Criteria for Sustainability of Old-Age Pension System Based on the NDC Principles

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Abstract

The topicality of the research subject. The foundations of the old-age pension scheme based on notional accounts, also referred to as the "notional defined contribution" or "non-financial defined contribution" (NDC) old-age pension scheme, were laid in Sweden in 1994, when the prevailing view was that a sustainable defined-contribution PAYG old-age pension scheme is impossible.

Since then, the NDC system modifications have been implemented in several countries; since 2000, this scheme is also part of the Latvian pension system and works significantly better than the other part of the pension system - the funded pension scheme. However, the sustainability of NDC scheme is still being questioned.

To prevent the NDC pension system sustainability problems, the authors (Pukis, M., & Dundure, I., 2012) in their publication "The Sustainability of the Pension System in Latvia" and (Dundure, I., 2015), the article "Sustainable Old-age Pension System by Developing Notional Defined Contribution Pension Scheme" have proposed a modified NDC model that provides sustainability of the pension system considering the known risks inherent in the pension system.

The aim of the paper is to research and analyse the conditions for building a sustainable pension system by developing a Notional Defined Contribution pension scheme and working out an adjusted (modified) old-age pension calculation formula.

In order to achieve the above mentioned aim, the authors set the following tasks:

_ Define the old-age pension system based on NDC principles;

_ Define the primary objectives of pension systems and perform analysis of pension adequacy;

_ Define the conditions for achieving a sustainable old-age pension system based on NDC principles;

_ Develop an adjusted (modified) old-age pension calculation formula based on NDC principles.

In order to achieve the established aim and tasks, the following scientific research methods have been used in the work: analytical method, comparative method, logically and abstractedly constructive method.

The analytical method and the comparative method are employed for conducting pension adequacy analysis and examination of pension capital indexation and indexation of pensions after retirement, as well as for the purpose of studying the Notional Defined Contribution pension system. The logically and abstractedly constructive method is employed for making forecasts and defining the main research results – the conditions for ensuring pension system sustainability that have been determined by the authors in the course of the research.

The authors proved that by basing on the principle of generation solidarity and equity and through improvement of NDC pension calculation formula, it is possible to create the old-age pension system, which would be capable of excluding the old-age pension instability causes.

KEYWORDS: Sustainability of pension system, NDC, pension model.
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The old-age pension system should be financially stable (robust) in the changing demographic and economic environment and at the same time display cross-generational equity (fairness) and equity among various income groups by diversifying economic and demographic risks. Scholars researching the pension sphere consider that the "Non-financial defined contribution" (NDC) scheme has a number of advantages over PAYGO systems, one of these being stable. Pension scheme of the NDC type ensures known level of fiscal stability because the promised profitability reflects the PAYGO characteristics, which form the basis of the programme rather than are based on the rate of return from investment operations on the market.

The authors of the paper analyse the principles of operation of the NDC-based pension system. The paper highlights the primary goals of pension systems, the *adequacy* or sufficiency of the pension income and the provisions for ensuring sustainability of the pension system based on NDC principles.

Basing on the NDC structure, the principles of solidarity, equity and voluntariness as well as the defined provisions, the authors of the paper propose to introduce changes in the pension calculation method to ensure financial, political and social sustainability of the NDC old-age pension system.

According to the proposed model, the virtual retirement system is used for calculation of the pension capital, where in the annual indexing not only the amount of tax that is assigned for old-age pensions is taken into account, but also the demographic changes (the changes in the number of the deceased and the new pensioners).

The paper shows that it is possible to achieve political stability if the two conditions are met. First, in the same way as in another physical or notional models of the funded pension systems, the system needs to be supplemented with a minimum guaranteed pension for those individuals, who have not been able or have not been willing to accumulate pension capital. Secondly, it is deemed necessary to keep explaining the motives for accumulation during the entire working life of a contributor.

The paper demonstrates stability of the model in respect of the key known risks immanent to pension systems:

1   the scheme is stable against the risk of aging population, because it provides a reasonable level of income regardless of demographic changes;

2   the scheme is stable against the economic crisis, because the proposed universal indexing allows to ensure improvement for all participants in equal measure;

3   the scheme is stable against the risk of default, because it stimulates each scheme participant to make the maximum contribution every year;

4   the system is stable against the insufficiency of the pension during the time after retirement, because the universal indexing procedure is equally applied to both the period of accumulation and the payout period;

5   the scheme stimulates an earlier start of the work life and later retirement, thus minimizing the amount of funding required to ensure sustainability of the system.

The authors proved that by basing on the principle of generation solidarity and equity and through improvement of NDC pension calculation formula, it is possible to create the old-age pension system, which would be capable of excluding the old-age pension instability causes.

The *"Notional accounts"* old-age pension schemes - the so-called "Notional contribution" or „Nonfinancial defined contribution" (NDC) old-age pension schemes were first introduced in Sweden in 1994, at the time when it was predominantly considered that a sustainable defined contribution PAYG old-age pension scheme is hardly ever possible to achieve. The new Notional accounts old-age pension scheme proved that it is still possible to build a sustainable old-age pension system that would be based on PAYG principle.

Ten years later, being encouraged by Sweden's example many other countries introduced a new NDC model. In Latvia, the NDC reform was formulated and provided a legal basis on the 1st of

Introduction

Description of the Notional defined contribution (NDC) old-age pension scheme

January, 1996; in Italy the NDC scheme was introduced in 1995; Poland also started its NDC reform in 1999. NDC can be also found in the reformed pension systems of other countries, for example, in 2002 the NDC pension scheme was introduced in Russian Federation, Norway and Kyrgyzstan (Holzmann, R., & Palmer, E., 2003).

Similar to any old-age pension system, upon joining the NDC old-age pension scheme, a participant goes through the two phases, which approximately correspond to the periods of work and retirement. During the period of work an individual's payroll tax is transferred to the virtual account. Similar to an individual account within the framework of the actual DC scheme, a certain value is set to a virtual account within the NDC scheme, which increases every year thanks to the made contributions and the interest yield, accrued on the account balance. Unlike the balance of funds on an individual account under the DC plan, the NDC individual accounts are *notional* because the financial information on the accruals is virtual and the rate of return is based on the internal growth rate of the system. When a person retires, he/she receives a pension benefit (annuity), which is based on the notional accrued pension amount at the time of retirement (Auerbach, A.J. & Lee, R., 2006).

Social insurance contributions made by the employed in a certain year are used to pay out old-age pensions to existing retirees. The government defines the contribution rate applicable to the employment and self-employment earnings by observing the following principle: the contribution rate for all generations is the same and the contributions are made either by individuals or by the employers in the name of such individuals.

The age, at which individuals become entitled to use the accumulated notional capital upon retirement, i.e., to receive fixed pension payments (annuities) from the pension plan, differs in different countries. The rules for paying out annuities are dependent on the mortality rate at the time when a certain generation reaches the age of retirement stipulated by legislation (for example, 65 years), and on the interest yield earned by a particular pension plan, which may be accrued at the same rate that was used during the pre-retirement accumulation phase.

Researchers, Holzmann, R., Palmer, E. & Robalino, D., *et.al.,* (2012), who study pension sphere, consider that the NDC scheme possesses a number of potential advantages over PAYGO systems, and one of these is stability. A pension scheme of a NDC type ensures a fair level of financial stability because the promised yield reflects the PAYGO characteristics, which form the programme basis, rather than is based on the rates of return obtained from investment operations on the market. The aim of the NDC system is to imitate a funded DC system structure, and, at the same time, to ensure financial stability by using a relevant internal rate of return (keeping in mind also the context of a fragile situation), rather than the market rate of return.

Primary objectives of pension systems and the essence and objectives of pension adequacy

In order to ensure political sustainability of the pension system – adherence to the principals of pension adequacy and equity towards members of the community - international organisations and national lawmakers advocate the policy shift away from the PAYG system towards the private, primarily pre-paid pensions. That is mainly supported by economic considerations about the fiscal austerity of financial sustainability of the ageing community and promotion of the development of financial and capital markets in order to facilitate economic growth.

As a result of pension reform, over the recent decades the size of the state pension has decreased, the pension qualification age has been raised and privately funded pensions became more widely promoted. However, Schludi, M., (2005) being affected by the economic and financial crisis, the majority of the EU member states experienced an economic downslide or economic recession followed by an increase in social expenditure. The state budget deficit (and debts) only further increased the pressure on pension schemes, because these had to be at least partially financed from the state budget.

Natali, D., (2010) writings about pension policies demonstrate agreement of the opinion on the fact that pension programmes (both in the state and private sector) are not protected from the aftermath of economic downslide and financial crisis.

When analysing the implemented pension reforms, the authors of the article came to the conclusion that, although the reforms sought to promote sustainability, the *adequacy* of the retirement income or pension sufficiency is pretty often being neglected and does not become the subject of public debate, mainly for the reason that poverty in the old age no longer seems a pressing issue in the European countries with advanced welfare systems. Although the level of poverty and the inequality of incomes differ in various European countries, at large, they demonstrate a tendency to grow - in many places the state pensions continue to decrease in size, whereas reliance on voluntary contributions in private pension funds is increasing. Financial crisis of 2000 and the financial tumbledown of 2008-2009 brought to the surface the problems related to funded pensions – their inability to provide the expected yield. These changes brought out the key points concerning the growing role of private pensions: whether retreat from the public (state) responsibility leads to a higher private initiative, which is supposed to fill in the future old-age income gaps? To what extent the risk of ensuring the retirement income is transferred upon an individual, and whether the inequality of incomes will continue to grow?

If we look back at the primary goals of the pension system, then, according to Holzman, R., Hinz, R.P., & Dorfman, M., (2008) the primary goals of any pension system should be to provide adequate, affordable, sustainable, fair and predictable old-age pension, while seeking for the possibilities to maximise the overall community welfare in a manner appropriate to the individual country. An adequate system is one which provides benefits to the full breadth of the population that are sufficient to prevent old age poverty on a country specific absolute level in addition to providing a reliable means to smooth lifetime consumption for the vast majority of the population.

The essence of pension adequacy in the EU pension policy documents is determined in the following way:

Securely financed adequate income that does not destabilise public finances or impose excessive burden upon future generations, while maintaining fairness and solidarity and responding to the changing needs of individuals and society (Social Protection Committee, 2000).

EU member states have undertaken to ensure adequate and sustainable pensions guaranteeing appropriate pension arrangements for all individuals and the opportunity to receive the pension that would allow them to maintain the reasonable living standards after retirement in accordance with the principles of intergenerational solidarity and fairness.

The European Commission (2001) defines the following pension adequacy objectives:

The pension system *should ensure that all older people enjoy a decent living standard, share in the economic well-being of their country and participate actively in public, social and cultural life.*

After retirement due to old age or invalidity or in case of a breadwinner loss, maintain the living standard of an individual's choice, by providing to all individuals access to proper pension arrangements.

These objectives European Commission (2003) were further specified as:

_ preventing social exclusion;

_ promoting solidarity between generations.

_ enabling people to maintain the accustomed living standards, and

The Council of the European Union (2001) singles out the *three basic principles for ensuring the long-term sustainability of pension system*, which are *adequacy, financial sustainability and adaptability to change.*

Borella, M., & Fornero, E., (2009) suggested that it is important to build a proper and fair relation between contributions and benefits since the sufficiency of income is the key objective of pension system. Whereas, the UK pension institute researchers Redwood, D., Carrera, L., Armstrong, J., & Pennanen, T. (2013) with reference to retirement income express an opinion that there are two major definitions of adequacy: first, to what extent does the pension income enable individuals to meet their basic needs at retirement, and, second, to what extent the pension income is able to ensure the living standard compared to the income received during the working life. While the first definition is given in order to apply the minimum guaranteed income standards and prevent the risks of poverty in the old age, the second definition is designed to evaluate the adequacy by analysing the replacement rate. For evaluation of the pension income adequacy the authors use one of the dimensions – the wage replacement rate. There is one matter, which does not cause any controversy of opinion - the pension system should be build in a way to protect individuals from poverty, as well as to enable them to maintain their former living standards.

Based on the conducted analysis and performed computations, the authors concluded that the replacement rate (%) in Latvia for the newly awarded pensions in relation to the average insurance contribution wages was 38% in 2007, 44% - in 2008, 60% in 2009, 64% - in 2010, 58% - in 2011, 52% - in 2012 and 38% - in 2013.

Studies of the replacement rate in Latvia in the context of the influence of all the three levels lead the authors -Pukis, M. & Dundure, I. (2012) - to the conclusion that given the existing pension system in Latvia *the theoretical replacement rate of 70% for the old-age pensions in Latvia in reality is an unattainable objective.* For a sustainable pension system it is necessary to ensure that senior citizens would not be affected by the poverty risk and could enjoy a decent living standard.

Conditions for achieving sustainability of the old-age pension system based on NDC principles

An old-age pension system must be financially stable in a changing demographic and economic climate, and at the same time it should create fairness among generations and income groups by diversifying the economic, financial and demographic risks.

The basic building block of political sustainability of the pension system is adherence to the principle of fairness (equity) towards community members. In theory, a fair pension system is the one, which ensures redistribution of income from the financially robust in favour of the poor in accordance with the society priorities, furthermore, does that in such a way so that no burden is laid upon the rest of the community members, who do not participate in the system. The principle of fairness (equity) is also ensured by a direct link between the contributions and the pension level within the context of NDC, since individuals are rewarded with a higher pension for every additional contributed monetary unit. Contribution of each insubstantial unit creates equal pension rights. This principle that ensures horizontal equality is at the root of NDC representation, which implies that it is based on the principle of fairness (equity).

On the macroeconomic level, fairness with respect to future generations and long-term financial stability are dependent on the real-life system build-up (structure) and the system's susceptibility to demographic and economic changes.

A well-functioning institutional system is also fundamental for a stable pension system, i.e., the government plays a significant role in any pension system. All pension systems to a large extent depend on the technical capacity of the public sector. As for the NDC pension system Holzmann, R. & Palmer, E. (2003) argue that it includes the ability to collect taxes and contributions, the ability to track the mobility of employees and, what is most important, the ability to monitor the contributions over a long time period and to forecast the volume of further contributions and benefits with a sufficient accuracy.

NDC pension schemes may achieve the desired results only on the provision that the system is well developed and implemented in the right manner, by providing:

_ economic stimuli to individuals to stay on the labour market;

_ flexibility in making retirement decisions;

_ visibility (predictability) of distribution;

_ motivation to pay taxes;

_ mechanisms, which ensure financial equilibrium;

_ stability amid the economic crisis;

_ ability to withstand the impact of demographic changes;

_ observation of the principle of fairness (equity) and solidarity.

Proceeding from the NDC structure, the principles of solidarity, fairness and voluntariness and the above mentioned provisions, the authors of the article propose to introduce changes in the method of calculating pensions to ensure long-term financial, political and social sustainability of the NDC old-age pension system.

In development of the new formula for calculating the old-age retirement benefits the authors proceed from the NDC pension system operation principles. Specifically, for each contributor - payer of social insurance - an individual account is established, which registers information on paid contributions. Interest income is accrued on the account balances, and a pension plan announces the amount of interest yield on an annual basis. Notional contributions are paid into the mentioned accounts throughout the lifetime, thus reflecting the actual taxes and payments. Together with the announced yield the notional contributions make up the value of such account at any given point of time. This information enables to perform calculation of the appropriate size of an individual's pension benefit at the time of retirement.

The basic elements of the proposed model are similar to that of Swedish and Latvian NDC model, however a range of peculiarities of the suggested solution allows to prevent all currently known instabilities against internal or external factors. Describing the proposed model with the help of the formulas, the authors chose a number of description principles:

Modified (adjusted) old-age pension calculation formula based on NDC principles

1 small letters define an individual pensioner or an individual contributor;

2 capital letters define the figure country wise;

3 small indexes define the year or the ordinal number;

4 superscripted indexes are not meant for summing up or multiplying, these are applied for characterisation purpose only.

Further description refers solely to the old-age pension accrued within the NDC system. Sources of the social (minimum) pension benefit, which should be provided in any case, are not reviewed, because there always be found certain individuals, who failed to accrue virtual pension.

In the consecutive year marked with the index *k*, a payer of social tax (payroll tax) pays a certain amount deductible from his tax, which is directed to old-age pension:

$$s_{ik} = Lw_{ik} \qquad (1)$$

(all formulas, except the fourth, created by authors Dundure, I.,& Pukis, M., (2015))

Where the notations used are:

s_{ik} – i-th payer's contribution in the k-th year;

w_{ik} – i-th payer's taxable income (wage) in the *k-th* year;

L – the contribution rate applied to taxable income directed to old-age pension (in Latvia's case - the rate L=20% is applied to those, who do not participate in the creation of the funded pension).

The total contribution during a year is the sum of all payments performed by the payers in that year - S_k. This amount in the consecutive year can be forecasted with a pretty high level of accuracy. In contrast to other NDC models, here we introduced the equilibrium (balance) of contributions and payoffs.

$$P_k = S_k \tag{2}$$

Whereas P_k is the amount of pension in the *k-th* year, which consists of individual pensioners' old-age pensions.

Formula (2), unlike the generally accepted payment procedure, shows the volatile nature of the amount of pensions in payment: depending on the aggregate contributions and the change in the number of pensioners, the size of the pension calculated for each consecutive year's changes. If the volume of contributions by working individuals grows, the earlier calculated pension may go up as well, and vice versa. With the decrease of the contributed amount, the size of the pension would also decrease. Until now, the traditional view was that an individual has "earned" a particular pension amount. In such a case the pension changes alongside with the changing amount earned by the respective generation of wage earners.

In the proposed model, similar to other NDC models, every *i-th* payer of social tax accumulates the pension capital from year to year, increasing it by means of his contributions s_{ik}, however, the earlier contributed sum is indexed. The novelty is the introduction of a general-purpose index I_k, which can be equally applied to pension capital accumulation and for indexing earlier awarded old-age pensions.

Pension capital of an i-th taxpayer is accumulated every year by the following formula

$$k_{i,k+1} = I_{k+1}k_{ik} + s_{ik} \tag{3}$$

Where the notations used are:

$k_{i,k+1}$ – the ith pensioner's pension capital in the forecasted year;

I_{k+1} – the general-purpose (universal) index forecasted for the kth year;

k_{ik} – the ith pensioner's pension capital in the kth year;

s_{ik} – the ith contributor's payment in the kth year.

Pension in the year of retirement D is calculated by the formula

$$p_{iD} = \frac{k_i}{G_i} \tag{4}$$

(Formula (4) in accordance with Article 12 of the Law "On State Pensions", Latvia.)

Where the notations used are:

p_{iD} – i^{th} pensioner's pension in the year of retirement;

k_i – i^{th} pensioner's accrued pension capital in the year of retirement;

G_i – i^{th} pensioner's forecasted average life expectancy in the year of retirement is a function of age and statistical data for a particular year.

From now forth the pension is indexed by the formula:

$$p_{i,k+1} = I_{k+1}p_{i,k} \tag{5}$$

Where the notations used are:

$p_{i,k+1}$ – the ith pensioner's pension in the $k+1^{th}$ year (forecast);

I_{k+1} – a general-purpose (universal) index *in the k+1*[th] year;

$p_{i,k}$ – the ith pensioner's pension in the kth year.

Annually indexed pension in the n-th year after retirement

$$p_{i,D+n} = p_{iD} \prod_{m=D+1}^{D+n} I_m \qquad (6)$$

Where the notations used are:

$p_{i,D+n}$ -the i- pensioner's pension in the year n-th year after retirement;

p_{iD} – i^{th} pensioner's pension in the year of retirement;

I_m – the universal index.

The annual general-purpose (universal) index is calculated by the formula:

$$I_k = \frac{S_k}{S_{k-1}}(1-\alpha_k) \qquad (7)$$

Where the notations used are:

S_k – the sum of social insurance contributions in the kth year;

S_{k-1} – the sum of social insurance contributions in the preceding year.

The value a_k is determined by taking into account the solidarity provision (2) and the changes in the number of pensioners in the kth year, i.e., the pension benefits unpaid to deceased pensioners in a certain year and pensions in payment to new pensioners in the same year are taken into consideration. Although the value of a_k is small, still, it does reflect demographic changes.

The a_k value is calculated in the following way:

$$\alpha_k = 1 - \frac{\left(1-\frac{\Delta P_k^M}{P_k}\right)}{\left(1-\frac{\Delta P_k^J}{P_{k-1}}\right)} \qquad (8)$$

Where the particular expenditure items are forecasted every year:

ΔP_k^M – pensions unpaid to deceased pensioners in the kth year;

ΔP_k^J – pensions in payment to the new pensioners in the kth year;

P_k – pension amount in the kth year;

P_{k-1} – pension amount in the preceding year.

In this article sustainability is illustrated as stability against the major known risks, which may cause insolvency or dissatisfaction of recipients of the old-age pensions.

Political stability

The major risk associated with the proposed model lies in the political stability. While the impact of the political factors can be set off through optimisation of the sources of pension resources and improved distribution, political stability strongly depends on the perception of justice present in the community, which may be both subjective and shifty.

The proposed model provides that every old-age pensioner receives the pension, which source is the generation solidarity. There are no major problems associated with this aspect, since in many developed countries for almost a hundred years this has been a time tested and well proven principle of funding, therefore it should not cause any notably negative public attitudes.

At the same time, the pension size is proportional to the life-long contribution. Crucial significance is attributed to the amount that has been contributed over the working life rather than to time in employment or other factors. The wage amount at any given point of time is not that important (for example, at the time of retirement or at any time shortly before retirement). Those, who have been paying a lot for several years and those, who have been contributing small amounts for many years will receive pensions equal in size.

Stability (robustness) of the proposed NDC model

It follows from the above formulated model that contribution in the pension capital made every year of the working life is proportional to relative wage (taxable income) of the *i-th* contributor (payer) in the *k-th* year:

$$r_{ik} = \frac{w_{ik}}{\overline{W}_k} \quad (9)$$

Where the notations used are:

w_{ik} – taxable income (wage) of a certain *i* taxpayer in a certain *k* year;

$\overline{W}_k$ - the average taxable income (salary) *k-th* year of payers. Pursuant to the adopted pension capital indexing system, the pension capital accumulated till the year of retirement is presented as follows:

$$k_{iD} = L\overline{w}_D \left(r_{iD} + M_D \sum_{J=1}^{D-1} \frac{r_{ij}}{M_j} \prod_{m=j+1}^{D} (1 - \alpha_m) \right) \quad (10)$$

Where the notations used are:

L – social security rate on taxable income directed to old-age pensions;

$\overline{w}_D$ – the average wage in retirement year;

M_D – number of payers of social tax;

$(1-a_m)$ – the value that characterises the change in the number of pensioners;

M_j – number of payers of social tax;

r_{iD} – relative accumulated contribution by a certain payer *i* in the year of retirement;

r_{ij} – relative amount of accumulated contributions by a certain payer *i* till the year of retirement.

Wage replacement rate for a certain pensioner *i* in the year of retirement is calculated by the following formula created by the author.

$$R_{iD} = \frac{LDr_i}{G_i} \quad (11)$$

Where the notations used are:

L – social security rate on taxable income directed to old-age pensions;

D – length of service (working career) (number of social tax payment years);

G_i – average life expectancy of a certain pensioner i in the year of retirement;

r_i – relative payer's contribution accumulated till the moment of retirement.

The formula for calculation of the wage replacement rate for a certain *i* pensioner in the year of retirement (12) shows the commitment of an individual contributor to assume responsibility for his or her old days.

Pension in the *n-th* year after retirement by applying the universal pension adjustment index is calculated by Formula 7.

$$p_{i,D+n} = p_{iD} \prod_{m=D+1}^{D+n} I_m \quad (12)$$

Where the notations used are:

$p_{i,D+n}$ – a certain *i* pensioner's pension in a certain year after retirement;

p_{iD} – a certain *i* pensioner's pension in the year of retirement;

I_m – forecasted index.

What is important is that after many years - also in the year of death - the pension would not get devalued, as it happens now. Many years on we continue to compare pension with the average wage in that year. If the multiplication of indexes would be close to 1, in that case a pensioner's relative income would be preserved as long as the absolute income during the period of retirement keeps pace with the solidarity wage growth.

The liberal approach, which is based on responsibility of each particular individual for his/her

own welfare, does not happen to be highly valued in the modern world. Nevertheless, the hope for the system stability is supported by the fact that since the implementation of such pension model in a typical welfare country like Sweden (where the majority of population upholds the values of social democracy) no public concerns were raised for more than 20 years. This indicates that in case of a welfare state oriented community a certain part of the social insurance benefits may be based on social responsibility.

The next element of fairness, which may have a significant effect on public perception, is application of the equal life expectancy standard both for men and women. Women on average live longer. Which means that women in retirement are going to receive part of the redistributed men's virtual accumulated pension. Such situation is characteristic to all NDC schemes. It is partially justified by the fact that women contribute less toward their retirement due to the period of childbirth and childcare. That also happens in cases when the retirement age for women is set to a lower level. At the same time women "are responsible" for existence of the new generation of pension providers. Previous experience is not indicative of any conflict of opinions with respect to such approach to the redistribution of accumulated pension.

One of the drawbacks in other NDC models is devaluation of pension over time after retirement. In this model the devaluation rate is minimal or even does not exist at all. This is an additional argument in favour of strengthening the sense of justice and fairness.

In any case, political stability may evaporate as a result of the government ineffectual communication policy. The fundamental issue is - which way to choose: either inform the community about the essence of the implemented pension system and operation of corresponding mechanisms or hold back these details from the public.

If political stability is needed as a sustainable process, then it would be better in every respect to inform the community and start explaining how one can earn larger pension already by doing it already in the secondary school.

The proposed old-age pension in principle cannot be sustainable unless a minimum pension is introduced and appropriately increased in proportion to the welfare level achieved by the society. At the same time, the more stimulating is the process of shaping the basis for such pension while augmenting the welfare of the society, the relatively less additional resources will be required to fund the minimum pensions. Therefore, it is possible to separate these pension types and review them on an individual basis.

Stability against the changes in age structure

This, in particular, is a great concern for the majority of the world pension schemes. Pretty much none of the most successful world economies can expect any positive change in this area - the share of pensioners keeps increasing while the share of contributors is decreasing.

In order to prevent these concerns, it is necessary to change the goods and services production structure by bringing the impact of technological progress into balance. Which means the relation between the producers and controllers should be slightly increased. Technological development leads to increased life expectancy. At the same time the number of employees in manufacturing and agricultural sectors decreases, with an excessive growth of the service industry and inflated bureaucracy. Sooner or later life will make adjustments to these proportions ensuring adequate living standards to the pensioners.

However, change of the employment structure is not the subject matter of this article. Let us consider pension adequacy in connection with the current tendency - ageing of population.

Formula (11) demonstrates a number of simple coherences: replaceability is directly proportion-

al to the deduction rate applied to earnings and the duration of the working life and is inversely proportional to the part of life spent in retirement.

If the relative investment r_i is equalled to *one*, then the replaceability will be calculated for a pensioner of the formerly "moderate means", who have been earning a countrywise average income throughout his life. Let us consider two cases:

1   the average earner started to work at the age of 16 and retired at the age of 65, his D=50. If the average life expectancy is 25 years and keeping L=0,2, we obtain R_{iD} = 0,4.

2   the average earner started to work at the age of 26 and retired at the same age of 65. Then D=40 and, *ceteris paribus*, the replaceability rate decreases R_{iD} = 0,32.

It should be remembered that an individual, who starts his career at such a young age will not be able to dedicate much time to his education, while an individual, who dedicated much time to studies, on the contrary, may potentially earn more if during his studies he acquires the skills that are highly assessed by the employer. Therefore, the prospects to obtain $r_{i>}$ 1 and compensate for the missing years in employment are higher.

In every respect it is important that in each subsequent year the pension is indexed in accordance with general-purpose (universal) index. Experience of dozens of years proved that wages use to increase in the long run. Therefore, except for the years of crisis - which is a special case, a pensioner is convinced that his pension does not decrease in value.

In general, the system resembles a social family model. The more the employable earn, the better is the life of the old people. The more children are born, the more comfortable is the life of the seniors in the society in general. However, there are no steep declines in the system, and in accordance with the formula (12), a pensioner maintains his earned "virtual" level till the very end of his life.

Stability against economic crises

If the pension amount is fixed at retirement, then the welfare of a pensioner becomes dependant on the economic cycle. At times when the number of employees drops, it seems unfair to cut the fixed "earned pension". That creates the need to borrow, which would be covered at the expense of future expenditures (normally - future pensions).

Under traditional NDC systems some years are favourable and some are unfavourable for retirement.

If indexing is linked to economic success of the society in general, then the system becomes stable. This is secured by the general-purpose (universal) index. From year to year the workers' virtual pension capital and pensioners' pension benefits are equally indexed according to the formula (3) and (4).

There is no reason both for the pensioners and the workers to be afraid of the short-term decrease of earnings or capital, because there is an assurance that things will improve over the next phase of the economic cycle.

Stability against early retirement tendency

If formulas (11) and (12) would be taught at school, each worker would easily evaluate his/her expected pension amount and act accordingly. In the systems, which lack firm assurance that longer working life would also ensure higher pensions, large part of the society endeavours to make their working life shorter. If the community become fully aware of the direct proportion of the length of the working life, the number of those who start their working career early and retire later would grow. Staying in the labour market also after the age of retirement will make payment of pensions easier to those who do not work.

Stability against tax evasion

In the proposed model the pension capital is calculated on the basis of actual contribution. If an employer reports smaller wages and pays less tax, the worker's pension is decreased. If the employer has social tax debts to the state, the pension decreases again. Under such system it becomes disadvantageous to work in a company to which tax privileges apply. An employee becomes embroiled in conflict with a dishonest employer.

Stability against decrease of value of the earned pension

The currently applied NDC schemes do not use equal indexing before and after retirement. This problem is going to become more aggravated with the growing average life expectancy. The high initial replacement rate is insufficient. Introduction of the general-purpose (universal) index solves this problem.

If after retirement the proportion of workers continues to decrease, the pension will grow proportionally with the increase of the aggregate wages and will decrease proportionally with the ratio between the pensioners and workers. This is evidenced by the formula (12). Previous practice shows that productivity caused by technological progress grows at a higher rate compared to increase of life expectancy. That is why the system remains stable against pension devaluation for many decades after retirement.

The paper shows that political stability is possible under the two conditions:

First, like in other physical or notional models of the funded pension systems, the system needs to be supplemented with a minimum guaranteed pension for those individuals, who have not been able or have not been willing to accumulate pension capital. Second, an active explanation of the accumulation motives is necessary during the entire working life of a contributor.

The paper demonstrates the stability of the model with respect to the main known risks of a pension system:

Conclusions

1. the scheme is stable against the risk of aging population, because it provides a reasonable level of income regardless of demographic changes;

2. the scheme is stable against the economic crisis, because the proposed universal indexing allows improvement for all participants in equal share;

3. the scheme is stable against the risk of default, because it stimulates each scheme participant to make the maximum contribution every year;

4. the system is stable against the insufficiency of pension during the time after retirement, because the universal indexing procedure is equally applied both to the accumulation period and the payout period;

5. the scheme stimulates an earlier start of the work life and later retirement, thus minimizing the payments required to ensure sustainability of the system.

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