Report by the Committee of Experts on the sustainability factor of the public pension system

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Members of the Committee of Experts on the sustainability factor of the public pension system

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1. Objectives of the Report

1.1. Presentation

Paradoxically, the main challenge faced by the Spanish public pension system is a reflection of two excellent pieces of news: first, that retired people are living increasingly longer as a result of higher life expectancy at age 65; and second, that after various decades of making a valuable contribution to the Spanish society, the first cohorts of the large baby boom generation will reach a well-earned retirement at the start of the next decade. If current trends continue, they will do so with a higher life expectancy than their European equivalents.[1] This is excellent news, but it raises far-reaching challenges for the pension system; this was true before the economic crisis, and it will continue to be so after it. The 27% rate of unemployment and lower GDP levels aggravate the problems of sustainability, but in no way are they responsible for them. The proposals for action described in this document should be implemented even if Spain were not in a serious economic crisis; in fact, they should have been implemented years ago. In light of this Committee's mandate and in order to prevent another costly delay, this report proposes a sustainability factor for the public pension system that represents a very significant improvement in the way that our policymakers, social partners, and above all our citizens, should tackle the challenge of guaranteeing the balance between revenue and benefits under the Social Security System.

Nothing could be worse for a society facing a serious and prolonged economic crisis that to lose hope and confidence in itself, thus generating unnecessary uncertainty with respect to the main source of income for a significant proportion of its population. Few things could shatter this confidence more decisively than not being able to **maintain the intergenerational pact** that ensures the continuity of society over time. Society must **honour its moral commitment to its elderly members**, and **provide them with a sustained horizon over time of adequate public pensions**. At the same time, the idea of an intergenerational pact implies the need to **look after the future generations** who inherit the legacy transmitted by earlier generations and **who need the guarantee of a realistic and viable horizon for their own long-term development**.

That is the challenge to which this Report on the sustainability of public pensions is a contribution. It has been prepared by a Committee of Experts, who would like to thank the Spanish government most sincerely for having honoured it with this commission. Being an independent committee, it accepted the task of producing the Report within the stipulated time, based on the knowledge and understanding of each and every one of its members.

The Committee has received the Government's commission to define the sustainability factor of the Social Security system following the Spanish Cabinet Agreement of 12 April 2013. Work in this direction had already started under Law 27/2011, of 1 August, which implemented a prior agreement reached by the Toledo Pact and signed by the Government and the employers' organisations (CEOE, CEPYME) and trade unions (CCOO and UGT).

[1] According to the OECD (2012), between 2008 and 2010 the life expectancy of a woman at age 65 was 22.4 years (18.3 years for men) in Spain, compared with 20.1 years in the EU-27 (16.5 years for men).

The mandate by the Government was very specific: develop a sustainability factor for the current pension system. Particular attention must be paid to two words in the mandate.

Sustainability means that the issuer of the mandate wants the pension system to be able to sustain itself. This is an aim we believe to be reasonably provided for by **the proposals made here**, which do not **prejudge whether Spanish society should decide to provide the pension system with funds from any particular source**. What the formula guarantees is that this process of transfer should be transparent, i.e., informed, and financially balanced.

The second relevant word is *current*. The Spanish public pension system is a defined-benefit pay-as-you-go system. "Defined-benefit" means that the amount of the initial retirement pension as a percentage of the regulatory base is defined from the start. The figure is obtained according to the calculation rules current at the time of retirement. They are applied to various aspects of the new pensioner's employment history (years of contribution, contribution base and the age at which the pension is received). "Pay-as-you-go" means that each year's costs (retirement, incapacity, widow's, survivors', and family assistance benefits) are paid using each year's revenue.

This Committee of Experts received the mandate to work with these materials, and that is what it has done. Although the sustainability factor may be an important element of the pension system, it should be clear that the design of the system is the competence of the decision-making bodies that have been democratically empowered by Spanish society, which have had the crucial assistance of the Toledo Pact since it was set up.

Our aim has been to achieve a system of pensions that, without being changed with respect to its nature, has a certified capacity to address its basic challenge of providing Spanish pensioners with adequate benefits today, tomorrow, the day after tomorrow and within thirty or forty years.

However, if a system of intergenerational distribution needs a sustainability or rebalancing factor, it is because it contains elements of potential unsustainability or imbalance. The first thing to say is that this potential imbalance exists. **The sustainability factor proposed here does not create or increase the imbalance; what it does is bring it to light and correct it in a carefully balanced way over time.**

That is precisely the reverse of what happens now. Recent history shows that most of society is relatively unaware of the problems of pension sustainability. This is evidenced in the lack of concern about the system of pensions shown by opinion polls. Monitoring and solving the problems that may arise is the task of the political elites and the social partners who participate in the process. This has given rise to short and intense periods of reforms with a significant effect on the rules of the game of the pension system, as has happened since 2011. But this kind of model of ad-hoc parametric reforms when tensions arise may have undesirable consequences. If the parametric changes to pensions (for example, the increase in the retirement age) are not carried out sufficiently in advance, the adjustment to the system is borne by a few generations instead of being distributed among as many as possible. When potential imbalances are not properly anticipated, the reform process ends up being a very unfair game: policymakers and society as a whole decide to turn their backs on the problem and

leave it to future generations.

1.2. The timeliness of the Report

This Committee believes that it is the right time to tackle the design and application of the sustainability factor, rather than leaving it to 2027 as under Law 27/2011. It is the right time for a number of reasons.

First, because it is advisable to preempt potential risks to the system. An ageing population resulting from increased life expectancy and the retirement of a large population cohorts is a challenge that has already been tackled by other European countries, as their baby boom occurred before than in Spain.[2] The sustainability factor proposed in this Report has the virtue of ensuring the system's budget equilibrium in advance in the face of the challenges that these risks give rise to.

Second, a sustainability factor that generates stability and confidence in the system, underpinning other reforms and measures that are already underway, boosts economic recovery. Two of the factors that have aggravated the intensity of the crisis most have been economic uncertainty, which has negatively affected consumption and investment, and the lack of confidence on the part of international investors with respect to the sustainability of the public finances, with the subsequent increase in risk premiums and credit crunch. The **early adoption of a sustainability factor** that strengthens, clarifies and guarantees the equilibrium of the system **helps clear up the uncertainty felt by current pensioners and those who are close to retirement age**. It also **contributes towards improving confidence in the sustainability of our public finances**.

Third, we believe that the time is right for an agreement and pact to be made based on reasonable proposals. In fact, **Spain has already come a long way in this respect with the implementation of the Toledo Pact, which is a tool for reaching consensus**. When implementing their own reforms, other countries had to set up what already exists in Spain and has demonstrated its potential for designing reforms.

1.3. Potential risks

The pension system is facing a clear *demographic* risk. If we look back in time, we see that we have already passed through situations that were similar to the present one from many points of view. But there is one aspect in which the current situation is completely new: the demography. This can be summed up in the fact that we have never lived in such an ageing society, and one that will continue to age in the future.

Progress of all kinds in the 20th century and the first decade of the 21st have resulted in more and more people reaching advanced ages, and once they reach these ages, they are living for an increasing number of years. Early in the 20th century, only 35% of each generation in Spain reached the age of 65; today the figure is 90%. In 1900 the life expectancy of Spanish people

[2] Appendix 1 includes the main features of the sustainability factors designed and/or implemented by 14 other developed countries.

aged 65 was 10 years; today, they can expect to live 20 years more (and by 2050 this figure is expected to be 25 years).[3] In addition, in the coming decades large population cohorts born in the baby boom between the late 1950s and first half of the 1970s will reach retirement age. All these phenomena mean that the proportion of the population aged over 65 years out of the total population has grown in recent decades to the current 17%, and is expected to reach 37% in 2052. At that date, one third of the population is therefore expected to be aged over 65. **In absolute terms, the number of pensions foreseen by the Social Security administration will increase from the current 9 million now to 15 million in 2052.**

It is clear that this risk can impact the stability of the public pension system. The pay-as-you-go pension system is ultimately very sensitive to the *dependency ratio*, i.e., to how many people are receiving pensions per working person. Everything suggests that this dependency ratio will increase over the coming decades.

Of course, we should not forget the potential short and long term *economic risks* to the system. In the short term, the revenue of the pension system may grow a great deal in the expansion phases of the economic cycle and fall substantially in the contraction stages. The system of public pensions should contribute to stabilise the economic cycle, fight against the consequences of this tendency, and not intensify them.

In the medium and long term, revenue depends on structural factors, which may push it up or down. Permanent changes in the structural rate of unemployment, the activity rate, wages or the productive structure all affect the generosity of the pay-as-you-go system. As a result, average pensions may grow more or less according to the growth of revenue in the system. Obviously, the structural dimension also includes any decisions on permanent increases or reductions to the contribution rates or other sources of finance for the system.

For all these reasons, it is important to have a system that helps smooth over the effects of the economic cycle on pension expenditure and also transfers gradually those structural trends affecting revenue into the expenditure.

This question is extremely important. As can be seen in more detail in Section 2, the application of the sustainability factor may lead to a divergence between pensions and wages. However, it is worth making two important points here.

The first is that this is only a possibility. It is something that can happen; and if we know that it can happen, it is precisely because we have applied the sustainability factor and observed its consequences. That means that as a society, we have the time and the possibility to adopt measures that will refute the prediction.

The second point is that if pensioners and the active population are to sustain adequate standards of living, with average pensions that grow in real terms, the key lies in ensuring that

[3] When we talk about the life expectancy of people of a certain age in a particular year, we are referring to the average number of years of life that these people can be expected to live from that year on. It is a biometric variable that is calculated by taking into account the mortality rates of the population for different generations, together with projections of these rates.

the revenue of the pension system grows at a higher rate than the increase in the number of pensions. That is something that the sustainability factor *brings to light*; it does not *create* it. In other words, if we do not apply the factor, the basic problem remains: revenue has to grow faster than the number of beneficiaries if we want pensioners to sustain relative standards of living equivalent to those at present. We believe that this is the best way of guaranteeing the mandate of Article 50 of the Spanish Constitution, which states that "the public authorities shall guarantee, through adequate and periodically updated pensions, a sufficient income for citizens in old age."

1.4. The sustainability factor

The sustainability factor is designed so that the imbalances in the pension system can be anticipated in a transparent fashion each year and be neutralised evenly over time. The main benefits that the sustainability factor can yield Spanish society are: first, the **transparency and predictability of pensions**; and second, a **mechanism for automatically correcting errors over time**, whose effects can therefore be accepted.

The factor consists, first, of an **Intergenerational Equity Factor (IEF)**, which aims to balance the pension conditions equally for all retired people, regardless of the demographic cohort they belong to; this does not occur at present. Second, there is an **Annual Growth Factor (AGF)**, which corrects the "natural" process by which the average pension increases by applying a correction factor based on the ratio between the revenue and the expenditure of the pension system. Put briefly, when expenditure grows more than revenue, the AGF slows the natural growth in pensions; when the situation is the reverse, it amplifies that growth. To prevent pension adjustments from forcing pensioners to intolerable sacrifices during economic downturns, the AGF is not calculated using figures for a single year, but rather for a set of years that cover as far as possible the whole economic cycle; and in case of an imbalance, the correction is made over a number of years rather than all at once.

Three important points

It is important to comment on three fundamental aspects of this formula. The first is the room for action by the political and social pact, in other words by the democratic channels. The second is how those who are already pensioners will be treated. And the third, which is closely related to the two previous points, is the current link between pensions and the consumer price index (CPI).

With respect to the *role of the democratic channels*, it has to be stated clearly that although the **sustainability factor** imposes a set of restrictions that must be complied with annually in order to ensure a balanced budget, this **does not prevent action by the political and social pact**. The factor is a combination of formulas that can be modulated by socio-political debate, although this Committee is not going to shirk its intellectual obligation of giving its opinions on what the most reasonable parameters for these formulas are. However, the formula must *fully* commit present and future governments to compliance year after year (the factor is not compatible with a policy of selective application), though in no way does it replace popular sovereignty. Those who have been elected to represent Spanish society continue to do so.

The democratic channels have **in their power the definition of the number of years to take into account when calculating the average values that are involved in the formula** to cover the whole economic cycle. This committee considers that the logic of the trends in the Spanish economy makes it advisable for these average values to be calculated for a period of not fewer than 11 years and not more than 13.[4] We consider that in this way conjunctural effects can be adequately differentiated from structural effects.

The democratic channels also intervene **in the choice of α, i.e., the parameter that defines the speed with which the possible imbalances between revenue and expenditure are corrected**. This Committee considers that a value of α coherent with the needs of the system and with an acceptable speed of correction would be between the values of 0.25 and 0.35.

The democratic channels also intervene in defining the **clauses that prevent a nominal reduction in pensions for current pensioners**.

They also intervene because, as this document explains, the **sustainability factor can enter into force in various forms and at different points in time**, with different consequences; and it is obvious that **it is these democratic channels that will define these forms**.

Finally, at the end of the day, they intervene because, as we have already pointed out, the development of the AGF formula does not prejudge the amount of either expenditure or revenue. In response to its mandate, the Committee has worked on the system *as it is*. But the system can be changed parametrically, without changing its basic rules. Such a change may affect expenditure (for example, through a change in the calculation of eligibility criteria for a pension, such as by taking into account contributions over the whole working life), or the other component, revenue, by making available new forms of finance, or increasing finance from existing sources. The Sustainability Factor, however complete and solid it may be, does not replace the need for other internal reforms to be introduced to the system itself in order to improve its efficiency and equity. The Sustainability Factor does not commit or *prevent* any of these measures, which belong to the operation of democratic channels within Spanish society. However, it does *make immediately clear* the consequences of these possible decisions, and thus helps Spanish society to be an informed society with respect to pensions; one that can make decisions based on knowledge.

How those who are already pensioners are to be treated is a discussion of great scope. The IEF only affects those who are entering retirement (it acts on the initial pension), but the AGF is an adjustment to *all* pensions. That means breaking the trend of the last few decades of reforms in Spain, which have always left existing pensioners outside the scope of adjustment.

It is absolutely true that the problem of adjusting pensions has to be seen in terms of capacity for reaction. People who see the rules of game of the pension system changing at 25 years of age have many years ahead of them to take decisions that can balance this effect. People who are affected by the consequences of lack of sustainability when they are 70 years of age have a very limited capacity for reaction; in many cases, their pension is now their only means of

[4] The fact that the *average values are calculated over 13 years* means that the formula uses 7 years of "forward" projection, in other words of an estimate of their future development.

livelihood.

The criterion of this Committee is that this circumstance should be addressed. That is why it recommends that those who finally have to discuss the sustainability factor should study the **introducing a minimum clause (or "floor clause") that prevents the nominal fall of pensions of those who are already pensioners at the time the factor is applied**.

It could be said that this minimum clause would push pensions in a direction that makes the factor itself lose its meaning. In other words, if the factor "says" that sustainability is coherent with a fall of 2% in pensions, but pensions neither rise nor fall, who pays for the difference?

We believe that this function should be fulfilled by the Reserve Fund. The current Reserve Fund can be understood as the result of pensions rises that were possible in good times, but were not passed on to pensioners. If we see it in this way, its function becomes one of providing a balance in the years in which the floor clause is applied. In addition, given that the factor is calculated for the whole economic cycle, and thus its results are moderated across the cycle, in the good years the system's funds will exceed the increase in pensions resulting from the factor, so the Fund can be allocated extra resources.

In any event, the main virtue of the sustainability factor, in this case of the AGF, is the transparency it provides. At a time when the situation of the system's revenue and expenditure obviously justifies a nominal fall in pensions but this is not applied, the factor provides a *clear vision of this difference*. For this and for other reasons, transparency is a vital part of the factor. Pensioners who receive 1,000 euros per month and continue to receive them must know that, in terms of the sustainability of pensions, they should be receiving 990 and that as a result they are receiving a transfer in their favour of 10 euros per month because of the floor clause. It is as important for citizens to know the reasons for the adjustments that annoy them as it is for them to know the size of the supports or balances from which they benefit.

Finally, we have to discuss the *link between pensions and the CPI*.

The commitment that pensions should rise in line with the consumer price index (CPI) is relatively modern. What is more, during the time it has been applied the commitment has been broken on a number of occasions. This shows that it is a qualified commitment: the purchasing power of pensions shall be maintained, *provided that it can be paid for*. This second part of the sentence is not expressly stated, but it is there. The sustainability factor simply makes it explicit and forces society to take it into account.

By bringing out the second part of the sentence, the sustainability factor puts an end to the simple and direct link between pensions and the CPI. That does not mean that pensions cannot rise in line with the CPI every year. In the same way the AGF does not presuppose that pensions may not increase above prices. The sustainability factor we have proposed **modulates the increment in pensions linked to the CPI according to the variables that determine the system's budget equilibrium**. And it does so gradually over time.

In a year in which the CPI is, for example, 2% and the increment in pensions resulting from the sustainability factor is 1%, what does the formula tell us? It tells us that, considering the

system's current revenue, pensioners and expenditure, and taking into account the whole economic cycle, raising pensions by 2% would compromise the long-term sustainability of the system. In other words, pensioners in the future could have to face more severe adjustments than the difference between 2% and 1% as a result of the decision to increase the value of pensions in order to guarantee their purchasing power in a particular year.

The Spanish society can react to the automatic application of the sustainability factor by accepting a rise of 1%. But it can also react by increasing permanently the funds allocated to the system so that pensions can rise 2% when applying the factor, thus preserving purchasing power. In this case, the formula *will make it clear what the amount of funds that have to be allocated permanently is in order to cover the gap between 1% and 2%*. This means that society, through its democratic channels, may discuss the pros and cons of making this transfer, the source of the funds, etc., in an informed fashion. However, this Committee recommends that the taxes that provide the funds for the system should be as predictable as possible, with the aim of avoiding additional uncertainties when making economic decisions.

In short, the **sustainability factor provides the citizens of our country with clear data regarding what the pension system can pay for itself** (that is precisely what sustainability is), **thus making it possible for them to enter into an open, informed and aware discussion** on whether this payment meets the criteria of adequacy, fairness and solidarity. If they conclude that it does not, they can discuss and decide precisely how they will balance a situation that they do not like.

That is why we will end these introductory remarks by highlighting something that has already been suggested: **the transparency of the sustainability factor is not an option. It forms a necessary part of it.** All Spanish people have to be in a position to understand the factor, its budget, its operation and its consequences. These consequences must be systematically explained: at a personal level (precise yearly description of the adjustments to the pension, broken down by its components); as an average (situation of the typical pensioner); and, of course, at the level of the system as a whole. The Social Security administration must establish a framework of specific information on the Sustainability Factor, in which all the elements of the formulas can be easily located. At the same time, the forecasts necessary for the calculations must be subject to scrutiny by the future Independent Fiscal Authority (*Autoridad Independiente de Responsabilidad Fiscal*) and, in any event, their assumptions, methodologies and results must be fully documented and available for public inspection.

2. The design of the sustainability factor

This Committee **proposes a sustainability factor made up of two components**:

a) an Intergenerational Equity Factor (IEF) for new retirement pensions
b) an Annual Growth Factor (AGF) for all pensions

2.1. The Intergenerational Equity Factor for new retirement pensions

This factor aims to protect the pension system from the impact on it of the increased longevity of future pensioners. Given the effects of increased life expectancy on pension expenditure

expected in the future, not linking the current framework of initial retirement pension to life expectancy means ultimately preserving a system by which people may obtain very different returns from the system with very similar contributions over their working lives. The initial retirement pension should be adjusted in such a way that the total amount expected from pension payments throughout the life of a pensioner entering the system at a specific time (t+s) with a specific regulatory base and age (j) and thus a specific life expectancy ($e_{j,t+s}$), is equivalent to that received by a pensioner who enters the system with the same regulatory base and at the same age but at a previous time (t) and thus with what is probably a shorter life expectancy ($e_{j,t}$). Under the current system, as they have the same regulatory base, these two pensioners would have the same initial pension, despite the fact that they will benefit from the pension system for a different number of years.

Our proposal is to **multiply the initial pension with which new pensioners enter each year into the system, under the current law, by an Intergenerational Equity Factor for new retirement pensions**. This coefficient **would be the result of dividing the life expectancy of those who have entered the system at a specific age at an earlier time by the life expectancy of the new pensioners who enter retirement at the same age but at a later time**. It would be applied once, and only to the new pensioners when calculating their initial pension. The effect would be to adjust the initial pension according to the life expectancy of each cohort.

Specifically, its formula is as follows:

$$FEI_{j,t+s} = \frac{e_{j,t}}{e_{j,t+s}}$$

To illustrate how it operates we have used the latest projections of life expectancy provided by the Spanish National Statistical Institute (INE). We are using as a hypothesis a reference age (j) of 65 years and 2014 as the initial year of application (t). For pensioners who retire in 2015 (t+1) at 65 years of age, the Intergenerational Equity Factor would mean multiplying the initial monthly pension they are to receive according to current regulations by 0.9928, which is the result of dividing life expectancy at 65 years in 2014 (20.27, approximately 20 years and three months) by life expectancy at 65 in 2015 (20.42, approximately 20 years and five months), as estimated by the INE (see Appendix 2).[5]

With the current projections of life expectancy, this coefficient would be equal to 0.9339 for pensioners who retire at 65 in 2024, and 0.8797 for those who do so in 2034. As can be seen, it takes a long time for the Intergenerational Equity Factor to have substantial effects on the calculation of the initial pension (-12%). Thus the factor introduces an important element of gradual change, which we believe is desirable in any pension adjustment or reform.

Figure 1 shows the projection to 2050 of the ratio of life expectancies at age 65, taking 2014 as the initial year, as well as the rate of decrease of this life expectancy ratio. This figure shows that

[5] We have used the latest INE projections to illustrate the application of the Intergenerational Equity Factor. At the specific time of its application, it will of course have to use the latest available forecasts. Unlike the projections of the Social Security administration, those of the INE are public and regularly updated.

the application of the IEF implies a downward adjustment in the calculation of the initial pension, with an average rate of 5% every 10 years. The shifts in life expectancy year by year are not swift or high, and they can be summed up by saying that life expectancy at the age of 65 increases by around 16 months every 10 years.

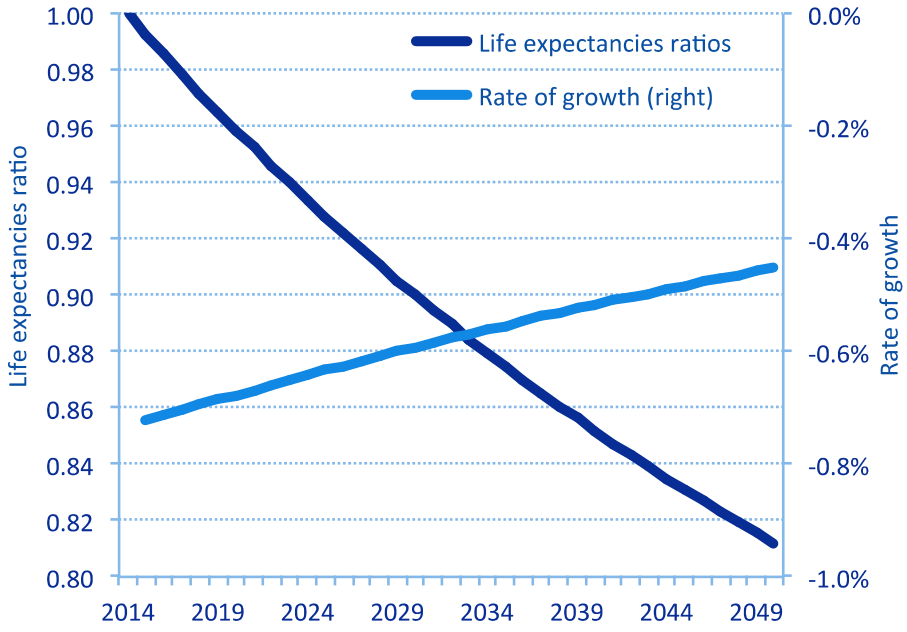

Figure 1: Intergenerational Equity Factor. Reference age: 65 years (2014=1) Source: INE (2012)

The application of the Intergenerational Equity Factor does not imply that the initial pension in real terms (and, of course, in nominal terms) has to fall as the number of years increases. As a result of economic growth or an increase in the number of years of contributions, the regulatory base on which the initial pension is calculated could lead to greater increases than the reductions resulting from applying the Intergenerational Equity Factor.

Taking into account that, as can be seen in Figure 1, the annual fall in the life expectancy ratio ranges between 0.4% and 0.7%, these are also the real rates by which the regulatory bases should grow as a minimum if the initial pension is to increase in real terms after applying the Intergenerational Equity Factor. For the purpose of comparison, the average new pension increased in real terms between 1995 and 2012 at an average rate of 1.87% per year, far above the average growth required for the initial pension to continue to grow in real terms between 2014 and 2050.

In short, although the **application of the Intergenerational Equity Factor gives rise to an initial pension that will decrease with respect to its regulatory base,** as a result of the fact that the pension will be enjoyed for a longer period (given longer life expectancy), it is **unlikely that it will involve a fall in the initial pension in real terms**.

As a result of the introduction of the Intergenerational Equity Factor, people have an added need for sufficient tools to foresee the consequences it will have on their pensions and act individually if they so wish. This means, specifically, making the system provide individuals with a greater decision-making capacity over the time of their retirement. For this purpose, taking into account the existing incentives, we suggest evaluating whether or not to introduce **additional incentives for extending the working life** (active ageing) so that workers who so wish can access higher average pensions by contributing for longer and benefitting from the pension system for fewer years. In this way they will also increase the pension to which they are entitled, and so offset the effect on their pension of increased life expectancy.

Although the application of the Intergenerational Equity Factor contributes significantly to the budget equilibrium of the public pension system in the long term, **its main purpose is to ensure equal treatment for people who as a result of increased life expectancy are going to receive benefits from the pension system for a very different number of years**. Above all, this coefficient therefore has a redistributive effect between generations with different life expectancies. This redistributive goal is basic for guaranteeing a balance between the efforts required from different generations, so as to ensure that the commitment to intergenerational solidarity on which the pay-as-you-go system is based remains firmly in place over time.

2.2. The Annual Growth Factor for all pensions

The logic of basing the Growth Factor on an indicator that is as comprehensible and complete as possible.

Once the system is insured against the potential longevity risk, others still remain: potential demographic risks not associated with longevity, that is, those associated with the dependency ratio (the ratio between pensioners and contributors), and the economic risks of a structural nature.

We propose using an **Annual Growth Factor applicable to all pensions, to be calculated according to the growth of revenue, the number of pensions, the replacement effect (resulting from the fact that pensioners who enter the system every year do so with different pensions from those who leave it), as well as the difference between the revenue and the expenditure of the pension system**, with the variations and qualifications that we will see below (Section 3).

We should remember that the goal of the Sustainability Factor is to **guarantee the budget equilibrium of the contributory system of Social Security over the whole economic cycle**. The guarantee refers to the fact that thanks to automatic annual adjustments resulting from the application of the Annual Growth Factor, long-term budget equilibrium tends to be ensured. Guaranteeing equilibrium over the economic cycle means that although it may be broken in years of recession or crisis, such an equilibrium tends to be achieved over the length of the cycle thanks to the surpluses resulting from expansive phases. It is therefore a case of preventing the correction from having pro-cyclical effects.

The indicator that best and most clearly reflects all the potential budget risks faced by a pay-as-you-go system is the difference between the revenue (*I*) and total expenditure of the contributory benefit system (*G*).

In simple terms (for more details, see Appendix 3), the revenue of the system (*I*) is the result of the product of the number of contributors (*C*) in the system, the average contribution base (representing a percentage of the average wage) and the average contribution rate. In addition to this revenue from contributions, there are central government transfers to finance minimum pensions, interest accrued by the Reserve Fund and other revenue that may be allocated to the system in the future.

Expenditure (*G*) may be broken down as the product of the number of pensions (*P*) and the average pension (*pm*). Seen in this way, it is clear that the difference between revenue and expenditure in the public pension system **will reflect all the important structural changes that take place in the variables that characterise the public pension system, whether demographic or economic:**

- changes in the dependency ratio, defined as the number of pensions over the number of contributors;
- changes in the unemployment rate, the activity rate and migratory flows that are reflected in the number of contributors;
- changes in productivity that are reflected in wages, which in the long term tend to increase in line with productivity;
- changes in social contribution tax rates and other potential revenues for the system.

To the extent that the difference between revenue and expenditure includes all these key elements of the system, **it is an indicator for insuring against all the potential risks that is more complete than other indicators that have been used for constructing sustainability factors in other countries**, as shown in Appendix 1**.**

The Annual Growth Factor for all pensions

The Annual Growth Factor we propose implies increasing all the pensions according to a rate (*g*) that depends on the growth of revenue and of the number of pensions, the replacement effect (derived from the fact that the pensioners who enter every year into the system do so with pensions different from those who exit the system) and the difference between revenue and expenditure over the economic cycle.

In accordance with the **Annual Growth Factor, the nominal growth rate (g)** that would **be applied to all pensions in *t*+1 would be calculated according to the following formula:**

$$g_{t+1} = \overline{g}_{I,t+1} - \overline{g}_{P,t+1} - \overline{g}_{s,t+1} + \alpha\left(\frac{I_t^* - G_t^*}{G_t^*}\right)$$

where $\overline{g}_I$ is the growth rate of revenue, $\overline{g}_P$ the growth rate in the number of pensions, and $\overline{g}_s$

the increase in the average pension due to the replacement effect, as a result of the differences between new pensions and the pensions of those leaving the system. All the variables appear defined in nominal terms.

The coefficient α measures the speed at which the budget imbalances in the system are corrected. As will be explained below, this Committee proposes that the value of α should be between 1/4 and 1/3. Given these values of α, the term between brackets in the Annual Growth Factor indicates that when the system is in surplus (*I**>*G**), pensions are incremented above the result of adding the rate of revenue growth, substracting the rate of pension growth and substracting the replacement rate ($\overline{g}_I - \overline{g}_P - \overline{g}_s$). In contrast, when there is a deficit (*I**<G*) pensions are incremented by a rate that is lower than the expression $\overline{g}_I - \overline{g}_P - \overline{g}_s$.

The bar (–) above the growth rates indicates that they are calculated as a moving arithmetic mean. The asterisk (*) indicates that the revenue and expenditure are calculated as a moving geometric mean. Both averages are calculated taking into account an uneven number of years (*n*) and are centered on *t*; in other words, taking into account the (*n*-1)/2 previous periods and the (*n*-1)/2 subsequent periods. Appendix 3 analyses how the geometric mean of expenditure should be constructed, by including future forecasts of changes in the average pension.

In the medium and long term, **the Annual Growth Factor guarantees that the budget balance of the system (*I*-G**) converges towards zero**. That is because, as $\overline{g}_I - \overline{g}_P - \overline{g}_s$ moderates when expenditure exceeds revenue, growth in *G* tends to be checked and it converges with revenue *I*. In this situation of balance, where *I**=*G**, the **nominal growth of the average pension** (g_{pm}) would be given by the growth rate calculated by the Annual Growth Factor (g) plus the increase in the average pension due to the replacement effect ($\overline{g}_s$).

$$g_{pm,t+1} = g_{t+1} + \overline{g}_{s,t+1}$$

This expression indicates that the average pension will normally increase above the rate of annual growth because pensioners who exit the system tend to have lower pensions than the new pensioners who enter the system.

Thus when *I**=*G**, the nominal growth of the average pension would be equal to:

$$g_{pm,t+1} = \overline{g}_{I,t+1} - \overline{g}_{P,t+1}$$

If the system is in equilibrium along the economic cycle, the average pension increases in accordance with the growth rate of revenue and the growth rate of the number of pensions, both defined in terms of moving arithmetic means.

When it comes to choosing *n*, and **with the aim of smoothing over the impact of the economic cycle on the adjustment of pension values**, it would be a good idea to consider a total of 11 or

13 years: 5 or 6 years before and after the year in which it is applied. Taking into account the average duration of economic cycles in Spain over recent decades, this choice for the value of *n* appears as the most appropriate in order to avoid an excessively pro-cyclical behaviour by the Annual Growth Factor.

The choice of *α* obviously depends on the desired rate of adjustment. If $\alpha = 1/3$, each year a third of the existing imbalance between revenue and expenditure will be corrected. In this way, in the first year 1/3 of the initial imbalance will be corrected, leaving 2/3. The second year 1/3 of the remaining 2/3 will be corrected, and the third year 1/3 of the remaining 4/9 will be corrected. So in this example, in three years around 70% of the initial imbalance would have been corrected. Appendix 3 analyses in more detail the speed at which the existing balance between revenue and expenditure can be corrected according to the value of this parameter.

When applying this formula, it is very important to make clear the revenue and expenditure of the public pension system that are under consideration. **Revenue must include contributions earmarked for contributory pensions, as well as other revenue for the system, such as interest accrued on the Reserve Fund or State transfers for topping up minimum pensions**. In addition, if considered necessary nothing prevents other public revenue from being allocated in the future to the payment of contributory pensions. **We understand expenditure to include the payment of contributory pensions** and all the costs associated with it, such as expenditure **due to interest payments on any debt that may have been incurred in by the system.**

The Equity Factor and the Growth Factor taken together

It is worth noting that the Intergenerational Equity Factor has an effect on the Annual Growth Factor and their effects balance each other. The reduction of the initial pension received by new pensioners with respect to their regulatory base due to the application of the Intergenerational Equity Factor means that the average pension can grow more, thus redistributing expenditure on the pensions of new pensioners to older pensioners, compared with the scenario in which the Intergenerational Equity Factor is not applied. If the IEF were not applied, the initial pension of new pensioners would be higher, so expenditure would also be higher, and thus the application of the Growth Factor would mean a lower rise in pensions. And inversely, a reduction in the life expectancy of new pensioners would result in a higher IEF and thus a lower rate of the Annual Growth Factor. In other words, the application of the two factors tends to offset the imbalances associated with the application of only one of them, given their characteristics.

Characteristics and advantages of the Annual Growth Factor

Below we explain the characteristics and advantages of the Annual Growth Factor designed according to the above criteria, and the conditions required for these advantages to be clearer.

First, the Annual Growth Factor for pensions **guarantees the mandate of Article 135 of the Spanish Constitution and the Basic Law on Budget Stability and Financial Sustainability**, according to which all the public administrations, including the Social Security system, must adapt their actions to the principle of budget stability, understood in structural terms.

Second, the automatic and annual application of the sustainability factor can and must be unlinked from decisions of a structural nature taken on the funds available to the public pension system. Decisions on the contribution rate or the application of other revenue to the financing of the contributory system obviously correspond to society through its political representatives**.** It is society and its representatives who decide how generously to fund public pensions and how to finance expenditure on pensions; in other words, basically with what type of public revenue the system is financed (in terms of the AGF formula: the size of *I*). That is, the Parliament can always increase pensions if it so deems appropriate by providing the system with a bigger revenue. However, it is very important that these decisions take into account what the most appropriate tax structure is in terms of creating jobs and increasing productivity, given that these variables also affect the revenue of the public pension system through the number of contributors and their contribution bases.

This Committee's criterion is that the contribution rate must remain as stable as possible in order to avoid additional uncertainties in economic decision-making, and that the contribution under the different Social Security schemes should tend to converge. There would be no sense in making frequent adjustments to the contribution rate depending on the evolution of the system's revenue and expenditure. The decisions taken by workers and companies would be made more difficult due to added uncertainty. It is therefore not surprising that the stability of the contribution rate is the strategy that has been followed by nearly all the countries that have designed a sustainability factor.[8]

Third, the Adjustment Factor proposed is **sufficiently flexible** so as to ensure budget equilibrium in the long term for the public pension system, as it **allows the average pension to be adjusted gradually to upward or downward changes in the rest of the variables making up the formula**.

Fourth, the Adjustment Factor proposed **takes into account more factors than the current increment rule (base on inflation), as it makes pension growth depend not only on price rises but also on other variables that are crucial for ensuring the system's budget equilibrium.** If we break down the nominal growth of revenue ($\overline{g}_I$) into growth of prices ($\overline{\pi}$) and real growth of revenue ($\overline{g}_I^r$) it is easy to see how, in the Annual Growth Factor formula, inflation becomes one of the elements to be taken into consideration, but not the only one:

$$g_{t+1} = \overline{\pi}_{t+1} + \overline{g}_{I,t+1}^r - \overline{g}_{P,t+1} - \overline{g}_{s,t+1} + \alpha\left(\frac{I_t^* - G_t^*}{G_t^*}\right)$$

In other words, the inflation-based adjustment is modulated by other relevant variables, which determine how the system behaves in the future. It is obvious that if the system is in equilibrium (*I**=*G**), and if the real growth of revenue were equal to or greater than the growth in the number of pensions plus the growth in the replacement effect ($\overline{g}_I^r \geq \overline{g}_P + \overline{g}_s$), pension growth

[8] The table in Appendix 1 shows that in none of the countries analysed does the result of applying the sustainability factor imply a frequent change in the contribution rate.

would be equal to or greater than the average rate of inflation. Thus the Annual Growth Factor is **broader than the increment rule current in force**, as it means that pensions can increase by the interaction of a wide variety of factors: wage increases, improved contribution bases, greater labour productivity (which is reflected in higher wages), higher employment rates, greater efficiency of the pension system itself, the reduction of the underground economy, and decisions to permanently increase revenue.

Fifth, as the adjustment to pensions is linked to nominal GDP, if there were no cyclical correction it would tend to be pro-cyclical (growing when nominal GDP rises, falling when it falls). To avoid this pro-cyclical effect and, in particular, to avoid sudden changes in the average pension, **the Annual Growth Factor is constructed using averages of sufficiently long series of past and future values of revenue growth rates and of the number of pensions, as well as the level of revenue and expenditure, all of which are corrected for the economic cycle.**

Sixth, thanks to the Annual Growth Factor, the system will be in equilibrium over the economic cycle as a whole, but during the cycle there may be cash deficits or surpluses. **The surpluses would be accumulated in the Social Security Reserve Fund and the deficits would be financed from the Fund.** Due to the nature of the deficits and surpluses in the system as a buffer against the cycle, cash surpluses must fully and automatically be allocated to the Fund.

In the hypothetical case that the Reserve Fund was not sufficient to supplement the financing of pensions during recessions, **it is important to note that the system would be financed by the Treasury issuing debt securities guaranteed by future revenue**. In contrast, in periods of economic expansion extraordinary revenues would produce **temporary surpluses that could be used to pay any debt that might have accumulated, and the excess would be added to the Reserve Fund.**

Seventh, as the Annual Growth Factor depends on the difference between revenue and expenditure, any potential savings that the **Intergenerational Equity Factor may generate in new retirement pensions are returned to the system** and thus to all pensioners through higher average pensions. Once more it is clear that the application of the Intergenerational Equity Factor to new retirement pensions makes it easier to comply with the goal of a balanced budget for the system, and at the same time with a redistribution goal objective between the population cohorts that will benefit from the pension system for a different number of years.

Eighth, the two formulas making up the sustainability factor **set a reasonable limit for the managers of the system, as they may not finance pensions with structural deficits**, although they may do so with cyclical deficits, as we have just said.

Ninth, in a similar way to the Intergenerational Equity Factor, the Annual Growth Factor **redistributes between present and future pensioners the additional resources and the lower expenditure achieved by way of other parametric reforms** to the system, such as those in place following the implementation of Law 27/2011.

Finally, the existence of the sustainability factor, and in particular its formula of annual growth, establishes an **environment of transparency and knowledge on the part of society** with respect to the sustainability conditions for the Spanish pension system, which we currently do not have.

The mere calculation of the AGF, even before applying it, has in itself a very high intrinsic value in terms of providing a true and comprehensible indication of whether or not there is a long-term deficit that has to be corrected. This allows for the future of the system to be assessed with very high levels of certainty.

2.3. Effects of the Annual Growth Factor on the real average pension

To understand fully the implications of the Growth Factor with the appropriate levels of caution, it is useful to analyse its effects on the real average pension. The Social Security administration will have to carry out adequate studies and calculations with all the information necessary to apply the AGF. At the same time, when it comes to establishing forecasts for the different variables appearing in the formulas, the projections of the corresponding official bodies will have to be taken into account.

In the medium and long term (when *I*=G**), as seen above, the nominal growth rate of the average pension may be written as[6]

$$g_{pm,t+1} = \overline{g}_{I,t+1} - \overline{g}_{P,t+1}$$

while the real growth rate would be equal to

$$g_{pm,t+1} - \overline{\pi}_{t+1} = \overline{g}^{r}_{I,t+1} - \overline{g}_{P,t+1}$$

which is simply the previous equation, only substracting from both sides the average growth rate in prices ($\overline{\pi}$).

Thus in the medium and long term (when *I*=G**), the previous expression shows that the real average pension will grow when the real growth of revenue for the system is greater than the growth in the number of pensions. Obviously, if the real average pension grows and inflation is positive, the average pension will also grow in nominal terms.

Figure 2 shows the projection for the number of pensions from 2013 to 2050 (left axis) carried out by the Social Security administration for this Committee of Experts, taking into account the reform of the pension system following Law 27/2011. The right axis of the chart shows the arithmetic mean of the growth in the number of pensions ($\overline{g}_P$) for *n*=11.

[6] Given that this Committee only has available the projections made by the Social Security system of the number of pensions, and does not have projections on the future of the composition effect, this section can only analyse the conditions under which the average pension may grow over the coming decades.

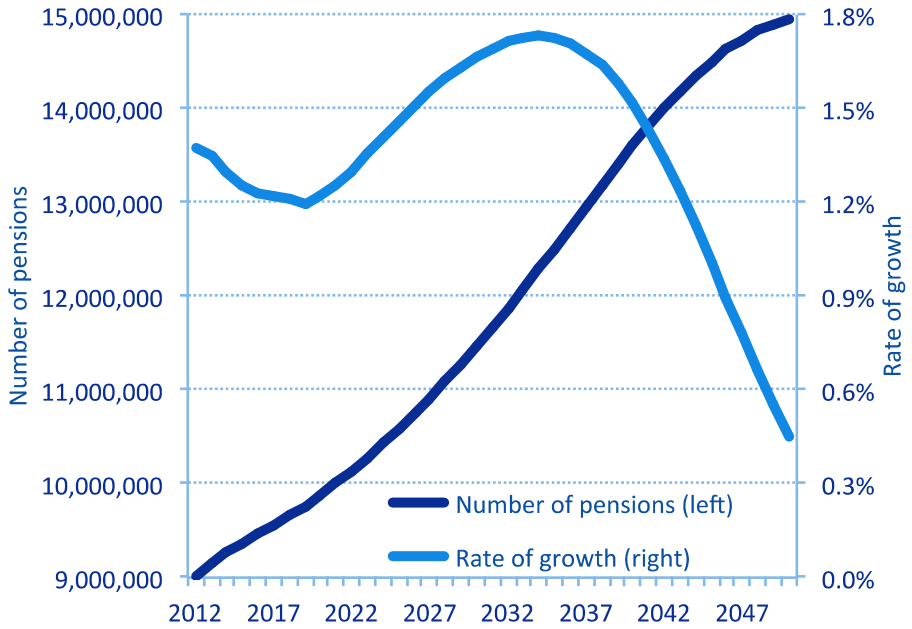

Figure 2: Projection of the number of pensions from 2013 to 2050 and the average growth rate in the number of pensions (*n*=11)
Source: Social Security administration (2013)

Taking into account the condition that has been derived earlier and the projection in Figure 2, over this time (2013-2050) **the real average pension will grow when the real growth of revenue in the system exceeds the growth rate in the number of pensions that appears in this Figure**. For illustrative purposes, we recall that average real GDP growth between 1985 and 2012, including two expansions and two recessions was 2.5%, and that this average was 2.3% between 1980 and 2012 (that is, including a significant portion of another recession). In other words, to the extent that the real revenue of the pension system is closely linked to real GDP, it is not improbable that real revenue of the system grew above the growth rate of the number of pensions projected in Figure 2.

Although the real average pension may continue to grow in the coming decades, the ratio of the average pension to the average wage is likely to fall. As shown in Appendix 3, in the medium and short term this ratio depends on the inverse of the dependency ratio (*C*/*P*), the contribution tax rate, the percentage of the wage making up the contribution base and sources of finance for the system other than social security contributions.

Current forecasts suggest that the dependency ratio will increase considerably over the coming years, as a result of the baby boom, unless structural reforms that lead to a significant increase in the number of contributors are implemented. If this is not the case, despite the real average pension probably continuing to increase, the application of the Intergenerational Equity Factor and of the Annual Growth Factor will give rise to a significant cut in the ratio between the average pension and the average wage. This reduction could make it difficult to achieve one of

the objectives that the European Union recommends for pension systems: to maintain standards of economic welfare for the retired population close to those they enjoyed in their economically active life.

Given this situation, Spanish society, through its political representatives, may choose between **a combination of the following options** to tackle the effects of the likely increase in the number of pensions and at least partially avoid a reduction in the ratio between the average pension and the average wage:

1. Increase the number of contributors by creating incentives for prolonging the active life of workers and through structural reforms that promote economic growth, quickly reduce unemployment and increase the labour force as a result of new migratory flows that are attracted by this increased growth.
2. Increase the contribution rates, increase the contribution base as a proportion of the wage and allocate additional revenue to the pension system, for example in line with the existing average levels in the euro zone.
3. Accept the reduction in the ratio of the average pension to the average wage, accepting that the pensions received from the public system (which may continue to increase in real terms) can be complemented with income from private savings.

3. Ways of applying the sustainability factor

3.1. Initial considerations

In determining the precise methods of applying the sustainability factor, this Report must provide criteria, suggestions, reflections and scenarios that are open to various possibilities, and which can be debated by the corresponding political and social agents, as well as society in general.

With respect to criteria, we would like to indicate the following.

First, we believe that in any event it is imperative **that the sustainability factor be applied from day one for information purposes.** Whatever the type of practical application (for example, to delay the moment at which one or other formula is applied), it is essential that the operation of the system should be transparent in the most immediate way possible; and it should be clear straight away both the pension that would in principle correspond to each person as a result of the application of the factor, and the result of the formula for the system as a whole.

Second, for reasons of fairness and prudence, the AGF **should be applied to current pensioners and future pensioners in degrees and forms that are very different**, given that these groups have different capacities, and time left, for reacting to changes.

Third, some variant of this criterion may be applied to those who will become pensioners within a relatively short period of time and need to adjust their expectations to a change in the rules of the game.

Fourth, **the changes should be smoothed over time**, to ensure they are not too sensitive to the economic conjuncture. That is why moving averages are proposed to calculate the Annual Growth Factor.

Fifth, the possible application of **Reserve Funds** should be taken into consideration to resolve ad hoc temporary situations.

Sixth, we should in any event bear in mind **the commitment to maintain minimum pensions**, which are financed with transfers from the State.

With this list of criteria, the Report next proposes some scenarios to establish how the factor can be applied. These scenarios will distinguish, first, the application of the Intergenerational Equity Factor from the Annual Growth Factor; and second, the situation of current pensioners (those who already receive a pension before the entry into force of the sustainability factor) from that of future pensioners.

3.2. The application of the Intergenerational Equity Factor

By definition, this coefficient shall be applied **only to future pensioners**, not current ones.[7]

This Committee's recommendation is to **apply this factor within the period 2014-2019**, although there are important reasons for doing so as quickly as possible, but taking into account the various circumstances of the groups affected by the 2011 law.

First, it is applicable only to those new pensioners entering the public retirement pension system, so there would be relatively few affected each year.

Second, for those affected there would not be any sudden change of expectations regarding their pension, as the annual adjustments are very gradual, as we have seen in Section 2.1.

Third, it means starting as soon as possible a path of correcting imbalances that will prevent them from worsening in the future, in the medium and long term.

Fourth, an early implementation of this coefficient strengthens the signal sent to the public at large, international investors and our European partners of our serious commitment to the budget sustainability of the pension system.

Fifth, it distributes between different generations the efforts that would probably otherwise have to be made alone by these cohorts for which the average pension represents a lower percentage of the average wage as a result of the increase in the dependency ratio over the coming decades.

[7] By current pensioners we mean those who are pensioners at the time the Annual Growth Factor begins to be applied.

3.3. The application of the Annual Growth Factor

The Annual Growth Factor is applied both to current and future pensioners.

With respect to **current pensioners** we propose **to guarantee that their pensions do not fall in nominal terms by the application of the Annual Growth Factor,** although in accordance with the growth scenario of the Stability Programme Update 2013-2016 this possibility is very unlikely. In any event current pensioners should receive this guarantee. The system cannot nominally reduce pensions under the ruling of the Constitutional Court on vested rights; and also because it would involve changing the rules of the game drastically for people who, due to their age, no longer have the time or the capacity to react and adapt to new circumstances.[8]

In addition, the application of the sustainability factor always has to be subject to the following restriction: **after applying it, no pension may become insufficient.** This concept has to be decided on by the democratic channels responsible for designing the public pension system.

In the case of **future pensioners**, a difference would have to be made between those who are close to receiving their first pension and those who are relatively far removed from this situation. Those who are soon to become pensioners have to be subject to a similar reasoning as that used for current pensioners, above all in terms of their limited capacity to react to change.

The above considerations lead us to propose **two scenarios in terms of the application of the Annual Growth Factor to all pensioners.**

The **first** is **immediate application in 2014**. In favour of this is that it is consistent with the positive elements we see in the Annual Growth Factor. It also sends a signal of strong determination to face the problem of the sustainability of the pension system, thus reducing the uncertainty of current and future pensioners.

The **second scenario** would involve **applying it gradually, but no later than 2019**. The advantage of this option is that it allows pensioners closest to retirement age to adapt during a transition period in which the parametric reforms of Law 27/2011 are already being applied.

In the second scenario, even though it would not be fully effective for the adjustment of pension values, the Annual Growth Factor would be calculated starting in 2014, for reasons of transparency of information and so that society can anticipate what the future has in store.

The possible deficits resulting from delaying the full application of the Intergenerational Equity Factor and/or the Annual Growth Factor could be cleared over the years by using the current Social Security Reserve Fund.

[8] Equally, a system of maximum and minimum limits could be considered in applying the Annual Growth Factor to current and future pensions. The most natural option would be that the nominal pension could not fall, and that in return it would not rise far above inflation. This value could be calibrated in such a way that the Reserve Fund could accumulate the resources needed to maintain the nominal value of pensions when the application of the Annual Growth Factor results in negative growth.

In any event, Spanish society and its political representatives must be aware that **the more the application of the two components of the Sustainability Factor is delayed, the greater will be the future adjustment, either by way of expenditure or revenue.** It is not therefore a case of a choice with no costs involved. In exchange for not beginning a gradual and smoother adjustment in the growth of pension levels in 2014, the current imbalance between revenue and expenditure in the system would accumulate over time, giving rise to lower average pensions in the future compared with the scenario in which the Sustainability Factor is applied immediately.

In short, given the advantages we see in the Sustainability Factor proposed, **this Committee is in favour of applying it as early as it is possible and prudent, within the period 2014-2019.**

3.4. Calculating the Annual Growth Factor

The Stability Programme submitted yearly in the spring for approval by the European Commission will have to include projections of the revenue and expenditure of the contributory system, prepared by the Secretary of State of Social Security. If n=11, data are needed on the variables appearing in the formula for the Annual Growth Factor for the four previous years, forecasts for the close of the current year and projections for the next six years. The future Independent Fiscal Authority will also have to make a positive evaluation of the projections of the contributory revenue and expenditure of the pension system before the Annual Growth Factor is applied. With these projections, the yearly national budget will set out in detail the adjustment in pension values for the following year obtained by applying the Annual Growth Factor.

4. Transparency and related subjects

The transparency of the system

Transparency is a necessary condition for the sustainability of the public pension system. For economic, social and political reasons, citizens should become involved in the debate and the solution of the problems of the system. To do so, they must be informed of the state and operation of the system on a regular and continuous basis. People must be provided with both aggregate information on the pension system and disaggregate information on their own current or future pension.

The developed world has for some time had effective plans for offering information on this subject. At present, the changes expected in Spain pertain only to people of an age that is close to retirement. It would be reasonable to include **younger people, precisely because they need to know at first hand and as soon as possible what their future pension will be.**

All citizens of any age should know not only what the pay-as-you-go system of public pensions involves, how it operates and what its situation is, but also, specifically, how all its elements influence the calculation of their own present or future pension.

First, society needs aggregate information on the elements that operate in the two formulas

that make up the sustainability factor: life expectancy (and demographic factors in general), the number of contributors and the total amount of contributions, and the number of pensions and their total amount, including the corresponding averages. At the same time, the Social Security administration and the future Independent Fiscal Responsibility Agency should monitor these figures, including a systematic comparison between actual and estimated figures (to see to what extent the forecasts of number of contributors, contributions, number of pensions and wages are being met).

Second, the information received by each pensioner (also applicable *mutatis mutandis* to contributors) must include information related to the pension that will result by applying the sustainability factor (the Intergenerational Equity Factor in the case of new pensioners and the Annual Growth Factor for all of them), together with, where applicable, any adjustment made to their pension by using funds from the Reserve Fund, or conversely by a transfer to the Fund.

This exercise of transparency requires an effort in terms of financial culture on the part of society. **The educational system should provide Spanish citizens with the basic tools they need to understand financial phenomena in general and the operation of the pension system in particular.**

But it is not enough that data should be accessible and understandable. They have to be paid attention to and given the importance due to them. Here a role should be played by the development of a civic culture that emphasises the value of the general interest and highlights the connection between the general interest and the specific interest of each individual. The development of this culture is the responsibility of everyone and of all the institutions, including the political system itself, which has an important educational mission in this respect. Obviously, for it to do so, it has to set an example with respect to the transparency of its own pensions and to the justification for any special schemes that it may have in this respect.

This Committee has made the following proposals for increasing transparency and improving the available information on the pension system with respect to the Sustainability Factor.

The first proposal is that the Social Security administration should create a specific information space for the Sustainability Factor on its website and in its publications. This should provide the historical series and forecasts for all the elements included in the IEF and AGF, as well as the corresponding moving averages, in a space that does not include other information or data that could lead to confusion. Website tools can and should be used to help people apply the formulas to their own cases.

The second proposal is that future and current pensioners should be clearly informed of how the application of the Intergenerational Equity Factor affects the calculation of their initial pension and how their pension is adjusted annually in accordance with the Adjustment Factor.

The third proposal is that the Social Security system should take into account the fact that with the application of the AGF, Spanish pensioners will lose the benchmark they had in the form of the CPI. After the entry into force of the AGF, the Social Security administration should offer similar information that will allow an equally simple monitoring process. It should therefore work on the necessary methodology to provide citizens with an even greater level of knowledge

than they have at present. In this respect it is useful to note that, as explained in the second section of this Report, the Annual Growth Factor may be written as follows:

$$g_{t+1} = \overline{\pi}_{t+1} + \left(\overline{g}^{r}_{I,t+1} - \overline{g}_{P,t+1} - \overline{g}_{s,t+1}\right) + \alpha\left(\frac{I^{*}_{t} - G^{*}_{t}}{G^{*}_{t}}\right)$$

Using this expression as a starting point for the purpose of informing pensioners, the adjustment of pension values may be broken down as the sum of three elements:

1. Average inflation
2. The real growth of funds in the system, minus the increase in the number of pensions, and taking into account the replacement effect
3. The effect of a surplus or deficit in the system.

Major related subjects: the welfare system, economic growth and cultural change

Although this Report focuses on the sustainability factor of public pensions, that should not prevent us from **mentioning related subjects**, which should be the object of attention and debate by the policymakers and society in general. These subjects can be grouped into three main areas: the welfare system, the economy and culture.

First, the Report focuses its attention on one part of the welfare system: the sustainability factor of the public pension system, based on certain assumptions. There are many other subjects and aspects to welfare policies that have to be addressed. Within the area of pensions, there are questions pending such as the improvement of the contributiveness of the system, the existence of special Social Security schemes, the development of complementary pensions (occupational pension funds paid by employers, individual pension funds and annuity schemes) and many other measures that will undoubtedly be taken in the future to improve equity and efficiency. The Sustainability Factor designed in this Report should be applied to all pensions paid from public funds with the aim of preventing unfair treatment between different groups.

Moreover, the policies related to the pension system in general should be placed in the context of other social policies such as those relating to problems associated with the ageing population (which leads to obvious problems related to healthcare and dependency, for example).

Second, the discussion on the sustainability factor highlights the need to be realistic and have a long-term vision of the problems relating to the countrys economic horizon. Without sufficient economic growth, prospects for the future of pensions will inevitably once more give cause for concern. A society that is concerned about the future of its pensions should also be interested in achieving a policy that really favours the increase of employment and productivity. At the same time, it must also implement a demographic policy that increase the birth rate and fosters immigration (for example, that of skilled foreigners, which would lead to higher income and higher contributions).

Third, this Report ultimately proposes a change in the narrative or discourse on potential problems in the pension system, in the sense of emphasizing its sustainability and thus a **realistic** vision of the economic (and not only economic) conditions and a **long-term** vision, of course without losing sight of the solidarity dimension. **Solidarity** must be exercised with the elderly who retire, but also with new generations, whose future pensions we want to guarantee. A key element of this cultural transformation is compliance with the goal of **transparency**, bringing with it the commitment by the authorities to offer clear, systematic, regular and precise information. However, there must also be a commitment by citizens to dedicate the attention and effort needed to assimilate the information, so that they can express their opinions and debate from a position of knowledge, guided by the rules and criteria of rational deliberation and communication.

In short, we need to resolve the key element that is the sustainability factor of public pensions now; but we should be aware of its context when we do so. The context requires consideration of a broader range of welfare policies, attention to the subject of economic growth and the cultural transformation that must come hand-in-hand with the demand for transparency.

5. By way of conclusion: a necessary, adequate and acceptable Sustainability Factor

This document presents what the Committee of Experts appointed by the Government considers that a Sustainability Factor for pensions should be: a simple and transparent rule that

1. ensures the Spanish public pension system can sustain itself;
2. reinforces the system against demographic pressures and changing economic conditions.

In other words, the Sustainability Factor must at all times guarantee the balance between cyclically-adjusted revenues and expenditures in a public pension system that must be monitored continuously and may need changes and reforms to comply with its objectives of adequate pensions, intergenerational equity and long-term sustainability.

What does the Sustainability Factor consist of?

The Sustainability Factor is made up of two formulas.

First, the Intergenerational Equity Factor or IEF, is only applied to the calculation of the initial pension and **moderates it in proportion to any increase in the life expectancy** of the retired person with respect to a life expectancy taken as a reference. The aim is therefore that any two people who retire at the same age and have accumulated the same regulatory base are treated always in the same way by the system.

The second is the Annual Growth Factor or AGF. It is a formula that **establishes a balanced growth of pensions in accordance with the available revenue, the number of pensioners among which this revenue has to be distributed, and the so-called replacement effect**; this calculation is adjusted in accordance with the relation between the revenue and expenditure of

the pension system, so that the deficits (more expenditure than revenue) moderate the growth of pensions and the surpluses (more revenue than expenditure) improve it.

These two formulas make up a Sustainability Factor that distributes over time the burdens derived from the tensions generated in the pension system, and which will be generated even more so in the future due to increased longevity and a higher dependency ratio. It also sends a message on the long-term sustainability of the Spanish pension system that can have a positive effect on the current economic situation. The factor may be considered as a “third generation" factor, which goes beyond alternative approaches to the pension system adopted by other developed countries.

Why do we consider this factor to be necessary?

We consider this factor is necessary because the increased life expectancy and demographic tensions affecting the pension system are a well-documented fact. They represent a potential threat to the economic welfare of those citizens who will amount to 15 million pensioners in a few decades; and by extension to society as a whole. If we do not act sufficiently in advance, most of the adjustments needed in the future will be borne by only a few generations, rather than being distributed between the largest possible number of them.

We also consider that it is necessary because we believe that the calculation and application of this Sustainability Factor must be combined with a decisive policy of transparency aimed at all citizens.

And we consider that it is needed now. The early adoption of a Sustainability Factor that strengthens, clarifies and guarantees the equilibrium of the system helps reducing uncertainty on the part of current pensioners and those who are close to retirement age. A Sustainability Factor that generates stability and confidence in the system, and that underpins other reforms and measures that are already underway, boosts economic recovery. And it also contributes towards boosting confidence in the sustainability of our public finances.

Why do we consider this factor to be adequate?

First, because the Sustainability Factor helps comply with the mandate of **Article 135 of the Spanish Constitution and the Basic Law on Budget Stability and Financial Sustainability**, according to which all the public administrations, including the Social Security administration, must adapt their actions to the principle of budget stability, understood in structural terms.

Second, because by considering a sufficiently large number of years in its calculations, it **minimises the effects of the economic cycle** and very significantly reduces its effects on pensions: in good years they grow less than they could, and in bad years they decline less than they should.

Third, because the fact that the factor grows less than it could in years with surplus revenue means that we can use extra revenue to continue to add to the **Reserve Fund**, which in this way becomes a useful element for offsetting the adjustments in bad years.

Fourth, because the Sustainability Factor is not synonymous with cuts now, but it does mean avoiding cuts that could have been made in the future if action were not taken sufficiently in advance. Pending official projections from the Social Security administration, if the future rate of economic growth of the Spanish economy remained at the values observed in the past, **the possibility that the application of the sustainability factor will result in a nominal fall in future pensions is low; and in contrast, the probability that in the medium and long term the real average pension will increase, improving its current purchasing power, is high**.

Current forecasts suggest that the dependency ratio will increase considerably over the coming years, as a result of the baby boom, unless structural reforms are implemented that substantially increase the number of contributors. That is why we also do not hide the fact that, with the current structure of the system, the average pension will represent a lower percentage of the average wage, which would make it difficult to achieve one of the objectives that the European Union assigns to a pension system: to maintain standards of economic welfare for the retired population close to those it had in its economically active life.

Given this situation, Spanish society, through its political representatives, may choose between **a combination of the following options that** tackle the effects of the likely increase in the number of pensions and at least partially avoid a reduction in the ratio between the average pension and the average wage:

- Increase the number of contributors by creating incentives for prolonging the active life of workers and through structural reforms that promote economic growth, quickly reduce unemployment and increase the labour force as a result of new migratory flows that are attracted by this increased growth.

- Increase the contribution rates, increase the contribution base as a proportion of the wage and allocate additional revenue to the pension system, for example in line with the existing average levels in the euro zone.

- Accept the reduction in the ratio of the average pension to the average wage, accepting that pensions received from the public system (which they can continue to increase in real terms) can be complemented with income from private savings.

Why do we consider this factor to be acceptable?

This Committee has no wish to hide the reality of things as they are. If it is necessary to design a factor for rebalancing pensions in Spain, this means that there is a potential imbalance. The Sustainability Factor owes its existence, then, to the need to moderate the growth of pensions if the resources in the system are not capable of supporting greater growth.

However, the Committee understands that the **situation of those who are already pensioners at the time of entry into force of the factor must be taken into account**. For most of these people their pension is the main, if not only, source of income, and in any event their capacity to react to changes in the environment that the factor involves is small or non-existent. That is why for those who are now pensioners, the Committee wants to recommend the application of a

clause that prevents the fall of their pensions in nominal terms. The Reserve Fund should be a sufficient instrument for balancing the effects of this clause.

The Committee is also aware that this sustainability factor involves breaking a rule followed for approximately the last decade and a half, of directly linking the annual increment of pensions to the annual CPI. We should in any event not forget that this rule has already been broken twice in the fifteen years it has been in place. In other words, however much it may be seen as an immovable and certain mandate, in reality it is an objective that is highly conditioned by whether or not there are sufficient resources to implement it. Rather than having rules that are not always complied with, it is better to have an objective mechanism such as the Sustainability Factor that is capable of telling all of us - politicians, social partners and citizens - how far the budget logic of the pension system can go in terms of increasing pension values; so that afterwards we can make informed and pertinent decisions.

For all the above reasons on the need, adequacy and acceptability of the Sustainability Factor formulated in this Report, this Committee's recommendation is to apply the factor within **the period 2014 to 2019**, although there are sound reasons for doing so as soon as possible.

Last, but not least…

This Committee would like to send a clear message to those responsible for the Spanish Social Security system, and by extension to the Government that manages it, as well as to the political groups that have the obvious role of supervising this management.

The message is as follows: all the work set out here on developing the Sustainability Factor will be much less useful if it is not accompanied by a **substantial effort of transparency**. Earlier we mentioned the emergence of a new model of relations in Spanish society with the subject of pensions, and we would like to repeat this here.

The Sustainability Factor must be applied with transparency and explained in simple terms to all citizens interested in it. The Social Security system should include all the data that are used in the formulas, in specific Internet spaces dedicated to that factor. The systematic monitoring of life expectancy, revenue, expenditure, number of pensioners and the replacement effect has to be published. This should help in applying the formula. An index should be created based on the systematic application of the Anual Growth Factor, to serve as an element that indicates the value of the adjustment that can be expected when the moment of application comes. Pensioners must have a benchmark to which they can refer to, as they now have with the CPI. The adjustment must be notified individually in a simple and comprehensible way. Predictions used for the factor must be published by the Social Security administration, including the assumptions and methodologies used, so that they can be properly judged and assessed. And finally, these forecasts must be checked by the Independent Fiscal Agency.

Appendices

Appendix 1
Basic features of the sustainability factor in different countries

Country	Date of approval	Initial date of effective application	Benchmark variable (*)	Parameter adjusted	How it works
Quasi-systems					
United States					The Office of the Chief Actuary constructs every year a predictive model of Old Age, Survivors and Disability Trust Funds, based on the impact of financial tensions on the level of contributions, with the flows projected to 75 years. However, there is no automatic or semi-automatic adjustment mechanism resulting from these predictions. The Simpson-Bowles Commission (2010) proposed parametric measures.
Canada	1997			Type of contribution and adjustment of pensions	The Canadian system of rebalancing is a last-resort system. Every three years the Chief Actuary's Office of the Canada Pension Plan assesses the financial situation of the system (partly sensitive to the financial markets). If the conclusion is that the system has sustainability problems, Parliament must agree measures; and only if this is not the case, a quasi-sustainability factor comes into play which freezes pensions and raises contributions for three years until the next review.
First-generation factors					
Finland	2005	2010	Life expectancy (adjusted by a discount rate)	Initial pension	The Eläketurvakeskus (pension authority) calculates the coefficient of survival of the cohort that is 62 years old in the year in question, based on data from the Tilastokeskus (Statistical Institute), making a life annuity with a discount rate of 2%. The pension is multiplied by the coefficient between the base year (cohort aged 62 in 2009, to the fifth decimal point) and the year in question.
Denmark	2011	2022	Life expectancy	Retirement age	Starting in 2022, when the retirement age will be 67, this age will be indexed using the difference between life expectancy at 60 years each year (with a shift of 5 years) and that of the same cohort in 2020. Life expectancies will be recalculated every five years starting in 2015. It is a semi-automatic factor (application requires parliamentary approval).
France	2003	2009	Life expectancy	Years of contributions (indirectly affects initial pension)	The basic aim of the French pension system is to ensure that, on average, the years of work occupy two thirds of the sum of these years and the years as pensioner. As a result, a review of life expectancy represents a change in the number of years of contribution needed to generate a pension.
Greece	2010	2021	Life expectancy	Retirement age	The Greek reform plans to index the retirement age to life expectancy starting in 2021.

Country	Date of approval	Initial date of effective application	Benchmark variable (*)	Parameter adjusted	How it works
Italy	2009	2013	Life expectancy	Retirement age and initial pension (notional accounts)	There are two elements in the Italian case: 1. Indexation of the retirement age to life expectancy since 2013 (initially, 2015). 2. Use of the "transformation coefficient" for calculating the pension, very similar to the annuity factor in an insurance operation. To be revised in 2019. Starting in 2019, both indexation and the transformation coefficient will be revised every two years.
Portugal	2007	2010	Life expectancy	Initial pension	The initial pension is modified by the relation between life expectancy at 65 at the time of calculation and in 2006 (anchor year).
Poland	1999	1999	Life expectancy	Initial pension (notional accounts)	The pension is calculated at the time of retirement as a life annuity that takes into account survival at 62 years.
Latvia	1996	1996	Life expectancy	Initial pension (notional accounts)	Latvia migrated in the 1990s to a NDC system, so the notional account is converted into a pension at the time of retirement, in accordance with life expectancy. This life expectancy is revised every year.
Second-generation factors					
Sweden	1994	1994	Wages, GDP, contributions, no. of pensioners, life expectancy	Adjustment of pensions and initial pension (notional accounts)	The Swedish pension system migrated to an NDC environment (notional defined-contribution accounts), adjusted in accordance with the average wage. The pension is calculated as the notional account depending on life expectancy, with a discount rate (1.6%) equivalent to the expected average growth of GDP (with adjustments during the life of the pension). In addition, an actuarial system is generated to calculate the current value of assets and liabilities so that if the liabilities exceed assets, the system checks its growth until it is back in balance.
Hungary	2009	2010	GDP, CPI, wages	Pension adjustment	Pensions are updated in accordance with CPI and wages, in proportions that depend on GDP growth: up to 3% of growth only GDP is used, and after that, wages become more important in the equation. Financial tensions affecting Hungarian pensions have forced the government to return to using the CPI.
Germany	2001	2005	Wages, ratio between pensioners and contributors	Pension adjustment	The German sustainability factor reviews the value of the pension in accordance with the growth of nominal wages, multiplied by a factor that is a quarter of the ratio between contributors and pensioners in the population.

Country	Date of approval	Initial date of effective application	Benchmark variable (*)	Parameter adjusted	How it works
Japan	2004		Ratio between workers and contributors, life expectancy	Initial pension, pension adjustment	The 2004 pension reform in Japan introduced a factor to calculate pensions that takes into account the size of the working population. Until balance is re-established, the initial pension is modified in accordance with the sum of the changes in the contributing population and life expectancy (although this is a ratio set at 0.35, established by law following 50-year projections carried out in 2002). This modifier operates as a deduction from the regular pension indexation. If the replacement rate falls below 50% the system has to be reformed.

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(*) Life expectancy, dependency ratio, wages, or any other variable that conditions the calculation of the initial pension or the updating of pensions.

Appendix 2.
The Intergenerational Equity Factor (IEF)

The values of the IEF included in this document are estimates of the factor that would have to be applied to maintain intergenerational equity for those entering retirement. It should be remembered that each year these values will have to be readjusted as new life expectancy forecasts are published.

The formula for determining this factor is as follows:

$$IEF_{j,t+s} = \frac{e_{j,t}}{e_{j,t+s}}$$

where:

- $e_{j,t}$: life expectancy for an individual aged *j*, in reference year *t*.
- $e_{j,t+s}$: life expectancy for an individual aged *j*, in year *t+s* (year when the factor is calculated).

The following information has been taken into account when calculating the Intergenerational Equity Factor:

1. Mortality tables for the general population, INE 2012.
2. The INE tables are published every year, and the latest are those for 2012. The mortality rates are published broken down by gender. The calculation of life expectancy for both genders has taken into account the long-term population projections (2012-2052) and their composition by gender, as published by the INE (population resident in Spain as of 1 January, by gender, age and year).
3. The reference year, or year for which the values of life expectancy and thus the Intergenerational Equity Factor has been calculated, is 2014. It is an estimated value based on the 2012 INE tables.
4. The age taken as a reference for the calculations is 65 years.

The Figures and Table below shows the projected life expectancy of men and women at 65 years of age and the Intergenerational Equity Factor according to the INE mortality tables.

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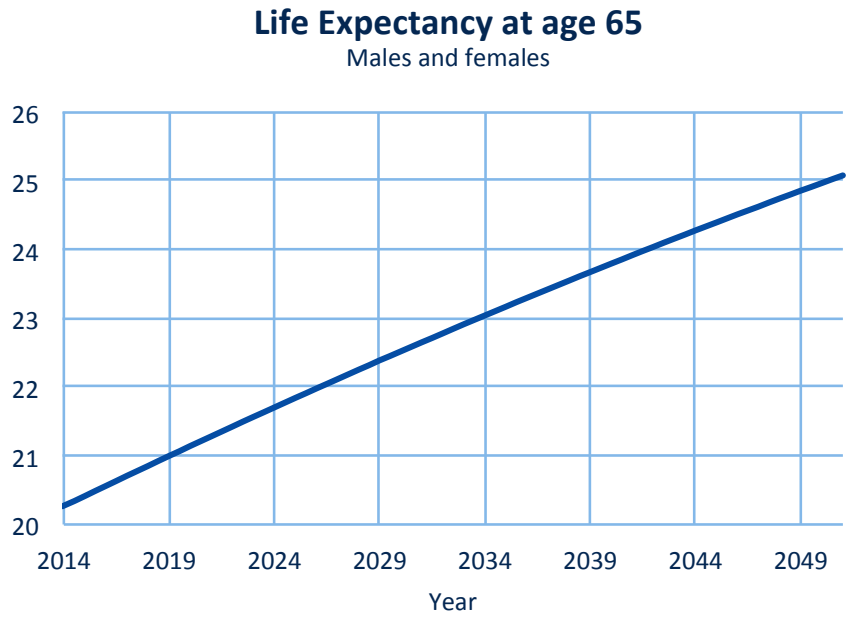
Life Expectancy at age 65
Males and females
26
25
24
23
22
21
20
2014
2019
2024
2029
2034
2039
2044
2049
Year

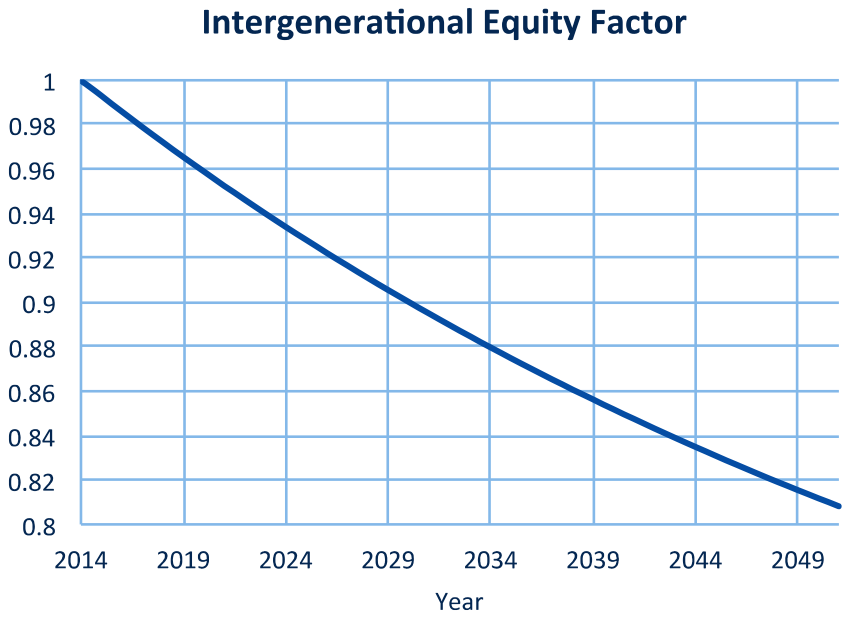
Intergenerational Equity Factor
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0.84
0.82
0.8
2014
2019
2024
2029
2034
2039
2044
2049
Year

Table A.1: Life expectancy at age 65 and the Intergenerational Equity Factor (2014=1). Source: INE (2012)

	e_{65}	IEF
2014	20.27	1.0000
2015	20.42	0.9928
2016	20.56	0.9857
2017	20.71	0.9788
2018	20.85	0.9720
2019	21.00	0.9653
2020	21.14	0.9588
2021	21.28	0.9524
2022	21.42	0.9461
2023	21.56	0.9399
2024	21.70	0.9339
2025	21.84	0.9280
2026	21.98	0.9222
2027	22.12	0.9165
2028	22.25	0.9109
2029	22.38	0.9055
2030	22.52	0.9001
2031	22.65	0.8948
2032	22.78	0.8897
2033	22.91	0.8846
2034	23.04	0.8797
2035	23.17	0.8748
2036	23.30	0.8700
2037	23.42	0.8653
2038	23.55	0.8607
2039	23.67	0.8562
2040	23.80	0.8518
2041	23.92	0.8474
2042	24.04	0.8432
2043	24.16	0.8390
2044	24.28	0.8349
2045	24.39	0.8309
2046	24.51	0.8269
2047	24.63	0.8230
2048	24.74	0.8192
2049	24.85	0.8155
2050	24.97	0.8118
2051	25.08	0.8082

Appendix 3
The Annual Growth Factor

A3.1 Calculation of the Annual Growth Factor

The Annual Growth Factor for all the pensions uses in the formula factors[9] formed by the unit plus the variation of a determined variable. In other words, they are of the form (1+*g*). They are called factors because in any year *t*+1 the variable *H* is obtained by multiplying the value of this variable in year *t* by the expected factor given by its variation in year *t*+1, represented by $(1+g_{t+1})$. In other words:

$$H_{t+1}=H_t\,(1+g_{t+1})$$

In the case of the Annual Growth Factor for all the pensions, we have the variables that are listed below.

Expenditure on pensions in year *t*+1, G_{t+1}, depends on the volume of expenditure in year *t*, G_t, multiplied by the following three factors:

a) $(1+g_{t+1})$: Factor in *t*+1 of the variation of pensions that were in the system in year *t* and that remain in the system in year *t*+1.
b) $\left(1+g_{P,t+1}\right)$: Factor in *t*+1 of the variation in the number of pensions.
c) $\left(1+g_{s,t+1}\right)$: Factor in *t*+1 of the variation in the replacement effect, i.e., the increase in the average pension produced by the different value of the pensions exiting the system in *t*+1, compared with the value of new pensions in *t*+1.

The formula relating these values is therefore:

$$G_{t+1}=G_t\,(1+g_{t+1})\left(1+g_{P,t+1}\right)\left(1+g_{s,t+1}\right)$$

In addition, the **revenue of the system** in year *t*+1, I_{t+1}, depends on the revenue in year *t*, multiplied by the variation factor of revenue in *t*+1, $\left(1+g_{I,t+1}\right)$:

$$I_{t+1}=I_t\,\left(1+g_{I,t+1}\right)$$

The equation of the budget balance for year *t*+1 is obtained by resolving the two equations.

$$G_{t+1}=I_{t+1}$$

[9] The term "factor" is used due to its multiplicative character and because it is similar to what is applied in financial mathematics.

So, by replacement:

$$G_t\ (1+g_{t+1})\left(1+g_{P,t+1}\right)\left(1+g_{s,t+1}\right)=I_t\ \left(1+g_{I,t+1}\right)$$

Reordering the terms, we get:

$$(1+g_{t+1})\ =\frac{\left(1+g_{I,t+1}\right)}{\left(1+g_{P,t+1}\right)\left(1+g_{s,t+1}\right)}\frac{I_t}{G_t}$$

The above equation is a special case that allows the adjustment factor for all the pensions to be calculated by only taking in to account what happens in year *t* and in year *t*+1.

To prevent the Annual Growth Factor from being contaminated by the economic cycle, ideally it would be better to work with variables corrected for the economic cycle.[10] Alternatively, annual averages could be used for sufficiently long periods that limit the cyclical effects, i.e.:

a) Moving arithmetic means of the different factors, which are represented with a bar above the factor (¯).
b) Moving geometric means for the ratio between revenue and expenditure[11], which is represented with an asterisk (*).
c) An exponent α, which measures the speed at which the budget imbalances in the system are corrected. It is a value between 0 (if they are never corrected) and 1 (if all are corrected in one year).

With all this, we will obtain the following expression:

$$1+g_{t+1}=\frac{(1+\overline{g}_{I,t+1})}{(1+\overline{g}_{P,t+1})(1+\overline{g}_{s,t+1})}\left(\frac{I_t^*}{G_t^*}\right)^{\alpha}$$

If we apply logarithms to both sides of the equation, the above expression becomes:

$$\ln\left(1+g_{t+1}\right)=\ln\left(1+\overline{g}_{I,t+1}\right)-\ln\left(1+\overline{g}_{P,t+1}\right)-\ln\left(1+\overline{g}_{s,t+1}\right)+\alpha\ln\left(\frac{I_t^*}{G_t^*}\right)$$

[10] One possibility would be to extrapolate all the annual series with 6 or 7 years predictions and apply the Hodrick and Prescott (1997) filter to the variables with a sufficiently high smoothed parameter (e.g. 100) so that the different components appearing in the Annual Growth Factor formula change gradually.

[11] As it is a geometric mean, it does not matter whether it is calculated on the ratio of revenue and expenditure, or on revenue and expenditure separately, then obtaining the quotient. $\frac{I_t^*}{G_t^*}=\left(\frac{I_t}{G_t}\right)^*$

To obtain a simpler formula, the following approximation can be used[12] for the logarithm function $g \cong \ln(1+g)$, which adjusts very well when the values of *g* are between -0.1 and 0.1, as occurs in the case we are dealing with.

The only one of the additions in the formula that has a different structure is the last one, so we are going to simplify it, adding and taking away the numerator $\square^*_\square$, although we are leaving the value of α as it appears in the expression:

$$ln\left(\frac{G_t^* + I_t^* - G_t^*}{G_t^*}\right) = ln\left(1 + \frac{I_t^* - G_t^*}{G_t^*}\right) \cong \frac{I_t^* - G_t^*}{G_t^*}$$

Thus after the approximation used for the logarithm function, the factor that has to be used for adjusting pensions in year *t*+1 is as follows:

$$g_{t+1} = \overline{g}_{I,t+1} - \overline{g}_{P,t+1} - \overline{g}_{s,t+1} + \alpha\left(\frac{I_t^* - G_t^*}{G_t^*}\right)$$

A3.2 Calculation of the geometric mean of expenditure on pensions

The geometric mean of *n* (with an odd *n*) values of *G* centred on *t* is calculated using the values known from *G*(*t*-(*n*-1)/2) to G(*t)* and the expectation from G(*t*+1) to G(*t*+(n-1)/2) under the following assumptions:

1. The number of pensions and the replacement effect are known until *t*.
2. The number of pensions has forecasts starting with *t*+1, i.e., $P_{t+j/t}$
3. The average pension, *pm*, of *t*+1 at *t*+(*n*-1)/2 increases in accordance with the adjustment to which the Annual Growth Factor gave rise in *t* and with the replacement effect in *t*, unless there is a forecast for it, i.e.:

$$G_{t+j/t} = P_{t+j/t} pm_t (1+g_t)^j (1+g_{s,t})^j$$

For example, for *n*=11, it can be seen that

$$G_t^* = \left(G_{t-5}G_{t-4}G_{t-3}G_{t-2}G_{t-1}G_tG_{t+1/t}G_{t+2/t}G_{t+3/t}G_{t+4/t}G_{t+5/t}\right)^{1/11} =$$
$$= \left(G_{t-5}G_{t-4}G_{t-3}G_{t-2}G_{t-1}G_tP_{t+1/t}P_{t+2/t}P_{t+3/t}P_{t+4/t}P_{t+5/t}pm_t(1+g_t)^{15}(1+g_{s,t})^{15}\right)^{1/11}$$

[12] This is the linear approximation of the Taylor formula for variable "*g*".

taking into account that

$$(1+g)^1(1+g)^2(1+g)^3(1+g)^4(1+g)^5 = (1+g)^{1+2+3+4+5}=(1+g)^{15}$$

A3.3 Effects of the Sustainability Factor on the ratio between the average pension and the average wage

Given that in the long term the Annual Growth Factor ensures a budget balance in the system ($I^* = G^*$), the following condition will be met

$$pm_t P_t = t_t bm_t C_t + OI_t$$

where *pm* is the average pension, *P* is the number of pensions, *t* is the contribution tax rate, *bm* the average contribution base, *C* is the number of contributors and *OI* other revenue for the system, including the interest accrued in the Reserve Fund.

If the average contribution base is a percentage β of the average wage (*bm*= β *w*), the above equation may be rewritten in terms of the average pension over the average wage:

$$\frac{pm_t}{w_t} = \frac{C_t}{P_t}\left(t_t\beta_t + \frac{OI_t}{w_t C_t}\right)$$

In other words, the application of the Sustainability Factor makes it transparent that in the medium and long term, the ratio of the average pension to the average wage depends on the inverse of the dependency ratio (*P/C*), the contribution tax rate (*t*), the percentage of the wage that represents the contribution base (β) and other sources of finance in the system other than social insurance contributions.

Current forecasts suggest that the dependency ratio will increase considerably over the coming years as a result of the baby boom, unless structural reforms are implemented to increase the number of contributors significantly. If this is not the case, the application of the Sustainability Factor (by application of both the IEF and the AGF) will give rise to a significant fall in the average pension as a proportion of the average wage.

A3.4 Percentage of imbalance corrected according to the value of parameter α for different time horizons

Value of α	Years									
	1	2	3	4	5	6	7	8	9	10
0.25	25.0	43.8	57.8	68.4	76.3	82.2	86.7	90.0	92.5	94.4
0.26	26.0	45.2	59.5	70.0	77.8	83.6	87.8	91.0	93.3	95.1
0.27	27.0	46.7	61.1	71.6	79.3	84.9	89.0	91.9	94.1	95.7
0.28	28.0	48.2	62.7	73.1	80.7	86.1	90.0	92.8	94.8	96.3

Value of α	Years									
	1	2	3	4	5	6	7	8	9	10
0.29	29.0	49.6	64.2	74.6	82.0	87.2	90.9	93.5	95.4	96.7
0.30	30.0	51.0	65.7	76.0	83.2	88.2	91.8	94.2	96.0	97.2
0.31	31.0	52.4	67.1	77.3	84.4	89.2	92.6	94.9	96.5	97.6
0.32	32.0	53.8	68.6	78.6	85.5	90.1	93.3	95.4	96.9	97.9
0.33	33.0	55.1	69.9	79.8	86.5	91.0	93.9	95.9	97.3	98.2

A3.5 The Annual Growth Factor and the inflation rate

If we break down nominal growth of revenue ($\overline{g}_I$) into growth of prices ($\overline{\pi}$) and real growth of revenue ($\overline{g}_I^r$), the Annual Growth Factor can be written as follows:

$$g_{t+1} = \overline{\pi}_{t+1} + \left(\overline{g}_{I,t+1}^r - \overline{g}_{P,t+1} - \overline{g}_{s,t+1}\right) + \alpha\left(\frac{I_t^* - G_t^*}{G_t^*}\right)$$

In accordance with this expression, the Annual Growth Factor can be broken down as the sum of three terms:

1. the average rate of inflation, centred on *t*+1;
2. a second component that reflects how much the average real growth rate of revenue grows above the average rates of growth in the number of pensions and the replacement effect;
3. a third component that reflects the surplus or deficit in the system over the economic cycle.

Obviously if the system were in equilibrium (*I*=G**), and if the real growth of revenue were equal to the number of pensions plus the replacement effect ($\overline{g}_I^r = \overline{g}_P + \overline{g}_s$), the adjustment of the value of pensions would be equal to or greater than the average rate of inflation.