

Comments on the paper entitled “Notional Defined Contribution Pension Schemes and Income Patterns” written by *Sergio Nisticò and Mirko Bevilacqua*

The paper presents a simple but very illustrative model to find the determinants of the replacement rates awarded to affiliates with different income patterns within a generic Notional Defined Contribution Pension system. The income patterns taken into account are synthetic; they do not come from a sample of contributors. The authors set the 3 income profiles analysed according to whether the affiliate’s wage growth is equal to, higher than or lower than average wage growth. They use, as in Sweden, the average wage growth as the notional rate. In practice other notional rates are also applied. In Italy, notional accounts are indexed in line with GDP growth based on a rolling 5-year average, whereas in Latvia and Poland the indexation of accounts during the accumulation phase is linked to covered wage bill growth.

The aim of the paper is mainly to investigate whether and to what extent a well-designed NDC pension system is able to provide ‘adequate’ pensions to its contributors-beneficiaries.

It is important to highlight that the authors consider the term ‘adequacy’ from a triple point of view:

- 1.- The pre-retirement standard of living for the whole retirement period. This aspect, Borella & Fornero (2009), is fairly important for low-wage workers, whose standard of living remains very close to ‘subsistence level’ for the whole working period.
- 2.- The ordinary retirement age established in the pension system. This is relevant for contributors employed for most of their careers in physically demanding jobs. They are often required to retire earlier than other workers.
- 3.- The individual rate of return (IRR), technically defined as the value of parameter i of the law of compound capitalization, which actuarially matches the expected flow of contributions with the expected flow of benefits. The IRR is an appropriate tool for measuring the degree of actuarial fairness.

With the aim of the paper in mind, the authors provide a model that enables the impact of different career patterns on NDC pensions to be evaluated and investigates the complex relationship between the level of the NDC pensions and contribution rates. The length and dynamics of the working career are also explored.

This paper is a welcome addition to the literature studying the main determinants of replacement rates within a generic NDC framework. In general the results are very interesting and make sense, but from my standpoint, as we will see later, the paper could be made very much stronger if at least the following aspects were discussed, added, modified and/or justified.

1.-I would include a section devoted to an analysis of the brief history of different countries’ experiences with the adoption of NDC models and an explanation of how the NDC model works in real life with its main advantages and disadvantages. The paper is not self-contained in this sense.

According to Holzmann, Palmer & Robalino (2012) and (2013), NDC schemes are now in their teens. The concept was born in the early 1990s and has been put into practice in a number of countries, beginning in the mid-1990s. To date, the most complete implementation has been in Italy, Latvia, Poland and Sweden, but key components of NDC schemes have recently been introduced elsewhere. Egypt and Norway, Holzmann et al (2012), have also recently legislated NDC reforms.

A Notional Defined Contribution scheme (account) (NDC) is a pay-as-you-go scheme that deliberately mimics a Financial Defined Contribution (FDC) scheme (account), paying an income stream whose present value over the person's expected remaining lifetime equals his/her accumulation at retirement; in doing so it has many of the features of an FDC scheme.

A notional account is a virtual account reflecting each participant's individual contributions and the fictitious returns which these contributions generate over the course of the participant's working life. The contribution rate is fixed and the returns are calculated in line with a notional rate that may be the growth rate of GDP, the wage bill, contribution payments, etc. When the individual retires, they receive a pension deriving from the value of the accumulated notional account, the expected mortality of the cohort retiring in that year and, possibly, a notional imputed future indexation rate. In this way, the notional model combines PAYG financing with a pension formula that depends on the amount contributed and the return on this amount. According to Holzmann (2006, 2007), NDCs have sufficient positive features for them to be put forward as a fundamental referent for the future unified pension system of the European Union.

At first glance NDC systems simply appear to be an alternative way of calculating the amount of retirement benefit, but in fact the notional method goes beyond what might be imagined. An NDC has positive features, and I would highlight the following:

- ✓ It promises to deal with the effects of population ageing more or less automatically. This is accomplished in part through the dependence of annuities on life expectancy and in part by the fact that the internal rate of return reflects not only the growth in productivity but also changing demographic conditions, the most important of these being declining fertility as propagated through the size of the labour force.
- ✓ It has stronger immunity against political risk than more traditional DB PAYG systems, because an NDC will increase the financial stability of the pension system due to the absence of politicians' promises concerning future retirement benefits.
- ✓ Risk is managed and diversified more effectively than in other pension paradigms as it does not create false expectations about pensions to be received in the future, it is made difficult for contributors to be tempted to behave opportunistically, and it is not subject to the financial risk of capitalization systems.
- ✓ Actuarial fairness is encouraged, stimulating the contributors' interest in the pension system as it brings to light any improper or hidden redistribution of benefits to privileged groups and reveals who really benefits from the legislation.
- ✓ Arbitrariness in benefit indexation rules and adjustment factors is avoided; the change in such factors has undermined the credibility of many unfunded DB systems.
- ✓ Portability of pension rights between jobs, occupations and sectors is permitted.

It is also worth highlighting that the NDC system is not a panacea, that there are also some negative characteristics, which in most cases it shares with the traditional (DB) PAYG system or with funded systems:

- ✓ The problem of demographic change is not fully dealt with. Although the evolution of mortality is taken into account, there is a delay before it happens.
- ✓ In a scenario with a fixed contribution rate and a persistent rise in longevity, the size of the pension tends to decrease.
- ✓ If the return on the contributions using the notional rate were less than the return on the capitalization funds—this would be more likely in mixed systems combining notional and individual capitalization accounts—then the individual might consider

that there was an implicit cost (tax) in the notional accounts equivalent to the difference in return.

- ✓ Political risk still exists insofar as the system's parameters could still be altered. The lower the level of legislative regulation, the greater this risk will be.

Some of these negative characteristics can be partially avoided if the system incorporates other instruments such as the actuarial balance or the automatic balance mechanisms the authors also mention in their paper.

2.- I would also briefly explain the most important differences between NDCs and FDCs, due to the fact that NDCs mimic FDCs and the differences are not easy for non-experts to see.

For Holzmann & Palmer (2006), the most important differences are, firstly, that the internal rate of return in a generic NDC account is a function of productivity growth, labour force growth and factors linked with contribution and benefit payment streams as opposed to “the” financial market rate of return. Secondly, the only financial saving that can arise is in the form of a reserve fund as opposed to the funded character of FDCs.

For Chłoń-Domińczak et al (2012), another (important) difference between FDC and NDC systems lies in the way the inheritance gain - the pension balances of deceased persons - is used. In FDC schemes, the funds of deceased contributors are usually inherited by the individual's survivors. They can be used to enhance the retirement savings of the survivor or be paid out as a lump-sum or as a phased withdrawal survivor benefit. In theory, the NDC scheme could also be designed to distribute explicit inheritance gains during the accumulation phase to the individual accounts of all surviving participants, which would create a higher benefit for all who survive to retirement. Among the countries in which NDC systems are in place, only Sweden applies what is called “inheritance gains” or a “survivorship dividend”.

This last difference is important as we will see later.

3.-With reference to sections 2 and 3, some of the points and/or assumptions made need to be addressed, clarified, modified, added and/or justified.

3.1.-The replacement rate used is not well justified, and indeed not even defined.

According to Biggs & Springstead (2008), whether a given replacement rate represents an adequate retirement income depends on whether the denominator in the replacement rate calculation is an appropriate measure of preretirement earnings.

Individuals use replacement rates as a rule of thumb in retirement planning. Policymakers use various replacement rate measures to analyse Social Security benefit adequacy under the current benefit schedule versus those that might be provided under alternative policies. However, confusion exists regarding the use of replacement rates. Specifically, while the numerator in the replacement rate equation is easy to isolate—either total retirement income in the case of retirement planning or periodic Social Security payments in the case of policy discussions—there is no consensus as to the correct way of measuring preretirement earnings.

In most cases replacement rates are measured relative to final earnings, i.e. earnings in the year or years immediately preceding retirement. There are several recognized advantages to measuring replacement rates relative to final earnings. However, this provides an imperfect measure in several respects:

- ✓ Final earnings are particularly volatile.

- ✓ Final earnings are not necessarily representative of the worker's lifetime earnings, which better reflect total consumption possibilities.

A suitable alternative for measure preretirement earnings - and consequently the replacement rate - could be the so-called "Real Average Earnings (Consumer Price Index Average)" i.e. the inflation-adjusted average of lifetime earnings. Boskin & Shoven (1987) and Rettenmaier & Saving (2006) advocate the CPI-indexed average of lifetime earnings. CPI-indexed average earnings avoid many of the problems of final earnings and wage-indexed earnings.

There are other alternatives for defining the denominator of the replacement rate: Wage-Indexed Average Earnings and Present Value (PV) Payment.

In the paper by Boado-Penas et al (2007), whose main objective is to measure the degree of aggregate economic risk to which pensioners are exposed when applying formulas for the calculation of retirement pensions based on notional accounts, projected average replacement rates based on the average wages are used.

The paper by Settergren (2006) discusses which preretirement earnings are appropriate for comparison with pensions in order to provide a measurement of the replacement rate. Several examples are applied to the Swedish case. The answer depends on the pattern of earnings used in the calculation. Where the pattern is straight-line, it is natural to compare the size of the pension with the individual's income in the year before retirement. If a concave income profile is used in the calculation, the question of which income to compare it with is more difficult. If the compensation rate is calculated through the comparison of the pension with final-year earnings, the calculation may yield a replacement rate that is considered misleadingly high.

In the applied replacement rate literature there is tremendous diversity in the measurement periods used to calculate the pre-retirement denominator. This diversity applies both to the part of the life-course chosen and to the number of years averaged in the calculation. A very good survey can be found in the paper by MacDonald & Moore. (2011).

In short, the concept of a single "replacement rate" may be simplistic. In any case, it is most important that replacement rates are explicitly defined to avoid confusion between different replacement rate measures. I would present the calculations for the replacement rate at least with the alternative of measuring preretirement earnings with the inflation-adjusted average of lifetime earnings. The results could be very different from those presented by the authors.

3.2.-The calculations made have not taken into account the so-called "survivor dividend".

As previously mentioned Sweden keeps track of the notional account values of the deceased and distributes them on a birth cohort basis. This component constitutes a part of their notional capital used to calculate their old-age pensions when they retire. Chłoń-Domińczak et al (2012) argue that "inheritance gain" constitutes an extra return from the NDC pension scheme, but this is not completely accurate. As Vidal-Meliá and Boado-Penas (2011) have pointed out, inheritance gains recompense survivors for exposure to the risk of not surviving. This arrangement is totally different from inheritance options in the funded pillars (phased withdrawals), where retirement savings of deceased beneficiaries are distributed to their inheritors. The difference is that in the funded schemes, usually the whole amount or part of it can be liquidated almost immediately, while in the case of notional accounts, this portion is liquidated as a stream of annual payments from retirement onwards.

In Poland and Latvia the inheritance gain surplus (due to the lack of inheritance gain) is used to finance an overhang from the “old system” and the shift to the funded scheme. Both countries decided to introduce funded components and as a result the revenue of pay-as-you-go pillars is reduced by contributions transferred to funded accounts, so the inheritance gains help to cover the double payment burden.

The main conclusion reached in the paper by Vidal-Meliá & Boado-Penas (2011) is that the survivorship dividend has a strong financial-actuarial basis which suggests that the system’s balanced contribution rate is the same as the one effectively credited to the individual contributor. At the same time, the amount of the pension might increase by more than 40% when the survivor dividend is included. However this result depends to a large extent on parameters such as the number of years contributed, individual salary profile, age of retirement and the mortality tables used for the calculations, among other things.

The credited contribution rate is higher than the system’s balanced contribution rate if the survivorship dividend is not included. Therefore the system generates a surplus and accumulates financial reserves continuously since ignoring the inheritance gains produces savings for the system. In practice, these reserves could fund the increase in spending on pensions resulting from increases in longevity for NDC countries that have not distributed the survivorship dividend. However, this becomes a hidden/non-transparent way of accumulating financial reserves in order to compensate for the increase in life expectancy.

To summarize, the calculations made by the authors underestimate the initial pension because the effect of the survivor dividend has not been included. At least some reference to inheritance gains should be included in the paper.

3.3.-The decision to assume a contribution rate equal to 30% is particularly relevant for the results shown in sections 2 and 3.

Although in footnote 5 the authors explicitly recognize that “*the choice to assume a contribution rate equal to 30% fits a quite hypothetical scenario in which the NDC scheme absorbs all forms of retirement savings (including the occupational and voluntary pillars)*” and in section 3, page 9, they mention that “*the assumptions made to run the simulations, might overestimate the actual performance of the NDC in that: (i) the 30% contribution rate is abnormally high;...*”, in my opinion they should consider the possibility of running new simulations with a contribution rate lower than the one they have used.

In Sweden, the contribution rate for the NDC scheme as a proportion of wages is 16%, and it is lower in Latvia (14%) and Poland (12.22%). In Italy the contribution rate is 33% (employees), 20% (self-employed) and 24% (atypical contracts), but according to the publication “Social Security Programs throughout the World”¹, the NDC scheme in Italy also includes permanent disability benefits and survivor benefits.

It is usual, Boado-Penas et al (2008), when the overall contributions made in the social security system are not allocated explicitly to different contingencies, to make some kind of assumption to enable us to find the contribution rate earmarked for the retirement pension contingency. A very simple way to do this is to determine the percentage of total spending

¹This publication highlights the principal features of social security programs in more than 170 countries. Published in collaboration with the International Social Security Association, one of four regional volumes is issued every six months. <http://www.socialsecurity.gov/policy/docs/progdesc/ssptw/index.html>

on pensions represented by spending on retirement pensions for a given calendar year (or for the average of the last 3-5 years) and to assign the same proportion of the total contribution rate to the old-age pensions.

In a generic NDC scheme, Boado-Penas et al (2007), the fraction represented by any replacement rate RR_i at a given contribution rate CT_i relative to a given replacement rate RR at contribution rate CT is equal to the ratio of the contribution rates (CT_i/CT). The authors arrive at the same conclusion as we can see on page 12, figure 2. For example, if we take into account the contribution rate in force in Sweden (16%), the replacement rate for the 'benchmark case' - a worker whose individual wage growth coincides with that of the average wage - will be only 38.24% ($71.7*(16/30)$). For a more reasonable contribution rate, 20%, if we take into account the fact that the level of population ageing in Italy is higher than in Sweden, the replacement rate for the 'benchmark case' would be 47.8%.

To summarize, the decision to assume a contribution rate equal to 30% only for retirement pensions falls far from the actuarial practice observed in countries where NDCs are in force. This assumption should be reconsidered because it produces an overestimated initial pension giving illusory replacement rates.

3.4.-The brief reference made in the paper (pages 10 and 11) to different wage profiles is important, but it should be extended and better explored.

The impact of changes in salary profiles has been previously studied in the actuarial literature for pension systems based on capitalization. For example Devesa-Carpio et al (2003) set out a model based on Whitehouse (2000) and Diamond (1999) to enable the explicit costs borne by the affiliate both during his working life and his retirement period to be assessed. Included in their model is the notable effect that some factors - such as gaps in contribution profiles, account transfers and changes in salary profiles - have on projecting the costs borne by the affiliates.

In their paper they also assume, as a benchmark case, that real wages grow at an annual accumulative rate, because this is the assumption most used in the literature and is simple to operate and calculate. However, they argue that although this assumption - the exponential function of constant growth - is valid for the nominal growth of salaries, it does not appear to be the most suitable method when real salaries are being calculated. With the aim of analysing the impact of the use of different salary functions on measuring administration costs, they use two additional wage functions: the Gaussian and the Carriere-Shand (1988). They conclude that changing the assumptions regarding salary profiles from the standard usually used has a great impact in the projected administrative costs for the affiliate.

To sum up, the authors should investigate the impact of changing assumptions regarding salary profiles on gaps in making contributions.

3.5.-To make the paper more comprehensible, footnotes should not be contained equations, derivatives, proofs or demonstrations. It would be better to include them in a technical appendix. Long footnotes should be avoided if possible.

4.-To finish my comments on this good paper written by Sergio Nisticò and Mirko Bevilacqua, I have to mention the conclusion section. From my standpoint this section should be modified because, except for the two first paragraphs, a great part of the section has little to do with what has been developed/reasoned in previous sections of the paper. Some of the comments could be moved to the introduction, to a new section or simply removed. Also, the paper has a lot to do with the concept of "individual pension information". Individual pension information, Larson et al (2008) is aimed at increasing the

knowledge contributors have about the contributions they make, the expected benefits and the degree of coverage they have for the various risks to which they are exposed during their work. The existence of personalized information like the orange envelope in Sweden, the blue envelope in France, the yellow in Germany and what is known as the “Social Security Statement” in the United States, apart from giving accounting information and an estimate of the benefits and risks covered, can also provide information about the pension system itself and how it works.

According to Regulez-Castillo & Vidal-Melia (2012), when estimating future benefits the Social Security Administrations have to make assumptions about future earned income, e.g. about growth in salaries and interest rates. In France, Sweden, the USA, the UK and Japan, the hypotheses regarding future pensionable earnings are all equal to the last one recorded before carrying out the forecast and constant in real terms. In Chile, Germany, Finland and Canada, different averages are calculated. In Chile, for example, an average is made of the last six years but with various contribution densities. i.e. gaps in future contributions are explicitly considered. In Finland and Germany they use an average of the tax base for the last 5 years and in Canada the average contribution base for the entire working lifetime. It could be said that the hypotheses used to estimate future pensions are in general over-optimistic and, especially where young contributors are concerned, tend to overestimate benefits.

I believe that the model developed in the paper and its main implications could be relevant for improving the estimated future retirement pension not only in NDC schemes. Gaps in future contributions and the possibility that individual wage growth could be (very) different from the average wage are factors that should be taken into account by Social Security Administrations when estimating future benefits.

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