

La sostenibilità dei sistemi previdenziali

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Seminario di specializzazione Mefop

Il sistema di welfare in Italia: tutela e sostenibilità sul versante pensionistico e assistenziale

Sala Conferenze Fineco- Milano

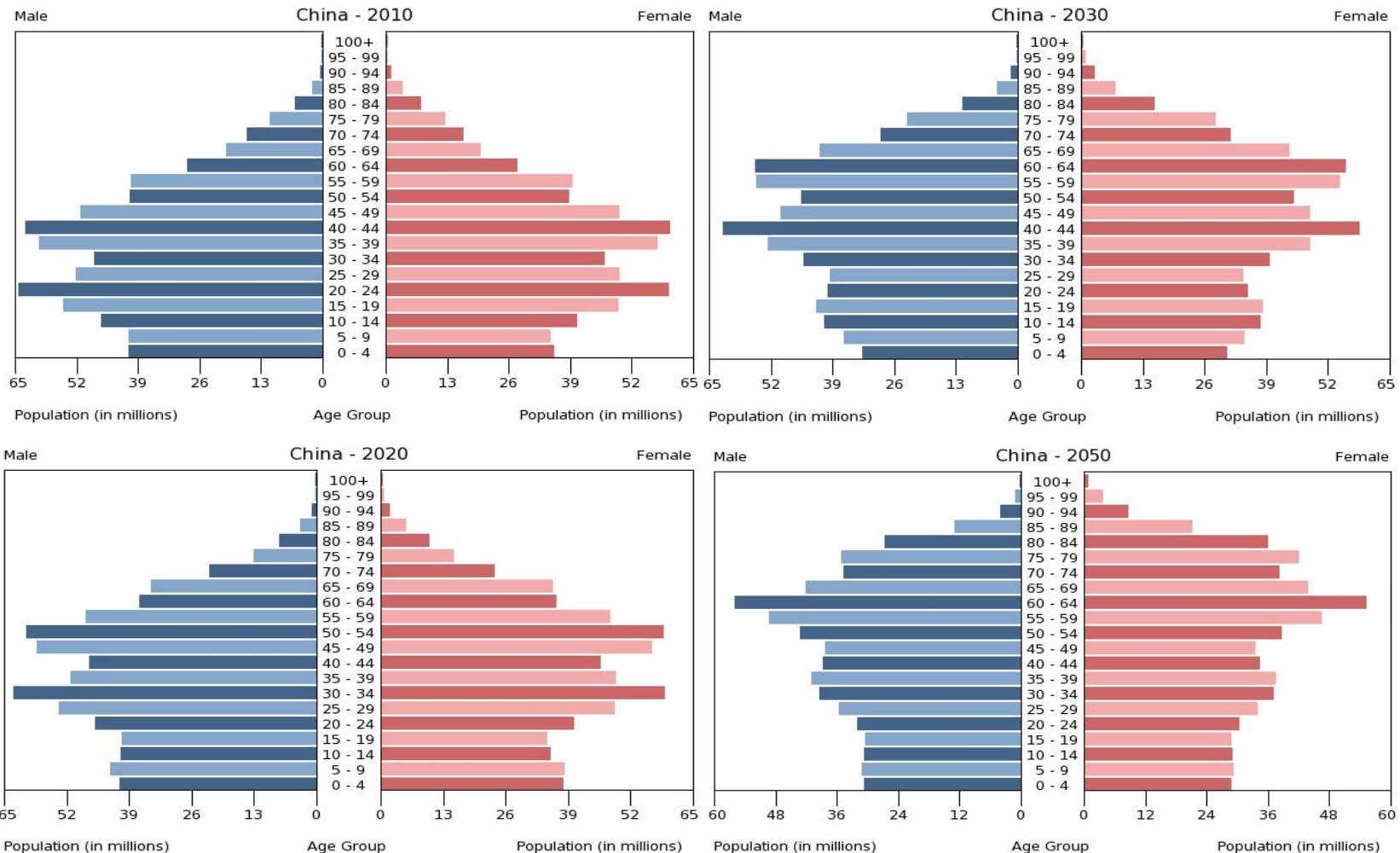
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Outline

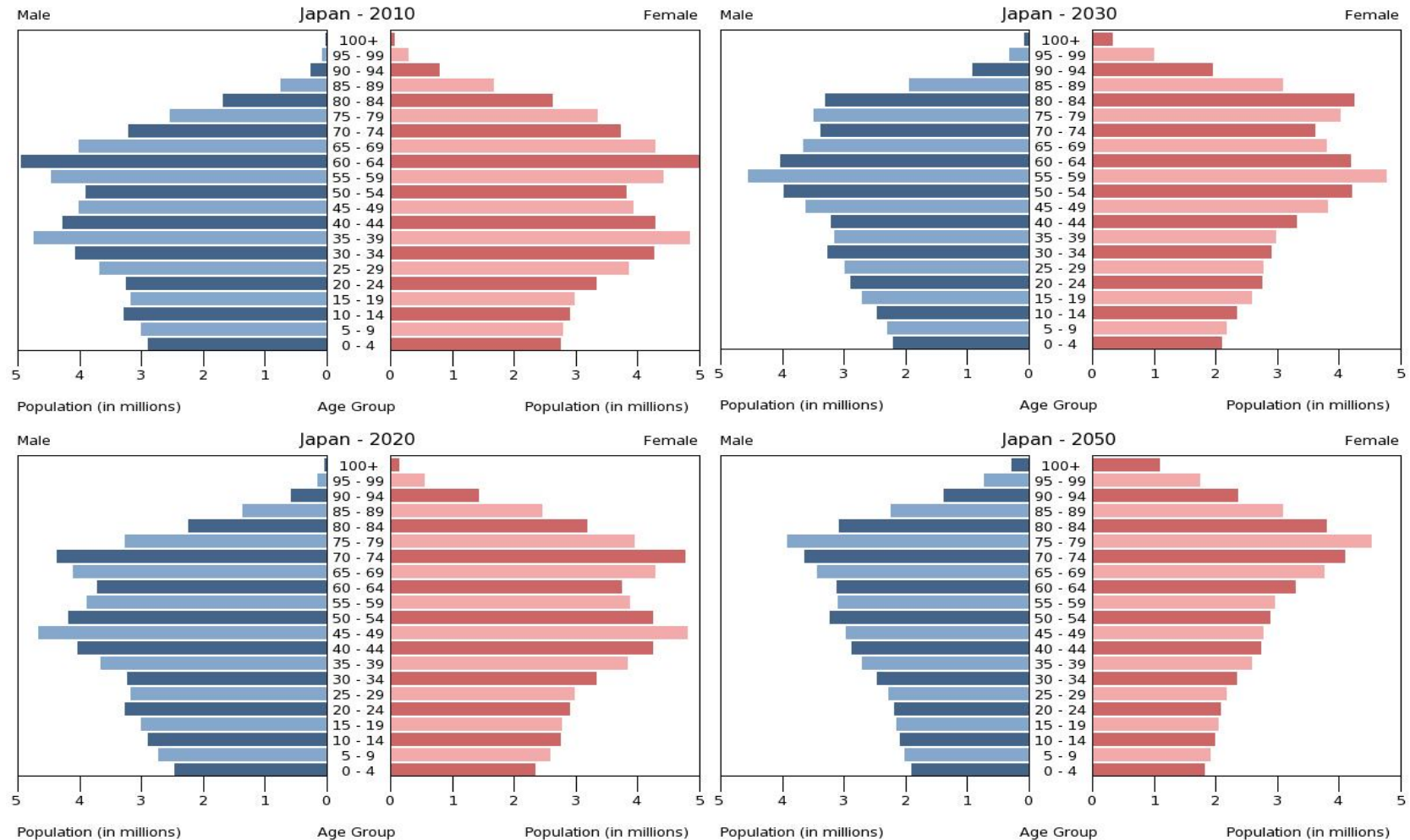
- Demographic Structures
- The Italian pension system
- The Swedish pension system
- The logical sustainability model: the separation principle
 - The separation principle for controlling the demographic wave
- The separation theorem. Exemplification

Demographic structures

China

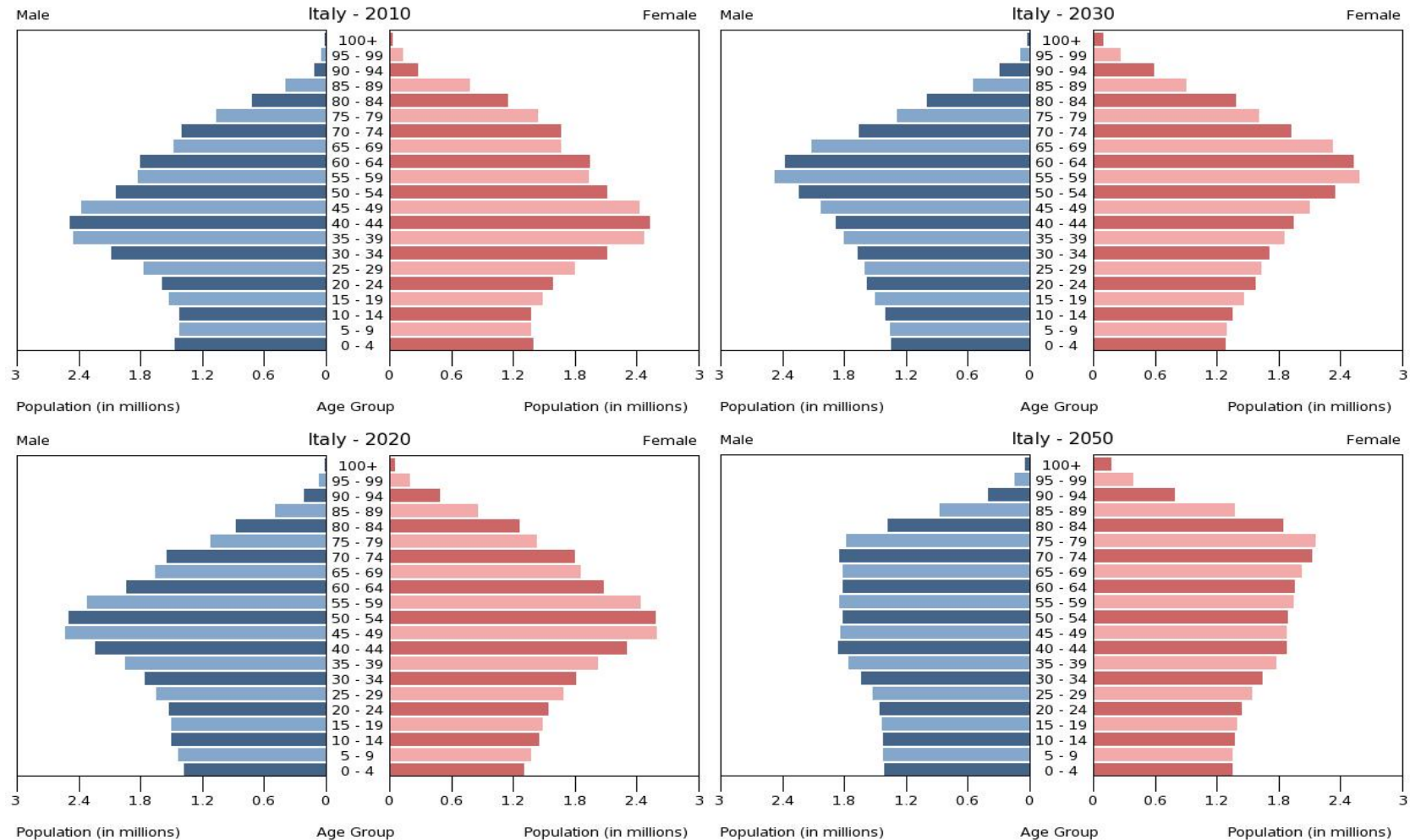


Japan

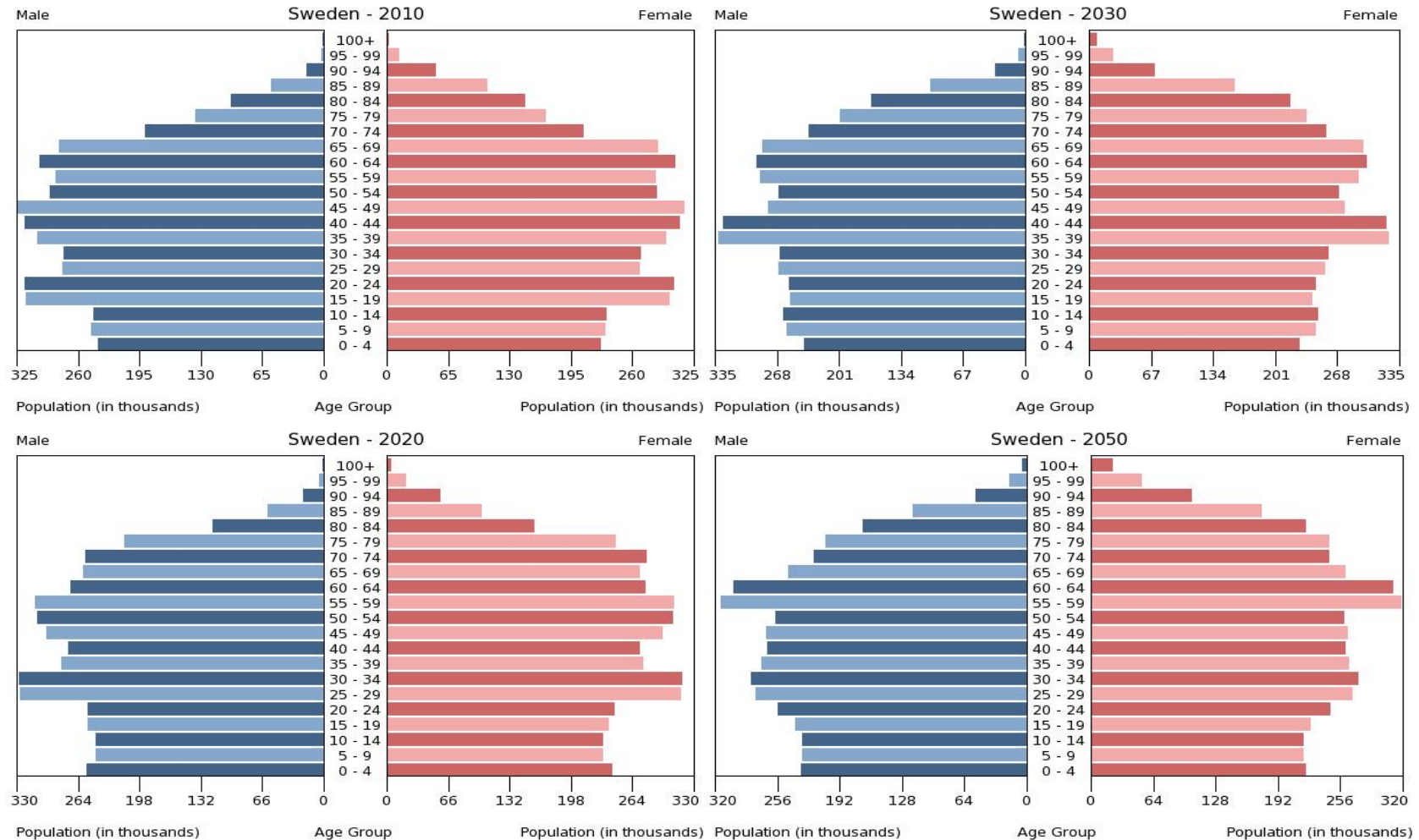


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Italy



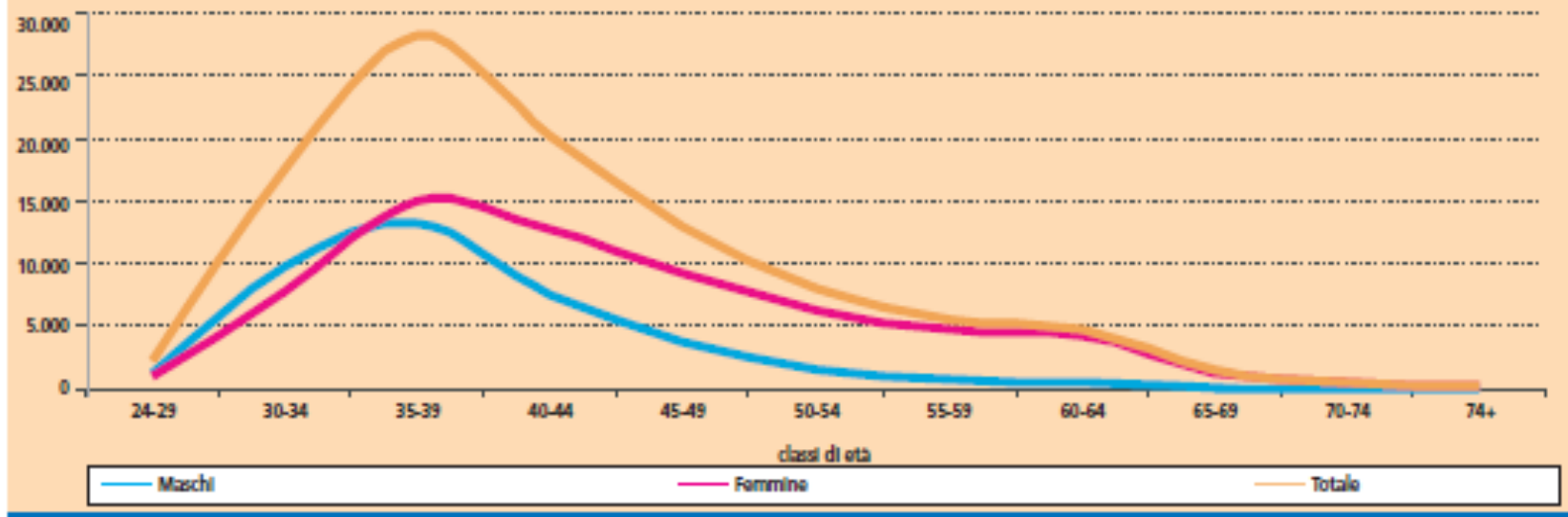
Sweden



Example 1

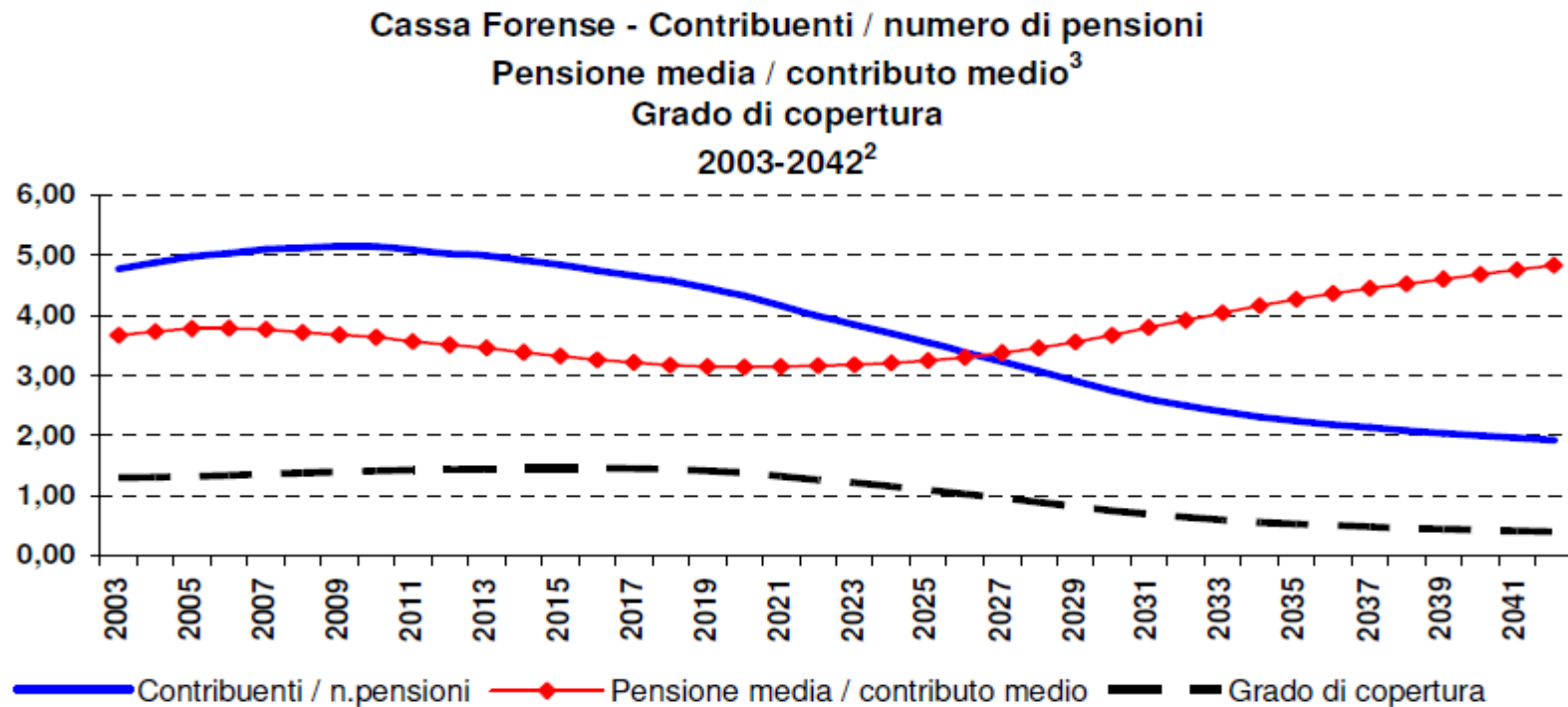
Grafico 1

Distribuzione per classi di età degli avvocati iscritti alla Cassa Forense al 31/12/2004



Angrisani M., 2005. Considerazioni di un economista sulla necessaria riforma della previdenza forense. In: *La previdenza Forense*.

Example 1

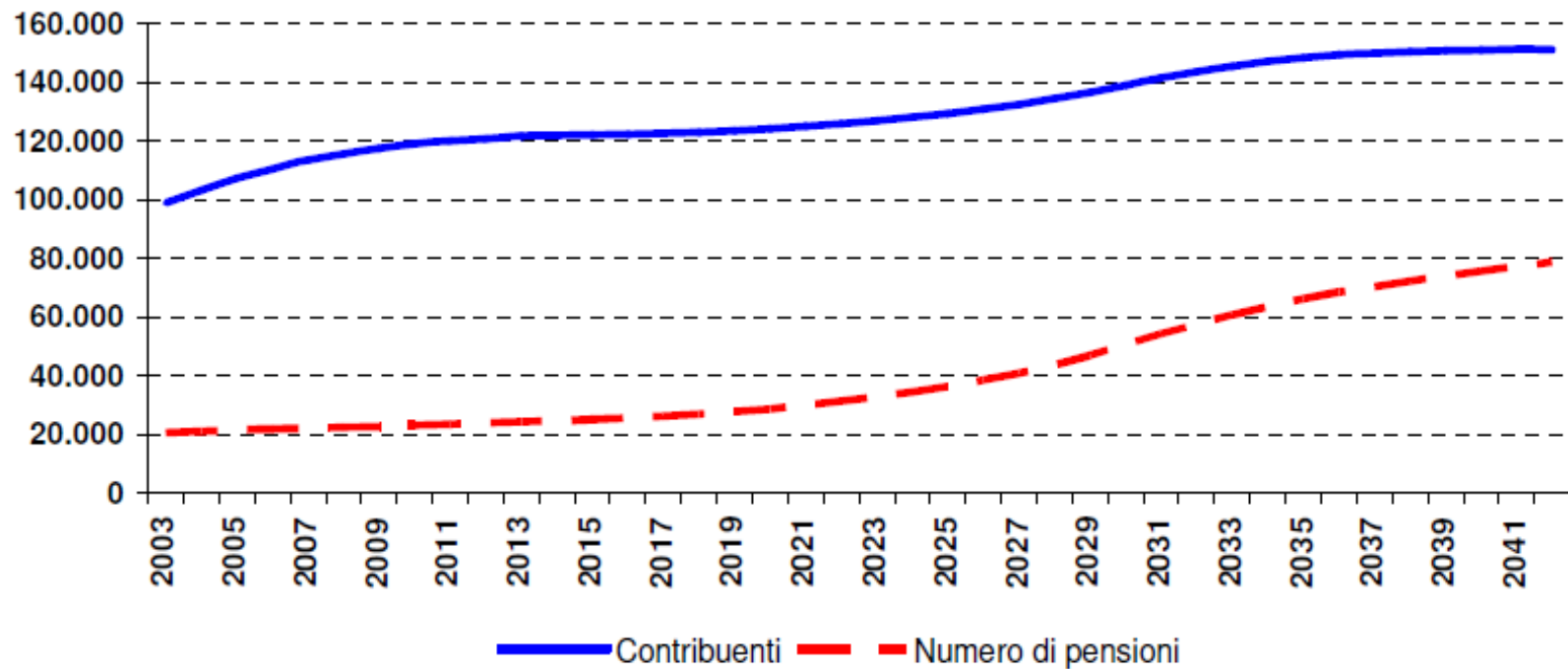


(2) = I dati relativi al periodo 2003-2042 sono tratti dal bilancio tecnico redatto al 31/12/2002

(3) = Tale rapporto fornisce un'indicazione, in termini medi, del numero di contribuenti necessari per "coprire" il costo di una pensione.

Example 1

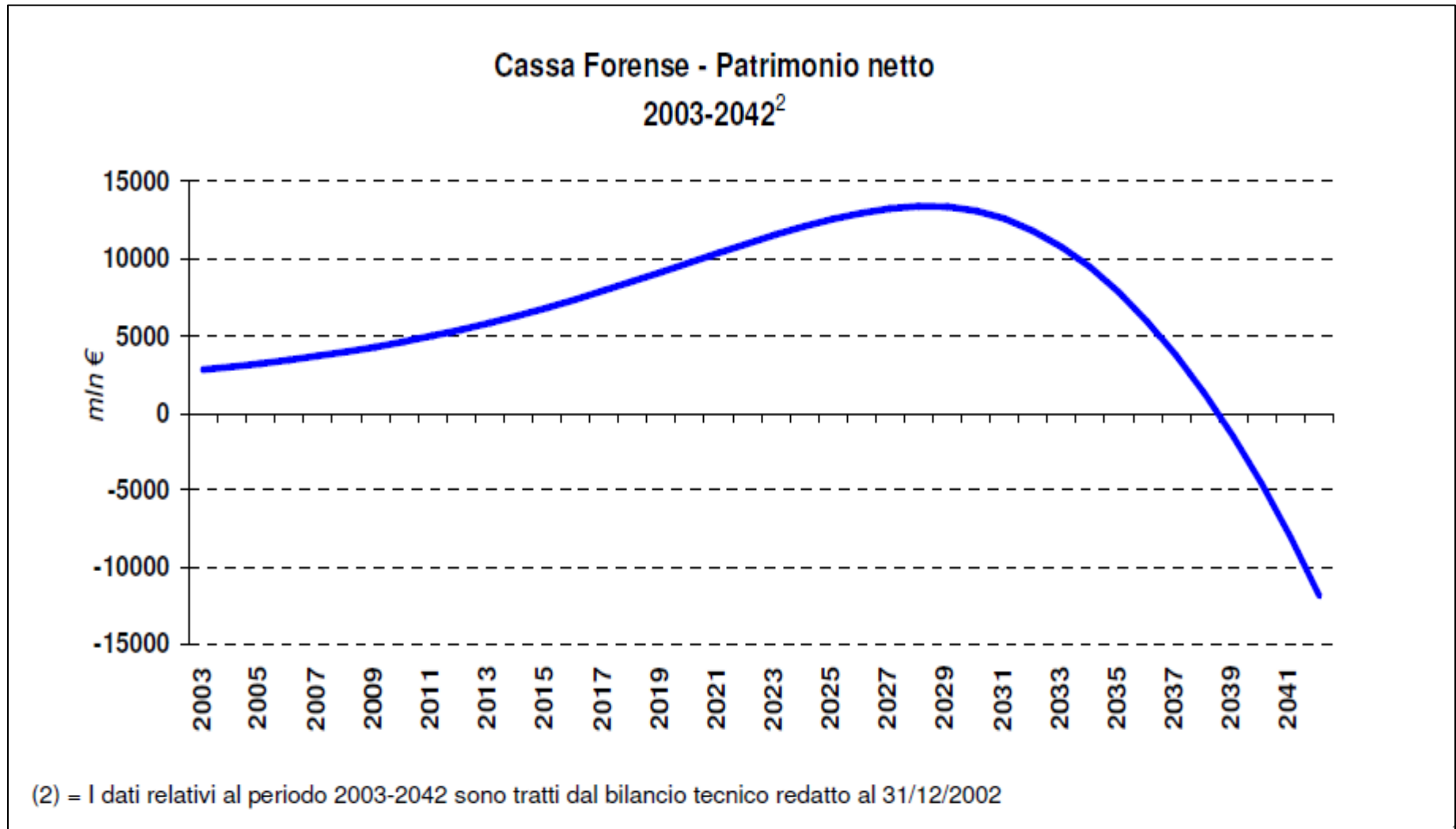
Cassa Forense - Contribuenti¹ e numero di pensioni
2003-2042²



(1) = Attivi + pensionati contribuenti.

(2) = I dati relativi al periodo 2003-2042 sono tratti dal bilancio tecnico redatto al 31/12/2002

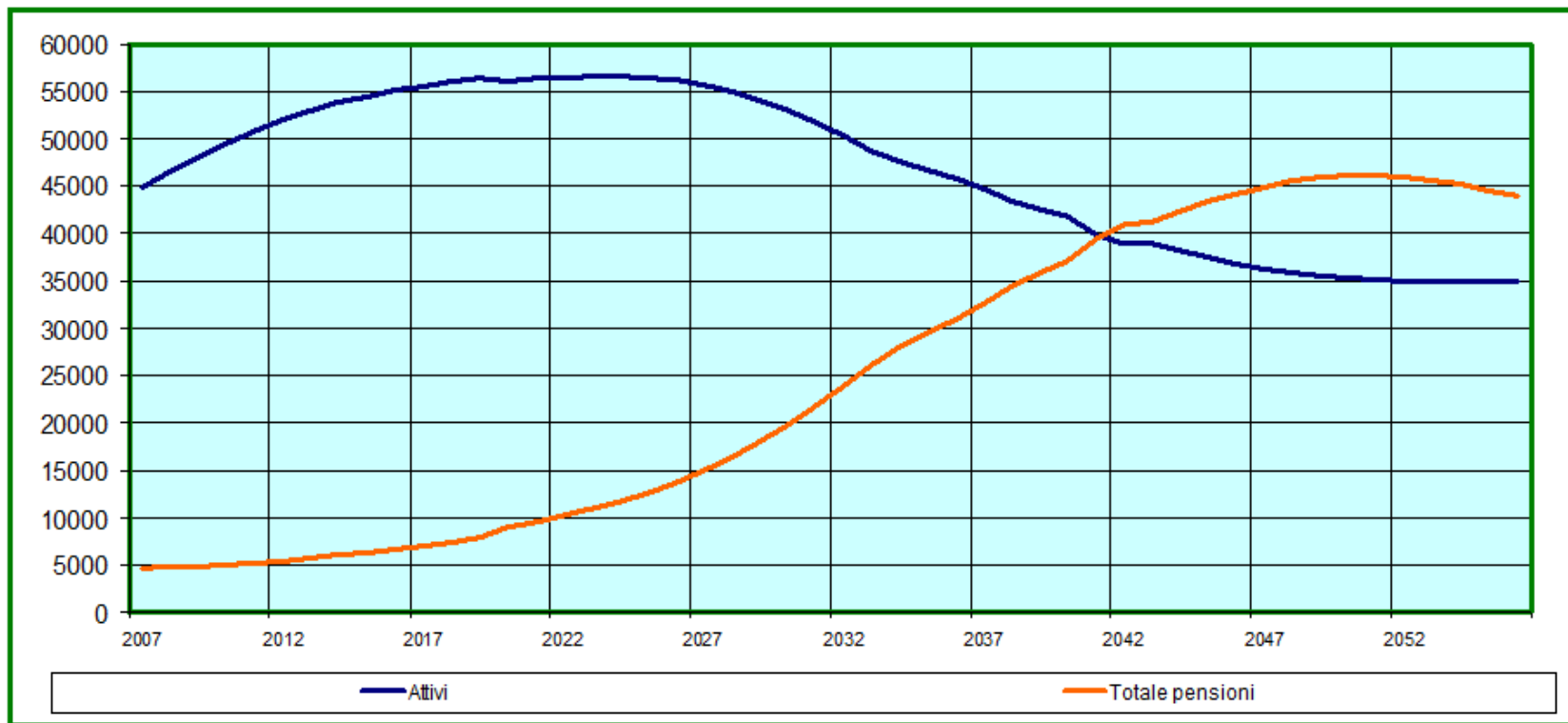
Example 1



Example 2

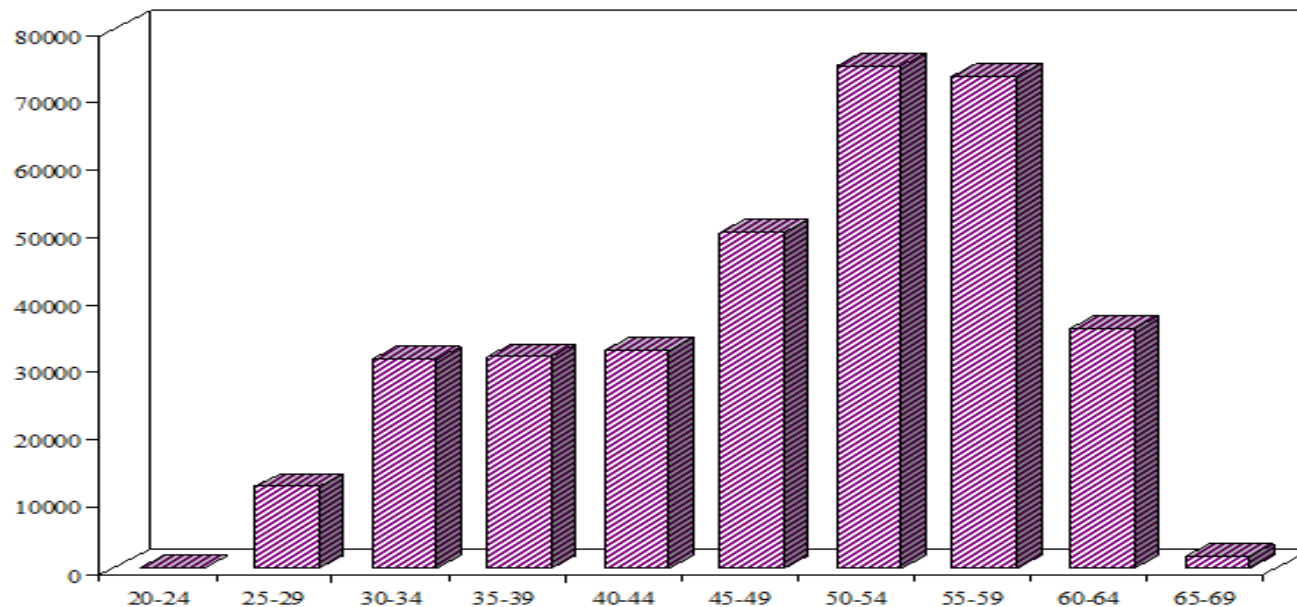
Cassa Nazionale di Previdenza e Assistenza a favore dei Dottori Commercialisti
Proiezioni: 2007 - 2056

GRAFICO 5: NUMEROSITÀ ATTIVI NON PENSIONATI E PENSIONATI (PROIEZIONE SPECIFICA)



Example 3

FONDAZIONE E.N.P.A.M.
ENTE NAZIONALE DI PREVIDENZA ED ASSISTENZA MEDICI
DISTRIBUZIONE PER CLASSI DI ETÀ DEGLI ATTIVI ISCRITTI AL FONDO
AL 31.12.2009



Relazione sul Bilancio Tecnico al 31.12.2009 (pubblicato in G.U. n. 31 del 6.2.2008)

The Italian pension system

The Italian multi-pillar pension system

I° Pillar

Basic Public Pension

Main features:

- Unfunded PAYG system
- NDC scheme
(except for the professionals category)
- Mandatory
- Financing:
 - *Employee/employer contributions*
- Covers all categories of workers
- Goal: provide a basic public pension of old-age, disability, survivor

II° Pillar

Complementary Pension

Main features:

- Funded system
- Occupational scheme:
 - *Contractual Pension Funds;*
 - *Open Pension Funds*
- “Mandatory”
- Financing:
 - *Servance pay “TFR”*
 - *Employee/employer contributions*
- Goal: complementary life annuity to integrate the lower public pensions of the new retirees

III° Pillar

Supplementary Pension

Main features:

- Funded system
- Individual scheme:
 - *Open Pension Funds*
 - *Life insurance products*
- Voluntary
- Financing:
 - *Employee contributions*
- Goal: constitute an additional annuity

Focus on the Italian PAYG-NDC system

The 1995 Dini Reform replaced gradually the previous *earnings-based* scheme with the actual *contributions-based* scheme

The Italy's PAYG system is totally unfunded and unbalanced

No structural fund is provided

- *Contributions are paid into individual notional accounts*

The contributions amount virtually accumulated in each individual notional account is revaluated, every year, by an opportune rate of return

- *Pension benefits are linked to contributions*

At the retirement the notional credit is transformed in life annuity (individual actuarial fairness) multiplying for a transformation coefficient specific for the age at the retirement

Focus on the Italian PAYG-NDC system

Pre-retirement phase

▪ Contribution rate

- Employed workers 33% (employees 9,19%)
- Self-employed worker 20%
- Atypical worker 24%

▪ Pensionable earnings

Career contributions capitalized at the last five year average of the GDP growth rate (not the contributions base growth rate)

Retirement phase

▪ Eligibility requirements

- Minimum contribution period of 20 years
- Retirement is possible between 66 and 70 (at least 67 as of 2021)
- An automatic adjustment mechanism is provided to link the age of retirement with the increases in life expectancy

▪ Pension benefit

- At retirement the individual's pension amount is converted in life annuity by means of a transformation coefficient, which depends on survival probabilities updated at the retirement and which also includes an assumed rate equal to 1.5% (based on the average trend of contribution base growth rate)
- Pension benefits are indexed only to prices

Focus on the Italian PAYG-NDC system

The Italian mandatory pension system's financial position is not in equilibrium.

Relevant public transfers cover the gap between contributions and benefits.

The Italian mandatory pension system is not self-contained.

INPS*	2012
Contribution revenue	195.755 mln €
Pension benefits	247.385 mln €
Financial position	- 51.630 mln €
Coverage degree	79.13 %

Source: *INPS is the largest Italian social security institution, covers about 95% of contributors

Main causes:

- *Early retirement phenomenon (baby pensioners)*
- *Pension benefits too high and unbalanced (with replacement rates equal to 80%) due to the previous earnings-based scheme too generous and due to a phenomenon of "illusion of financial wealth" caused by the economic and demographic boom of the 60s and 70s*

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Focus on the Italian PAYG-NDC system

To cope with this financial imbalance, in the last 20 years have been made at least 15 interventions on the system (improperly called "reforms" given their tendency contingency) which have not tackled in a structural and long-term perspective the problem of imbalance.

Main interventions:

- *Cuts and suspension of the CPI pension benefits indexation*
- *Systematic raising of the retirement eligibility*
- *Contribution rates raising*
- *Imposition of solidarity contributions*

A short-term orientation was adopted both in its meaning "cash" in the sense of spending cuts and revenue increases, and in its meaning "political" in the sense of using social security as a means to broaden the electorate.

Focus on the Italian PAYG-NDC system

The only real structural reform adopted in Italy in the last 20 years is the 1995 Dini Reform which replaced gradually the previous *earning-based* scheme with the actual *contribution-based* scheme

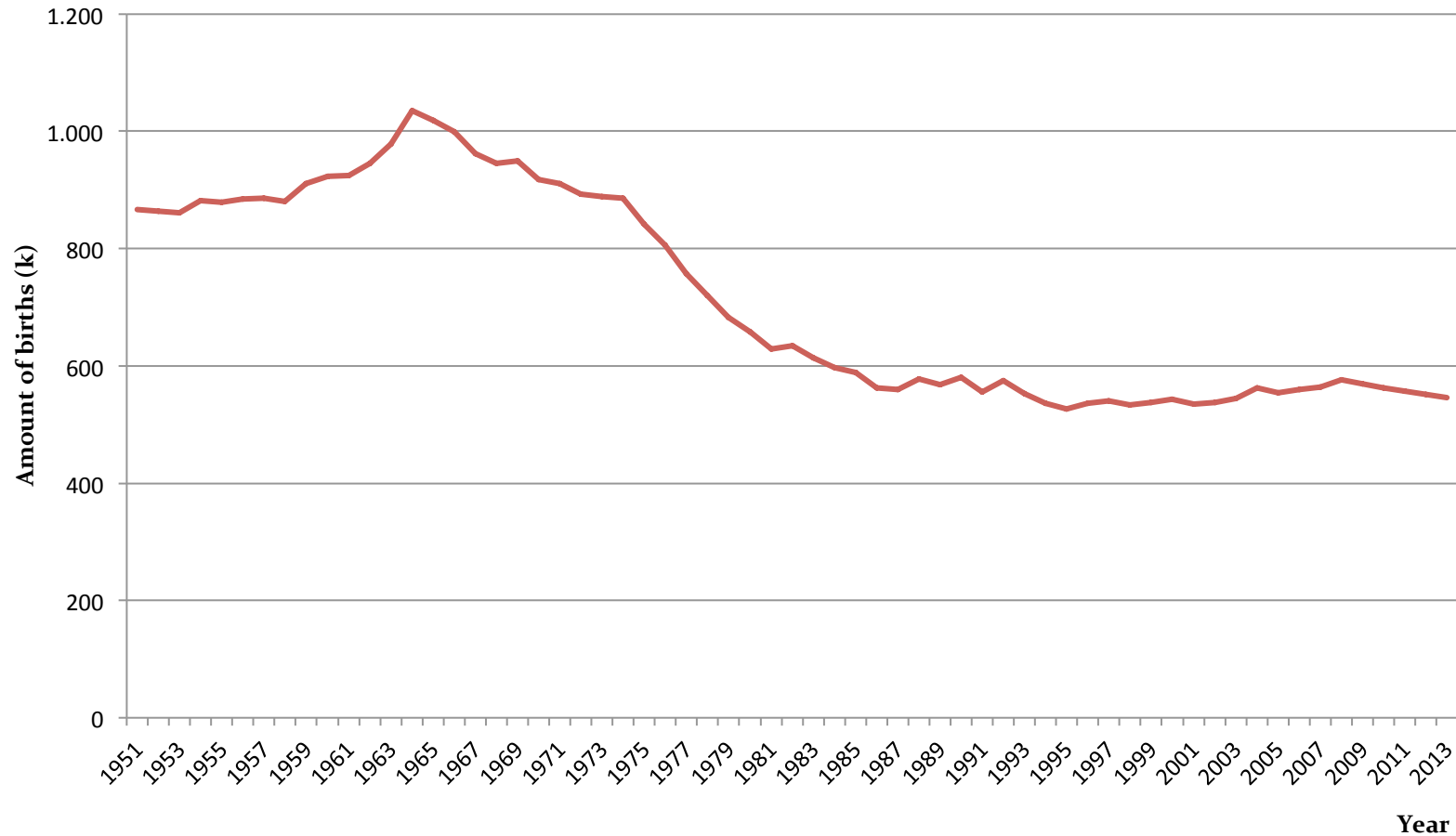
The last intervention on the Italian pension system (Law no. 214/2011) has only extended the *contribution-based* scheme to all worker as of 2012

However, the full transition to the *contribution-based* scheme does not solve the Italian pension system's problems of financial imbalance and fairness because the system:

- *has currently to drain the promised debt for the defined-benefit pensions*
- *will have successively to pay for the baby boomers' defined contribution pensions*

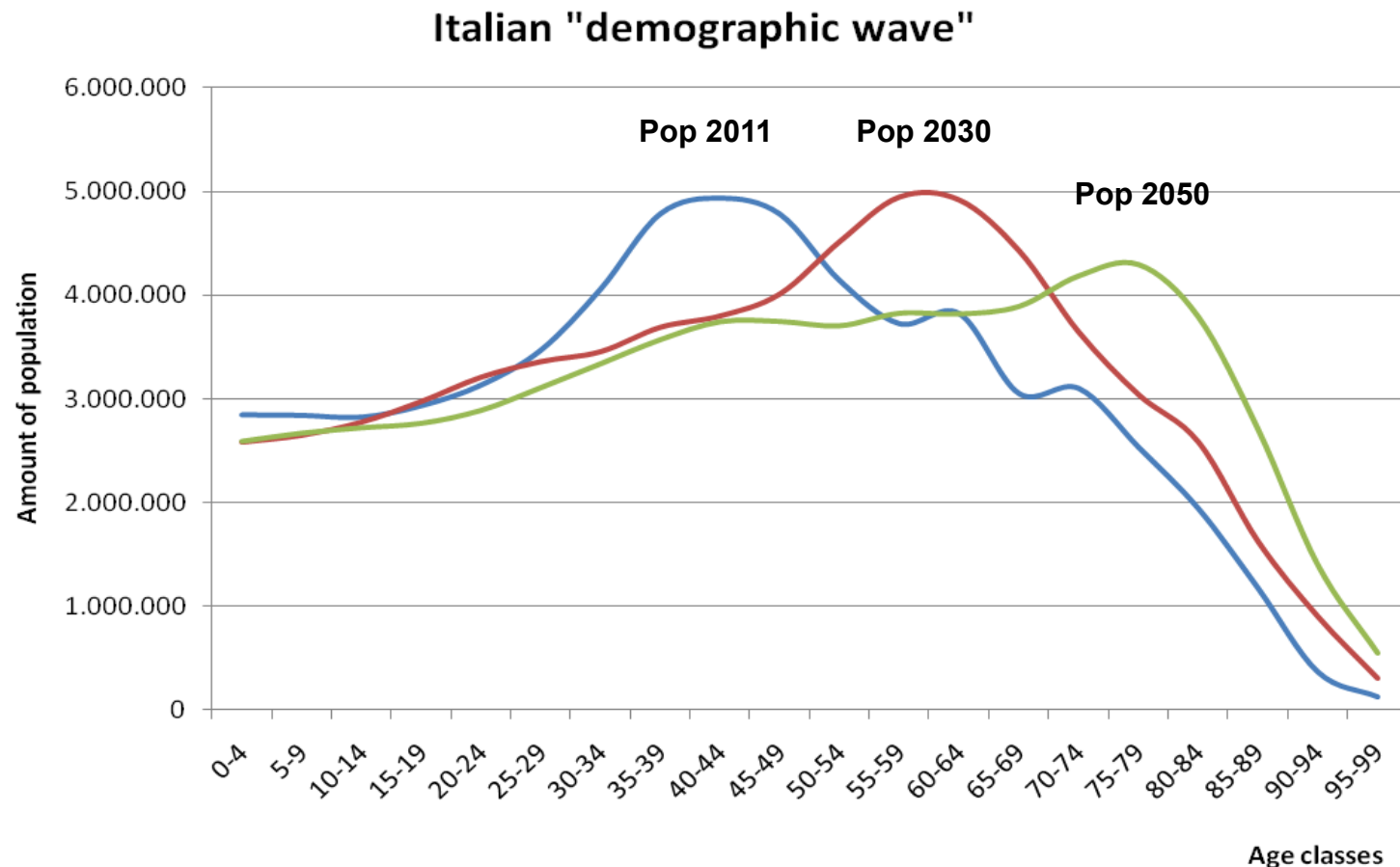
Italian demographic trends

Trend of births 1953-2013



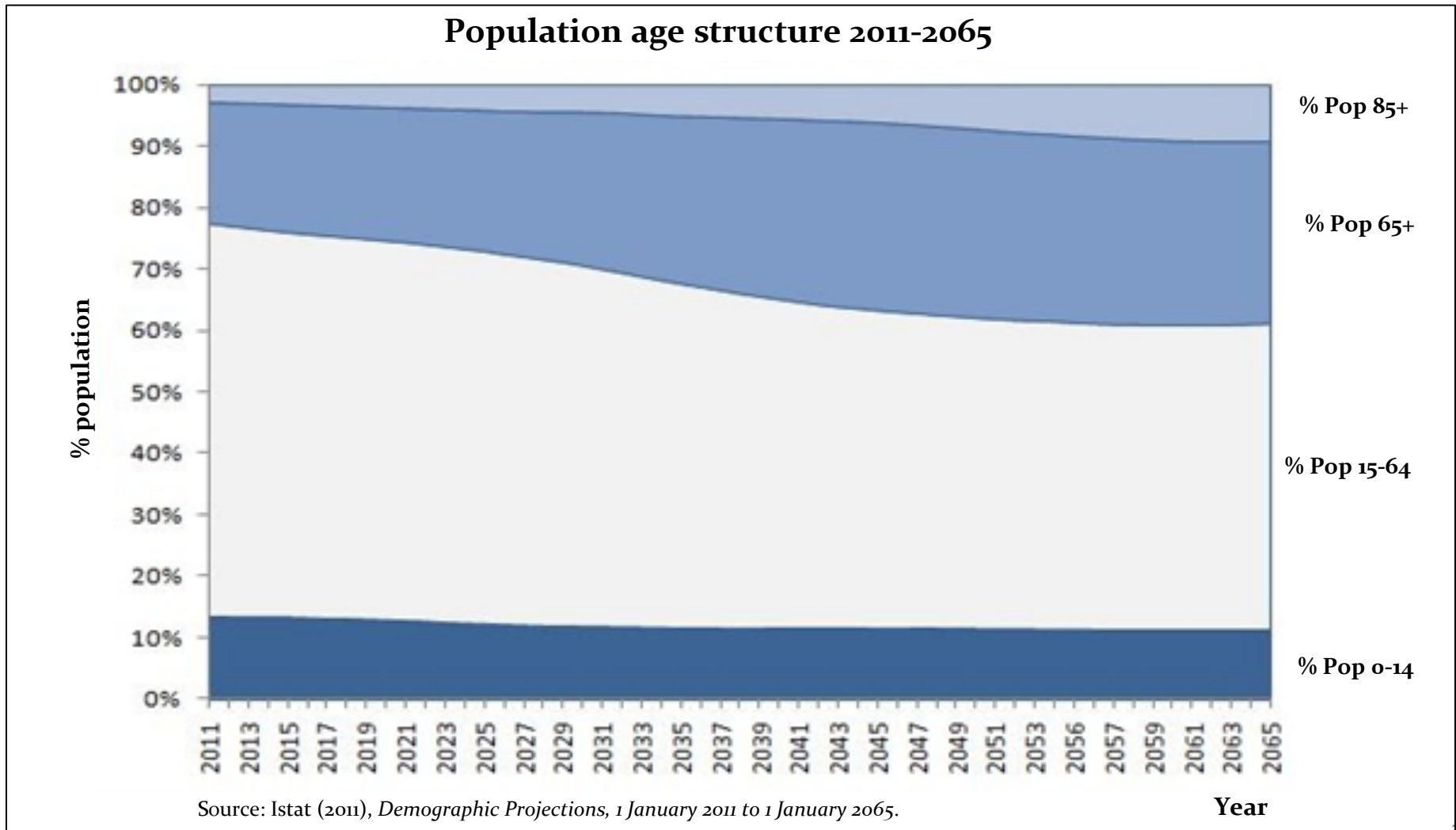
Source: Istat (2011), *Demographic Projections, 1 January 2011 to 1 January 2065*.

Italian demographic trends



Source: Angrisani M. et al., (2001), *Pensioni: necessità di una riforma* (ch.3), Ed. Ideazione (update on the Istat (2011), Demographic Projections, 1 January 2011 to 1 January 2065)

Italian demographic trends



Italian macroeconomic trends

All this must be seen in the National macroeconomic context with a relevant public debt (2.135 mln € in 2014 – 132,1% of GDP) and a GDP decline rate equal to 2,4% in 2012.

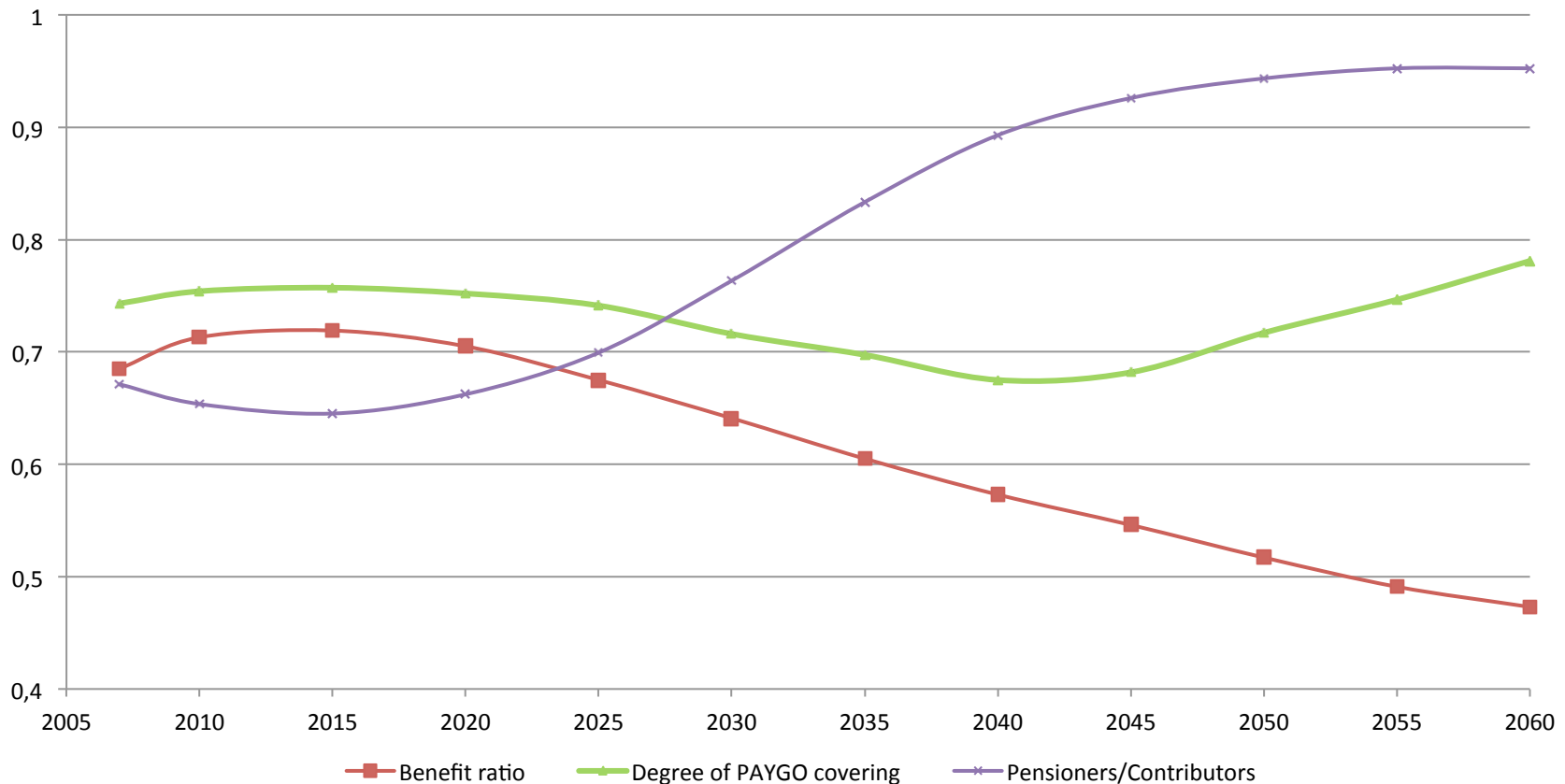
Macroeconomic trends	2013	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Employment (growth rate)	-0.2	0.1	1.2	0.5	0.1	-0.1	-0.3	-0.2	0	0	0
Potential GDP (growth rate)	-0.4	0.1	1.3	1.1	1.3	1.6	1.5	1.5	1.6	1.6	1.5
GDP in 2013 prices (mln €)	1560	1558.1	1628.2	1726.5	1831.9	1973.2	2132.6	2295.2	2485.2	2693.8	2908.3

Source: DG ECFIN, AWG, (2014), The 2015 Ageing Report: Underlying assumptions and Projection Methodologies, European Commission

Under pension system profile, this means:

- *Smaller number of employed workers*
- *Lower amount of contributions*
- *Lower rate of return on the retirement savings*

Sustainability? Intergenerational equity?



Benefit ratio = the ratio of the average pension to the average wage

Degree of PAYGO covering = the ratio of contributions to the pension expenditure

Source: DG ECFIN, AWG, (2009), *Ageing Report: Economic and budgetary projections for the EU-27 Member States (2008-2060)*, European Communities
Di Palo C., (2011), *The demographic challenge on pension systems: empirical results from Italy*, Review of Applied Socio-Economic Research

Basic concepts for a reform proposal

Aiming to the intergenerational equity and the sustainability of the present and future Italian pension system, our proposal is based on the *Separation Theorem* and consists in:

- *Structuring the mandatory pension system in two components, the Pivot (unfunded) and the Auxiliary (funded) pension systems, which recognize the same rate of return*
- *Recognizing the rate of return according to the rule in the Separation Theorem*
- *Using the Public Property to constitute the missing part of the Funded component*

The Swedish pension system

Reform's reasons of the old Swedish pension system model

Main issue

“... With the pension reform, however, portions of the old system have been removed and reshaped. To come to the realization that the old national pension plan (ATP) had developed serious flaws harmful to the individual and to society, and needed redesigning in certain fundamental aspects, was a difficult and sometimes painful process...”

Reform's reasons of the old Swedish pension system model

Main issue

The Swedish pension system has to be financed according to the PAYGO scheme. In fact, the ATP system had one of the largest reserve for a public pension system, but this reserve was insufficient to put the pension system in a financing scheme different substantially from the PAYGO one.

The ATP system is a defined-benefit pension system and, hence, it is “not manageable” in a “logical manner” according to the PAYGO financing scheme as it is possible in a defined-contribution pension system.

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Solution inspired to the Aaron's theorem [1]

Transition from the ATP system to the Notional Defined Contribution system which is a defined-contribution system “potentially logically manageable” in a PAYGO financing scheme.

[1] Aaron H., (1966), *The Social Insurance Paradox*, Canadian Journal of Economics, vol.32, pp.371-74.

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Solution inspired to the Aaron's theorem “via” Steady State hypothesis

Aaron's theorem

A pension system can work without reserves and hence according to the PAYGO scheme if it recognizes to its liability the rate of return given by
“... the sum of the rates of growth of population and real wages...” [1]

The Aaron's theorem “can be applied” if the pension system is defined contribution type and in Steady State situation,
which “is a demographic-economic static equilibrium condition”.

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Solution inspired to the Aaron's theorem “via” Steady State hypothesis

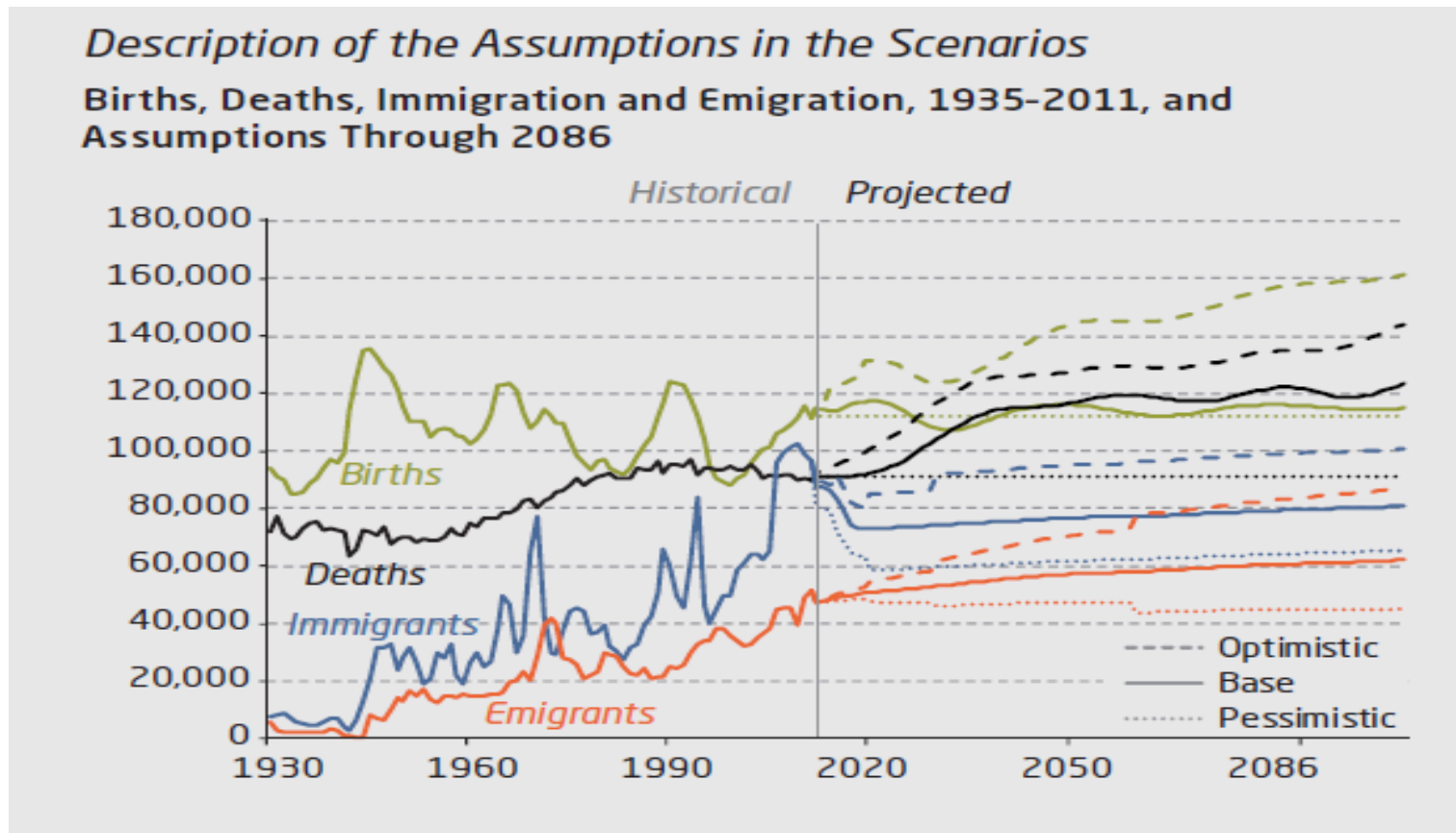
The new Swedish pension system “must be” in Steady State condition. The Steady State equilibrium is, “hence”, based on the effective demographic equilibrium.

The demographic situation of the Swedish population was not and is not in “demographic equilibrium” due to few births.

*Solution of the “demographic equilibrium” issue:
increasing births and using immigration.*

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Solution inspired to the Aaron's theorem "via" Steady State hypothesis



Source: Orange Report 2011

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The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Solution inspired to the Aaron's theorem "via" Steady State hypothesis



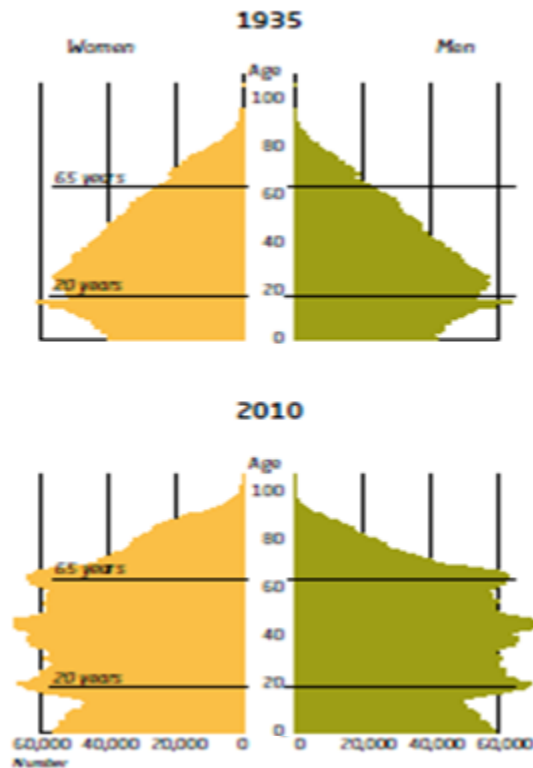
Source: Orange Report 2011

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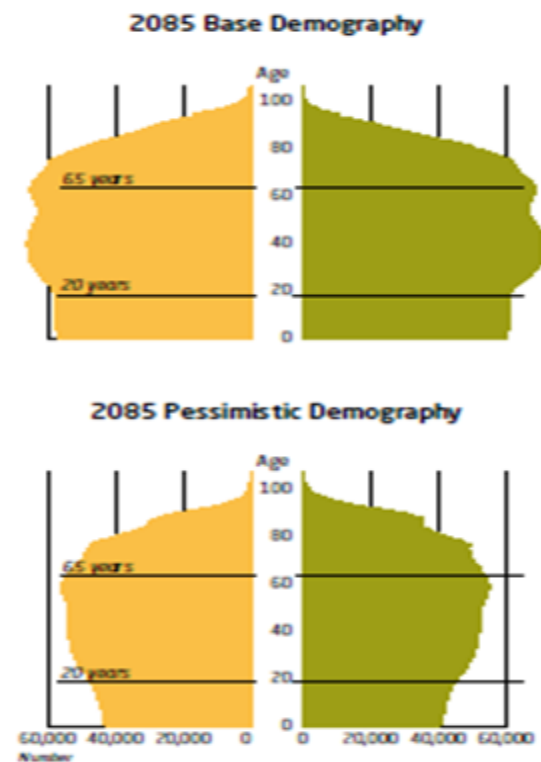
The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Solution inspired to the Aaron's theorem "via" Steady State hypothesis

Population 75 years ago, at present



Population in 75 years



Source: Statistics Sweden (SCB)

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Specific conceptual aspects

“... The vital issue of fairness between generations is managed through the “full package” - the fixed contribution rate, average income as the basis for compounding in the system, adjustment of pension levels to changes in average life span before age 65, absence of any adjustment thereafter, the buffer fund, and automatic balancing.

“No creation of safety margin”

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Specific conceptual aspects

The rate of return of the new pension system

“... The interest on the inkomstpension account is normally determined by the growth in average income. Average income is measured by the income index...”

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Specific conceptual aspects - The rate of return of the new pension system

Remark

The indexation made by the Swedish system aims at “saving” the growth rate of labor force under the assumption the number of workers is increasing, as it is assumed in the optimistic and base scenario of the Orange Report.

In this way, the system is oriented to facilitate the re-equilibrium of pension expenditure, for which a current deficit is expected in the next thirty/forty years according to the considered scenario.

Under the assumption that the number of workers decreases, as it is assumed in the pessimistic scenario of the Orange Report and as it is plausible considering the current economic and demographic situation, the recognizing of the growth rate of average wage would be too high.

Hence, it would aggravates the disequilibrium of the current pension expenditure in the next decades, instead favorites it.

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

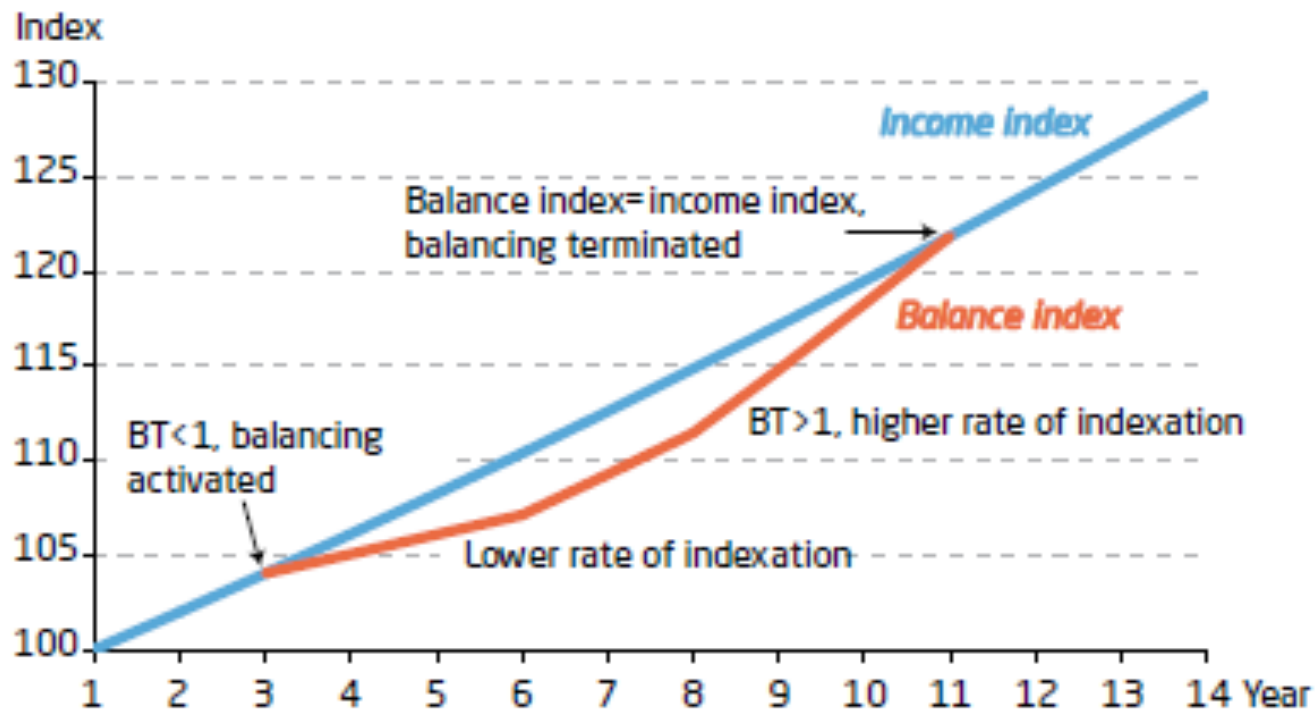
Specific conceptual aspects

Balance Ratio and Balancing

“... Under certain demographic and economic conditions, it is not possible to earn interest on the inkomstpension account and the inkomstpension at a rate equal to the growth in average income and at the same time to finance payments of the inkomstpension with a fixed contribution. In order to maintain the contribution rate at 16 percent, income indexation must be suspended in such a situation. This is done by activation of balancing...”

The inspiring principles and specific conceptual aspects of the new Swedish pension system model

Specific conceptual aspects - Balance Ratio and Balance Mechanism



Source: Orange Report 2010

Close attention on...

Specifically, under the light of the logical sustainability model we analyse the Swedish pension system and its sustainability indicator, the balance ratio, regarding to the following aspects:

The role of the Buffer Fund

The rate of return on the pension liability

The role of the Buffer Fund

As indicated in the Orange Report 2001 p.61, the Buffer Fund has to

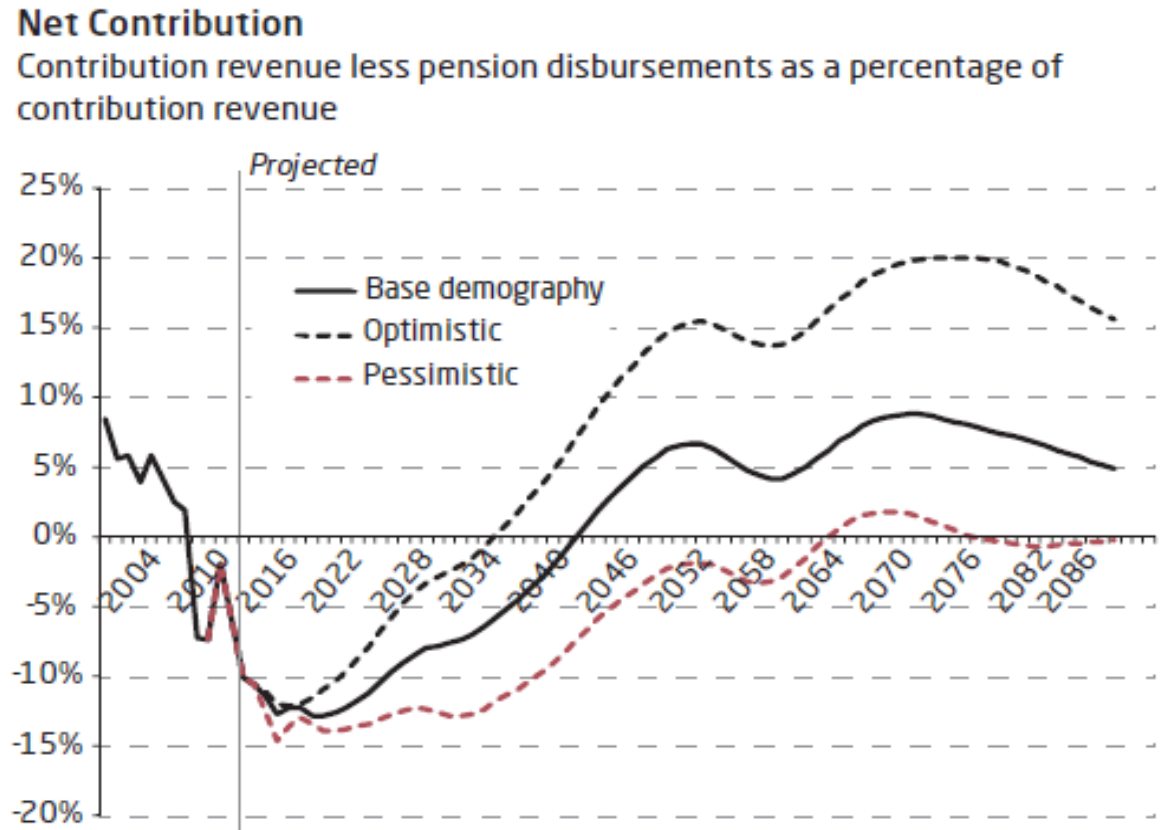
“...absorbs INTERPERIOD DISCREPANCIES between pension contributions and pension expenditure in a pay-as-you-go system. The primary purpose of the buffer fund is to stabilize pension levels and/or pension contributions in relation to economic and demographic fluctuations...”

Starting from 2005, the “economic and demographic fluctuations” are indicated as “variations”

The role of the Buffer Fund

Fluctuations
Or
Structural
disequilibrium?

We take into account
the Net Contribution
estimated in three
different scenarios of
projections



Source: Orange Report 2011

The role of the Buffer Fund

The main role of the buffer fund

appears to be not only the “coverage” of fluctuations

but

consists in directly paying a part of the pension expenditure,

that is in covering a part of the pension liability

The buffer fund can be assimilated to the differential reserve [2] for structural phenomenon of unbalancing between contributions and benefits, as it occurs in the case of demographic and economic waves flowing into the system.

[2] Angrisani M., (2006), *Funded and unfunded systems: two ends of the same stick*, Paper presented at the 28th International Congress of Actuaries, 28 May - 2 June, 2006, Paris, France

The role of the Buffer Fund

The buffer fund

is used to directly pay a part of the pension expenditure

but

*the rate of return on the buffer fund is not used in the computation of
the rate of return on the pension liability*

$\beta(t)$ *can not be directly controlled*

The $\beta(t)$ definition

$$\beta(t) = \frac{L^T(t) - F(t)}{W(t)}$$

where

$L^T(t)$ is the total pension liability

$F(t)$ is the pension system fund

$W(t)$ is the instantaneous flow of wages

First consequence

Let us take into account the sustainability condition of the Swedish pension system provided by the comparison of the balance ratio with number 1:

$$BR(t) = \frac{\alpha W(t)Td(t) + F(t)}{L^r(t)} \geq 1$$

It is equivalent to

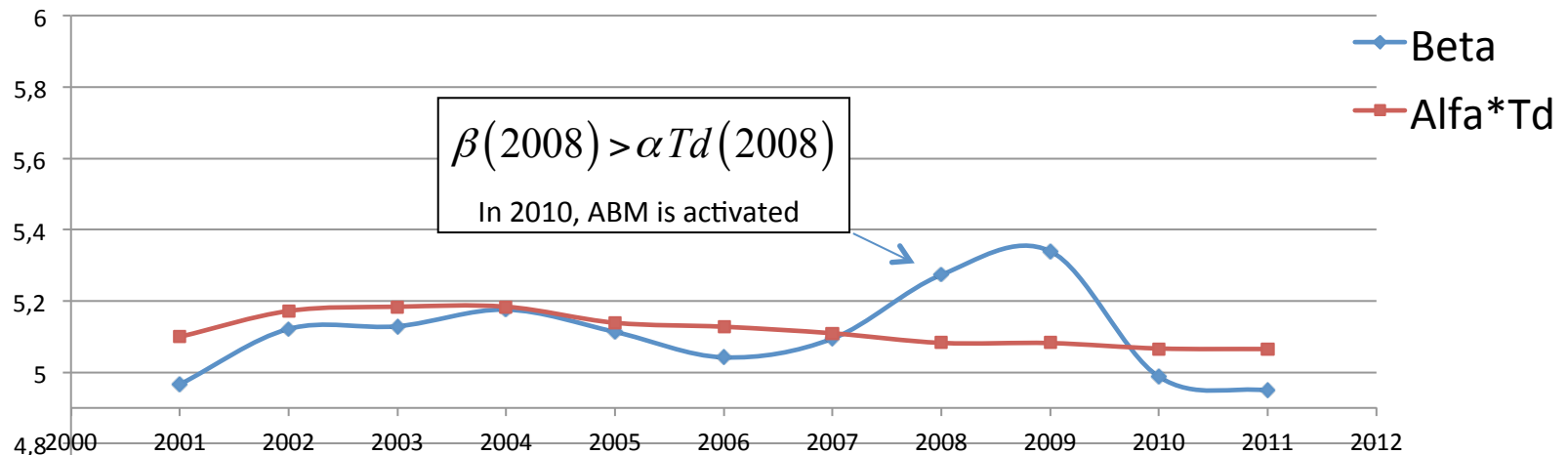
$$\alpha \geq \frac{L^r(t) - F(t)}{W(t)} \cdot \frac{1}{Td(t)} = \frac{\beta(t)}{Td(t)}$$

$$\beta(t) \leq \alpha Td(t)$$

The application of the rule of the weighted average allows to block the value of $\beta(t)$

$\beta(t)$ can not be directly controlled
but

it must be adjusted “a posteriori” by the automatic balance mechanism

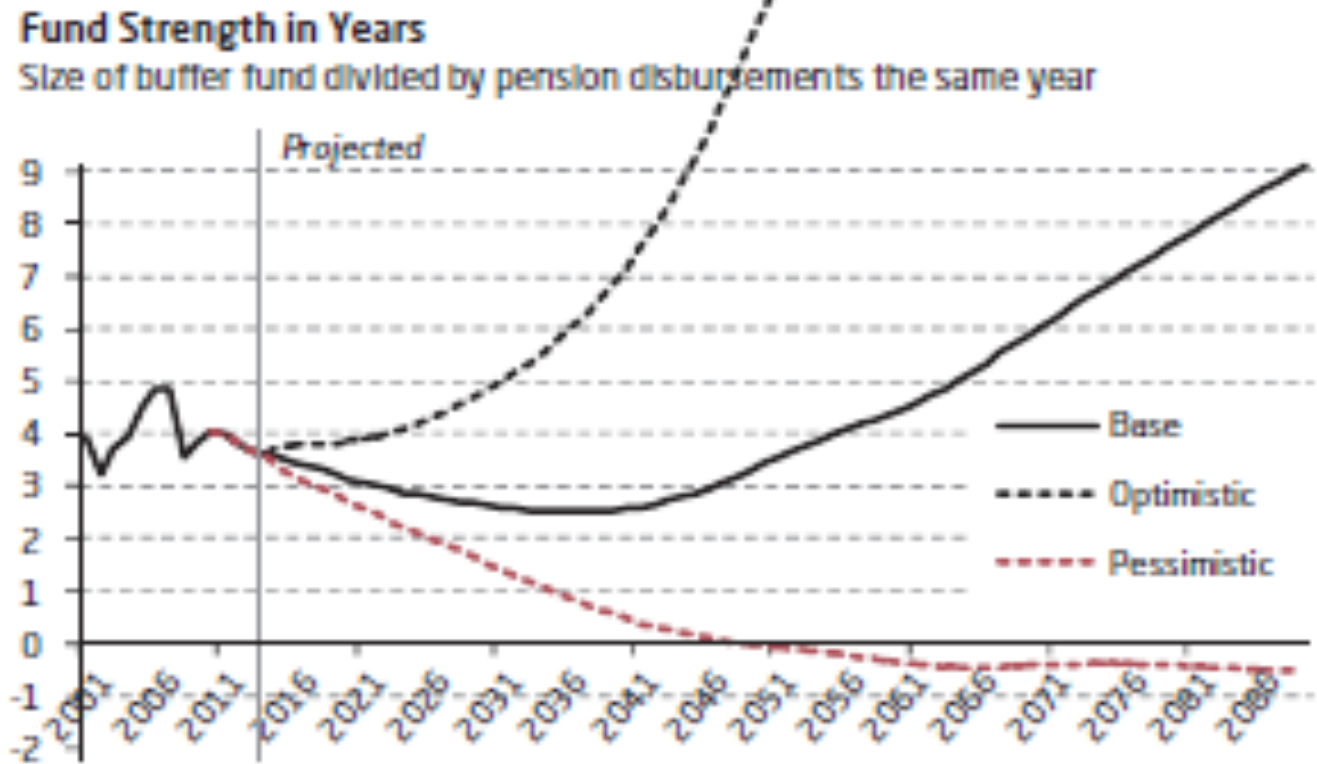


Data Source: Orange Report 2001-2011

Second consequence

If $\beta(t)$ is not blocked, the pension system, which is projected in a stabilization phase in the base and optimistic scenario, recapitalizes itself instead of redistributing the returns on the buffer fund to the system's participants

We look at the Fund Strength, as is projected in the base and optimistic scenario.



Source Orange Report 2011

A related question

Is it reasonable that all the immigrants are inserted in the pension collectivity without taking into account working instability and eventual lower productivity?

A possible answer:

the separation theorem

M. Angrisani, C. Di Palo 2014. *Managing the baby boomer demographic wave in defined contribution pension systems*. POLITICA ECONOMICA (ISSN:1120-9496) 51- 72

The immigrants with features of working instability and/or lower productivity have to be inserted in the Auxiliary Part of the pension system, which uses the same rules and recognizes the same rate of return of the Pivot Part of the pension system.

The logical sustainability model: the separation principle

The separation principle

Our approach moves away from the solution suggested in the existing literature and proposes a different principle (which we term the separation principle) and its related consequent theorem.

We thereby overcome the classical juxtaposition between the two alternative schemes of financial management, funded or PAYG.

The proposed separation principle asserts that:

it is necessary to fund all that is unmanageable according to the PAYG scheme.

The separation principle for controlling the demographic wave

In particular, with reference to the demographic wave problem, this principle implies that the group of individuals of the demographic wave has to be fully funded.

The first subsystem continues to receive the same number of new entrants with stable wage dynamics. Hence, this subsystem remains in a state of economic and demographic stability and is the natural continuation of the pre-existing stable pension system. We refer to this as the Pivot Pension System.

The second subsystem receives the demographic wave's individuals. We refer to this as the Auxiliary Pension System. This subsystem has to follow the fully-funded scheme. It becomes a closed group when it stops receiving new entrants, namely when the total number of new entrants goes back to the stability value, and it runs out when the last participant in the Auxiliary Pension System dies.

The separation theorem

Exemplification

The separation theorem

The DC Total Pension System is in a state of stable sustainability: it has a constant contribution rate; it recognises the rate of return on the pension liability according to the rule for the stabilization of indicator $\beta(t)$; and it has a constant ratio between pension liability and pension expenditure.

Let t_i be the time in T starting from which the demographic wave enters into the system and the Total Pension System is separated in the two subsystems, PPS_1 and APS_2 , which adopt the same constant contribution rate.

Furthermore, starting from t_i , it is assumed that:

[A1] *the instantaneous rate of return, or borrowing rate, on the fund and the wage growth rate are both constant, r and σ_1 , respectively and such that $r < \sigma_1$*

[A2] *the two sub-systems recognize the same rate of return on the pension liability according to the rule*

$$r_L(t) = rD_c(t) + \bar{\sigma}_1(1 - D_c(t))$$

[A3] *the instantaneous flow $F_2(t)(r - r_L(t))$*

named compensation flow, is transferred from PPS_1 to APS_2 .

The separation theorem

Then for each $t \geq t_i$

$[T_1]$ APS_2 is fully funded

$[T_2]$ $\beta_1^{\text{og}}(t) = 0$ and hence $\beta_1(t) = \overline{\beta}_1$ with $\overline{\beta}_1 = \beta_1(t_i)$

$[T_3]$ the degree of funding of PPS_1 cannot be definitively lower or higher than the degree of funding of \overline{SPS}_1 .

Exemplification of the demographic wave

First phase

Starting from the initial time, we assume

$$\alpha = 16\%, \quad r = 2.6\%, \quad g = 4.8\%, \quad r_L = 6.2\%$$

In our example, when the degree of funding of the pension liability funding falls below the 32% level, we apply the rule for the stabilization of $\beta(t)$.

Consequently, the level of the unfunded pension liability in relation to wages remains constant and equal to 3.977.

The pension system is sustainable without adjusting the contribution rate; the degree of funding of the pension liability stabilizes at a value of 9.504%.

Exemplification of the demographic wave

In our exemplification, we have the following assumptions.

- At time t_i , the number of the new entrants begins to increase in relation to the stability value, which is 1000 units per year;
- The number of new entrants has a constant yearly increase, equal to 400 units per annum, for the first five years, up to the value of 3000 units per annum. Then it remains constant over the following ten years; hence, it decreases yearly by a constant number, equal to 400 units per year, for another five years. The number of new entrants goes back to the stability value, which is 1000 units per year.

During the wave phase, the state of demographic stability of the pension system is interrupted.

Exemplification of the demographic wave

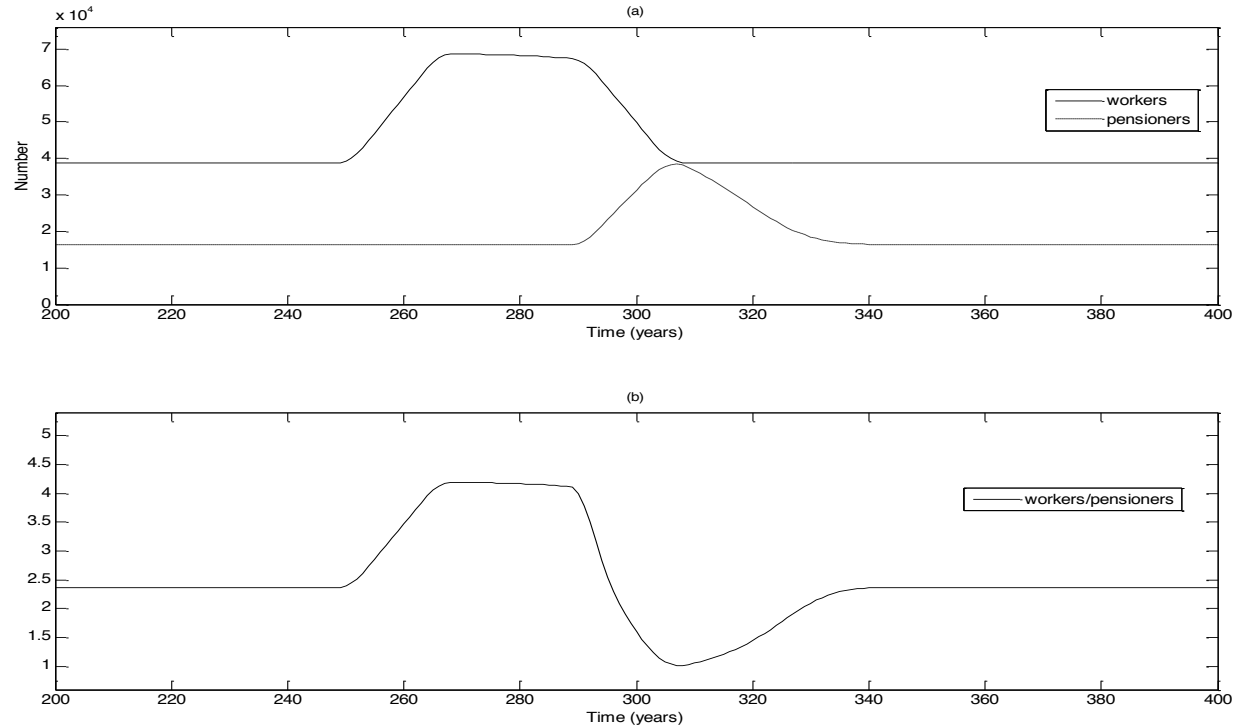


Figure 1: (a) Number of workers and pensioners (b) Worker-to-pensioner ratio.

Firstly, the number of workers and successively the number of pensioners are no longer stationary and the worker-to-pensioner ratio fluctuates compared to the stability value.

Exemplification of the demographic wave

Since it is assumed that $r < \bar{\sigma}_1$ and the degree of funding is stable at around 9.5% before the demographic wave commenced, then we can note that the total pension system proves to be sustainable

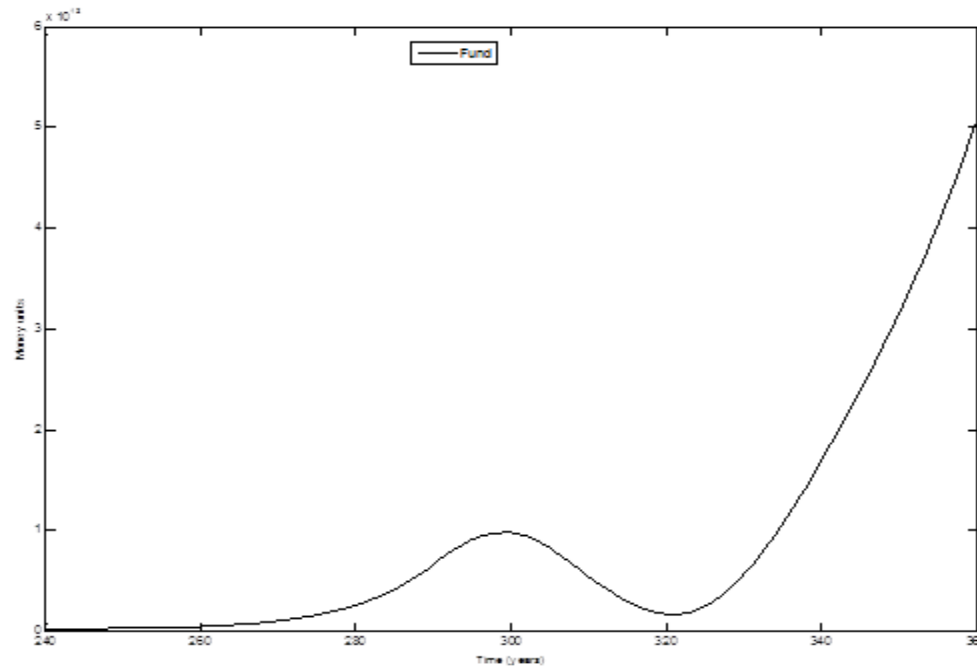
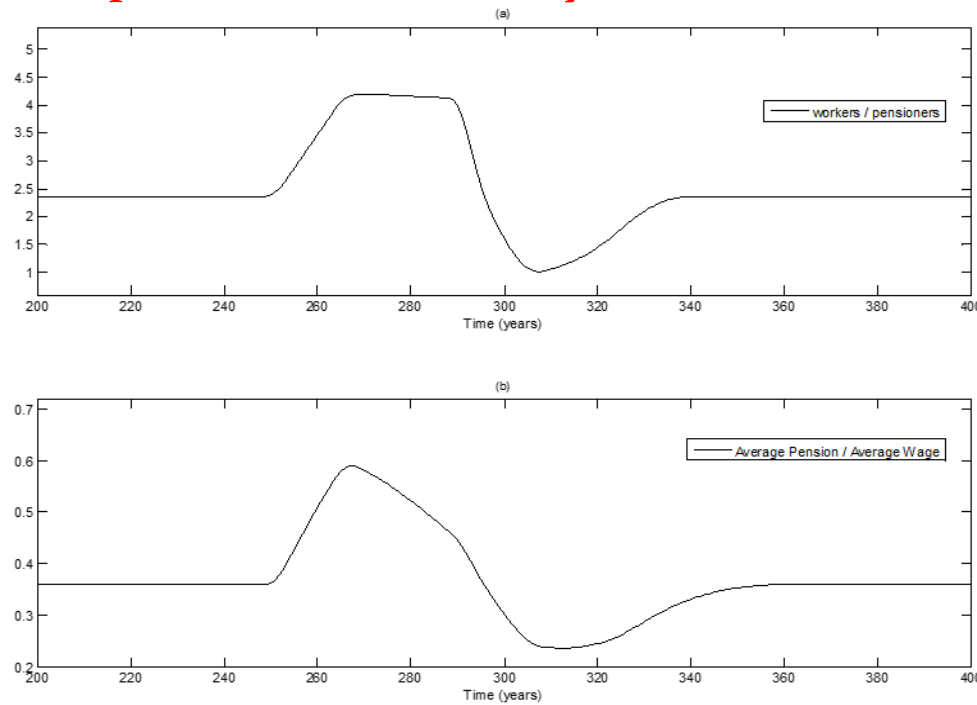


Figure 2: Fund dynamics when the $\beta(t)$ stabilisation rule is applied during the wave phase.

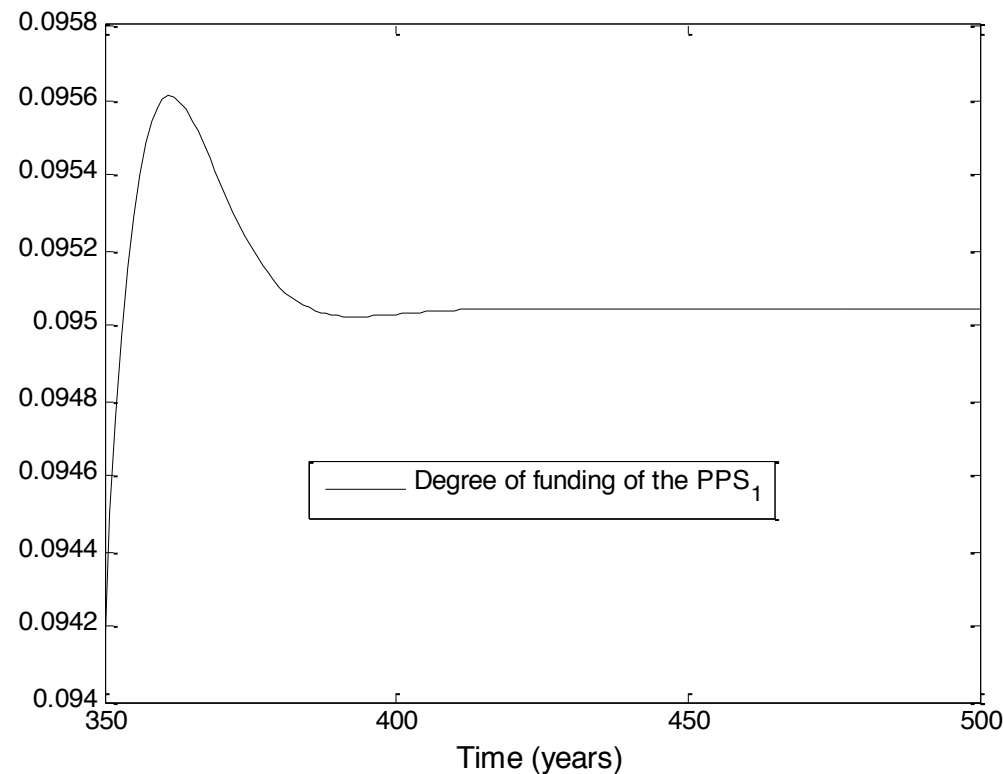
Exemplification of the demographic wave

However, the only application of the stabilization rule without separating the total population involves a relevant loss of intergenerational equity during the demographic wave. In fact, the **average-pension-to-average-wage ratio fluctuated greatly compared to the stability value.**



Exemplification of the demographic wave

The degree of funding of the Pivot system oscillates around the stability value of the degree of funding of the stable system.



Exemplification of the demographic wave

We note that the application of the Separation Theorem involves a greater observance of intergenerational equity with respect to the only application of the stabilization rule.

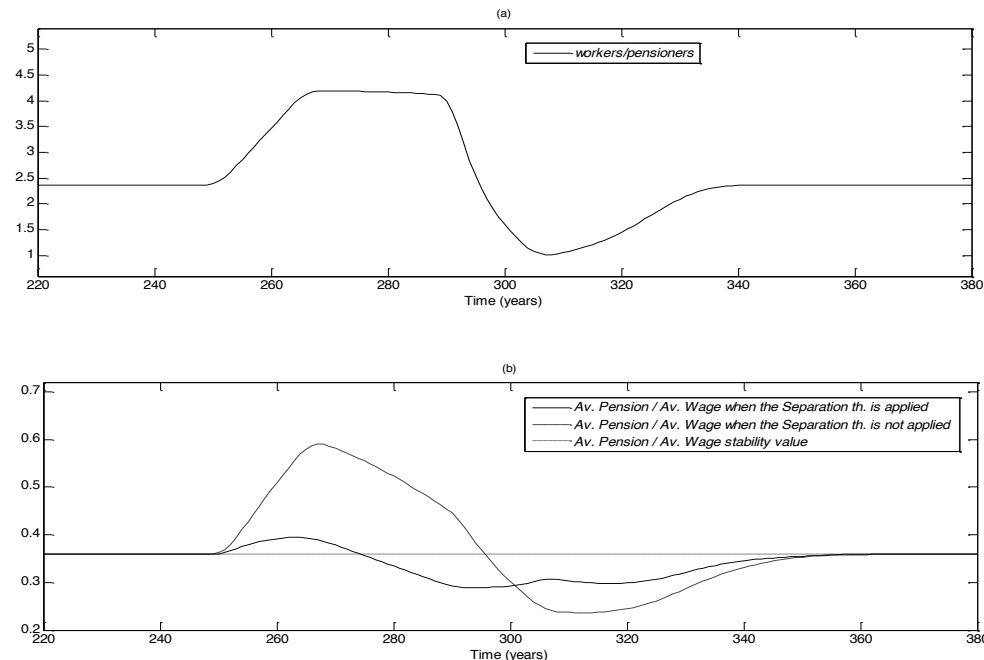


Figure 5: (a) Ratio of workers to pensioners (b) Average-pension-to-average-wage ratio when the Separation Theorem is applied during the wave phase.

Conclusion

We proved that in order to face the demographic wave problem **it is not possible to exclusively follow the PAYG scheme.**

We also proved that it is not necessary to shift to a fully-funded scheme, as several authoritative authors argued (cf. Modigliani et al. 1999; and Feldstein and Rangelova 2000).

In fact, it relies on the funding of the individuals who belong only to the demographic wave rather than on the funding of the whole pension system.

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