

Could the notional defined contributions pension scheme be included in the Spanish system?

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ABSTRACT This article presents a first approach to notional account-based defined contribution pension systems. This is done by analyzing their definition –at the theoretical level– and a practical example with the Swedish pension system. The latter is the most representative case amongst the countries that have adopted a notional accounts system. Similarly, the potential application of this approach in Spain is considered, since the Spanish public pension system –one with defined distribution and benefits– continues to show financial solvency problems despite the last two reforms in the years 2011 and 2013. Thus, it seems necessary to introduce a deeper reform. While notional account systems have some disadvantages that should be considered, they have a number of inherent advantages that could be very beneficial to Spain – underscoring the fact that the distribution system is maintained, and thereby upholding intergenerational solidarity.

KEYWORDS defined contribution, notional accounts, Swedish model, pension fund, reforms.

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¿Se podría incluir en el sistema español el sistema de pensiones de cuentas nocionales de aportación definida?

RESUMEN En este artículo se presenta una primera aproximación a los sistemas de pensiones basados en cuentas nocionales de aportación definida, mediante un análisis tanto a nivel teórico, a través de su definición, como práctico, del sistema de pensiones sueco, ya que se trata del caso más representativo entre los países que ya han adoptado un sistema de cuentas nocionales. De igual forma, se considera su posible aplicación en España, dado que el sistema público de pensiones español, de reparto y prestación definida, pese a las dos últimas reformas realizadas en los años 2011 y 2013, sigue mostrando problemas de solvencia financiera; así las cosas, parece necesario realizar una reforma más profunda. Si bien los sistemas de cuentas nocionales tienen algunas desventajas que deben ser consideradas, también tienen asociadas una serie de ventajas que podrían ser muy beneficiosas para España, destacando que se mantiene el sistema de reparto, y por tanto, la solidaridad intergeneracional.

PALABRAS CLAVE aportación definida, cuentas nocionales, modelo sueco, pensiones., reformas.

Poderia se incluir no sistema espanhol o sistema de aposentadoria de contas nocionais de prestação definida?

RESUMO Neste artigo se apresenta uma primeira aproximação aos sistemas de aposentadoria baseados em contas nocionais de prestação definida, por meio de uma análise tanto teórica, através da sua definição, quanto prática, por meio da análise do sistema de aposentadoria da Suécia, o caso mais representativo entre os países que já adotaram um sistema de contas nocionais. Na sequência, considera-se sua possível aplicação na Espanha, tendo em visto que seu sistema público de aposentadoria, de repartição e prestação definida, apesar das duas últimas reformas feitas nos anos 2011 e 2013, continua a mostrar problemas de solidez financeira. Assim, parece necessário realizar uma reforma mais profunda. Ainda que os sistemas de contas nocionais tenham algumas desvantagens a serem consideradas, também estão associadas a um leque de vantagens que poderiam ser benéficas para a Espanha, levando em conta que o sistema de repartição permanece, e por tanto, a solidariedade em geral é mantida.

PALAVRAS CHAVE Prestação definida, contas nocionais, modelo sueco, aposentadoria, reformas.

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Introduction

For some years, the concern for the sustainability of public pay-as-you-go (PAYG) pension schemes has increased. This is due to the economic-financial instability to which most countries are being subjected, brought on by the economic and financial crisis which started by the end of the year 2007 and which still affects Spanish economy, bringing devastating consequences to the job market. This situation, added to the progressive aging of the population as a worldwide phenomenon, are factors which have resulted in problems for the sustainability of public PAYG pension schemes, in which the benefits of pensioner members are being financed by contributions made by the system's contributing members at a given time, thereby bringing out the flaws in these systems.

In this context, the changes in the job market, along with demographic changes, have led governments to reconsider the way they face the challenges of maintaining income in senior years. Thereby, the partial capitalization and PAYG pensions systems have been strongly criticized because they have not been considered to take into account the relationship between benefits, contributions, and the accelerated demographic change. In Europe, as well as Latin America, some problems have surfaced as a result of elevated social benefits, accelerated demographic change, and a highly elevated unemployment rate. For this purpose, the States incorporated reforms to their pensions systems, which implied more realistic adjustments to the parameters of their PAYG schemes, higher incentives for people's individual savings, and a higher concern for the financial sustainability of their plans, as stated by Tuesta (2001), with multiple investigations taking place to determine whether these systems are sustainable in time, just as they are defined, or if more reforms need to take place in order to minimize risks.

In this sense, Guillén, Domínguez, Encinas, Nagore & Rosado (2010) point out that the European Commission has drawn attention to this worrying situation, and has proposed a series of objectives, such as finding the sustainable balance between working time and retirement time, prolonging work life, and enhancing access to supplementary pension schemes. Moreover, this report shows in detail some of the practices undertaken by member nations in an attempt to control this

situation, such as penalizing those who opt for early retirement and compensation for those who choose to retire later on, and the promotion of private supplementary pension schemes.

Most of public pension schemes in Europe are either capitalization systems, or PAYG schemes, in which another system can be found: the Notional Accounts System¹.

Following Díaz (2014), the main difference between PAYG and capitalization systems is that in capitalization systems, the contributions made by assets to the system act as an investment, so that the returns from these investments will be their future pensions; conversely, the PAYG scheme, on which this research is centered, is based on the fact that the contributions made by contributing members cover pension expenditure for the liabilities in that same period of time, creating a guarantee for generational handover.

During the last few years, a surge of reforms to Social Security systems has occurred in Europe, and therefore to their pensions systems, maintaining, for the most part, their pay-as-you-go schemes, with some modifications to their parameters. On their part, in Latin America, Chile launches a structural reform in 1981 in which it modifies the way of funding and managing them, and at the same time, it modifies the requirements. This way, it implements the individual capitalization system as the only system for granting pensions, and it remains this way until the 90's, when the surge of reforms in pensions goes hand-in-hand with the second generation reforms, oriented towards economic revival, the increase of domestic savings, and deepening capital markets.

1 In the pay-as-you-go pensions scheme, each person's pensions are financed by the input (part of the contributions) made by active workers, whilst in the individual capitalization system, each member of the Social Security system has an account in which their contributions are deposited, which will capitalize along with the profitability of the investments made by administrators using resources from their funds, and these will determine the amount of their future benefits. On their part, the notional accounts system is framed within the PAYG scheme, being a system of defined contribution; meaning that a contributing member will not be able to know what their final pension will be, since it will depend on parameters such as retirement age, number of contributing years, contribution bases, but also on a notional factor which will depend on the country's financial circumstances at the time of retirement and the evolution of life expectancy.

In spite of the reforms, low coverage was still evident, partly due to the dynamics of the job market, which hinders the fulfillment of the requirements and contribution period. Besides, the results of capitalization systems with private management showed that low salaries, low contributions, and high commissions result in very low pensions. To face this, changes to what was reformed have been introduced: in Chile's case, which carries out modifications in 2008 and presents new proposals in 2015, and Argentina's case, which reverses to defined-benefits system as the only system, just as stated by Bertranou, Cetrángolo, Grushka, C. & Casanova (2012). Nevertheless, the tendency in Europe is parametric reforms to PAYG schemes or structural changes to systems that maintain their PAYG schemes but modify the way to calculate their pensions based on defined contribution². In this last case, countries such as Sweden, Italy, Poland and Latvia stand out, in Europe, aside from Brazil's case, which have opted for the implementation of notional accounts of defined contribution systems.

Following this analysis, the Spanish public pensions system is a PAYG defined benefit system, just as most of the countries in the European Union. The fact that it is a PAYG scheme implies that, for each considered period, revenues received by the system by means of contributions, by entrepreneurs as well as by workers, will be enough to cover the payment of contributory pensions generated by pensioners in that same time period. And, by being a defined contribution system, the formulation of the amount of the first pension received has a regulation that sets and defines it (Guillén *et al.* (2010).

Therefore, and due to the bases the PAYG pensions scheme is founded on, any change suffered by the assets or liabilities at a given period of time, can cause the system to get financially unbalanced, making any variation in any of the groups a risk for the system.

2 In *defined benefit* PAYG schemes, the pension can be known and calculated beforehand, since it will depend on retirement ratio, the number of years of contributions, and the contribution bases. Nevertheless, in a *defined contribution* system it is not possible to know the pension in advance, since (aside from these factors) the benefits are calculated by applying a factor which depends on the country's financial situation at the time when the pension will be received.

This is why almost all European pensions schemes are being subject to numerous studies, in which the new conditions of each country are analyzed, and proposing measures that minimize risks and guarantee financial sustainability of the systems over time. In Spain, the Social Security System has undergone many investigations, among them: Domínguez, Devesa, & Rosado (2012), Rosado (2014), Guillén *et al.* (2010), Devesa (2011), Boado & Lanot (2012), Rosado & Domínguez (2014), Rosado & Alonso (2015), and Rosado, Domínguez & Alonso (2015). Each one of these research papers is centered on analyzing different aspects of the system, which is why they have obtained different results, but coincide on establishing the existence of a serious problem in long-term financial solvency of the current pensions system and, therefore, in the need to make structural changes to the system, in spite of the parametric reforms developed in Spain over the last few years. In this sense, Bill 27/2011 introduced, as one of the most innovative measures, the sustainability factor, which would be deployed from the year 2027. Nevertheless, and due to the Social Security cash problems, the regulation and implementation of said factor comes ahead in time through the passing of Bill 23/2013, on December 23rd, which regulates the sustainability factor and the Social Security pensions system's revaluation index.

The objective of this investigation is to align pensions systems based on notional accounts, highlighting the Swedish model and considering its possible implementation in Spain, taking into account that the goal is to introduce the defined contribution notional accounts model in Spain, recognizing that they are very different countries, with different economic, political, social, cultural and heterogeneous population factors.

In this sense, according to the World Bank, the numbers surrounding unemployment rates are highlighted, which in Sweden is situated at 8% and in Spain at 24%, and in the average salary, which exceeds 43.000 euros per year in Sweden, versus 26.000 euros per year in Spain. In addition to that, Swedish informal economy positions itself at 14%, in contrast to Spanish informal economy, which ranges between 20% and 25%.

This article is structured as follows: after this introduction, the notional accounts system is presented through its definition, and the Swedish model experience of defined contributions notional

accounts, considering the transition towards this model, the new organization of the system and the calculation formula of retirement pension, in addition to some assessments, advantages and disadvantages associated to this type of systems. Next, the possibility of adopting a notional accounts pensions system in Spain is considered, through different adjustment formulas and taking into account the last two reforms made to the Spanish retirement pensions system. Lastly, the conclusions derived from this investigation are presented, and it finalizes with the bibliographical references that were used.

The defined contribution notional accounts system: the Swedish model.

A notional accounts system is a defined contribution PAYG scheme, by which, just as it happens in the current pensions system in Spain, the contributions made to the system in a given period of time are used to cover the benefits of that same period of time; in other words, it is a system in which intergenerational solidarity continues, but, at the same time, in an individual way, all contributions made by each worker throughout their working life are collected in what is known as a notional account.

A notional account, as defined by Domínguez, Boado, Valdés & Vidal (2007), “is a virtual account in which individual contributions of each contributing member and the fictitious profits generated by said contributions throughout their working life are registered”. Thus, a notional account does not really exist, in the sense that it is not a bank account in which the contributions made by each individual are deposited, but it consists in keeping score and an accounting record of each one of the contributions made individually. This is why the profits generated by this account are not real, since they are derived from a notional point, and are registered in the same way as the contributions made. Some examples of notional points can be the rate of GDP growth or the income from contributions.

Thus, according to the Consultative Group on Public Policy (2013), the adjective “notional” is used to express the accrued rights that allow each individual into retirement. The moment in which an individual accesses retirement, they

are entitled to a pension equivalent to the total of contributions made throughout working life, plus yearly revaluation given by them, derived from the notional point, and with the amount of the retirement pension depending consequently on three factors: the total amount in contributions, the notional point used to capitalize them, and a conversion factor, which will take into account that year’s cohort’s life expectancy, and through which the cumulative total will become an annuity.

Therefore, taking into account everything mentioned before, it is often said that notional accounts systems are nothing other than an alternative to the way of deriving retirement pension. That is why it is important to highlight that a notional accounts system can be a part of the pensions system, as pointed out by Valero, Artís, Ayuso & García (2011), but not the entire system, as safety nets must exist to try to avoid some of the inconveniences associated to this model.

The Swedish model

Before reforming its public pensions system, Sweden used a defined benefit PAYG system, which was widely accepted by the Swedish population. As explained by Vidal, Devesa & Lejárraga (2002), it all began when in 1984 a government commission was created with the objective of analyzing the system’s viability. When the final report was presented in 1990, the expectation that in the year 2020 the system would experience serious financial difficulties stood out. That is why, in 1991, looking to obtain a system that was financially stable and transparent, and which provided solutions to other problems found in the analysis, a work group was created to be in charge of designing the reform process. This group submitted their proposal in 1994, which was finally approved by Parliament in 1998.

The new pensions system was introduced in 1999, which consisted on maintaining the PAYG pensions scheme, substituting defined benefit for defined contribution notional accounts, and introducing a small part of capitalization. Furthermore, since the year 2001, Sweden puts together an annual actuarial balance sheet of its pensions system, from which it is possible to derive the system’s solvency ratio and to link an Automatic

Adjustment Financial Mechanism (AAF³) to it, in order to get to know the situation the system is going through, and to perform more rapidly in case it is necessary. It is noted that, this new pensions system, as opposed to the previous one, exclusively covers retirement pension, and therefore other benefits, which used to be covered by the previous regulation, transferred to other schemes representing parts independent to it. As far as this goes, Settergren (2006) points out that State administration makes annual contributions to the system to cover certain contingencies. This way, contributions are made to cover non-contributory periods caused by unemployment periods, disability, childcare, and other causes, which can include military service and further education. In the report on the Inter-American Social Security Conference (2005), this operation is described as “imaginary” contributions, meaning that, even when the worker is out of the job market due to previously mentioned contingencies, their notional accounts still get their corresponding contributions as if they never left it.

Organization of the new system

With the new reform, it is accurate to say the Swedish retirement public pensions system stands on three main pillars. Taking into account that the contribution rate is 18,5%, 16% goes toward each worker’s individual notional account; this is the first pillar —as explained before, the notional account is a “fictitious” account, and it is the instrument through which the PAYG scheme is maintained, just as it happens in this case—. The remaining 2,5% goes toward an individual capitalization account; this is the second pillar; this way, 2.5% of the total rate is invested in the financial market through the private sector, although it is managed by the Swedish Pensions Agency. As far as this part of the system is concerned, there are over 800 different funds, from which workers will be able to select up to five of them. Lastly, the third pillar is composed by the pensions plans of the occupational kind. These plans are well extended

among workers, they are voluntary, and they are estimated to affect 90% of them.

On the update of the capitalized part as well as the notional account, the capitalized part earns some interest, and the part corresponding to the notional account is updated according to the moving average of three years the variation rate of the average salary. As a result, each worker obtains some returns, which progressively accumulate in their individual accounts, subtracting a commission for management expenses from this operation. In the same way, this model has the peculiarity of distributing the cumulative total in the notional accounts of workers who have passed away in a year, among the rest of the notional accounts of workers of their same generation who have survived, just as described by Settergren (2006), so, to the latter, a “survival bonus” should be added. It is to be noted that in the year 2012 there was no obligation to contribute if the annual salary was less than 2.168€, which corresponds to 5% of the average salary (Díaz, 2014).

Calculation of retirement pension

The moment there is access to retirement, the initial pension will depend on the cumulative total in the worker’s account and the so-called annual “divisor”. Settergren (2006) explains that this annual “divisor” takes into account the worker’s life expectancy, their retirement age, which must be over 61, and a type of technical interest, which is established to be 1,6%. This way, the total cumulated amount in the worker’s individual account will be divided by the annual “divisor”, in such a way that if life expectancy lengthens, the divisor will increase and, as a result, the initial pension will decrease. In doing so, what this calculation seeks is a lifelong income starting from the amount accumulated by each individual, this is, a self-funded pension, taking into account the years the individual will likely benefit from it, in a way that, if those years increase, it is reasonable that the initial pension decreases to be able to cover the whole period. Likewise, it is possible to neutralize this life expectancy effect over the amount of the initial pension, as it is shown in the following table.

Thus, if two generations are compared, for example 1940 and 1990, as done by Settergren (2006), it can be seen how the generation born in 1940 was 65 in 2005, with a life expectancy from said age (calculated based on projections), and if

³ Later, in the section “Automatic adjustment financial mechanism and annual actuarial balance sheet” in this paper, more information about annual actuarial balance sheets, solvency index, and AAFM is provided”.

TABLE 1. Effect of life expectancy over pension

| GENERATION OF BIRTH | 65 YEARS OLD | DIVISOR OF THE FORMULA | EFFECT OF AN INCREASE IN LIFE EXPECTANCY OVER PENSION | RETIREMENT AGE TO NEUTRALIZE THE EFFECT OF LIFE EXPECTANCY | LIFE EXPECTANCY AT 65 YEARS OLD |
|---------------------|--------------|------------------------|---|--|---------------------------------|
| 1940 | 2005 | 15,7 | - | 65 years of age | 18 years and 6 months |
| 1950 | 2015 | 16,4 | -4% | +7 months | +11 months |
| 1960 | 2025 | 17,0 | -7% | +13 months | +20 months |
| 1970 | 2035 | 17,5 | -10% | +18 months | +28 months |
| 1980 | 2045 | 17,9 | -12% | +23 months | +35 months |
| 1990 | 2055 | 18,2 | -13% | +26 months | +41 months |

Source: Settergren (2006)

the generation born in 1990 is observed, they will be 65 in the year 2055, with a life expectancy from said age of 18,5 years plus 41 months according to projections. This way, as life expectancy increases, the divisor used to calculate the initial pension increases, which can be seen in the example above described, since in the generation of 1940, this component will have a value of 18,5, while the generation of 1990 will have life expectancy of 18,5 + 3,43 as value, meaning 21,92. In any way, if retirement age is postponed, it is possible to neutralize the effect of life expectancy over the annual “divisor”, and therefore, over the amount of the initial pension. Continuing with the generation born in 1990, if this generation retires at 65, the pension they will receive will be 13% lower than it would be if they retired at age 67 and 2 months (26 more months), since this way, the effect of the higher divisor is removed, obtaining similar substitution rates to those born in the generation of 1940.

Just as loss account balances during the contribution period are annually updated, vested pensions are updated according to the growth rate of the average nominal salary, amount from which the type of technical interest mentioned above, 1,6%, must be subtracted.

So far, the calculation of the pension of the part relevant to the notional account has been calculated. As far as the capitalized part, at the time of retirement there will be an option to, either turn it in a lifelong income, just like the notional account, or keep investing, obtaining this way, as with any other investment, variable annuity.

Finally, it is important to point out that, starting from the age of 65, if the pension resulting from the above described calculation is lower than the minimum established by Law, this pension will be complemented by means of general

taxes, thus guaranteeing a minimum pension. In 2012, this social pension rose to 911€ a month, in cases in which the individual lived alone and did not receive any pension from the pay-as-you-go scheme (Díaz, 2014). Devesa (2013) points out that in 2009, close to 42% of all retirees received some sort of complement.⁴

Financial automatic adjustment mechanism and annual actuarial balance

Given the main objective of this investigation is to come to a financially stable system, there are two notable characteristics destined to achieve this goal: the development of an annual balance, and the financial automatic adjustment mechanism, both closely related.

A financial automatic adjustment mechanism (FAAM) can be defined as a set of lawfully pre-established measures which come into operation immediately when the solvency or sustainability indicator requires it to, in order to restore financial stability in the pay-as-you-go pensions scheme through their successive implementation, and without the repeated intervention of legislators (Vidal, Boado & Settergren, 2008). This is way, in order for the FAAM to exist, the previous calculation of the financial solvency ratio is necessary, which derives from the system’s annual balance, and which allows the FAAM to be activated automatically before given values.

⁴ Because the “automatic adjustment” financial mechanism (which we shall explain below) was activated this year, these complements happened in the way of tax deductions.

Sweden develops an annual actuarial balance of its pensions system since the year 2001. Following Boado, Settergren & Vidal (2011), the actuarial balance of a pensions system can be defined as the financial state that links obligations with contributing members and pensioners of the system, with the magnitudes of the assets which back those obligations on a given date. This way, the system will be considered solvent as long as it can meet the obligations acquired through the contributions made by the assets, meaning, with no need for State intervention, be it to provide resources or through the activation of the FAAM.

Below, the evolution of Sweden's balance is shown as a percentage of the GDP⁵ between the years 2007 and 2010, as well as the solvency ratio for the same period.

TABLE 2. Actuarial balance of the Swedish pensions system as a percentage of the GDP. Notional accounts system

| YEARS | 2010 | 2009 | 2008 | 2007 |
|------------------------------|--------|-------|-------|--------|
| ASSETS | | | | |
| Financial assets | 27,1 | 26,8 | 22,1 | 28,7 |
| Contribution assets | 199,2 | 205,9 | 202,1 | 195,6 |
| Actuarial losses | — | 2,6 | 8,2 | 2,7 |
| Accumulated loss | 9,8 | 7,9 | — | — |
| Total asset | 235,1 | 243,2 | 232,4 | 227,0 |
| LIABILITIES | | | | |
| Liabilities | 223,2 | 243,2 | 231,8 | 223,8 |
| Actuarial benefits | 12,9 | — | — | — |
| Accumulated surplus | — | — | 0,6 | 3,2 |
| Total liability | 235,1 | 243,2 | 232,4 | 227,0 |
| INDICATORS | | | | |
| Original % of solvency index | 101,39 | 95,7 | 96,72 | 100,26 |
| Modified % of solvency index | 100,24 | 95,49 | 98,26 | 99,45 |

Source: Vidal, García & Regúlez (2011).

As shown above, during the years 2007 and 2008, the system has accumulated benefits, while

during the years 2009 and 2010, deficit has increased. In addition to this, the value of financial assets is highlighted, since, as Boado *et al.* (2011) point out, this item represents the value of financial assets owned by the pensions system, which are significant magnitudes for a PAYG scheme, and even more so when compared to the value of the Spanish reserve fund which, in 2008 represented 5,21% of the GDP, while in Sweden it reached 22,1%.

Based on the results obtained by the balance —for which data is never calculated based on projections—, the State is aware of the situation its pensions system is in. Among the different operations that derive from this balance, the solvency ratio is found, used, as pointed out by Vidal *et al.* (2008), to measure whether the system can face the obligations undertaken with the liabilities, as well as to decide if the implementation of the FAAM is necessary.

$$\text{Solvency ratio} = \frac{\text{Financial assets} + \text{Contribution assets}}{\text{Contribution liabilities} + \text{Pension liabilities}}$$

This way, if the solvency ratio is less than 1, the FAAM will be activated, in order to reduce growth of pension liabilities, meaning, to vested pensions as well as the contributors' notional fund (Settergren, 2006), so that the notional point used during the period of time in which the solvency ratio is less than 1 will be under its value, consequently creating lower revaluations. But, just as Settergren points out, this mechanism not only reduces revaluations, but also has the power to increase them, as long as it has been previously activated, in case the solvency ratio is more than the unit. Thus, the revaluation of vested pensions and the national fund will be more than the average wage variation, up until the moment when they reach the same value as if it had been activated (Vidal *et al.*, 2008). As it can be seen in Table 2, the solvency ratio got a value lower than a unit in the year 2008 with a value of 0,9826, consequently activating the FAAM for the first time, according to Boado *et al.* (2011), to the financial crisis which affected markets that same year, causing great impact over the value of financial assets, losing more than 20% its value. In 2012, the ratio increased, as Díaz (2014), points out, reaching 0,9837. In the same way, Vidal *et al.* (2011) indicate that,

⁵ Although the balance presented here is created as a percentage of GDP to facilitate its comprehension, in Sweden the actuarial balance is done in Swedish crowns.

according to the projection⁶ of the Swedish actuarial balance (as a base scenario) until the year 2084, the ratio or solvency index will oscillate around the unit until the year 2020, and from this year on, an increase in the solvency is foreseen, estimating that in the year 2063 it will exceed 1,1 and thus, the accumulated surplus will be distributed among contributors and pensioners.

Assessment and transition

The new Swedish pensions system has definitely been the result of a long reform process, qualified as one of the most ambitious to the date, taking care, as Settergren (2006) points out, not of the short-term difficulties, but the long-term deficit and, consequently, instead of accumulating small reforms through time, they decided to make a single comprehensive reform, which gave, as a result, the Swedish model. Alonso & Conde (2007) indicate that, with the new system, it is expected to limit public spending in pensions to 11% of the GDP for the year 2050, according to projections of the Swedish Finance Ministry (2006).

On the other hand, the transition planned for total adoption of the system, as opposed to its process, has been qualified as short. Vidal *et al.* (2002) indicate that the transition towards this system was projected to happen in 20 years, although it decreased this period due to delays in parliamentary procedures, and will finally be 16, in order to achieve its total implementation before the year 2020, eliminating the old system altogether.

As it can be seen in table 3, during the transition phase, both pensions systems, the old as well as the new, coexist. This way, as Vidal *et al.* (2002) indicate, the adjustment to the new system is done in such a way that pensions will be calculated taking into account both systems, through the implementation of determined coefficients (table 3), which depend on the year of birth.

TABLE 3. Calendar for the adjustment of the reform to the pensions system in Sweden

| YEAR OF BIRTH | % OF ATTRIBUTABLE PENSION TO THE NEW SYSTEM |
|-----------------|---|
| Before 1938 | 0 |
| 1938 | 20 |
| 1947 | 50 |
| 1953 | 95 |
| 1954 henceforth | 100 |

Source: adapted by Vidal *et al.* (2002), from Sunden (2000)

Advantages and disadvantages

Various experts and specialized investigators of the pensions system list the advantages and disadvantages brought on by the implementation of this type of system. For example, Devesa (2013) highlights that there were no transition costs as an advantage of the change towards this model, although it is necessary to continue to pay the pensions of the old system.

Vidal *et al.* (2002) also indicate a number of advantages, such as, on one hand, the perception of contribution more like deferred pay than a tax, and on the other, the increase of equity of the system, as the relationship between contributions made and benefits received becomes stronger.

In turn, the disadvantages pointed out by Valero *et al.* (2011) point out the possibility that more attention will be paid to the distribution of consumption and to assurance, than to the reduction of poverty and redistribution, which are two goals of a pensions system. It is also important to keep in mind that, as it has been presented, this system is adequate for retirement pension, and as such, the system must be complemented, in a way that some of the benefits covered by the current system, should stop being contributory, and be transferred to other plans, as it happened in Sweden.

Other inconveniences related to notional accounts is that they do not entirely eliminate the risk associated to demographic changes, and are also exposed to the macroeconomic risks, probably making it necessary to implement parametric adjustments; on the other side, they can provoke an excessive number of early retirements, since each contributing member may choose the age

⁶ For the making of the actuarial balance sheet as exposed before, no projections are recurred to, but rather true facts. However, there are determined projections to know its evolution.

at which they wish to retire, just as Vidal *et al.* (2002) state.

Adjustment of the notional accounts system to the Spanish case

The Spanish pensions system is a PAYG pensions scheme in which current pensions are financed by the contributions made by current contributing members, creating dependency on future generations; plus, it is a defined benefit scheme, which is why pension is determined by a series of parameters that are known beforehand, such as retirement age and number of years of contribution.

Up until 2011, the Spanish pensions system was regulated by Royal Decree 1647/1997.⁷ Nevertheless, factors such as the increase in unemployment, the decrease of economic growth, and the rise of national debt led the State to an accelerated process of reform to the Spanish pensions system, driven by the increase of public expenditure which they will represent in the immediate future.

In this context, the Spanish government passed Bill 27/2011, about updating, adjusting, and modernizing Social Security, which describes a set of measures, whose aim is future sustainability of the Spanish pensions system. This Bill provides parametric measures, which have been implemented by surrounding countries. Although these measures may remedy the system's solvency problems, Antón (2006) considers these reforms do not ensure the increase of either efficiency or equity of the pensions systems.

Bill 27/2011 introduces modifications⁸ in terms of legal retirement age and the strengthening of contributions, which means they are entitled to 100% of contributory pension. This way,

two modalities are established in terms of form of retirement: at 67 years of age and 37 years of effective contribution. Nevertheless, those who have reached the age of 65 may also have access to ordinary retirement when they have reached 38 years and 6 months' worth of contributions, although, on the other side, the minimum contributory period, set at 15 years, is maintained, from which at least 2 years must be comprised within the 15 years immediately preceding retirement. However, the reform increases the years of effective contribution to 25, which must be taken into account for the calculation of the pension's regulatory base.

One of the novelties introduced in Bill 27/2011 is the inclusion of the *sustainability factor*, in order to guarantee future financial solvency of the Spanish pensions system. This way, it is established that from the year 2027, the fundamental parameters will be revised because of the differences between evolution of life expectancy to 67 years of age in the year when the revision takes place and life expectancy at 67 years in the year 2027. In spite of this, the increase in the unemployment rate produced during the period of 2008-2014 has brought with it a descent in Social Security income, and also resulted in liquidity problems in the system's fund, anticipating the regulation and implementation of the sustainability factor.

Finally, the entire Congress definitely approved the reform to pensions based on Bill 23/2013, in December 23rd, which regulates the Social Security pensions system's sustainability factor and revaluation. This bill highlights the following:

- The sustainability factor (SF) is defined as an instrument that automatically allows to link the amount of retirement pensions in the Social Security system to the evolution of life expectancy of pensioners, adjusting the amounts received by those who retire in similar conditions at different times, taking into account the variation of life expectancy in a quinquennial period.
- The Pensions Revaluation Index (PRI) implies revising all the pensions according to a rate (g) according to income variation, the number of pensions, the substitution effect, and the difference between income and expense throughout the economic cycle. The PRI will be subject to a minimum threshold of 0,25% and a maximum of 0,50% over the CPI.

⁷ Royal Decree 1647/1997, by which aspects of Bill 247/1997 were developed, of consolidation and rationalization of the Spanish Social Security system, as approved by the Royal Legislative Decree 1/1994, on June 20th.

⁸ For a more detailed analysis of the pensions reforms in 2011, go to works by: Devesa, Meneu & Devesa (2011); Devesa J. E., Devesa, M., Encinas, Domínguez, Nagore & Meneu (2011); Meneu & Encinas (2011); Domínguez et al. (2011); Domínguez, Devesa & Rosado (2012) and Encinas (2012).

The reforms implemented to the date to the Spanish public pensions system, while progressing well—in achieving a sustainable system due to measures mainly centered on expenditure reduction—, have not accomplished a solvent system yet. Therefore, the base of the Spanish pensions system is still the same, since the reforms have been mostly parametric, contrary to what has happened in other countries, in which they have opted for structural reforms to their pensions systems, with a tendency for capitalization and notional account systems standing out among them. Various papers and investigations, highlighting Rosado (2014), Rosado & Domínguez (2014); Rosado & Alonso (2015) and Rosado, Domínguez & Alonso (2015), among others, state that although the Spanish PAYG pensions scheme's sustainability has improved after the reforms implemented in 2011 and 2013, as seen in the Financial Schedule to the Parliamentary Bill 23/2013, the system's financial solvency issue is still pending, requiring reforms that will generate higher impact or a structural change in the system.

For this reason, and given that it is necessary to adapt the Spanish pensions system to a model that fits the changing environment to which it is submitted, a structural reform to the retirement pensions system is proposed, consisting on implementing a notional accounts system in Spain, in which benefits defined by defined contribution notional accounts are substituted as the main novelty.

According to the trend followed by other countries, it seems more adequate to implement a notional accounts system in Spain, more than a capitalization system—since this is another possible option—, given that these systems, as seen in the paragraph above, have several advantages linked to them that could be very interesting for Spain; the main reason: to implement a capitalization system for Spain would be a much more drastic change than the one caused by implementing a notional accounts system. The former, mainly because these systems are no longer based on the distribution, the transition to this model could be much worse, and it would be necessary to educate people in financial aspects given that, contrary to what happens in notional accounts systems, financial markets do interfere in capitalization systems, so the accounts stop being fictitious, and thereby play by market rules, with the higher risk this entails; on the other hand, intergenerational solidarity inherent to the PAYG scheme would end.

In fact, no European country has reformed their PAYG scheme; only some Latin American countries such as Mexico, Chile and Bolivia have transitioned, as stated by Alonso & Conde (2007), and besides, many of these countries are reverting to PAYG schemes because of the low amounts and coverage of their pensions.

The following table shows a comparison between the main magnitudes in the Swedish and Spanish pensions systems in the year 2008.

TABLE 4. Main magnitudes of the Swedish and Spanish pensions systems

| INDICATOR | SWEDEN 2008 | SPAIN 2008 |
|-------------------------------------|----------------|---------------|
| Reserve fund (s/GDP) | 22,0% | 5,3% |
| Implicit debt (s/GDP) | 0% | 212% |
| AF imbalance (s/GDP) | 0% | 158% |
| Cost per standard pension | 1,0 | 1,60 |
| Solvency ratio | 0,9826 | 0,625 |
| Internal rate of actual performance | 1,6% | 4.74% |

Source: Devesa (2013)

In the results presented in the table above, what was analyzed in prior chapters about the Spanish pensions system can be seen, and it can be compared with the situation the Swedish system is actually in, which seems to be more favorable. The only value that is not compromised in Spain's case is the state of the reserve fund, although according to Valero *et al.* (2011), for the year 2009 it will be drained, which is why if this fact is faced, foreseeing that the pension expenditure will exceed 15% the GDP for the year 2050, it seems that it turns into another favorable point to consider the option of implementing a notional accounts system in Spain, seeing the good results obtained in Sweden.

As mentioned before, the notional accounts system, by itself, cannot cover all the actual benefits of Social Security in case of its implementation, so it must be complemented with traditional formulas for the case of non-contributory benefits. In this sense, various authors have proposed different models to complement this system, such as Domínguez *et al.* (2007), who present the possibility of replacing the current system with a notional system complemented with an explicit benefits system for the lowest incomes, this is, a two-pillar system.

In the same way, just as pointed out in the report by the Inter-American Social Security Conference (2005), the recommendation is to meet a series of requirements before its implementation; for example, enough public administrative capacity, foresight of long-term positive growth of the contribution, sufficient political capacity, and enough disparity on the level and distribution of the profits.

Similarities and changes yet to be made for the implementation of the Swedish model

Starting from the definition of the Spanish and Swedish pensions systems, other than the calculation formulas for retirement pensions, the similarities between both systems can be analyzed, as well as the changes or new necessary changes or insertions for the implementation of a model based on notional accounts. The Swedish model is taken as a reference because, as seen in the previous section, about the positive results they have obtained, keeping in mind that those positive results have been possible due to the commitment and cooperation of all political parties, as well as a long reform process. In the same way, it is necessary to point out that this analysis is centered on notional accounts, so the occupational plans and the capitalized part will not be examined, as they would be part of a different investigation. Nevertheless, it must be noted that, just as Settergren (2006) indicates, the implementation of a small part of mandatory capitalization (2,5% of the total contribution rate) to the new system did not have a financial reason—despite the fact that its implementation was an advantage for Swedish economy—, but a political one. As it can be seen in the paper presented by Vidal *et al.* (2002), other countries which have already implemented a public pensions system based on notional accounts have introduced this capitalized part in different ways, either complementary, as is Brazil and Italy's case, or just as Sweden, on a mandatory basis, as in Latvia or Poland.

The current Spanish pensions system is a defined benefits PAYG scheme, and the Swedish model is a PAYG scheme, articulated through notional accounts with defined contribution.

This way, the can be seen scheme is maintained, and therefore the intergenerational solidarity, with the contributions made by contributing

members covering the benefits of pensioners of the same period, one of the main reasons why it is considered that this model is the best suited for Spain, but replacing defined benefits with defined contribution. This change implies, according to Alonso & Conde (2007), establishing a determined contribution, but contrary to defined benefit systems, it will not be possible to know what the resulting pension will be, since it will depend on various factors, such as accumulated capital profitability or life expectancy at the time of retirement.

Although in Spain, so far, the used system can be designated as a traditional system, the last reform to the pensions systems cannot be overlooked, through the introduction of the sustainability factor. With the introduction of this factor, which will enter into force in 2019, it can no longer be considered a traditional defined benefits system, since this factor links the pension amount to life expectancy of the retiring cohort, so it will no longer be possible to know for sure what the amount of the pension will be; however, in the same way parameters such as age and years of contribution are taken into account, macroeconomic factors must be considered, such as income, expenses, GDP growth, or the country's productivity. For the implementation of a system based on notional accounts, it will be necessary to introduce a notional factor, linked to macroeconomic variables, subject which will be addressed in the following section.

On the other side, based on the calculation formulas for retirement pensions, another change which must be introduced in the time period taken into account for the calculation of the pension, given that in Spain's case all working life is not envisaged, but to calculate the regulatory base, according to the reform implemented in 2011, between 15 and 25 years are considered (during the transition period), while in the Swedish model the entire working life of contributing members is considered.

Proposals for different adjustment models

The notional factor or value used, applied to update the workers' notional accounts, and to revalue vested pensions, varies depending on each country, given that each one can select the notional value that best fits their specific conditions.

In this sense, Domínguez *et al.* (2007), in their proposal to implement a notional system in Spain complemented with an explicit benefits system for cases in which low income have been received all throughout active life, carry out a study on the effect of using one or the other notional value in the calculation formulas for retirement pension. The considered notional values are shown in the following table.

TABLE 5. Calculation formulas⁹

| FORMULA | NOTIONAL VALUE FOR CONTRIBUTING MEMBERS | NOTIONAL VALUE FOR PENSIONS |
|---------|---|---|
| 1 | VPIB | Constant in real terms |
| 2 | VSAL | Constant in real term |
| 3 | VPIB | Constant in real terms ± differential VPIB |
| 4 | VPIB | Constant in real terms ± differential VSAL |
| 5 | VSAL | Constant in real terms ± differential VPIB |
| 6 | VSAL | Constant in real terms ± differential VSAL |
| 7 | VPIB | VPIB |
| 8 | VPIB | VSAL |
| 9 | VSAL | VPIB |
| 10 | VSAL | VSAL |

Source: Domínguez *et al.* (2007)

The researchers mentioned before take into account ten different formulas to determine initial pension and its further variation. With the results obtained in that study it is concluded that formulas 2 and 10 would be the most adequate in case of implementing a notional accounts system in Spain, both implying the use of variation of salary as the notional value for contributions, and for pension revaluation, in case of using formula 2, to maintain vested pensions constant in real terms, given this formula offers a higher initial pension, and in case of using formula 10, the variation of salaries, so that even though this formula provides initially a lower pension, it will be increasing in real terms. The choosing of these two formulas from the ten selected is due to, among other

factors, the fact that they are the ones that offer a higher minimum Internal Return Rate (IRR), in the case of formula number 2, with a 95% probability, and in case of formula number 10, it offers a higher expected average IRR. In regards to this last result, for the case of a 65 year-old man, an average IRR of 1,47% is estimated, while under current legislation at the time the study was developed. For the same case, the expected return is 4%¹⁰. Taking into account the estimation made by Domínguez *et al.* (2012), which determined that the IRR should stand around 3%¹¹, it can be verified how using these formulas would help guarantee the financial viability of the system.

On the other side, just as Domínguez *et al.* (2007) point out the systematic risk¹² to which the beneficiaries are subject to in a notional accounts system, as can be the “economic” risk, when the IRR obtains by their contributions with the expected one, Alonso & Devolder (2015) point out that the main critique made to the pure defined contributions pension plans is that too much risk is transferred to the system’s participants, with their pensions depending in great measure on their contributions’ returns, which is why, in their study, they try to provide a solution to this problem establishing a minimum return guarantee.

Another proposal for reform towards a defined contribution notional system model is made by Valero *et al.* (2011); they propose to use defined notional contribution as the main apex of the reform of the system, and complementing the model, so that it is guaranteed that the pensions will reach all active population, and that these pensions, in time, are adequate. In this study, it is considered that the notional interest rate is equivalent to the rate of nominal GDP growth (5,9%), and the revaluation of vested pensions would be 2% per year, resulting in that, at equal cost, the retirement pension obtained with this model

⁹ The formulas utilized here consist of different combinations between the notional amount used in the monthly contributions, considering GDP and salary variation, and the notional amount for pensions already accrued.

¹⁰ In this study, given it is an earlier one, the last two reforms to the Spanish pensions system are not taken into account. Rosado & Domínguez (2014) estimate the IRR of the reformed system is 3,48%, which is why an improvement is perceived, although it still does not fit the established solvency limits.

¹¹ As Domínguez *et al.* (2012) state, given this has been the average growth rate of the real GDP in Spain over the last 30 years.

¹² Domínguez *et al.* (2007) indicate those risks are qualified as non-diversified, as they are directly associated to the economy’s global risk.

TABLE 6. Balance sheet for all the Spanish retirement pensions systems regime as a percentage of the GDP

| DATE | 2010 | | | 2050 | | | 2084 | | |
|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| Scenarios | N | O | P | N | O | P | N | O | P |
| ASSET | | | | | | | | | |
| Financial assets | 3,7 | 3,7 | 3,7 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Asset by contributions | 171,5 | 171,5 | 171,5 | 190,5 | 190,0 | 193,6 | 193,9 | 194,9 | 195,9 |
| Actuarial losses ¹ | 0,0 | 0,0 | 0,0 | 6,4 | 3,2 | 11,2 | 7,8 | 2,8 | 17,3 |
| Accumulated deficit | 91,1 | 64,3 | 122,6 | 406,3 | 274,5 | 581,4 | 645,8 | 379,2 | 1.052,3 |
| Total asset | 266,4 | 239,6 | 298,8 | 603,4 | 467,7 | 786,2 | 847,5 | 576,9 | 1.265,5 |
| LIABILITY | | | | | | | | | |
| Liabilities with pensioners | 61,7 | 56,4 | 68,1 | 166,1 | 126,7 | 224,5 | 135,0 | 99,5 | 189,8 |
| Liabilities with contributing members | 204,6 | 183,1 | 229,8 | 287,1 | 237,6 | 342,0 | 284,2 | 237,8 | 335,3 |
| Financial liabilities | 0,00 | 0,00 | 0,00 | 150,2 | 103,4 | 219,7 | 428,3 | 239,6 | 740,4 |
| Total liability | 266,4 | 239,6 | 298,8 | 603,4 | 467,7 | 786,2 | 847,5 | 576,9 | 1.265,5 |
| SOLVENCY INDEX | | | | | | | | | |
| Solvency index % | 65,7 | 73,1 | 58,6 | 31,6 | 40,6 | 24,6 | 24,6 | 33,7 | 15,5 |

* Vidal *et al.* (2011) indicate that the actuarial losses in the year 2010 are not void even though they show a value of 0, but they are already included in the value of accumulated loss.

Source: Produced by Vidal *et al.* (2011) based on Vidal-Meliá, C., García-García, M. and Regúlez-Castillo, M. (2011).

exceeds by almost 9% the pension which would be derived from the current model, limited to its funding capacity.

One of the notable characteristics of the Swedish pensions system is the development of an annual actuarial balance sheet of their notional accounts pensions systems, which, as mentioned before, help to know the real situation the system is in, without resorting to projections. Furthermore, the calculation of the solvency ratio or index derives from this balance sheet, which is linked to the automatic adjustment financial mechanism (AAFM).

Various authors have developed an actuarial balance sheet of the Spanish pensions systems, attending to the features of Sweden's actuarial balance sheet, such as Vidal *et al.* (2011), Domínguez *et al.* (2007) and Vidal *et al.* (2008). Hence, in the following, the application of the Swedish actuarial balance sheet to the Spanish case is shown, as is the projection of the solvency index, considering three different scenarios¹³: normal (N), optimistic (O) y pessimistic (P), done by Vidal *et al.* (2011).

As it can be seen, following Vidal *et al.* (2011) in the following comments, the results obtained in the year 2010, and above all, in the projections, are very shocking in any of the considered scenarios. The deficit accumulated by the system in relation to the GDP in the year 2010 is high, but if the projections are observed, it reaches a very high level, as a consequence of the continuous accumulation of financial-actuarial losses. In the same way, if the evolution of the solvency index is observed, it can be seen how it decreases compared to previous years in the three foreseen scenarios, given that the liability increases in the system at a higher pace than the asset. Thus, in the year 2010, in the normal scenario, the solvency index is 65,7%, which means that only this percentage of the liabilities is covered by an asset, therefore 34,3% of the commitments made will not have any coverage. For this reason, if an AAFM existed, it would have already been put into operation to reduce the growth of liabilities by pensions. As a final comment, Vidal *et al.* (2011) highlight that if Spain had an instrument like the shown actuarial balance sheet at hand, which will be produced officially, periodically and independently, it is very likely that the reforms made to the pensions system could have been done before.

13 These scenarios show a combination of the demographical and financial situation.

Conclusions

The main objective of this paper was to make a first approximation toward the pensions systems based on notional accounts, especially the Swedish model, considering its possible implementation in Spain, once their last reforms were made in the years 2011 and 2013, given that based on the results of various investigations, in which it is determined that the Spanish public pensions system's sustainability does, indeed, notably improve with the implemented measures, but its financial solvency¹⁴, understood as the excess of profitability that the pensions system provides the contributing members in relation to the country's economic growth is still pending; this is where it becomes necessary to include measures or structural changes to the system, which based on some kind of parameter, includes the country's financial circumstances at every moment, so that they directly influence the pensions of the occupationally passive population. As it was proven, one of the advantages associated with notional accounts systems is that the relationship between the contributions made and the contributions received increases. In the same way, in the analyzed studies in which different adjustment formulas are considered, the result obtained is that the system, through the use of notional accounts, would achieve solvency, just as, with equal expenses, the pension obtained through the use of notional accounts would be higher than the one obtained through the implementation of small reforms in the system.

It is evident that the environment in which the Spanish public pensions system develops has changed considerably compared to the moment in which it was launched, and this is why it is necessary to adjust it to the new financial and demographic conditions in which it is currently developing. The reforms implemented by the Spanish State to try to adjust the system to these new conditions have been progressing well, but they are not enough, given that if life expectancy has been linked to the calculation of initial pension through the inclusion of the sustainability factor, financial factors should also be taken into account, relating the country's financial state with

pension amount. The development of an annual actuarial balance sheet based on real data, which allows to accurately know the system's situation at all times, as well as responding almost automatically before the difficulties due to the solvency ratio and the AAFM, would be fitting before such a dynamic environment as the current one.

Spain has mainly opted for parametric reforms to its system, leaving the solvency issue unresolved, just as Rosado & Domínguez (2014) state. It appears that, after the study was carried out, the Spanish system will need deeper reforms to be able to solve the concerns raised by it, given that the subsequent use of parametric reforms will not appear to be enough. In spite of the fact that the reform appears to have cushioned the sustainability issue, and partly improving solvency, through the system's expenditure cuts, it seems like this situation will not be solved. From the results obtained by Valero *et al.* (2011) it can be proven that a notional accounts system would be more beneficial to Spain, that limiting the current system through small reforms to get it to obtain, besides sustainability, solvency.

This way, by witnessing the positive results obtained by Sweden, and the possibility of continuing to use the PAYG scheme, the authors of this paper consider that the use of notional accounts in the Spanish retirement public pensions system would be a good option, continuing on this path of study to find the formula which best fits the Spanish case, and that at the same time offers a series of guarantees. Moreover, they believe that a decision needs to be reached regarding the not-so-distant future due to the insolvency detected in the system, given that, in case of having to transition to another model, it will be best to do it counting on a substantial reserve fund, on the grounds that, although at the beginning the transition to a notional accounts system does not present transition costs, it would be necessary to continue paying pensions derived from the previous system, apart from converting certain benefits now considered contributory to non-contributory benefits.

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14 According to proposals by Aaron (1966) and Samuelson (1958), a PAYG pension scheme is financially solvent as long as it provides coinciding profitability with the country's long-term economic growth.

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