme Diffusion: Constraints and Drivers." Social Protection and Jobs Discussion Paper, No. 1927. Washington, D.C.: World Bank Group.

Holzmann, Robert. 1988. *Reforming Public Pensions? La Réforme des Régimes Publics de Pensions*. Paris: OECD.

_____. 1997. "Pension Reform, Financial Market Development, and Economic Growth: Preliminary Evidence from Chile." *IMF Staff Papers* 44, June, 149-178.

_____. 1999. "On the Economic Benefits and Fiscal Requirements of Moving from Unfunded to Funded Pensions." In *The Welfare State in Europe*, ed. Mario Buti, Daniele Franco, and Lucca Pench, pp. 139-196. Cheltenham, UK, and Northampton, MA (Edward Elgar).

_____. 2006. "Toward a Coordinated Pension System in Europe: Rationale and Potential Structure." In Robert Holzmann and Edward Palmer, eds. *Op. cit.* Chapter 11: 225-265.

_____. 2013. "Global Pension Systems and Their Reform: Worldwide Drivers, Trends and Challenges." *International Social Security Review* 66(2): 1-29.

_____. 2016a. "Do Bilateral Social Security Agreements Deliver on the Portability of Pensions and Health Care Benefits? A Summary Policy Paper on Four Migration Corridors Between EU and Non-EU Member States." *IZA Journal of European Labor Studies* 5(17): 1-35.

_____. 2016b. "Taxing Pensions of an Internationally Mobile Labor Force: Portability Issues and Taxation Options." CESifo Working Papers No. 7515. CESifo, Munich.

_____. 2017a. "La Fase de Percepción de los Pagos de las Pensiones: Tendencias, Problemas, Principales Desafíos y Papel del Gobierno." In *Ideas para una Reforma de Pensiones*, ed. Luis Carranza, Ángel Melguizo, and David Tuesta, pp. 297-340. Capítulo 11. Lima: Universidad di San Martin de Porres.

_____. 2017b. "The ABCs of Non-financial Defined Contribution (NDC) Schemes." *International Social Security Review* 70(3): 53-77.

Holzmann, Robert, and Richard Hinz. 2005. *Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform*. Washington, D.C.: The World Bank.

Holzmann, Robert, and Alain Jousten. 2013. "Addressing the Legacy Costs in an NDC Reform: Conceptualization, Measurement, Financing." In Robert Holzmann, Edward Palmer, and David Robalino, eds. *Op. cit.* Chapter 18: 227-308.

Holzmann, Robert, and Edward Palmer (eds). 2006. *Pension Reform: Issues and Prospect for Non-Financial Defined Contribution (NDC) Schemes*. Washington, D.C.: The World Bank.

_____. 2012. "NDC in the Teens: Lessons and Issues." In Robert Holzmann, Edward Palmer, and David Robalino, eds. *Op. cit.* Chapter 1: 3-29.

Holzmann, Robert, Edward Palmer, and David Robalino (eds). 2012. *NDC Pension Schemes in a Changing Pension World, Volume 1: Progress, Issues, and Implementation*. Washington, D.C.: The World Bank and Swedish Social Insurance Agency.

_____. 2013. *NDC Pension Schemes in a Changing Pension World, Volume 2: Gender, Politics, and Financial Stability*. Washington, D.C.: The World Bank and Swedish Social Insurance Agency.

Holzmann, Robert, David Robalino, and Hernan Winkler. 2019. "NDC Schemes and the Labor Market: Issues and Options." Social Protection and Jobs Discussion Paper, No. 1914. Washington, D.C.: World Bank Group.

Holzmann, Robert, Jennifer Alonso-García, Heloise Labit-Hardy, and Andrés M. Villegas. 2019. "NDC Schemes and Heterogeneity in Longevity: Proposals for Redesign." Social Protection and Jobs Discussion Paper, No. 1913. Washington, D.C.: World Bank Group.

Könberg, Bo, Edward Palmer, and Annika Sundén. 2006. "The NDC Reform in Sweden: The 1994 Legislation to the Present." In Robert Holzmann and Edward Palmer, eds. *Op. cit.* Chapter 17: 449–66.

Lu, Bei, John Piggott, and Bingwen Zheng. 2019. "The Notional and the Real in China's Pension Reforms." Social Protection and Jobs Discussion Paper, No. 1921. Washington, D.C.: World Bank Group.

NEST (National Employment Savings Trust). 2017. Communication Material. www.nestpensions.org.uk/schemeweb/nest/resources/communication-materials.html

Nisticò, Sergio, and Mirko Bevilacqua. 2013. "Notional Defined Contribution (NDC) Pension Schemes and Income Patterns". *Economics: The Open-Access, Open-Assessment E-Journal*, 7: 2013-29. <http://dx.doi.org/10.5018/economics-ejournal.ja.2013-29>.

Organisation for Economic Co-operation and Development (OECD). 2017. *Pensions at a Glance 2017: OECD and G20 Indicators*. Paris: OECD Publishing.

Palacios, Robert. 2019. "Administrative Requirements and Prospects for Universal NDCs in Emerging Economies." Social Protection and Jobs Discussion Paper, No. 1920. Washington, D.C.: World Bank Group.

Palmer, Edward. 1999. "Individual Decisions and Aggregate Stability in a NDC PAYG Account Scheme." Available on: www.rfv.se/english.

_____. 2000. "The Swedish Pension Reform Model: Framework and Issues." Social Protection Paper 0012, Pension Reform Primer. Washington, DC: World Bank.

_____. 2002. "Swedish Pension Reform: Its Past and Its Future." In *Social Security Pension Reform in Europe*, ed. Martin Feldstein and Horst Siebert, pp. 171–210. Chicago: University of Chicago Press.

_____. 2006. "Conversion to NDCs—Issues and Models." In Robert Holzmann and Edward Palmer, eds. *Op. cit.* Chapter 9: 169-202.

_____. 2013. "Generic NDC: Equilibrium, Valuation, and Risk Sharing With and Without NDC Bonds." In Robert Holzmann, Edward Palmer, and David Robalino, eds. *Op. cit.* Chapter 11: 309-333.

Palmer, Edward, and Bo Könberg. 2019. "The Swedish NDC Scheme: Success on Track with Room for Reflection." Social Protection and Jobs Discussion Paper, No. 1901. Washington, D.C.: World Bank Group.

Palmer, Edward, and Sandra Stabina. 2019. "The Latvian NDC Scheme: Success Under a Decreasing Labor Force." Social Protection and Jobs Discussion Paper, No. 1902. Washington, D.C.: World Bank Group.

Palmer, Edward, Sandra Stabina, Ingemar Svensson, and Inta Vanovska. 2006. "NDC Strategy in Latvia: Implementation and Prospects for the Future." In Robert Holzmann and Edward Palmer, eds. *Op. cit.* Chapter 15: 397–424.

Robalino, David A., and András Bodor. 2009. "On the Financial Sustainability of Earnings-Related Pension Schemes with 'Pay-as-You-Go' Financing and the Role of Government Indexed Bonds." *Journal of Pension Economics and Finance* 8(2): 153–87.

Sandbrook, Will, and Ranila Ravi-Burslem. 2019. "Communicating NEST Pensions for "New" DC Savers in the United Kingdom." Social Protection and Jobs Discussion Paper, No. 1923. Washington, D.C.: World Bank Group.

Settergren, Ole. 2013. "A Decade of Actuarial Accounting for the NDC Scheme in Sweden: Quantifying Change in the Financial Position of a PAG Plan." In Robert Holzmann, Edward Palmer, and David Robalino, eds. *Op. cit.* Chapter 21: 392-391.

Settergren, Ole, and Buguslaw D. Mikula. 2006. "The Rate of Return of Pay-As-You Go Pension Systems: A More Exact Consumption-Loan Model of Interest." In Robert Holzmann and Edward Palmer, eds. *Op. cit.* Chapter 7: 117-147.

Sundén, Anika. 2013. "The Challenge of Reaching Participants With the Message of NDC." In Robert Holzmann, Edward Palmer, and David Robalino, eds. *Op. cit.* Chapter 17: 257-272.

Symeonidis, Georgios. 2016. "The Greek Pension Reform Strategy 2010–2016." Social Protection & Labor Discussion Papers No. 1601. Washington, DC: The World Bank.

World Bank. 1994. *Averting the Old-Age Crisis*. Washington, DC: The World Bank.

Social Protection & Jobs Discussion Paper Series Titles 2017-2019

<u>No.</u>	<u>Title</u>
1929	Developing Coherent Pension Systems: Design Issues for Private Pension Supplements to NDC Schemes by William Price April 2019
1928	Pensions in a Globalizing World: How Do (N)DC and (N)DB Schemes Fare and Compare on Portability and Taxation? by Bernd Genser and Robert Holzmann April 2019
1927	The Politics of NDC Pension Scheme Diffusion: Constraints and Drivers by Igor Guardiancich, R. Kent Weaver, Gustavo Demarco, and Mark C. Dorfman April 2019
1926	Setting Up a Communication Package for the Italian NDC by Tito Boeri, Maria Cozzolino, and Edoardo Di Porto April 2019
1925	Sweden's Fifteen Years of Communication Efforts by María del Carmen Boado-Penas, Ole Settergren, Erland Ekheden, and Poontavika Naka April 2019
1924	Information and Financial Literacy for Socially Sustainable NDC Pension Schemes by Elsa Fornero, Noemi Oggero, and Riccardo Puglisi April 2019
1923	Communicating NEST Pensions for "New" DC Savers in the United Kingdom by Will Sandbrook and Ranila Ravi-Burslem April 2019
1922	Harnessing a Young Nation's Demographic Dividends through a Universal NDC Pension Scheme: A Case Study of Tanzania by Bo Larsson, Vincent Leyaro, and Edward Palmer April 2019
1921	The Notional and the Real in China's Pension Reforms by Bei Lu, John Piggott, and Bingwen Zheng April 2019
1920	Administrative Requirements and Prospects for Universal NDCs in Emerging Economies by Robert Palacios April 2019
1919	Bridging Partner Lifecycle Earnings and Pension Gaps by Sharing NDC Accounts by Anna Klerby, Bo Larsson, and Edward Palmer April 2019

- 1918 The Impact of Lifetime Events on Pensions: NDC Schemes in Poland, Italy, and Sweden and the Point Scheme in Germany
by Agnieszka Chłoń-Domińczak, Marek Góra, Irena E. Kotowska, Iga Magda, Anna Ruzik-Sierdzińska, and Paweł Strzelecki
April 2019
- 1917 Drivers of the Gender Gap in Pensions: Evidence from EU-SILC and the OECD Pension Model
by Maciej Lis and Boele Bonthuis
April 2019
- 1916 Gender and Family: Conceptual Overview
by Nicholas Barr
April 2019
- 1915 Labor Market Participation and Postponed Retirement in Central and Eastern Europe
by Robert I. Gal and Márta Radó
April 2019
- 1914 NDC Schemes and the Labor Market: Issues and Options
by Robert Holzmann, David Robalino, and Hernan Winkler
April 2019
- 1913 NDC Schemes and Heterogeneity in Longevity: Proposals for Redesign
by Robert Holzmann, Jennifer Alonso-García, Heloise Labit-Hardy, and Andrés M. Villegas
April 2019
- 1912 Annuities in (N)DC Pension Schemes: Design, Heterogeneity, and Estimation Issues
by Edward Palmer and Yuwei Zhao de Gosson de Varennes
April 2019
- 1911 Overview on Heterogeneity in Longevity and Pension Schemes
by Ron Lee and Miguel Sanchez-Romero
April 2019
- 1910 Chile's Solidarity Pillar: A Benchmark for Adjoining Zero Pillar with DC Schemes
by Eduardo Fajnzylber
April 2019
- 1909 Sweden: Adjoining the Guarantee Pension with NDC
by Kenneth Nelson, Rense Nieuwenhuis, and Susanne Alm
April 2019
- 1908 The ABCs of NDCs
by Robert Holzmann
April 2019
- 1907 NDC: The Generic Old-Age Pension Scheme
by Marek Góra and Edward Palmer
April 2019
- 1906 The Greek Pension Reforms: Crises and NDC Attempts Awaiting Completion
by Milton Nektarios and Platon Tinios
April 2019

- 1905 The Norwegian NDC Scheme: Balancing Risk Sharing and Redistribution
by Nils Martin Stølen, Dennis Fredriksen, Erik Hernæs, and Erling Holmøy
April 2019
- 1904 The Polish NDC Scheme: Success in the Face of Adversity
by Sonia Buchholtz, Agnieszka Chłoń-Domińczak, and Marek Góra
April 2019
- 1903 The Italian NDC Scheme: Evolution and Remaining Potholes
by Sandro Gronchi, Sergio Nisticò, and Mirko Bevilacqua
April 2019
- 1902 The Latvian NDC Scheme: Success Under a Decreasing Labor Force
by Edward Palmer and Sandra Stabina
April 2019
- 1901 The Swedish NDC Scheme: Success on Track with Room for Reflection
by Edward Palmer and Bo Könberg
April 2019
- 1803 Rapid Social Registry Assessment: Malawi's Unified Beneficiary Registry (UBR)
by Kathy Lindert, Colin Andrews, Chipso Msowoya, Boban Varghese Paul, Elijah Chirwa, and Anita Mittal,
November 2018
- 1802 Human(itarian) Capital? Lessons on Better Connecting Humanitarian Assistance and Social Protection
by Ugo Gentilini, Sarah Laughton and Clare O'Brien, November 2018
- 1801 Delivering Social Protection in the Midst of Conflict and Crisis: The Case of Yemen
by Afrah Alawi Al-Ahmadi and Samantha de Silva, July 2018
- 1705 Aging and Long-Term Care Systems: A Review of Finance and Governance Arrangements in Europe, North
America and Asia-Pacific
by Laurie Joshua, November 2017
- 1704 Social Registries for Social Assistance and Beyond: A Guidance Note & Assessment Tool
by Phillippe Leite, Tina George, Changqing Sun, Theresa Jones and Kathy Lindert, July 2017
- 1703 Social Citizenship for Older Persons? Measuring the Social Quality of Social Pensions in the Global South
and Explaining Their Spread
by Tobias Böger and Lutz Leisering, July 2017
- 1702 The Impacts of Cash Transfers on Women's Empowerment: Learning from Pakistan's BISP Program
by Kate Ambler and Alan de Brauw, February 2017
- 1701 Social Protection and Humanitarian Assistance Nexus for Disaster Response: Lessons Learnt from Fiji's
Tropical Cyclone Winston
by Aisha Mansur, Jesse Doyle, and Oleksiy Ivaschenko, February 2017

To view Social Protection & Jobs Discussion Papers published prior to 2017, please visit www.worldbank.org/sp.

ABSTRACT

Nonfinancial defined contribution (NDC) pension schemes have been successfully implemented since the mid-1990s in a number of European countries (Sweden, Italy, Latvia, Poland, and Norway). The NDC approach features the lifelong contribution–benefit link of a financial defined contribution scheme, but is based on the pay-as-you-go format. An NDC approach implemented by the rulebook can manage the economic and demographic risks inherent to a pension scheme and by design creates financial sustainability. This paper offers a nontechnical introduction to NDC schemes, their basic elements and advantages over nonfinancial defined benefit schemes, the key technical frontiers of the approach, and the experiences of countries with NDC schemes.

ABOUT THIS SERIES

Social Protection & Jobs Discussion Papers are published to communicate the results of The World Bank's work to the development community with the least possible delay. This paper therefore has not been prepared in accordance with the procedures appropriate for formally edited texts.

For more information, please contact the Social Protection Advisory Service, the World Bank, 1818 H Street, N.W., Room G7-803, Washington, DC 20433, USA. Telephone: +1 (202) 458 5267, Fax: +1 (202) 614 0471, E-mail: socialprotection@worldbank.org or visit us on-line at www.worldbank.org/sp.

