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Contribution (NDC) Schemes**

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ABSTRACT

The ABCs of Nonfinancial Defined Contribution (NDC) Schemes*

Nonfinancial defined contribution (NDC) pension schemes have been successfully implemented since the mid-1990s in a number of European countries such as Italy, Latvia, Norway, Poland, and Sweden. The NDC approach features the lifelong contribution-benefit link of a financial defined contribution (FDC) personal account scheme, but is based on the pay-as-you-go format. At its start-up, the pay-as-you-go commitments of the preceding defined benefit (DB) system are converted into individual personal accounts, allowing for a smooth transition from the DB to the DC format, while avoiding the very high transition costs inherent in a move from a traditional pay-as-you-go DB scheme to a fully funded FDC scheme. The NDC approach implemented by the rule book is able to manage the economic and demographic risks inherent to a pension scheme and by design creates financial sustainability. As in any pension scheme, the linchpin between financial stability and adequacy is the retirement age; in the NDC approach the individual retirement age above the minimum age is by design self-selected and by incentives should increase the effective retirement age in line with population aging. As a systemic reform approach NDC has become a strong competitor to piecemeal parametric reforms of traditional nonfinancial DB (NDB) schemes. While frequent, these reforms are far from transparent and usually too timid and too late to create financial sustainability while providing adequate pensions for the average contributor. This paper offers a largely nontechnical introduction to NDC schemes, their basic elements and advantages over NDB schemes, the key technical frontiers of the approach, and the experiences of NDC countries.

JEL Classification: H55, J11, J26

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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, when the post-WW 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. The 1980s were characterized by the search for internal solutions to address the schemes' perceived short-term financing gaps and longer-term demographic challenges given the transition to lower fertility levels. Then the "reform" discourse was limited to interventions around the adjustments of 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). There was little discussion at that time of 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 for 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. The parametric adjustments to NDB schemes were typically implemented in a string of minor reforms that somewhat reduced the funding gap and economic distortions 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 pension reform of the country's 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, financial returns received, and life expectancy at retirement. The tight relationship between contributions and benefits is expected to offer much better incentives for labor supply decisions, including for formal labor market participation and retirement age selection. Of course, for such improved labor market effects the incentives of the pension system as a whole matter, including basic provisions, occupational pensions, and voluntary savings provisions. These need to be appropriately (re-)designed to support the expected lower labor market distortions.

Second, from an unfunded scheme in which current revenues are used to finance current pension benefits with the expectation that future contributors will finance the benefits of future beneficiary, the Chilean reform moved in one go to a fully funded scheme in which benefit obligations to retirees and workers were fully funded and backed by marketable financial assets. As such a transition makes the implicit debt of an unfunded scheme explicit, realizing the expected advantages of the reform such as a higher rate of return 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 the funding reform and abolished (Argentina, Hungary) or substantially reduced (Poland, Latvia) the funded pillar. Of course, the fallout of the 2008 financial crisis did not help.

In view of the attraction of a DC approach but the challenges of funding change, two countries in Europe (Italy and Sweden) independently developed a systemic reform concept that moved from DB to DC but remaining 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, in Europe 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). For a few other countries such as Greece (Symeonidis 2016) it is claimed that the recent reforms introduced elements of NDC.

The first ideas on the track of NDC can be traced back to Buchanan's (1968) rough sketch of a universal public benefit, which built on Samuelson's (1958) neoclassical model with a universal DB for all that was indexed to the growth of the economy presented. Components of NDC are also reflected in a hands-on proposal by Boskin, Kotlikoff, and Shoven (1988) for reform of US Social Security for Old Age, Disability and Survivors – namely, use of life expectancy in determining the size of the pension and in their case, a rudimentary balancing mechanism.

For a long time it was thought that such an unfunded DC scheme could not work, both conceptually and 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. This “ABCs Note” tries to keep the technical language as simple as possible to convey the main concepts, issues, and possible solutions while still being technically accurate. The note is, of course, unable to cover all the intricacies around the NDC approach; many of these are addressed in two anthologies (in 3 volumes) on the topic (Holzmann and Palmer 2006; Holzmann, Palmer, and Robalino 2012, 2013).

The rest of this note is structured as follows. Section 2 sketches the basic features of an NDC scheme that make it attractive and how it works. Section 3 compares the working of the NDC approach to typical NDB schemes. Section 4 outlines where further technical work is needed. Section 5 briefly reviews the international experience with NDC schemes or reform attempts in this direction while Section 6 concludes. The Annex offers the topics of a forthcoming NDC III conference in October 2017 that will address some of the technical frontiers.

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 (pseudo-) actuarial structure of contributions and benefits,¹ and the macroeconomic level, which promises financial sustainability while remaining unfunded. Simply put, an NDC scheme is an individual savings account scheme in which individuals receive a common internal rate of return consistent with the financial sustainability of the scheme, and at retirement they receive a benefit consistent with the remaining cohort life expectancy.

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

- a) Individual accounts exist into which contributions of each individual (and those of their employer) are recorded based on a fixed contribution rate and the individual contribution wage.
- b) The individual account receives an annual remuneration; i.e., an internal interest rate payment or account value indexation.
- c) The initial benefit is based on an annuity calculation in which the individual account accumulation (i.e., all past contributions and interest received) and the life expectancy of the individual at retirement determine the initial pension value.

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.

- d) During the disbursement of the annuity (i.e., the pension benefit), an annual indexation takes place at the level of account remuneration (i.e., internal interest rate).²

This (pseudo-)actuarial structure is appealing because:

- e) The strict link between individual contribution and benefit in sustainable present value terms creates transparency and strong ownership of the approach: what you pay in you get out, and what you get out you paid in, but not more.
- f) It has a (pseudo-)actuarial structure and is thus broadly actuarially fair, so it offers the right labor market incentives for formal labor market participation and retirement decisions.
- g) 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.
- h) By intent and design, the basic NDC does 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.

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

- i) A fixed contribution rate that broadly keeps the share of retirement income in gross domestic product (GDP) constant across generations.
- j) Application of a rate of return for individual account remuneration that is consistent with the financial sustainability of the scheme, i.e.; the rate of growth of the contribution-based wage sum.
- k) A mechanism that adjusts automatically the initial benefit level to changes in (cohort) life expectancy.
- l) A strong economic incentive to postpone retirement as life expectancy increases as the key mechanism to address increasing longevity (and as an alternative 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

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).

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

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 a maximum 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. 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 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 rising life expectancy. Parametric reforms of NDC schemes in recent years have tried to address such distortions and failings. It is theoretically possible to design a well-reformed NDB scheme that goes a long way toward fixing many but not all of its problems. An NDB reform that fully mimics an NDC scheme is conceptually possible yet never done given the complexity and the need for repeated complex political decisions, rather than operating on “autopilot.”

- a. 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 the individual accounts; the liability toward retirees is broadly the sum of the individual annual pension amounts times the 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. Sweden developed a method to estimate the PAYG asset amount from cross-sectional data and compares this annually with the liability to determine solvency (Settergreen and Mikula 2006).
- b. An NDC scheme implemented by the rule book offers many **automatic adjustments** to parameters that under NDB schemes require difficult discretionary political decisions. Key examples are the following:
 - 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. Some countries succeeded in indexing the retirement age with changes in (period not cohort) life expectancy. This major accomplishment still falls short of the technically correct solution, however, and faces political resistance and implementation delays.
 - An NDC scheme, in principle, has no standard retirement age, only a minimum pension access age that may (or should) be indexed. As life expectancy increases, the same accumulation buys one a lower pension for a given age, creating strong economic incentives to delay departure from the labor market. But this may not be case leading to too low-a-benefit unless a minimum access age exists and is indexed.

- 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 inequities among individuals.

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 as the accumulation at retirement (broadly) divided by the remaining cohort life expectancy of this age, any early retirement has both less 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.

- c. 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 could have 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.

- 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 proportionate 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 hanging out to retire.

- d. **Separating income replacement from redistributive considerations** 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, i.e. 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. However, redistributive interventions have to be explicitly introduced into the scheme and resources have to be provided when these liabilities are created, not only 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.
- e. 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 in some countries 20 or even 30 percent, 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 an approximately positive linear relationship between lifetime income and life expectancy at retirement consists in having 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 estimations of the required contribution split. Gender inequality in heterogeneity can be addressed by applying gender-specific life expectancies at retirement (Ayuso, Bravo, and Holzmann 2016b); an economically correct but politically quite likely difficult approach.
- f. Reforming (partner) survivor and disability benefits is an important aspect of any pension reform. NDC schemes offer better prospects for accommodating this than NDB schemes. The need for these

programs' reform emerges as (i) women's labor force participation is approaching that of men, 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).

- No good solutions exist to separate survivor and disability benefits from old-age provisions under an NDB scheme. Disability can clearly be separated from old age during working life but the transition to old-age benefits at retirement remains a design challenge. Survivor benefits across partners can be subject to income tests (as is increasingly done) to reduce financial and equity problems but this gets even more complex in the case of multiple divorces.
- Under an NDC approach, the separation of benefits is conceptually straightforward. For (partner) survivor benefits, some transitional and time-limited defined benefits 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 accumulation of the deceased 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. In the case of disability, while a (transitory) benefit is granted, the disability insurance pays the contributions to the (old-age) NDC account. At a notional (indexed) standard retirement age, the individual receives an NDC old-age pension.

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

g. **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 the insurer has to the insured are always transparent.

- To harmonize national NDB schemes typically requires one 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 and 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 NDC scheme takes no more than a year or so. 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 the 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 the person one day from retirement (hardly influenced by the new rules) to the two-week entrant to the labor market (hardly influenced by the old rules).

h. **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 EU for all member states). They seemingly 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). Absent such agreements, 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).

i. The **taxation of cross-border pensions** is an unaddressed issue of fiscal sustainability. The current OECD guidance on cross-border taxation of 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, which to date has been 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 were to be in line with recent policy changes in Australia and the UK.
 - Under an NDC scheme, an alternative exists that distinguishes between creation of the tax liability in a frontloaded system and its payment. It offers 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, 2017). To allow for a delay between liability and payment requires, analogous to NDC individual savings accounts, creation of related tax accounts in which liabilities are recorded as well as payments undertaken through, say, tax annuities (Holzmann 2016b). Such an approach promises to address fiscal equity and sustainability issues between countries while keeping existing double taxation treaties broadly unchanged.
- j. **FDC and NDC in comparison to NDB** share a number of commonalities but also differences.
- The advantages of (F or N) DC schemes compared to NDB schemes include the close contribution–benefit link and thus the conjectured lower distortions for a publicly mandated scheme. Redistribution can still take place but as an add-on to the pension scheme and in a transparent manner, with the costs also externally financed and provided when the liabilities are created.
 - 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.
 - NDC and FDC schemes 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 NDC or replace it, at least partially.

4. Key frontiers in design and implementation of NDC schemes

While a lot of thinking has gone into the development of NDC schemes in and outside NDC countries, 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 in nontechnical terms key issues and some of the proposed solutions that await further finessing.

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

- In an economic and demographic steady state environment, there is no need for a proxy of the nonfinancial rate of return, as the key variables all offer the same value, i.e., the implicit rate of return of an unfunded scheme: the growth rate of 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. For financial stability the larger value can be applied, as the demographic component (if positive) is a key element for an unfunded scheme.
- Given the reality of economic and demographic shocks and measurement issues associated with each of these candidate variables, it is not as easy to decide which variables best proxy the rate that is expected to best guarantee financial sustainability. In reality, NDC countries selected different rates and for different reasons: Italy chose the GDP growth rate, which may be on the generous side but is politically understandable in view of the low growth rates over the past decade or more; Sweden selected the per capita wage growth to offer some cushioning in front of an aging and perhaps shrinking work force; Latvia, Norway, and Poland selected the growth rate of the contribution wage sum; i.e., the covered wage bill but with variance in scope (ceiling) and definition.
- Of course, the rate of return that guarantees financial solvency can be theoretically calculated (when starting from equilibrium) from the growth rate of the PAYG asset and the rate(s) of return of the financial assets/ the reserve fund realized on the financial market. But how best to estimate the PAYG asset and its change is still research in progress, 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.

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

- There is neither an empirical variable (such as the growth rate of the contribution-based wage sum) nor any model-based estimate that can claim to achieve financial sustainability of a NDC scheme without the need of any future corrections. In consequence, an NDC scheme is well-advised to have a balancing mechanism that corrects the selected internal rate of return indicator if a relevant difference between liabilities and assets of the scheme is detected. Such a balancing mechanism is best automatic to take the politics out of the mechanism and thus it has to determine when it is triggered, over how many years the correction is phased, and whether it applies symmetrically in both directions.

- Interestingly only one country – Sweden – has established an automatic balancing mechanism (ABM), with issues of its own (Barr and Diamond 2011). Norway relies essentially on its huge national wealth fund to guarantee sustainability (which some claim makes it germane to a funded system). The other countries need the general budget or future rule corrections to cover the imprecision of the scheme’s indexation. There are strong indications that the current accounting of contribution revenue and benefit expenditure in some of the NDC countries has a lot of room for improvement before an effective balancing mechanism can be developed.
- In contrast to the empirical ambiguities of NDC countries, academic research has produced a number of proposals 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 2006, 2008; Boado-Penas and Vidal-Meliá 2014; Alonso-Garcia and Devolder 2017).

c. 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, which needs to be financed. These legacy costs are similar to the transition costs of moving from an NDB and FDC scheme but smaller, as only the unsustainable part of the pension liabilities is made explicit.
- These legacy costs could be financed by levying a cost-covering contributing 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. 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 think about using 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).

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

- Using cohort life expectancy compared to the period (cross-section) life expectancy is already a major contribution toward a sustainable NDC scheme. As the 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, say, price indexation thereafter. But many other possibilities and arrangements exist on how to share the longevity risk among retirees and contributors. These should become the object of further study.
- One suggested way to share the longevity risk with the population at large is for the government to issue NDC bonds (Palmer 2013). More specifically, 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 with tradable longevity bonds for the risk management of occupational FDC and FDB schemes were little successful as the failed introduction in a few countries has demonstrated (Holzmann 2017).

e. 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 have often been characterized by an increase in part-time employment of which only part is voluntary and concern often women, by long spells of unpaid internships, by a succession of temporary and lower paid contracts, and by an increase in the number and spells of unemployment.⁵ 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 prospects of 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 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 – not only an approach to address heterogeneity in longevity but also an approach to address marginalization? Or should it be a mix of interventions to deal with related but different objectives and individual situations?

⁵ For simulations on the impact of unemployment spells on pension benefits in the Portuguese and Spanish pension scheme, see Bravo and Herce (2017).

- In search of such answers, the 3rd international NDC conference, entitled “Facing the Challenges of Marginalization and Polarization in Economy and Society,” is scheduled for October 2017 in Rome. This conference will bring together some 70 authors and invited experts to discuss these and related topics from different angles (see the Annex). The planned publication in two volumes should be launched in September/October 2018.
- On paper, NDC individual accounts provide the ideal basic building block for public policy regarding provision of pension rights in conjunction with childbirth, retraining/re-education in conjunction with disrupted careers and necessary career change, providing pension rights in association with granting disability, sharing of rights between partners, and much more. NDC’s claim to fame here 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 and the pension effects are more difficult to gauge.

f. How to market the advantages of NDC 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 their 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. Main 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 messages of NDC (Sunden 2013), and it may be that the messages provided are still too complicated. Recent communication work under the voluntary and funded UK scheme NEST is very innovative and promising (NEST 2017); the results may be used for NDC.
- On substance 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 also made clear and publicly explained that an NDC scheme that disregards heterogeneity of longevity and marginalization in its design is not a good deal for lower-income groups and higher-income groups may lose compared to the status quo.

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 the 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.

a. Countries with NDC reform experiences and possible ambitions

To date, five European OECD countries have implemented a full NDC reform, albeit with some variation across countries:⁶ Sweden (legislated 1994, implemented gradually, beginning in 1996, with full implementation 1999), Italy (legislated as of 1995 and implemented as of 1996, with reform measures and accelerated implementation as of 2012), Latvia (legislated 1995, implemented as of 1996), Poland (legislated 1998, implemented as of 1999), and Norway (legislated 2009, implemented as of 2011). The variations across countries include the choice of the 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, and Turkmenistan) adopted some NDC features in their pension schemes, but system information and assessment of the outcomes are scant. Egypt legislated an NDC scheme in 2010 but implementation keeps being interrupted by the Arab Spring. Greece introduced an NDC approach in 2012 for a small sub-set program of the social insurance scheme with a long transition period but little accessible information. Implementing an NDC scheme in the environment of a middle-income country is bound to raise a number of new conceptual and operational issues about which the understanding and knowledge are currently very limited. From Russia, it is known that the government recently moved to a point system, reportedly because valuation of points allows the country to better disguise its high level of insolvency than it 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 countries in Europe such as Greece, Portugal, and Spain; and several countries in Asia, in particular Iran and China. The latter country has a two-tier type contribution structure with province-specific attempts to make the individual contribution funded. 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.

b. 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 well the 2008 crisis and following years and no reform reversal was 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.

A review of the first 15 years of reform in the four early adopters (Italy, Latvia, Poland, and Sweden) suggests seven lessons (Holzmann and Palmer 2012). Five years later and with additional country

⁶ For detailed information on the working of the NDC schemes in these countries since their start, see Chlon-Dominszak et al 2012, and Christensen et al 2012). Critical updates and comparisons for these countries are under preparation for the forthcoming NDC III conference and publication (see the Annex).

information, the lessons remain unchanged but preparation of the NDC III volume added three more lessons:

- i. NDC schemes work broadly pretty well, but there is room to make them even better. The key lesson is to follow the rule book in design and fast transition options in implementation.
- ii. Transition immediately to NDC accounts and avoid parallel schemes and delayed implementation. The lesson for other countries is to go cold turkey and move straight from NDB to NDC schemes without transitional arrangements.
- iii. Identify and finance the legacy costs in an explicit manner as they emerge, as they will have to be faced sooner or later. Ignoring legacy cost does not work and not foreseeing an appropriate financing mechanism can be dangerous if unexpected shocks hit.
- iv. 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.
- v. 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.
- vi. 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.
- vii. Address the implications of NDC schemes for subgroups such as women, marginalized individuals, and marginal labor market participants heads-on through analysis and political discourse, and explore options to address issues through an enhanced design that broadly keeps the advantages of the scheme approach while taking care of these groups' needs.
- viii. 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.
- ix. Explore early on in design and implementation the integration of the 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.
- x. Last but not least, 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 the key criteria of a pension scheme: adequacy, affordability, and sustainability, and all these schemes weathered relatively well the recent financial crisis, 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 actual functioning of such mixed schemes. The implementation of an NDC scheme has a number of institutional requirements that are not easily met by emerging economies.

Still, 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; an NDC reform would require facing the political implications and tradeoffs. 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.

The forthcoming NDC III conference and volume offer an opportunity to fill important knowledge gaps, such as the working of NDC schemes in both OECD and non-OECD countries, the design options to address concerns for marginalized groups within an NDC scheme, and the communication issues surrounding NDC.

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Annex:
Outline of NDC III Conference (October 2017) & Volume (autumn 2018)

**Nonfinancial Defined Contribution Schemes (NDC):
Facing the Challenges of Marginalization and Polarization in Economy and Society**

Part 1: Setting the Stage

1. Taking stock
 - = Present issues and challenges for European NDC countries (separate country papers for Italy, Latvia, Norway, Poland, and Sweden)
 - = Comparing points schemes with NDC: France, Germany, and Russia
 - = What can we learn from the nascent and thwarted processes around NDC in other countries

Part 2: Addressing Marginalization and Polarization

2. Efficient integration into (N and F)DC of interventions designed to prevent poverty in old age (encompasses all types of old-age income guarantees)
 - = Conceptual overview paper
 - = Country case studies for Chile and Sweden
3. (N and F)DC schemes and longevity: Uncertainty and heterogeneity in longevity (mortality/life expectancy)
 - = Conceptual overview paper
 - = Technical papers on estimation issues and policy design
4. (N and F)DC schemes and the labor market: The challenge of participation and postponed retirement
 - = Conceptual overview paper
 - = Country case studies on emerging and advanced economies

Part 3: Transversal Topics

5. NDC, gender, and family (Conceptual overview paper and country case studies)
6. NDC schemes in emerging economies (Conceptual overview paper and country case studies)
7. Financial literacy, communication, and political economy
8. Other topics on NDC - unattended important issues
 - = NDC and disability, survivors' benefit reform, and long-term care inclusion
 - = How to best tax pensions in a globalizing world and how do NDC and NDB compare
 - = The Integration of voluntary funded pension plans with NDC schemes