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THE INVERSION OF THE AGE PYRAMID AND THE FUTURE POPULATION DECLINE IN FRANCE : IMPLICATIONS AND POLICY RESPONSES *

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The inversion of the age pyramid and the future population decline in France. Implications and policy responses

The demographic landscape is changing dramatically ; the industrial world is facing unprecedented population trends : hyperlongevity is combining with hypofertility, thus producing a progressive reversal of the age pyramid.

But the notion of "below-replacement" fertility is vague. From a theoretical point of view, it comprises all levels of Total Fertility rates (TFR) between zero (extinction) and 2.1 children per woman (stationarity, or equilibrium). The impact of the emerging new trends is not familiar, but it is powerful ; if we put aside the role of the population momentum inherited from the past fertility, a TFR of 1 (child per woman) is the symmetrical value of a TFR of at least 4 children per woman, or, more precisely of a Net Reproduction Rate (NRR) of two surviving daughters per woman. Let us push further the argument : if in some regions or cities, the TFR drops to 0.5 child per woman and then stabilizes, the population is subject to a division by eight after two generations ; the symmetrical value on the demographic scale is a NRR of 4 (that is an average family size of at least 8 children). The well-known mechanism of population explosion (multiplication) gives place to a population implosion (division, or exponential decrease).

The modern fertility decline usually took place from the mid 1960s to the mid 1970s but is was sometimes earlier (Japan) or later (Southern and Eastern Europe). Since that fall, the fertility level tends to remain constant or to decline slowly. Such is the case of France and Germany for example where, contrary to common belief (based on the Easterlin hypothesis or on the supposed timing impact), fertility did not recover and, as a consequence, did not describe a cyclical curve. Short term fluctuations can exist but they are small and until now, the long term trend seems to be rather linear, structural. No sign of longstanding upturn has appeared since the 1970s.

The ultimate or "final" value of the stabilization level is widely differentiated from country to country. Some (few) populations stick to stationarity while others could experience a massive reduction like a division by two every 30 years.

I. The four patterns of below-replacement fertility

At present, with current international data, we can, at least provisionally, make a distinction between four patterns of below-replacement fertility depending on the stabilisation level during the latest stage :

- First scenario : 1.8 to 2.1 children per woman. Slightly insufficient fertility, which can come back to the replacement level if the population policy is modernized and adapted to the needs of young couples in terms of money, space and time. This is especially true in countries where surveys show a wide discrepancy between the actual and the desired number of children. Possibility in the longer run to master the compensating migrations (labour shortage).

- Second scenario : 1.5 to 1.8 children per woman. Strong dearth calling for a deep revision of the population policy. In the longer term (from 2005-2010 onwards), higher risk of labour shortage and reduced capacity to integrate new immigrants ; since the main engine of integration of foreigners is the school, this integration cannot happen if a minimal fertility is not realized among the resident population.

- Third scenario : 1.2 to 1.5 children per woman. Heavy and structural contraction, which digs a deep hole at the basis of the age pyramid and consequently compromises the future of the society at large. Limited chance to get a return to equilibrium ; evaporation of population numbers. The prolongation of such a scenario could imply a massive renewal of the population stock on the given territory ; the resident population is progressively replaced by a continuous and bulky inflow of immigrants.

- Fourth scenario : less than 1.2 children per woman. Extreme case which is less and less rare, namely in Southern Europe and in the former Eastern bloc. A severe amputation of the base of the age pyramid is taking place under our eyes, this vacuum can be aggravated if the fertility remains depressed. Acute and rapid aging process ; deep and longlasting migratory dependency that could be unbearable or unmanageable without social tensions.

To each of these scenarios is associated a given range of reversal of the age pyramid : the lower the fertility, the narrower the foot of the age pyramid.

Let us consider the French case. Since the mid 1970s the TFR is at the lowest limit of scenario 1 and the upper limit of scenario 2, but we have to take into account the magnitude of the fluctuation ; in the former time span France experienced an intense and long baby-boom covering all the period 1946-1973. The shift of fertility is important thus creating a big swing. So, scenario 2 is more relevant.

We will first examine demographic consequences of population aging, then we will consider the financial, the economic and the political impact, and finally envisage policy responses.

II. The demographic ramifications of aging

The first consequence of population aging is the loss of reproductive potential. The number of women at childbearing ages will peak and then decline. This number increased by 40 % between 1950 and 1990, then it reached a maximum of 14 million during the 1990s ; a decrease will occur during the next decades, bringing back this figure to lower values. However only two different fertility assumptions have been envisaged, because they seem more or less realistic now : a slight fertility recovery from the present value (1.7) to 1.96, a stabilization level reached by 2015-2020 ; the high variant, with a final value of 2.36 children per woman in 2030-2050 seems to be out of reach ; it can only be used for the purpose of comparison or illustration.

Under the first assumption (low-variant) the number of women at childbearing ages falls below the threshold of 10 million in 2050, that is below the value of 1950, which was historically very weak because of structural subfertility and the adverse impact of the First World War and the Great Depression on natality. In the middle of the 21st century, the number of young women should be affected by the influence of longlasting depression of fertility ; if no change occurs, it should continue to decline.

Under the second assumption (medium-variant) -which as compared to the prevailing fertility of the post-transitional period 1973-2000, seems rather high- the fertility fall continues, but at a slower pace (table 1).

Whatever the fertility trend, until 2015 (and even further if we take into account the absence of teen-age pregnancies in France), the number of women at childbearing ages will diminish during the coming two or three decades. The shift has a strong meaning for the future of the population ; the annual number of births can fall back to the historically low levels of the pre-war period : around 600 000 a year, instead of 850

000 during the baby-boom phase. A spiral of decline can eventually emerge and reinforce from decade to decade.

Table 1 : Population trends in France : past (1950-2000) and prospects (2000-2050)

Indicator	1950	1970	1990	2000	2010	2030	2050
Total population (million)	41.8	50.8	56.7	59.1	59.7-60.6	57.8-61.6	51.7-59.9
Number of women aged 15-49 (million)	10.3	12.0	14.1	14.4	13.8	11.6-12.4	9.5-11.8
Population aged 60 or over (million)	6.8	9.2	10.8	12.1	13.9	18.2	18.8
Median age (years)	34.5	32.3	34.7	37.6	40.3-40.8	43.6-46.1	43.9-49.8
Age 60 or over/Age 0-24 (ratio)	0.43	0.44	0.54	0.64	0.77-0.81	1.04-1.30	1.12-1.63
A : Low-variant : total fertility rate falling from 1.71 children per woman in the 1990s to 1.56 during the period 2005-2010, than remaining constant. This is a scenario of slight fertility decrease. B : Medium-variant : total fertility rate rising from 1.71 children per woman in the 1990s to 1.96 during the period 2015-2020, then remaining constant. This is a scenario of slight fertility increase.							
Source : United Nations, 1998. World Population Prospects. The 1998 Revision. Volume I. Comprehensive Tables, New York.							

Aging influences vital rates ; typically an older population will not only have fewer births but also more deaths. The potential for demographic decline is already inscribed in the age distribution : the baby boom cohorts will age and the number of deaths will grow. Negative natural increase will occur by 2020 or so, and it will continue in an older population, even if fertility were to move around the replacement level : the small numbers at reproductive age and the larger numbers at older ages would still imply fewer births than deaths. Even if France is not at the bottom pattern described above, the potential for population decline will be difficult to revert : the population momentum is declining below unity, thus working against any spontaneous recovery.

Whether European, North American, or East Asian, industrial countries will experience a radical change in the age distribution of the population ; the classical triangle profile shaped by high mortality and high fertility of the pretransitional era gives progressively the way to a pagoda shape when fertility comes close to replacement. In a third stage which is now beginning, the transformation still goes further. The base of the age pyramid becomes narrower and narrower while the top

enlarges. The so-called "pyramid" takes progressively a bonsai-like shape. The corresponding structure is an inverted pyramid ; the contemporary population trends tend to produce a more or less profound reversal of the age pyramid.

France is no exception. The demographic weight of a strong and sustained baby-boom has limited the impact of the fertility depression on the number of births. When the baby bust cohorts born from 1974 onward will reach the age 20 to 34 years, this protecting screen will disappear and, other things being equal, the number of births could drop by 15 %. The history of French population was atypical ; the secular fertility decline began one century before the rest of the West ; as a consequence, all over the period 1850-1950, France had the oldest population in the world ; the share of the elderly was the highest ever seen in the history of mankind ; the baby-boom created a parenthesis, but the transition phenomenon is resuming. With the ongoing stages of the post-transition (much below-replacement fertility and increased life expectancy) population aging will reach new summits which will be much higher than the past ones.

The process of population aging is in fact the combination of two phenomena : the maturation of the cohorts born during the above-replacement fertility regime which inflates the upper part of the age distribution, the amputation of the base of the pyramid associated to the below-fertility regime. The second was unanticipated since the model of the demographic transition theory usually announced a post-transitional fertility equal or close to the replacement level. Therefore all calculations made on numbers, rates and ratios (population size, renewal of the labour force, dependency ratio, percentage of the elderly, etc) have to be reconsidered.

Let us call the latest United Nations population prospects (UN, 1998). Three fertility assumptions have been selected :

• "the medium" : regular fertility increase from the present level (1.71 in the 1990s) to 1.96 in 2015-2020, then stabilization.
• the "high" : sustained fertility recovery, bringing the TFR to a value which does not exist any more in the advanced parts of the world : 2.36 children per woman at the end of the period of projection (2030-2050) ; as above mentioned, we will not use it in our comments.
• the"low" : small and regular fertility decline ; the TFR reaches 1.56 in 2005-2010, then remains constant.

The evolution of mortality is not differentiated between the three sets of projection ; the same is true for net migration rates. These rates are 0.7 per 1 000

population at the beginning of the period 1995-2000, then they diminish : 0.3 in 2000-2005 ; 0.2 in 2005-2010 to finally become nil.

By the year 2000, the population of France is 59 millions inhabitants ; under the medium-variant projection, it would peak around 61-62 million between 2020 and 2030 then slowly decline (60 million in 2050) ; the amplitude of variation is narrow : fertility is supposed to increase by 15 % to come back closer to the replacement line.

Under the low-variant projection, the maximum population is a bit lower (59 million) and the decline begins earlier (2005-2010). The difference is rather small ; in both cases, the peak is similar (about 60 million). But the percentage aged 60 and over differs greatly ; when all the baby-boomers have entered this age-group (60 +), that is by 2030-2035, the number of elderly is maximal (it could nearly double between now and that period) ; but the corresponding share continues to grow since the new depleted generations continue to shrink, thus changing the global age profile converging towards a bonsai or mushroom shape. According to the medium-variant assumption, the percentage of the population aged 60 or ever which was 20.2 % in 1995 would cross the 25 % mark by 2015, and the 30 % mark in 2030 to finally reach approximately 1/3 in 2050 (32.5 %). The pace of aging is even more striking under the low-variant assumption ; the progression becomes much steeper at the end of the period of projection : in 2050, the percentage of elderly is 38 % and the process has not ended. The inversion of the age pyramid is so acute that the number of "elderly" (60 or over) is nearly twice as large as the number of "young" (population aged 0-24). The impact of a small fertility difference on the age structure in the long run (half a century) is huge. For the next few decades, the findings are the following : the higher the age group, the faster the population increase ; the younger the age group, the stronger the population decrease. Thus the difference is maximal between the two extremes of the age scale. The residual population increase (if any) will be imbalanced : progression of the elderly, notably the "old old", regression of the youth, notably the very young. At the two extremities, the trends tend to be exponential, but opposite. The digging of demographic deficits at the youngest ages has begun ; it will become not only more and more likely but much deeper in the coming decades (table 2).

Table 2 : Fertility differential and the pivoting age structure

Indicator	1995	2000	2010	2020	2030	2040	2050
Fertility differential (medium - variant minus low - variant)	1.72 0	1.73-1.63 ↓ 0.10	1.86-1.56 ↓ 0.30	1.96-1.56 ↓ 0.40	1.96-1.56 ↓ 0.40	1.96-1.56 ↓ 0.40	1.96-1.56 ↓ 0.40
Corresponding absolute variation in the ratio	0.77	0.85	0.95-1.01 ↓	1.16-1.41 ↓	1.37-1.76 ↓	1.53-2.13 ↓	1.51-2.33 ↓
Age 65 or over/Age 0-14 (ratio)	0	0	0.06	0.25	0.39	0.60	0.81
Source : Calculated from United Nations, op.cit., 1998.							

III. The non-demographic impact of aging

The consequences of population aging are manifold and covered by an extensive literature. In this short essay, we shall try to summarize briefly only three points : the financial aspect, the economic aspect and the political aspect.

A. The financial dimension

This part is a matter of arithmetics and therefore largely consensual. It has been studied by international agencies (IMF, OECD, World Bank) and national bodies (Social Security authorities, government councils).

The growing transfer of resources for the elderly (pension and health costs) to the detriment of younger workers can have a feedback effect, creating a disincentive to fertility. At present, three decades before the peak of population aging, the composition of the social security budget is already affected by the reversal of the age pyramid. The main branch of Social Security in France is the pension system, with a total amount of FF 1 000 billion for a total social budget of 2 200 billion ; the second function which is predominantly devoted to the elderly is the health cost : FF 600 billion. The childhood and family get a meagre amount of FF 200 billion.

The pension system is a PAYG (Pay-As-You-Go)

The basic equation between contributions (left) and outlays (right) is then the following :

Aowr = Eip

with A : adult population (potentially active population)

o : proportion occupied ; Ao is the employed or contributing population

w : mean wage

r : rate of contribution

E : number of elderly

i : proportion of inactive people among the elderly

p : mean pension

The key political variable is the rate of contribution r :

$$r = \frac{Aow}{Eip}$$

This rate is the product of three factors : the demographic one $\frac{A}{o}$ (age structure), the economic one $\frac{o}{i}$ which expresses the division of labor along the age/sex structure, the retirement age is a crucial factor in this division of labor ; and the institutional (or political one) $\frac{w}{p}$: this ratio is the replacement ratio of the wage by the pension, it is a matter of public choice or of trade-off between workers and pensioners. Demographics can be considered as a given (at least provisionally). Only the four other variables can be changed, and one of the major elements of adaptation will be the rise of the effective age at retirement, which is exceptionally low (58,5 years). The mechanism will probably be largely spontaneous, directly influenced by the dynamics of the generation renewal. New generations entering the labor market now have a median age of about 22.5 years, as compared to 13 years for the present generations of retirees ; the beginning of the professional career is delayed, the career itself is frequently discontinuous (unemployment) : the rise of the retirement age will happen by necessity. This argument is reinforced by the possible decline of the relative level of pensions : the present low retirement age is partly induced by the high level of pension (retirees have a higher standard of living than workers) ; reciprocally, the reduction of the relative level of pension to a more reasonable standard should work in the opposite direction.

B. The economic aspect

This point is much more open to debate. Let us mention a few arguments.

The early stages of aging produce net economic benefits ; with the reduction of the young population, there is a high proportion of the population at labour force ages (this phenomenon is called the "demographic bonus"), there is also less need for family allowances or specific budget for childhood ; at the same time, there are more double-income families, hence a broader fiscal base.

But after a while, adverse effects tend to appear : an older labour force means more rigidity, less geographical and occupational mobility, smaller capacity to adapt to economic change ; this could represent a threat to innovativeness which is so important in the global competition.

Another crucial issue is the linkage between the demographic recession and economic growth. The changing size and structure of the population can have a negative impact on demand. This is the case for large sectors of the economy, like housing, infrastructure, equipment, etc. As the number of young households diminishes, many related segments of investment should contract, thus creating a negative pressure on economic growth.

Another facet of the demographic crisis is the downward pressure on the value of assets ; this holds true for the housing market. In a shrinking and greying population, the supply of vacant houses grows faster than the demand, thus reducing the prices ; for the majority of French people, the main property is their own housing ; the implicit consequence is obvious : the demographic change means that their family capital could melt.

However the greying of the baby-boomers during the next few decades will pave the way to the emerging market of the seniors ; in parallel, there will be the explosion of the market of solitude with the corresponding needs (flats, food processing, health care, safety, etc).

C. The political aspect

The political implications of population aging are difficult to measure quantitatively : they are mainly qualitative.

The main point relates to the risk of conservatism. A population which is numerically dominated by elders should -others things being equal- be less open to change and more prone to maintain the status quo. Moreover, as the number of elderly

expands, the senior lobbies could become ever-more powerful and claim to an ever larger share of public budgets. Hence an unavoidable tension : the opposition of interest between the pensioners and the taxpayers could lead to a clash between generations. The growing reluctance to accept necessary reforms (even now, the government does not dare to harmonize the pension benefits between the public and the private sector) could have a major impact not only on the rise of costs but also on the improvement of productivity. The past experience of France in the former period of aging (IIId Republic : 1870-1945) shows a country progressively lagging in terms of growth and innovation (SAUVY, 1984). Older generations tend to keep their generation of knowledge ; their opposition to reform is pernicious, since an aging population requires more adaptation. A rapidly aging society could ignore it at its peril, thus losing its position in the international ranking, whether demographic, economic or cultural.

IV. Policy responses. Strenghts and weaknesses of the French population policy

The French population policy is commonly viewed as "pro-natalist". This was true for the first decades 1938-1962 ; this is not the case any more ; only rhetorics have subsisted. The social expenditures devoted to family welfare are now n° 4, after pensions, health care and unemployment benefits (their share in the social security budget is 9 %) ; they ranked n° 1 until the 1960s ; other countries of the EU (Scandinavia, UK) spend more on children. The population policy did not changes in accordance with deep social change such as : the end of the predominance of agriculture, the priority of the career in women's status, the explosion of the cost of children, etc.

The French system has two main relative advantages : the existence of a successful, universal preelementary school (for the 2 to 5 years age-group) ; the fiscal system called "quotient familial",which creates substantial child-related rebates. However one has to keep in mind that the threshold is so low that only half of households pay income tax. The efficiency of the preelementary schooling is appreciated by the public and also by the parents who find there a good alternative to a career break or to the use of childminders. At the beginning of the 1980s, the fiscal system was hotly debated ; now there is a consensus between the left and the right on the principle of taxation (the principle that was voted in December 1945 by the Parliament with a full unanimity ; it is considered as a matter of general orientation, based on the "Déclaration des Droits de l'Homme et du Citoyen" : taxation has to be calculated not on incomes, but

on the contributive capacity, that is on a relative income, taking the household composition into account).

Now, there are weaknesses, since no major breakthrough has been decided during the last three decades. The purchasing power of family allowances has regulary deteriorated. Many income-tested (about twenty allowances) have been created, so that the system lacks transparency and seems more dedicated to poverty alleviation than to compensation of family costs. The distribution of the minimum income to the unemployed (R.M.I. : Revenu Minimum d'Insertion) is managed by the Caisse Nationale d'Allocations Familiales (CNAF) ; this is the strongest argument showing this bias.

Let us mention other discrepancies :

• women born since the 1970s have invested more in education than men. They take the decision to have a partner and build a family only when their professional career has begun and seems to be stabilized. A growing share of them work full-time in the private sector, often in qualified jobs. Thus, the opportunity cost of children is much higher now than in former generations ; this requires a reconsideration of childhood policy : as mentioned above, children have access to publicly subsidized pre-elementary school from the age of two onwards. There is a missing chain between the maternity leave and early schooling. The access to parental leave is limited by parity (only to high parity children) and by income (only to poor couples). The distance between Nordic countries and France becomes considerable ; parental leave is exceptional and not related to the wages of the parents : it is a social minimum, and thus penalizes the couples who are both engaged in professional life and decide to become parents. This factor is probably the most serious obstacle to childbearing,

• the inadequate supply of reasonable price housing in big urban centers, namely in the Paris region. Many official reports have underlined the need to revise the system of moderate rent housing ; the access to this stock is in practice more given to a political clientèle or to middle class couples than to families in need of space.

• the absence of consideration of the expenditures linked to older dependent children, whether students or unemployed. These children have come of age, but they are not financially autonomous ; their parents face the most expensive years (the fiscal law is adapted to this new reality, but it is not the case of the social security system ; there are many similar contradictions).

• the absence of clear doctrine both on the respective responsabilities of the State and of the private sector, on the role of the State, of the system of social welfare and of supra-national (European) authorities. The pension system continues to be prosperous, likely because older people are more likely to vote and become a majority. Since children have no lobby, they do not exist politically.

Public policy has to address the needs of children who now have a higher rate of poverty than the elderly. Potential parents are waiting for a framework opening the way to a real "free choice" in terms of number of children.

Another direction which is still taboo in France as well as in many countries of western Europe is the renouncing of the so-called "zero immigration policy" -which, given the demographic and economic international imbalances between the two rims of the Mediterranean sea (and particular the situation of sub-saharan Africa), is totally unrealistic- the country needs labour at the two extremes of the levels of qualification : low skilled and highly skilled labour. The government might favor admitting more young immigrants, along the lines of a quota policy ; French history and international experience call for such a reconsideration.

Conclusion

A demographic benchmark will soon happen. By the year 2010, people aged 65 and over will outnumber people aged 0-14. In spite of the peculiarity of French history in the field of population aging (due to the early fertility decline), the ratio of youth (0-14 years) to elders (65 years and over) was 2.5 in 1950. As the number of elderly explodes and the number of youths shrinks, this ratio will continue to diminish from approximately 1 by the year 2010 to 0.6-0.7 by the year 2030 and finally 0.4-0.7 by the year 2050. The fact that elders outnumber youths is new in human history. This will take place in a context of declining population : if the fertility remains low, population numbers will decline progressively ; under the low-fertility assumption, the population could decrease by 13.5 % over the period 2010-2050 (59.7 and 51.7 million respectively).

The unprecedented association of hyperlongevity and hypofertility will induce a massive reversal of the age structure, that is an inversion of the age pyramid. The median age will rise to unprecedented values of about 45 to 50 years. The change is impressive : in the year 1945, the median age of the population in France was 35 years

and it was then the world record. As described above, in the future, the elderly will become predominant in number over the young, thus creating a major challenge for society. With a persisting sub-fertility, the age distribution is pivoting around a dividing line which will be marked by the generations born around 1974-1975 (the period when fertility fell below replacement). All institutions established since time immemorial for "normal" (that is triangular) age distribution will have to be reconsidered ; special measures could be envisaged to avoid gridlock if the grey vote is organized into a political lobby, it could represent half of the total vote and become a majority not only at the local level ("communes") but also at the national level (Parliament and government).

Immigration is not the appropriate response to this challenge (United Nations, 2000). From the middle of the nineteenth century until the second world war, France experienced both immigration and population aging. Immigration is basically an economic regulator, used to meet the labour needs of employers. The immigration policy does not take into account demographic considerations like the will to repair or rectangularize the age distribution. Such an imperative would need a solution totally opposed to basic human rights : the import of children without their parents.

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