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Demographic drivers, population structures and pension systems

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Demographic drivers, population structures and pension systems – 2nd quarter 2014

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Introduction

Population structures and the main demographic drivers behind them have a major impact on pension systems, their financial status and reform needs

This applies in steady-state considerations when all key drivers (more precisely their changes) are kept constant; this applies even more so in the long period of transition between main changes of demographic divers to which population structures and pension systems typically are exposed to. As an example, think about the move from a high fertility rate to a low fertility rate that furthermore settles below reproduction level.

This policy paper attempts to shed some light on the interconnections as they can explain past developments but also help for projecting and understanding the future, including the possible scope of actions and needed reforms.

The key demographic drivers of population structures are limited and three by number: birth, death and migration. Birth is an inflow to a population, death an outflow, and migration can be both depending whether it is an inflow (immigration) or outflow (emigration), and then the net-migration level and the age at which this happens matter. The level and change over time of these three drivers determine largely the demographic structure of a country and the world. In the global case, migration drops out as net-migration across the world is zero.

There are other socio-economic drivers on population structures, such as marriage, that had a main influence on birth, death and migration; this influence, however, has been reduced in most developed economies. Other socio-economic drivers, in particular labor force participation and unemployment, have little impact on the population structure but affect very much the relationship between number of contributors or tax payers and the current or future number of beneficiaries. This has an impact on the financial situation of a scheme or the whole system, but in an often little understood manner.

In the real world the divers typically change concurrently so that the impact on population structure and financial outcomes of the pension system gets blurred and in the social policy discussion they are often mixed-up. We want to isolate and present the different effects of the key drivers separately to allow a better understanding of the links. In order to do so, we will expand the flow/stock consideration to the pension system and assess their effects on flows (i.e. pension system revenues and expenditure) as well as stocks (i.e. pension system assets and liabilities).

To this end, the structure of the policy note is as follows: Section 2 presents the demographic drivers and the population outcome- conceptually and with summary data for the world, Europe, and Spain. Section 3 sketches the impact of demographic outcomes on pension systems. Section 4 highlights the need to move from a flow towards a stock oriented accounting approach for pension systems under demographic changes. Final comments are made in Section 5.

2. Demographic Drivers and Population Outcomes

The number of births is the key entry flow into a country's demographic structure. As the number for birth depends on the existing demographic structure- the more women in birth-giving age, the higher the number of births- it is useful to normalize for discussion and analysis the birth numbers through the total fertility rate (TFR), i.e. the number of children born alive per women in reproductive age (typically selected between age 15 and 45). If no women were to die before age 45, 2 children per women would allow for demographic reproduction. Advanced economies are nowadays close to this low mortality situation leading to a TFR at reproduction level of below 2.1; in some developing countries with still high mortality rates at younger aged the TFR at reproduction rate is still around 2.7 (such as in the Democratic Republic of Congo). Until the 1800's the reproductive TFR level was even higher in Europe. Thus impact of birth and fertility rates on demographic dynamics needs to be seen in context of mortality developments.

Assuming constant morality (and zero net-migration), the TFR drives the whole demographic dynamics. With the TFR well above reproduction level the population of a country grows in the school-book typical demographic pyramid and in the steady state (and everything else constant), the population growth rate equals the growth rate of the labor force of the economy. With a TFR decreasing from a higher to a lower TFR, the population will be aging according to all aging measures (see Text Box 1) even if the TFR is still above reproduction level as the size of the younger cohorts shrinks relatively to the older cohorts. If the fall in TFR were to stop at one moment above reproduction level, the population structure would stabilize again but with higher aging levels and lower population growth. If the TFR falls below the reproduction level and stabilizes there, population growth would eventually become negative (i.e. the population shrinks), population aging would be further accentuated as a constantly shrinking base of younger cohorts would have to support older cohorts that also shrink, but less quickly, and the population structure would become a honey comb with a smaller base and larger head. All this population aging and change in the demographic structure happens without any change in mortality in the population, i.e. with constant life expectancy.

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Text Box 1: Defining and measuring population aging is faced with two key choices: What measure to use and from what age onward to consider age cohorts as old.

Four main concepts are typically used as measure of population aging, each with different information and implications for policy settings. All move in the same direction under steady state conditions, but differences emerge outside the steady state in an often long transition.

a) An increase in the *number of old people*. This measure is, *inter alia*, relevant for the provision of services and number of staff to be hired to provide age-related services. Different age limits are chosen to signal different service demand: e.g., the elderly (or old) above 60 or 65; the very old are those above 80 or 85; and centenarians are those above 100.

b) An increasing *share of old people in the population*. This measure is, *inter alia*, relevant for signalling changes in society' structure.

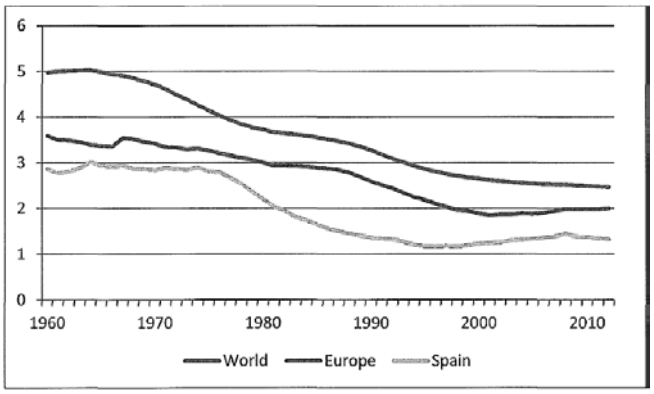
c) An increase in the *ratio of the elderly to active population*. This ratio is, *inter alia*, relevant to signal potential issues with the financing of social benefits and services. It proxies the number of potential beneficiaries to the number of potential contributors or (income) tax payers.

d) An increase in the *median age* of the population. The median age concept is typically preferred over other means as it simply divides the population in half: those that are younger than the median age and those that are older.

The selected age threshold for old-age was traditionally set at age 60, but nowadays age 65 or higher is often selected in advanced countries. The starting age into the active population was historically 15 years, but is nowadays often replaced by the age of 20 in advanced countries. These choices influence the magnitude of measures (a) to (e), but have limited bearing on their dynamics

This "aging from below", i.e. a change from high to low TFR, is behind much of the measured aging across the world. In much of the industrialized countries, this population aging effect gets accentuation by a stabilization of the TFR well below reproduction level, in some case around half this level. Figure 1 presents the changes in the TFR in the World, Europe and Spain over the last 50 years. As it is visible, the fall has been dramatic in much of the world, with the TFR of the World having reached slightly reproduction level, of Europe, below reproduction level, and of Spain slightly more than 50 percent of reproduction level. This value is one among the lowest in the world.

Figure I. Total Fertility Rate in the World, Europe and Spain



Source: Authors' elaboration based on UN and World Bank data

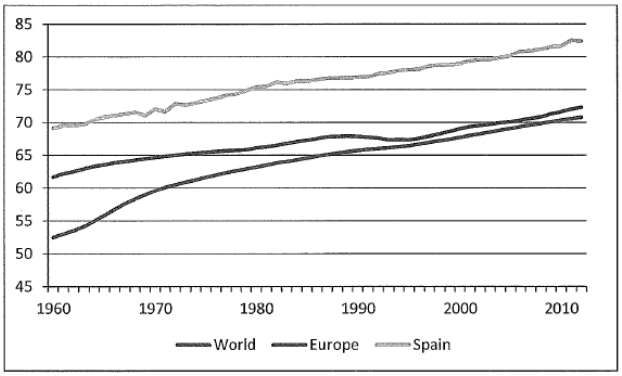
The number of deaths, as outflows from the population, is the second driver of population dynamics and structure. As for birth it is best expressed in a normalized manner that takes care of the population structure. To this end the age-specific mortality rate is used as the number of individuals of an age cohort that is expected to die during the next year and compared to the stock at the beginning. The mortality rates typically decrease after birth and higher child mortality rates, remain broadly constant for some time and start to increase slow but progressively with age; onwards, and for developed economies, they seem to plateau at highest ages or even to fall. The complementary concept is the survival probability, i.e. the rate of individuals of an age cohort that will survive to the end of the year. Aggregating the survival probabilities at birth gives the life expectancy as a measure of the median age an individual of an age cohort can be expected to live (see Ayuso and Holzmann 2014).

Assuming a TFR at (old) reproduction level, all the population dynamics are driven by the change in the mortality rate/life expectancy. A proportionate reduction in the vector of mortality rates/ increase in the survival probabilities will increase the life expectancy at birth (or any other selected age) and lead to an "aging from above", as the older cohorts are getting relatively more important than the younger ones. All population aging indicators would increase and also population growth would take place largely triggered by surviving people at any age but also by more birth of women that survived to a higher age. Expanding the productive age range would further boost birth (somewhat).

Figure 2 exhibits the change in life expectancy for the World, Europe and Spain over the last 50 years.

In all cases the progress made is impressive, with the advance in Europe dominating that of World and Spain being among the most advanced countries in the world where life expectancy achieved.

Figure 2. Life Expectancy at Birth for the World, Europe, and Spain



Source: Authors' elaboration based on UN and World Bank data

To understand the population dynamics even better, three developments need to be kept in mind: First, demographic transition that results from the timing the reduction in mortality rates/increase in LE took place before a reduction in fertility set in. This important detail is behind most of the population explosion in Europe, US and Japan in the 19th century and the rest of the world in the 20th century. The temporary inflow of large birth cohorts makes populations younger for some long period of transition, and old-age retirement programs seemingly easy to finance.

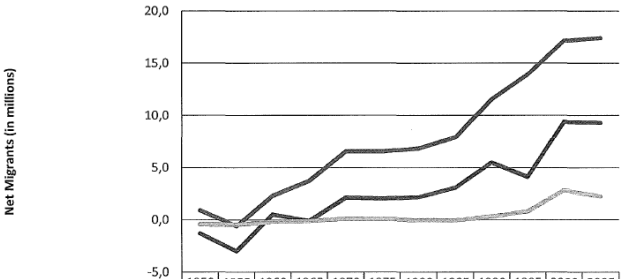
Second, the staging of mortality reduction that takes initially a greater importance for the younger age cohorts. As a result this swells the active population compared to the retired population even more and camouflages future financing issues. As the mortality rates before retirement are getting smaller and smaller, progress in life expectancy at birth is getting essentially driven by progress in life expectancy after (traditional) retirement age.

Last but not least, the current level of population aging in Europe- however measured- is broadly equally split between aging from below and aging from above. If TFR settles at around 50 percent of reproduction level and LE at birth/retirement increases as in the past, both drivers of population aging will remain broadly unchanged for Europe and Spain (unless corrected by migration). This has a bearing on the choice of appropriate pension policies.

The number of migrants may have a major bearing on population structure depending on the following characteristics: (1) are they emigrants leaving the country, or immigrants coming to the country? Most countries for any given year have typically both flows so that the level of net migration matters for the overall population size. (2) At what age are the migrants coming and/or leaving? This has a bearing on the population structure and aging. If they are coming when young, they make the population younger. The same thing happens when they are leaving around or after retirement age. (3) Are they seasonal, temporary or permanent migrants. As seasonal migrants they count temporary for the labor force but not as resident population; as temporary migrant they count for both labor force and most but not all countries as resident population while present. As permanent migrant they become residents and population member, and depending on the naturalization policy they become nationals or remain foreign residents. Due to generous naturalizations in many European countries the share of foreign born residents is some double of the share of foreign residents. The differentiation has a bearing for counting social transfers to nationals and foreigners inside and outside the country, in particular after retirement. Last but not least, (4) migrants can come in (go out) as labor migrants (in possession or search for a job) family members (as part of family re-unification), asylum seekers, and others (e.g. inter-firm migrant). In Europe in recent decades only few of the immigrants were labor migrants; most were family members. Some of the latter may become eventually part of the labor force. Else they increase the population but not the labor force.

Figure 3 presents key data on net migration for the world, Europe and Spain. As net migration for the world is zero, the more developed regions (per UN definition) serve as the benchmark. All three units of interest start out with low or negative balance after Second World War, i.e. as migrant sending countries. Since the 1960s (the more developed regions) and the 1970s (Europe) became net migrant receivers. It took Spain till the 1990s to move into this position; by the 2000s it received more than a quarter of all European net migration; the most recent figure shows again a reduction.

Figure 3. Net Migration Dynamics in the World, Europe, and Spain



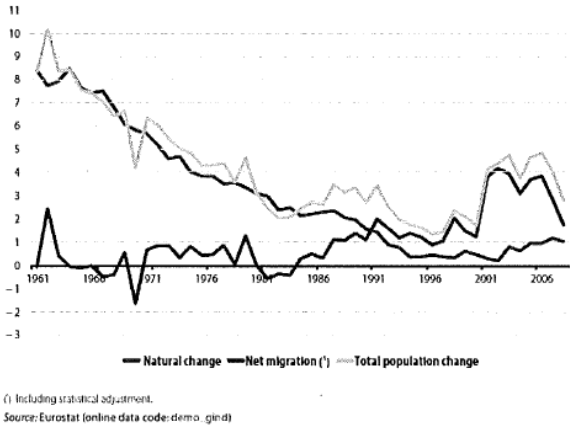
	1950 - 1955	1955 - 1960	1960 - 1965	1965 - 1970	1970 - 1975	1975 - 1980	1980 - 1985	1985 - 1990	1990 - 1995	1995 - 2000	2000 - 2005	2005 - 2010
More developed regions	0,9	-0,6	2,3	3,7	6,5	6,5	6,8	7,9	11,6	13,9	17,1	17,4
Europe	-1,3	-3,0	0,5	-0,1	2,1	2,0	2,2	3,1	5,5	4,1	9,4	9,3
Spain	-0,4	-0,5	-0,2	-0,1	0,1	0,1	0,0	-0,1	0,3	0,8	2,8	2,3

Source: Authors elaboration based on OECD, World Bank and UN data

As regards the share of migrants in the world population it has re-increased after a low in the 1950s to some 3.1 percent, or some 215 million in 2013. In Europe the share of migrants measured as both foreign born residents and as foreign resident (i.e. having only a foreign passport) increased substantially over recent decades moving Europe from a traditional emigrant continent into a new immigrant continent. This change was even more pronounced for Spain that had a very low level of foreign born/foreign residents till the 1980s. With the financial crisis of 2008 the situation was partially reverse: Some recent migrants return home or left for other countries; a rising number of born Spanish workers are leaving for other countries to seek work within and outside Europe.

Finally, Figure 4 illustrates the change in demographic drivers in Europeans contributors to the overall population dynamics. Till the 1990s the total population change in the EU27 was driven by the "natural change". i.e. birth and death. Ever since it is the net migration that dominates EU population dinamics.

Figure 4. Population Change by Component, EU 27, 1961-2009 (in 000')



Source: Eurostat 2011: Figure 1

3. Population Dynamics and Pension System

The changes in population dynamics and structure outlined above have, of course, a major bearing on the pension systems in the World, Europe, and Spain. This section sketches three: (1) The main implications of aging from below, above, and aside; (2) the impact of return migrants; (3) the scope of demographic options to improve the situation. For reason of focus we concentrate on earnings- related pension schemes only.

3.1. The main implications of aging from below, above, and aside for pension systems

If most or all of the aging were to be from below as a result of a TFR below reproduction level, the implications for pension schemes would be dire and the policy options little appealing. The effect of this demographic driver would be eventually a permanent negative population and- ceteris paribus -labor force growth, a likely negative impact of the shrinking number of youth cohorts on macroeconomic productivity, and a constantly deteriorating old-age dependency ratio (i.e. number of elderly to active population as a proxy for number of beneficiaries to the number of contributors).

A negative labor force growth would deteriorate the first component of the internal rate of return of an unfunded system- the growth rate of insured. A negative productivity growth will deteriorate the second component of the internal rate of return, namely the real wage growth per worker. The possible magnitudes can be quite impressive as they may amount to 1 percentage point rate reduction each thus eliminating or even over-compensating any macroeconomic productive growth (technical progress) the economy may have left. Thus not only the population but also the economy in real term would be shrinking. And having a funded system would not really help even if it is already in place: The domestic investments are likely to also suffer from reduced rates of return, and investing abroad may punish the domestic economy further and not be compensated by foreign investments' inflow (see Holzmann, 2009).

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The key policy options remain unchanged- higher contributions, lower benefits and increased retirement age- but the environment makes them even less appealing. Increasing retirement age when life expectancy is not increasing is not welfare enhancing; increasing contributions at a time of low or negative wage growth does the same as cutting benefits.

This scenario contrasts with one in which population aging from above is largely or only driven by increasing life expectancy, in particular at higher ages. In this scenario population as well as labor force growth could take place broadly in line with the increase in life expectancy if the retirement age were to be adjusted accordingly. Such a policy option may be fully justified as individuals share their gains in remaining life between longer work and more leisure (assuming that the starting position was in equilibrium; else a prior adjustment would have to take place). Working longer as retiring later may also have a positive effect on economic productivity as it encourages human capital accumulation through the extended use. Such a scenario may not need increases in the contribution rate or cuts in benefits.

Aging from aside or more precisely rejuvenation through sufficiently sized immigration of younger workers may be able to compensate the effects in the aging from below scenario (outline above): It helps stabilize the population and labor force, and it contributes to productivity growth, in particular if the migrants are the talents the economy needs. Adding the effects from the aging from above scenario would effectively lead the country into positive territory.

Compensating for nation allow or negative labor force growth through immigration is a much more relevant scenario than thinking about migration as an instrument to stabilize the old-age dependency ratio. As migrants also age, such an approach would require an exponentially increasing inflow of migrants, a not only politically unrealistic scenario.

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3.2. The impact of return migration on pension systems

A share of migrants will eventually return to their home country as originally planned or later decided, while others may move on to other countries. What is the impact of such mobility on the economy of the host country and the financial situation of the pension scheme? To facilitate the discussion, two mobility scenarios are differentiated- a moving in and after some time a moving back of a patch of migrants; and the revolving moving in and back; and two portability scenarios- no or full portability.

If the acquired rights or pension in disbursement where not to be portable, the prior social security contributions would amount to an additional tax that boosts the revenue of the pension system. Within the EU full portability of benefits is guaranteed between member states and most EU members have signed bi-lateral agreements for important migrant corridors with non-EU members. As a result the origin of the migrant has limited bearing on pension system of the host country. A spike of in-and-out of migrants, even if large scaled and somewhat protracted, should have limited effects on the host country's pension system, as the economy would not permanently adjust to the spike in labor force and hence not entail long-run productivity implications. If the contribution-benefit link of the pension system is broadly actually neutral, the additional temporary contributions would lead to a temporary build-up of reserves under an appropriate government structure and accounting system as it would have no effect on the pension systems operation (say more generosity motivated by the additional cash or less pressure to continue reform). After departure of the temporary migrants the reserves would be gradually depleted over a long period of time. In view of the cash orientation of most public pension systems in Europe, this is perhaps a too optimistic scenario. If so, a temporary flush in migrants risk having no short term effects on the economy, and the longer term impact on the financing of pension system may be negative if the transitional cash surpluses are spent.

A sustained and revolving labor migration to the host country should lead to an adjustment of the economy to the conceptually equivalent permanent inflow of workers and create acquired rights for these temporary migrants that build-up over time till so me steady-state is achieved. Whether the adjustment by the economy to the accessibility of temporary migrants supports productivity growth of the economy, or is detrimental, depends on the migration regime. The experience in the Gulf Cooperation Council countries suggests that their predominant focus on low skilled labor, the special license regime and lacking labor mobility for migrants affects productivity negatively (Holzmann et al. 2014). In an EU environment this may work differently, albeit full mobility of migrants is also not assured. The build-up of new liabilities towards the revolving migrants over a protracted period of time should not really matter as it would be not materially different to having permanent migrants in the country. However, the cash-flow orientation by the public pension systems may not follow such logic.

3.3. The scope of demographic options to improve situation

Last but not least, we report on an empirical exercise that explores the feasibility of compensating current demographic developments via single or joint demographic actions: Increasing the TFR back to replacement level, increasing the retirement age with life-expectancy and beyond, and increasing the net-migration to compensate the labor force gap (see Holzmann 2006).

In a nutshell, the numerical simulations based on the demographic structure in the mid-2000 indicate that no single demographic intervention, as assumed, would be sufficient to compensate the demographic development within Europe. The demographic gap is simply already too large to allow for a single instrument compensation. However, a combined approach across all three options signals a joint quantitative response that could be sufficient. Yet, we may still not have the good public policy instruments to push fertility rates, engineer strong and sustained increases in effective retirement age, and for many more politically acceptable migrants, to make it happen

4. Pension Systems and Accounting Framework

To translate any successful approach handling the demographic challenges requires, however, not only appropriate policies but also the right accounting and policy framework. This section sketches in all brevity three considerations: (1) From flow to stocks in pension systems; (2) Toward a full asset/liability approach; and (3) Including the taxation of pensions into the Framework.

4.1. From flow to stocks in the assessment of pension systems

To address the challenges of demographic shifts well requires a move from merely relying on a cash- flow framework in assessing the sustainability of all national pension schemes (i.e. those making up a national pension system) toward stock variable considerations that are underlying the revenues and expenditure flow variables. Cash flows alone give often a wrong signal about the financial direction a pension scheme is heading.

The concept of implicit pension debt to measure the unfunded liabilities of public pension scheme has been around for some time but it was mostly used within the framework of comprehensively assessing the outstanding explicit and implicit public debt level (see Franko 1995, Holzmann et al. 2004). The sustainability aspect stock assessments has found much less attention.

As flipside to the public debt perspective and as part of comprehensive household wealth assessments the unfunded public pension entitlements have been brought into the orbit of the National Account standards (SNA2008 and its European Version ESA2010). In this process it will become mandatory for European countries to publish estimates of such unfunded public pension entitlements from 2017 onward.

4.2. Toward a full asset/liability approach

While the annual publication of estimations of the liability side (for government)/asset side (for households) definitely constitutes progress, it falls short of taking explicit account of the asset side of unfunded pension schemes and the move toward a fully specified asset/liability approach.

As regards the asset side of unfunded schemes, the conceptual work on NDC pension scheme has helped develop the concept of a contribution (or PAYG) asset (see Robalino and Bodor 2008). It can be understood as the present value of future contribution payments minus the present value of benefit payments derived from this.

There is, however, a further link of the contribution asset to the broadest pension liability concept, namely the open system liability of a pension scheme covering liabilities for all cohorts from now into the future. As it turns out, the open system liability can be presented as the flipside of the contribution asset (Holzmann 2014).

4.3. Including the Taxation of Pensions into the Framework

Even a comprehensive asset/liability framework would, however, be incomplete without the explicit introduction of the tax treatment of contributions, asset returns and benefit payments. How to do this well and consistently is one of the big underdeveloped topics in the pension reform discourse. This requires reviewing the principles of taxation that got already pushed beyond the comprehensive income tax and the consumption tax approaches. It requires revisiting all tax concepts against the fact of population aging that has no end in sight. This requires also rethinking the tax treatment of contributions, asset returns and benefit payments in a globalizing world with increasing mobility of capital and labor

5. Conclusions

Demographic drivers differ between countries and regions but whatever their size and development they have a major bearing on the financial prospects of pension system that need to be better understood by policy makers and the public at large to assess policy options.

Among the European countries Spain has an exceptional position as her demographic drivers are consistently among the most extreme: One of the lowest total fertility rates, one of the highest life expectancies, and more recently one of the most versatile migration patterns.

To address the resulting challenges well does not only require adequate policies. They need also to be guided by an accounting framework that moves beyond cash-flow considerations, i.e. a fully blown asset/liability approach that includes consistent tax treat of public and private pension schemes.

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Data

World Bank	population data
United Nations,	population data
OECD,	Migration data