Lifecycle deficit in France: an assessment for the period 1979-2011

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National Transfer Accounts (NTA) measure the way in which individuals produce, consume, save, and share resources at each age. They make it possible to identify the periods for which private and public consumption (education, healthcare, etc.) is not funded by labour income, before identifying the transfers between the ages that enable such consumption to be funded. This article presents individual age profiles of consumption and labour income in France, as established using that method, and how they changed from 1979 to 2011. The profiles are also calculated at aggregate age level, highlighting the importance of changes in the demographic structures over time. We also reconstruct partial cohort trajectories, thereby providing a generational reading of the changes.

In 2011, consumption by old people was higher than consumption by young people, which was not the case in 1979. The rise in consumption at each age, observed generation on generation, slowed down as from the cohort born in 1950. The range of ages at which labour incomes are received has narrowed, while the age at which labour income reaches its highest level has shifted from 36 to 46 over the years. The increase in labour incomes, observed at each age in the generations from 1930 to 1950, seems to have been interrupted momentarily between the 1950 and 1960 generations, at least at the beginning of working life. It resumed in the generations from 1970 onwards, but to a less pronounced extent. In 2011, the ages at which consumption exceeded labour income, corresponding to a deficit, ran from 0 to 24 and from 59 to 82. With the rise in life expectancy in France, the number of years in a deficit situation at high ages has increased considerably, going from 14 to 24 years between 1979 and 2011. Finally, the labour income and consumption profiles for France are very similar to those of the other European countries.

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Keywords: consumption, labour income, lifecycle, age profile, National Transfer Accounts, intergenerational transfers.

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Evolution in the magnitude of transfers between generations and between ages is a recurrent issue in the public debate. It is even more crucial in times of economic slowdown or low growth, uncertainty about the sustainability of welfare systems, and profound demographic transformation, which tend to characterise France today. The ambition of the National Transfer Accounts (NTA) Project is to measure all public and private transfers between ages and between generations with a breakdown of these economic variables by age.

This article presents the results of the first phase of the project, consisting in calculating the age profiles for consumption and for labour income. Comparing these two profiles makes it possible, by subtraction, to obtain the ages for which the total individual consumption (private and public) is not funded by labour income and thus relies on transfers or asset-based reallocations between ages. The methodology of National Transfer Accounts (NTA), whose origins are to be found in the work of Lee (1980) and Mason (1988), is described in a reference manual published by the UN (United Nations, 2013). The principles and the results that have been brought to light so far have been the subjects of various recent publications (Lee & Mason, 2011; Lee et al., 2014; d'Albis et al., 2015; d'Albis & Moosa, 2015). This age-specific accounting offers multiple advantages.

Initially, it establishes mean values by age for economic variables, highlighting any inequalities between ages or generations. This approach also facilitates the economic assessment of the effects of demographic changes. NTAs provide a new analytical framework for analysing a society on the basis of the economic relationships between generations, thereby revitalising and supplementing the conventional frameworks that are based, for example, on relationships between supply and demand on markets. As a statistical database, NTAs appear useful for economists who use age-structured models such as lifecycle or overlapping-generations models. Finally, they offer the advantage of presenting a set of data that are consistent with the National Accounts and constructed similarly from one country to another[1].

In France, NTAs supplement the work already done in the field of age-specific inequalities in resources. As early as the 1980s, Masson (1986) proposed measures of labour income by age for the period from 1949 to 1967, making it possible to compare not only age groups over time, but also cohorts at given ages. In 2002, a special edition of the journal *Économie et Prévision* was devoted to generational accounting (Accardo, 2002; Bonnet, 2002). More recently, Arrondel and Masson (2007) have quantified public and private transfers between two large age groups for a single year, around the pivot point of people aged 60.

The aim of generation-specific accounting was to compute, essentially for prospective analysis purposes, the balance of the State's net transfers, i.e. the difference between the benefits received and the taxes, duties, and contributions paid, over the lifecycle of each generation. This gave rise to a number of criticisms, from being based on the strong assumption that the social and tax legislation will be maintained for all current generations to the results, which are highly sensitive to the assumptions made (Bonnet, 2002). Although NTAs tie in with similar literature on studying economic flows between ages and generations, the method and goal differ from the methods and goals in such literature. NTAs look at all of the economic flows and they aim firstly to compare what each age (and possibly each generation whenever the NTAs have been available for a sufficiently large number of years) consume and produce, before studying the way in which consumption is funded at each age when it is not funded by labour income.

The first phase of the French NTA project is dedicated exclusively to calculating the labour income and total consumption profiles. It sheds light on how the gap between consumption and labour income has been changing in France over the last three decades, from 1979 to 2011. This choice of period can be explained by the fact that, in order to construct NTA, it is necessary to have individual data relating to the consumption and to the labour income of households[2]. The data are mapped with the French System

1. Today, about 70 national teams compile these accounts using the same methodology. See the National Transfer Accounts website for a presentation of the entire network of national teams: http://www.ntaccounts.org/web/nta/show/.

*2. 1979 and 2011 correspond to the earliest year and to the most recent year for which the French Household Expenditure Surveys (*Budget de famille*) are available. The choice was made to estimate the labour income and private consumption profiles on the basis of the same statistical survey, and thus on the basis of the same sample for any given survey year. It is quite possible that other surveys might lead to somewhat different estimated age profiles, for reasons of sampling, for example. The other surveys available in France do not include data relating both to private consumption and also to labour income. Only the* Budget de famille *Survey collects information about private consumption expenditure (conversely, other statistical sources do exist for income).*

of National Accounts data to determine, at each age, the mean levels of consumption and income for a given individual and for the population as a whole. Implementing NTA for France has produced some significant results.

Between 1979 and 2011, the level of labour income of people aged from 50 to 60 and the level of consumption of people aged 40 and over increased faster than the corresponding levels in younger age groups. Analysis of the profiles by cohort shows that the generations born up until 1940 have seen their level of consumption increase markedly compared with the generation born ten years earlier, and it also shows that the baby-boom generations have enjoyed a very significant increase in their level of labour income when compared with the generation born ten years earlier. Overall, the period of lifecycle surplus, i.e. the ages at which labour income exceeds consumption, has shortened over the period studied. It was 39 years in 1979 and only 34 years in 2011, even though the lengthening in life expectancy is mechanically increasing the funding needs during the retirement period. On an international level, comparing the French profiles with the profiles from other European countries reveals similarity in consumption, labour income, and lifecycle deficit profiles.

In the remainder of the article, we study the age profiles in 2011 for the most recent year of construction, and then the changes in consumption and labour income over time from 1979 to 2011[3]. The results also undergo comparative analyses, be it between cohorts or indeed at international level.

National Transfer Accounts

NTAs quantify the acquisition and the use of economic resources at each age (Lee & Mason, 2011). They are based on a unified international methodology that consists in introducing age into National Accounts (United Nations, 2013). These accounts serve to understand the way in which economic flows move between the various age groups of a population for a country and for a given year. For any given year, determining the age profiles requires calculating the mean levels of consumption and of labour income in the population, for each age. Such profiles also specify the different sources of income (labour and capital) and the different uses of that income in terms of whether it is used for private and public consumptions or for savings.

During their lives, individuals consume at all ages. Conversely, they produce economic wealth in working adulthood only. During youth and old age, consumption therefore exceeds labour income. The difference between the total consumption and labour income age profiles corresponds to the lifecycle deficit using the NTA international methodology (United Nations, 2013). Initially, this difference or gap makes it possible to define surplus and deficit situations without this being for normative purposes. The aim is to distinguish between the periods for which labour suffices to fund consumption at a given age and the periods during which labour income is insufficient[4].

The way the lifecycle is organised results in reallocations of resources that can be voluntary or be organised by the public decision-makers. These reallocations go from the surplus period during which the gap between consumption and labour income is negative, i.e. working adulthood, to the deficit periods during which that gap is positive, i.e. during youth and old age. The different public policies clearly influence the ages at which private and public consumption is greater than or less than labour income, e.g. through education or retirement choices. Demography also plays a part in determining the lengths of these periods, through the increase in life expectancy.

The NTA are based on an accounting identity such that, at each age a, resources must be equal to the uses that are made of them (United Nations, 2013):

(1)

$$Y^L(a) + Y^K(a) + T^I(a) = C(a) + S(a) + T^O(a)$$

The sum of labour income $Y^L(a)$, capital income $Y^K(a)$ and transfer inflows $T^I(a)$ must be equal to the sum of private and public consumption $C(a)$, savings $S(a)$ and transfer outflows

3. The database used for this article and the detailed technical manual for constructing the profiles are available on the website dedicated to NTA in France: ctn.site.ined.fr.

4. From a terminology point of view, the concept of lifecycle deficit can be confusing. On the one hand it would suggest that the age groups in deficit necessarily have a negative impact. If we take the case of the young ages, for example, the deficit is due solely to the fact that children are not able to participate in the labour market. On the other hand, it explicitly refers to the lifecycle even though the deficit is instantaneous: it is computed for all ages for an observed population and for a given year (cross-cutting approach) and not for individuals that are monitored all through their lives (longitudinal approach). Despite its limitations, the choice has been made to use this concept of lifecycle deficit that has imposed itself in the international NTA network.

$T^O(a)$. This accounting identity shows the gap between consumption and labour income $C(a) - Y^L(a)$, which, at each age, corresponds to the life cycle deficit (Lee, 1994) :

(2)

$$\left(C(a) - Y^L(a)\right) = \left(Y^K(a) - S(a)\right) + \left(T^I(a) - T^O(a)\right)$$

The difference between consumption and labour income results in resource reallocations being made between the ages, in the form either of net public or private transfers $T^N(a) = T^I(a) - T^O(a)$, or of asset-based reallocations, which refer to asset income net of savings $Y^K(a) - S(a)$. For each of these components, the methodology chosen includes three stages.

- The first stage consists in calculating an age profile for a given flow and for a given year. This profile $f(a)$ is obtained from survey data.

- In a second stage, the profile undergoes smoothing of the statistical series $\tilde{f}(a)$ over the ages. Although this profile is computed at individual level, it is also possible to obtain the aggregate profile that takes into account the overall age structure of the population. With the number of people at each age *a* in the population being noted $N(a)$, the aggregate flow *F* is $F = \sum \tilde{f}(a) N(a)$.

- Finally, the last stage consists in adjustment on the basis of the National Accounts, so that the aggregate flow *F* coincides with the corresponding book aggregate *C* for the year in question. The corrective term $c = F / C$ is then calculated and applied to the individual and aggregate smoothed series. The corrected profiles are $\tilde{f}^c = \tilde{f} / c$ at individual level and $F^c = F / c$ at aggregate level.

The NTA for France have been computed by using the data from the French System of National Accounts for determining the aggregates, from data collected through surveys conducted on households, and from other sources of public statistics. The methodology and the various statistical sources uses are described in detail in the on-line supplement. In view of the availability of the various editions of the French Household Expenditure survey (*Budget de famille*), NTA have been constructed for the years 1979, 1984, 1989, 1995, 2000, 2005 and 2011. That period, which came after "*les trente glorieuses*" (France's thirty years of post-war boom), began with the second oil crisis and ended in the aftermath of the financial crisis of 2007-2010. Overall, it corresponds to a period of fairly low economic growth up until the mid-1990s, followed by even lower growth (Bergeaud et al., 2014)[5].

The lifecycle deficit in 2011 in France

Consumption higher in retirement than in working adulthood

Total consumption spending accounted for 1,425 billion euros in France in 2011. That spending breaks down as follows: 65.9% for private consumption, and 34.1% for public consumption. The spending structure differs considerably between the two types of consumption. Of the private consumption, spending on education and health accounted for very small percentages, namely 1.1% and 3.8% respectively. Of the public consumption, education accounted for 18.8%, health for 29.8%, spending related to the elderly[6] for 4.2%, housing benefits for 3.4%, and other non-assignable spending such as defence, justice, or public administration for 43.8%.

In 2011, the consumption per capita profile shows that the total private and public consumption increased strongly during the youth years[7], rising from 10,601 euros at age 0, between birth and the first birthday, to 22,810 euros at age 20 (Figure I)[8]. Then, the level of consumption remained relatively stable until the age of 50 (about 21,500 euros), whereupon the total spending increased almost linearly to the age of 66. At that age, the sum of private and public consumptions was at its maximum (27,202 euros). Beyond that age, consumption swung between 25,500 euros and 28,000 euros, without any real downward or upward trend emerging. This age profile shows two important things. Firstly, for any given year, the levels of

5. In France, GDP per capita growth was 1.8% per annum from 1979 to 1995, and 1.0% per annum from 1995 to 2011.

*6. The "old people" item includes spending that is specific for this age group, in particular personal independence allowance (*allocation personnalisée d'autonomie *or "*APA*") (see details in the on-line supplement).*

7. Readers are reminded that a cross-cutting approach is used in this part of the article, by describing the age profiles at a given date, namely 2011. This is not a lifecycle approach in which the individuals are monitored as they advance in age.

8. The rise in private consumption excluding healthcare and education, which accounts for nearly one half of total consumption during youth (45.6% from 0 to 9, and 46% from 10 to 19) is highly dependent on the rule used for breaking down intra-household private consumption (excluding healthcare and education). The relative weight of the children is assumed to be equal to 0.4 until the age of 4 inclusive, and then to grow proportionally to the age of 20 to reach 1, and to remain constant thereafter.

total consumption that are observed for retirees substantially exceed the levels observed for working-age adults. Secondly, mean consumption is relatively stable at high ages.

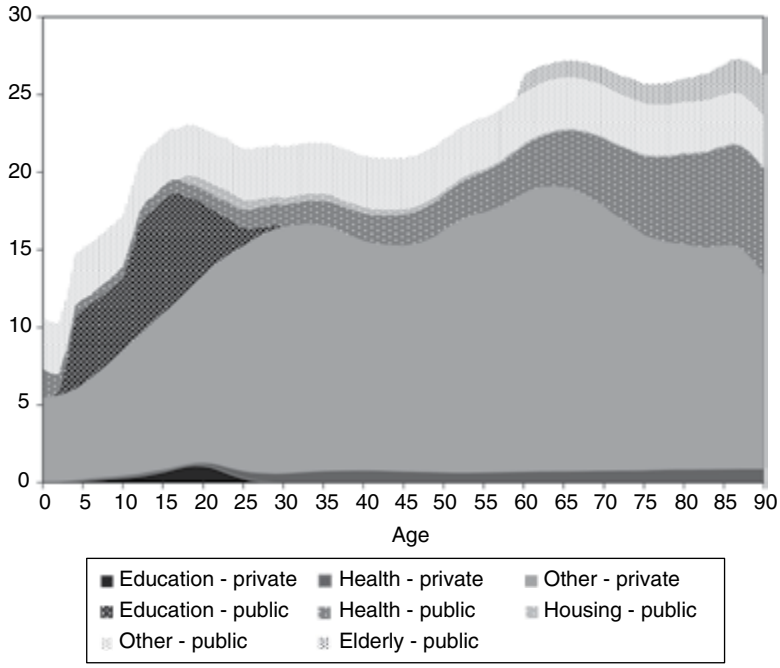
While the breakdown of private consumption by age depended mainly on spending excluding education and heath, due to the very low weights of those two items, public spending increased very strongly at the young ages through education spending and at the high ages under the influence of the "old people" spending item and of healthcare spending. Public expenditure per capita was at its maximum at the highest ages, with a mean amount of 12,837 euros at the age of 90. That sum was twice as high as the public spending in the 30-40 age bracket (5,285 euros on average). It was also higher than public consumption at the age of 15 (11,455 euros).

In 2011, the weight of public consumption in total consumption was 53% for the 0-9 age group and 50% for the 10-19 age group (Table 1). The reduction observed for the next age groups resulted from the large increase in private consumption. The contribution from public spending varied from 24.3% to 28.8% from age 30 to age 69. Looking in more detail, public spending on education represented 30.2% of total consumption for the 10-19 age group, but only 8.5% for the 20-29. The share represented by public spending on health was at its minimum for the 10-19 age group (4%). Compared with this age group, the weight of public spending on health was nearly five times larger for the 70-79 year-olds, nearly six times larger for the 80-89 age group, and indeed more than six times larger for the over 90s[9]. As a result of this growing healthcare spending at higher ages, and due to the spending related to the "old people" item, the relative significance of private spending in total consumption declined with increasing age: 74.1% for 50-59 year-olds, 63% for 70-79 year-olds, and 50,5% for people aged 90 and over.

9. By way of comparison, the weight of private spending on health was 3.2% for 70-79 year-olds, 3.3% for 80-89 year-olds, and 3.4% for people aged 90 and over.

Figure I
Consumption spending over age – per capita profiles – France 2011

Amount (in thousands of euros)



Reading note: in France, mean public and private consumption was 26,197 euros at the age of 60 for the year 2011.
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 2011 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 2008 permanent sample of people insured under state health insurance schemes and public statistics data, authors' calculations.*

The M-shaped age profile of private consumption observed in 2011, with a first mode at 33, a second mode at 64, and a low point at 45 between these two modes, can be observed for several countries taking part in the NTA Project (Tung, 2011). The V-shape from 33 to 64 corresponds to the ages at which the individuals have children in their households, their presence resulting in downward transfers within the households in order to fund children's consumption. The reduction in consumption after 64 can be explained by liquidity constraints, precautionary saving or motives for transmission (Deaton, 1992). An alternative explanation for this drop can be found in the fact that the consumption profile obtained in 2011 mixes generations born between the 1930s and the beginning of the baby boom. Those generations have experienced periods of war and of shortage that have marked their consumption behaviours throughout their life-cycles (Bodier, 1999).

The aggregate profile, which takes into account the population numbers, shows a sudden drop in consumption for the ages over 65[10]. This break is due to demographic changes, since the individuals aged 65 years or younger belong to the many baby-boom generations. The aggregate consumption is at its maximum for the ages ranging from 60 to 63, at about 22 billion euros per age, under the effect of two phenomena. Firstly, consumption per capita is high at those ages. Secondly, the population sizes associated with those ages that correspond to the first cohorts after the end of the Second World War, born between 1948 and 1951, are large. The aggregate level of consumption increases considerably from the age of 3 (9.6 billion euros) to the age of 19 (18.8 billion euros), due to the rise in public spending on education, and then increases at a lower rate during the working period. At higher ages, the aggregate consumption is 12.8 billion euros at 70, 11 billion at 80, and 4.2 billion at 90.

10. Figure C2-1 of the on-line supplement C2.

Table 1
Breakdown of total consumption by ten-year age group – France 2011

In %

Age Group	Private Consumption				Public Consumption					
	Education	Health	Other	Total	Education	Health	Elderly	Housing	Other	Total
0-9	0.8	0.6	45.6	47.0	22.3	6.8	0.0	0.0	23.9	53.0
10-19	3.3	0.7	46.0	50.0	30.2	4.0	0.0	0.5	15.3	50.0
20-29	2.1	1.9	64.4	68.4	8.5	5.2	0.0	2.9	14.9	31.6
30-39	0.0	3.4	72.3	75.7	0.0	7.2	0.0	2.0	15.1	24.3
40-49	0.0	3.6	69.9	73.5	0.0	9.3	0.0	1.7	15.6	26.5
50-59	0.0	2.9	71.2	74.1	0.0	11.0	0.0	0.9	14.0	25.9
60-69	0.0	2.8	67.3	70.2	0.0	13.0	4.0	0.5	12.2	29.8
70-79	0.0	3.2	59.9	63.0	0.0	19.0	4.9	0.5	12.6	37.0
80-89	0.0	3.3	53.6	57.0	0.0	23.2	7.0	0.5	12.3	43.0
90+	0.0	3.4	47.1	50.5	0.0	25.4	11.4	0.4	12.3	49.5
Overall	0.7	2.5	62.7	65.9	6.4	10.2	1.4	1.2	14.9	34.1

*Note: private consumption for education includes schooling fees and charges borne by the household (private school fees and higher education enrolment charges) and purchases of school equipment paid for by the household. Private consumption for health is what remains to be paid by the household after state health insurance cover. The other private consumption corresponds to the other items of private consumption (food and soft drinks, alcoholic drinks and tobacco, clothing and footwear, housing - including imputed rents, furniture, articles for everyday upkeep of the home, transport, communications, leisure and culture, hotels, cafés, bars and restaurants, and miscellaneous goods and services). Public consumption of education includes public spending for primary, secondary, and higher education. Public consumption of healthcare corresponds to state health insurance spending. Public spending for dependency is not included in the "health" or "healthcare" item, but rather in the "elderly" item (see on-line supplement). The "housing" item corresponds to personal housing benefit (*aide personnalisée au logement – APL*). Finally, the other public consumption spending corresponds to all of the public spending that cannot be allocated by age to individuals (defence, justice, public administration, etc.).*

Reading note: in France, public health consumption represented 11% of total consumption for the 50-59 age group for the year 2011.
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 2011 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 2008 permanent sample of people insured under state health insurance schemes and public statistics data, authors' calculations.*

A concentration of labour income from 30 to 55

In France, the sum of labour income totalled 1,214.1 billion euros for the year 2011. These resources corresponded for the most part to employee earnings (68.4%) and, to a lesser extent, to employer social contributions (24.8%), the share accounted for by self-employment income being more limited (6.8%).

The age profile for labour income at individual level approximately forms an inverted U-shaped curve (Figure II). There are three distinct periods. Firstly, the income increases very steeply for the ages ranging from 20 to 35, by which age the mean income equals 37,023 euros. Then, the mean income continues to grow with increasing age, but at a much slower pace until the age of 45. At that age, labour income remains relatively stable for about 5 years, with a mean amount of 42,000 euros. Finally, after 54, labour income starts falling suddenly: 37,453 euros at 55, then 28,326 euros at 58, then 19,872 euros at 60, then 12,657 euros at 62, then 6,737 euros at 64, and 3,325 euros at 66.

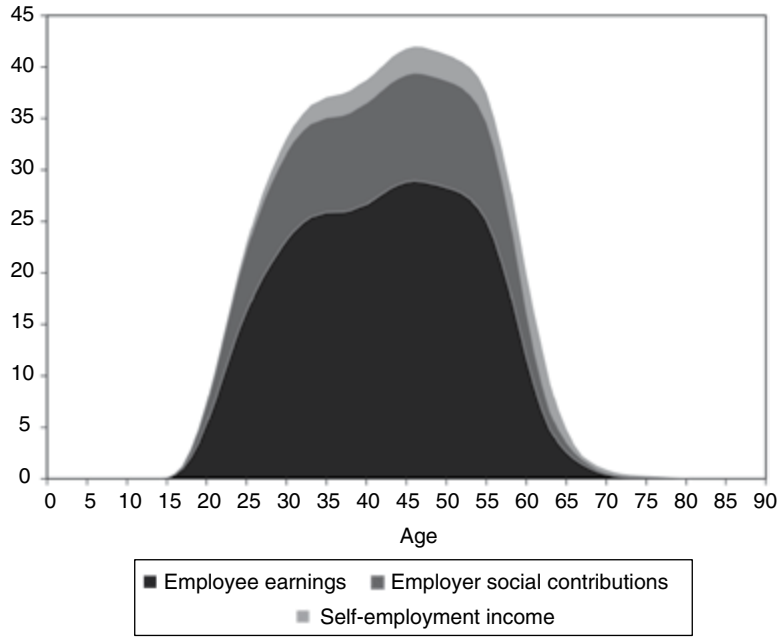
Quite a high concentration of labour income results from this profile: the 18 highest-income years account for one half of the labour income, while the 30 highest-income years account for 80% of it. Probable explanations for this concentration of labour income lie firstly in the increased length of time spent studying, and in the difficulties encountered by young people for integrating the labour market, resulting in very low mean earnings at young ages, and secondly in the retirement age that was, on average, 59.3 years for men and 59.6 years for women in France for the year 2011 according to the OECD[11].

At aggregate level, the age profile of the labour income looks somewhat different from the individual profile[12]. The effects of seniority that result in regular increases in employees' earnings from 25 to 40 at individual level are attenuated. From 30 to 34, the share contributed to

11. The actual retirement ages calculated by the OECD correspond to weighted means taken over 5-year periods for workers aged 40 and over. For 2011, the period taken into consideration is 2006-2011.
12. Figure C2-2 of the on-line supplement C2.

Figure II
Labour income – per capita profiles – France 2011

Amount (in thousands of euros)



Reading note: in France, mean labour income represented 41,948 euros at the age of 46 for the year 2011.
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 2011 French Household Expenditure Survey (Insee, Budget de famille*) and public statistics data, authors' calculations.*

the total aggregate income by each of these ages is roughly stable, at about 28 billion euros for the year 2011. Labour income then increases steeply until the age of 40. The aggregate profile highlights the major contribution made to total income by individuals aged from 40 to 50 inclusive: the share contributed by this age group represents exactly one-third of total income. Finally, the first generations of the baby boom are now contributing very little to labour income because of them retiring.

More years of deficit than of surplus

At each age a, the difference between total consumption $C(a)$ and labour income $Y^L(a)$ (i.e. the share of consumption that is not funded by income from work) is equal to public transfer inflows minus public transfer outflows $TPU^I(a) - TPU^O(a)$ plus private transfer inflows minus private transfer outflows $TPR^I(a) - TPR^O(a)$ plus the private and public asset income net of private and public saving $Y^K(a) - S(a)$[13]. Public transfer inflows include public consumption and public cash transfers (retirement pensions, unemployment benefit, family allowance, etc.), while public transfer otuflows correspond to the total tax (i.e. the compulsory levies comprising employee and employer social contributions, and all taxes and duties). Private transfers include intra-household transfers (funding of consumption and transfers of imputed rents) and inter-household transfers (financial and in-kind assistance, excluding inheritances and excluding gifts or donations).

At aggregate level, the gap between consumption and labour income $D = C - Y^L$ totalled 211 billion euros in France in 2011, i.e. 10.2% of GDP. This overall deficit was funded by asset income net of saving (asset-based reallocations) $Y^K - S$ for an amount of 251.6 billion and by net public or private transfers for an amount of – 40.6 billion. The public components of the asset income and of the savings are negative, – 35.7 billion and – 76.4 billion euros respectively, which can be explained by public debt. The fact that the net public or private transfers T^N are negative corresponds to a situation in which the transfers given to the rest of the world exceed the transfers received from the rest of the world.

The per capita profile of the lifecycle deficit by age for the year 2011 follows the course of the major periods of life (Figure III). At the young ages, the maximum gap between consumption and labour income is observed at 16, and is equal to 22,344 euros. At the retirement ages, this gap remains roughly stable as from 68, at about 26,500 euros. The ages at which the gap between consumption and labour income is negative range from 25 to 58. Thus, the lengths of the periods during which consumption exceeds labour income are equal to 25 years at the young ages (from 0 to 24) and to 24 years at the retirement ages (from 59 to 82), on the basis of a life expectancy at birth of 82, as observed in 2011[14].

The length (49 years) of the cumulative period for which the difference between consumption and labour income is positive is less than the length (34 years) of the period for which the gap is negative during working adulthood (from 25 to 58). The latter period thus represents 40% of mean length of life in 2011. The largest surplus, equal to 20,952 euros, is observed at the age of 46 years. It exceeds 15,000 euros per annum over a relatively short period of 20 years, in the age range 35 to 54.

Comparing the per capita and aggregate profiles reveals gaps that can be observed above all for the high ages[15]. As the population sizes decline due to mortality, there is a mechanical decrease in the aggregate amount of the gap between consumption and labour income. For the old-age period, the maximum gap is reached at the age of 64 (for an amount of 15.7 billion euros), which corresponds to the cohort born in 1947. The annual amount of the deficit then declines slowly to the age of 80 (11 billion euros), whereupon it decreases much faster to 90 years (4.2 billion euros). Beyond that age, it is small in view of the small sizes of the very old populations in 2011. At aggregate level, the ages at which the labour income is greater than consumption remain equal to 25 and to 58.

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13. More precisely, net public savings corresponds to gross savings by public administrations (or "PAs" for short) minus fixed-capital consumption by PAs. PA gross saving is composed by the difference between inflows (gross national income of the PAs, current taxes on net income and wealth of the PAs, and other current transfer inflows) and outflows (public transfers in cash and in kind, other current transfer outflows). Such public saving does not have any counterpart in the statistics that are usually presented in public finance. The public asset income (before savings are deducted, but net of fixed-capital consumption) is composed of capital income and of property income of public administrations. Such property income corresponds to income from assets owned by the public administrations. Public capital income is equal to the net operating surplus of the public administrations.

14. Life expectancy at birth was 78.4 years for men and 85 years for women in 2011 (Beaumel & Bellamy, 2013).

15. Figure C2-3 of the on-line supplement C2.

The dynamics of the lifecycle deficit

A deficit that is gradually increasing

Over the last three decades, life expectancy in France has risen from 74 years in 1980 to 82 years in 2011, and the structure of the population has changed with the advancing ages of the baby-boom generations. The mean age was 40.3 in 2011, after being 36.9 in 1991. The French economy has gone through several economic crises, in particular in 1979-1981 (2nd oil crisis), in 1993 (EMS crisis), and more recently with the financial crisis that began in 2008 and then the euro zone crisis in 2010.

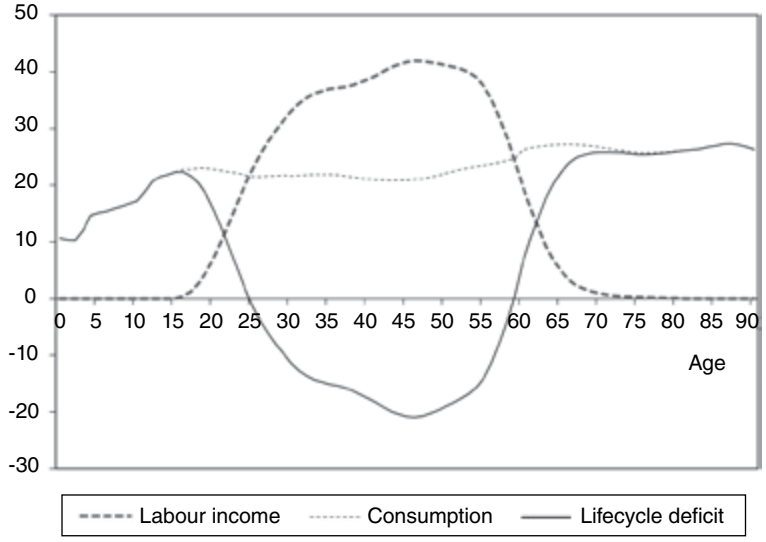
France has also undergone profound societal transformations. For example, the number of years of study has increased considerably because the school life expectancy between the ages of 2 and 29 rose from 16.9 years in 1985-1986 to 18.8 years in 1995-1996, before decreasing slightly until 2013-2014, when it reached 18.3 years (French Ministry of National Education, 2016). There have also been significant changes in the length of the contribution period and in the retirement age. In 1982, the pension entitlement age was lowered to 60 years with an insurance period of 37.5 years for full pension entitlement. The "Balladur" reform of 1993 then increased that insurance period to 160 quarters. The "Fillon" reform of 2003 aligned the insurance period for civil servants with the insurance period for private-sector employees, before the 2010 reform came and gradually increased the full pension entitlement age to 62. These changes alter the gap between consumption and labour income, now studied over the period going from 1979 to 2011 (Table 2)[16].

At aggregate level, there are two distinct periods. During a first stage, the total deficit grew steeply from 1979 to 1989. While labour income was 15.8 billion euros higher than total consumption in 1979, the gap between consumption and labour income then deteriorated abruptly. It became positive as of 1981, and then increased steeply to reach 100.7 billion in 1989. That amount represented 15.3% of the total consumption for that year. Labour income was then

16. *The amounts are expressed in 2011 euros. So far, this dynamic aspect in the NTA Project has been addressed only in the United States (Donehower et al., 2011), in Sweden (Lindh et al., 2011) and in Taiwan (Lai & Tung, 2015).*

Figure III
Life cycle deficit – per capita profiles – France 2011

Amount (in thousands of euros)



Reading note: in France, the lifecycle deficit (corresponding to the gap between total consumption and labour income) represented a negative value of -20,952 euros at the age of 46 for year the year 2011.
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 2011 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 2008 permanent sample of people insured under state health insurance schemes and public statistics data, authors' calculations.*

no longer sufficient to cover total consumption, which had to be funded otherwise, in particular by asset income net of savings (both public and private). We can thus observe an increase in the share of that income in funding consumption, from 0% in 1979 to 6.8% in 1984, and to 12.2% in 1989.

During a second stage, the ratio of consumption to labour income saw its growth slow down considerably, going from 1.12 in 1989 to 1.17 in 2011. Since 1989, the total gap between consumption and labour income has accounted for about 15% of the amount of private and public consumption. Over the last decade, growth in the lifecycle deficit has significantly slowed but it remains high (+ 23.1% from 2000 to 2005, and + 17.6% from 2005 to 2011).

The age profiles of lifecycle deficit per capita are characterised by a lowercase v-shape, over the whole of the studied period, from 1979 to 2011 (Figure IV). Regardless of the year considered, the difference between consumption and labour income is positive for the young ages and for old people, while the intermediate age groups who are working have more income than they consume. Comparison of

Table 2
Variation in National Transfer Account aggregates – France 1979-2011

(in real terms, 2011 constant euros)

Aggregate	1979	1984	1989	1995	2000	2005	2011
1. Lifecycle deficit							
Consumption (in billions of euros)	761.0	848.6	975.6	1056.7	1182.9	1317.8	1425.0
Private consumption (in %)	68.1	67.0	68.2	65.9	66.5	66.1	65.9
Education (in %)	0.8	0.8	1.0	0.9	0.9	0.9	1.1
Health (in %)	2.1	2.4	2.9	3.4	3.3	3.5	3.8
Other (in %)	97.1	96.8	96.2	95.7	95.8	95.5	95.1
Public consumption (in %)	31.9	33.0	31.8	34.1	33.5	33.9	34.1
Education (in %)	22.9	22.0	20.5	22.0	22.0	20.6	18.8
Health (in %)	24.2	24.1	25.7	26.1	26.4	29.2	29.8
Housing (in %)	2.1	3.1	3.5	4.1	4.0	3.5	3.4
Old people (in %)	3.8	3.8	4.0	4.0	3.7	3.9	4.2
Other (in %)	46.9	47.0	46.3	43.8	43.9	42.8	43.8
Labour income (in billions of euros)	776.8	805.7	874.8	925.8	1037.2	1138.5	1214.1
Employee earnings (in %)	63.8	63.2	63.7	66.0	67.8	68.0	68.4
Employer social contributions (in%)	22.6	23.6	24.4	24.9	24.5	24.3	24.8
Self-employment income (in %)	13.6	13.2	11.9	9.1	7.7	7.7	6.8
Ratio of consumption to labour income	0.98	1.05	1.12	1.14	1.14	1.16	1.17
Lifecycle deficit (in billions of euros)	- 15.8	42.9	100.7	130.8	145.7	179.3	211.0
Lifecycle deficit (in % of consumption)	- 6.2	8.9	15.3	15.9	14.9	15.0	14.8
Lifecycle deficit (variation in % [t -(t-n)] / t-n)	-	- 371.4	134.8	29.9	11.4	23.0	17.6
2. Funding of the lifecycle deficit							
Net public or private transfers	- 15.6	- 14.7	- 18.1	- 20.2	- 28.4	- 33.1	- 40.6
Asset income (in billions of euros)	121.3	112.1	234.2	241.2	327.5	327.2	316.4
Private assets (in %)	101.9	110.2	107.0	113.0	111.1	111.4	111.3
Public assets (in %)	- 1.9	- 10.2	- 7.0	- 13.0	- 11.1	- 11.4	- 11.3
Savings (in billions of euros)	121.5	54.5	115.4	90.2	153.4	114.7	64.7
Private savings (in %)	82.0	117.9	94.7	150.1	99.5	131.1	217.9
Pubic savings (in %)	18.0	- 17.9	5.3	- 50.1	0.5	- 31.1	- 117.9
Ratio of asset income to savings	1.00	2.06	2.03	2.67	2.14	2.85	4.89
Ratio of assets net of savings to consumption	0.0	6.8	12.2	14.3	14.7	16.1	17.7

Reading note 1: in France, the share of public consumption in total consumption rose from 31.9% in 1979 to 34.1% in 2011.
Reading note 2: in France, the lifecycle deficit in real terms (in constant euros) increased by 17.6% from 2005 to 2011.
Coverage: Metropolitan France and French Overseas Départements*.*
Source: data from public statistics (French System of National Accounts).

the four profiles presented (1979, 1989, 2000, 2011) clearly shows that the gap between consumption and labour income has widened increasingly over the recent period. Expressed in constant euros, i.e. in real terms, the widest gap observed for the young ages has been multiplied by about 1.6 between 1979 (14,249 euros) and 2011 (22,344 euros). For the elderly, this gap almost doubled over the same period, from 13,979 euros in 1979 to 27,571 euros in 2011. This faster growth in the lifecycle deficit for the old ages compared with the young ages can be explained by the dynamics of the increase in consumption, which is more pronounced for the 60 years old and over from 1979 to 2011.

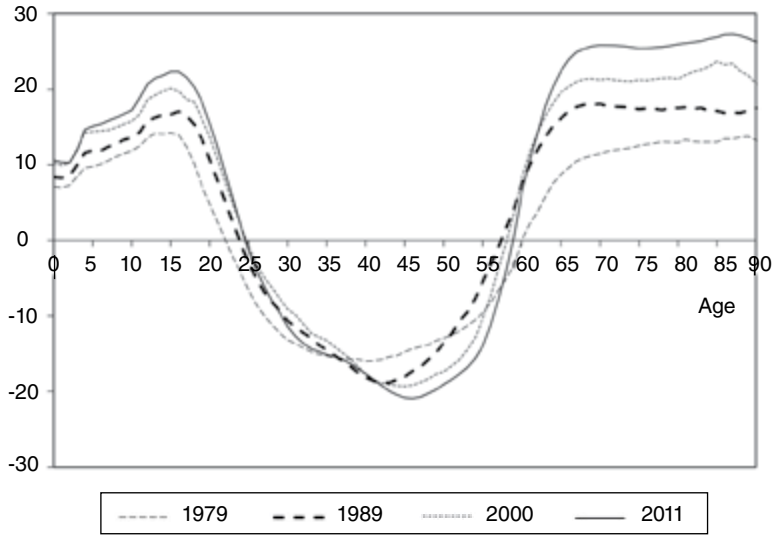
In parallel, the increase in the maximum surplus is of much smaller magnitude, going from 16,006 euros in 1979 to 20,951 euros in 2011 (i.e. a rise of 30%). The lengths of the periods for which consumption is greater or less than labour income have changed accordingly over time (Table 3). The number of years for which consumption exceeds labour income during youth increased significantly from 1979 to 1995 (going from 22 years to 26 years), and then remained stable at from 2000 to 2011 (at 25 years). The age at which consumption becomes greater than labour income again is 58 for the majority of the years considered, except for 1979, 2000, and 2011. A given individual consumed more than they produced at the age of 61 in 1979, and at the age of 59 in 2000 and in 2011.

With the continuous increase in life expectancy in France, the number of years in a deficit situation at high ages has increased considerably, going from 14 years in 1979 to 24 years in and 2011. Gradually, the number of years for which the gap between consumption and income is positive during old age is approaching the number observed during youth. Due to the concomitant lengthening of the deficit periods at young and old ages, the ratio of the ages for which consumption exceeds labour income to the ages for which labour income is higher than consumption has risen from 0.92 in 1979 to 1.44 in 2011. In 1979, 49% of the ages were characterised by a deficit, for a life expectancy equal to 74 years. That ratio then increased before becoming stabilised at about 60% from 1995 onwards.

At aggregate level, the lifecycle deficit profile continues to have a lowercase v-shape for the

Figure IV
Variation in life cycle deficit over age – per capita profiles – France 1979-2011

Amount in real terms (in thousands of 2011 constant euros)



Reading note: in France, at the age of 70, the mean lifecycle deficit grew from 11,445 euros in 1979 to 18,068 euros in 1989, to 21,221 euros in 2000, and then to 25,811 euros in 2011 (in real terms, 2011 constant euros).
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 1979, 1989, 2000 and 2011 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 1992 and 1998 Irdes Health and Welfare Surveys (Irdes*, enquêtes Santé et Protection Sociale*), 2000, 2002, 2004, 2006, and 2008 permanent samples of people insured under state health insurance schemes, and data from public statistics, calculations by the authors.*

various years used[17]. For the year 1979, labour income exceeded consumption by 11 billion euros for the ages from 29 to 32, corresponding to the first cohorts of the baby boom, born from 1947 to 1950. Those cohorts are also those for which the difference between consumption and labour income was at its minimum in 1989 (they were then aged from 39 to 42), but they do not stand out from the other cohorts in 2000. Conversely, the gap during the old age period is at its maximum (more than 14 billion euros) for the 1947 and 1948 cohorts in 2011, when they were aged respectively 64 and 63. The increase in the mean gap, which particularly affects the high ages, has a major impact on the aggregate gap in a demographic context in which the share of the elderly population is increasing.

An improvement in the relative situation of people aged 60 and over

The composition of consumption has changed substantially over the period. The weight of private consumption has decreased in favour of public consumption, going from 68.1% in 1979 to 65.9% in 2011 (Table 2). However, this proportion has been remarkably stable since 1995, at about 66%. At a finer level, private education spending is very low whereas private health spending has been tending to rise steadily (2.1% of private consumption in 1979, 3.4% in 1995, and 3.8% in 2011). Public health spending has also increased considerably over the period, going from 24.2% of public consumption in 1979 to 29.8% of public consumption in 2011. Meanwhile, the share of public consumption devoted to education has tended to decline over the last decade (22% in 2000, 20.6% in 2005 and 18.8% in 2011).

At individual level, the age profile of total consumption is characterised by two main transformations. Firstly, the annual profiles have shifted upwards over time. The consumption levels have been systematically higher at each age since 1979 (Figure V). Secondly, the general shape of this profile has changed over the period. In 1979, consumption increased steeply from the ages of 0 to 16, and then the profile varied very little from the ages of 20 to 60. As from 2000, variations in consumption have been more marked during working-age adulthood. Since 1989, the level of consumption has been characterised by a first peak at about the age of 18. Beyond that age, a slight reduction in consumption is observed until about the age of 40, whereupon the level of consumption starts to rise again, and the magnitude of that growth has increased over the recent period. This upturn in total consumption in the second part of the working life coincides with ages when parents no longer have to provide for their children financially.

Comparison of the mean levels of consumption of the three main age groups (young adults, old people) highlights this relative improvement in the situation of the elderly. In 1979, people aged

17. *Figure C2-4 of the on-line supplement C2.*

Table 3
Characterisation of the gap between consumption and labour income at individual level – France 1979-2011

Consumption – labour income	1979	1984	1989	1995	2000	2005	2011
Youth – last age at which $C > Y^L$	21	22	23	25	24	24	24
Youth – number of years for which $C > Y^L$	22	23	24	26	25	25	25
Old age – first age at which $C > Y^L$	61	58	58	58	59	58	59
Old age – number of years for which $C > Y^L$	14	18	20	21	21	23	24
Total number of years for which $C > Y^L$	36	41	44	47	46	48	49
Total number of years for which $C > Y^L$	39	35	34	32	34	33	34
Ratio of years of $C > Y^L$ to years of $C < Y^L$	0.92	1.17	1.29	1.47	1.35	1.45	1.44
Ratio of years of $C > Y^L$ to life expectancy	0.49	0.55	0.57	0.60	0.58	0.60	0.60

Note: the number of years for which public and private consumption exceeds labour income during old age is given by the difference between life expectancy and the first age at which (inclusive). Life expectancy at birth was 74 years in 1979, 75 in 1984, 77 in 1989, 78 in 1995, 79 in 2000, 80 in 2005 and 82 in 2011.

Coverage: Metropolitan France and French Overseas Départements*.*
Source: 1979, 1989, 2000 and 2011 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 1992 and 1998 Irdes Health and Welfare Surveys (Irdes*, enquêtes Santé et Protection Sociale*), 2000, 2002, 2004, 2006, and 2008 permanent samples of people insured under state health insurance schemes, and data from public statistics, calculations by the authors.*

from 60 to 79 are characterized by a level of consumption that was greater by 1.7% on average than the consumption of the 20-59 age group. This difference has been accentuated over the period as a whole: + 7.5% in 1989, + 8.7% in 2000, and + 17% in 2011. Conversely, over the period as a whole, consumption of the 20-59 age group remained, on average, in the range 22% to 28% greater than consumption of young people aged 0 to 19. The dynamics of the consumption of 60-79 year-olds can be explained essentially by an increase in their level of private consumption relative to the younger age groups, because the relative level of public consumption between age groups remained stable from 1979 to 2011. The ratio of the private consumption of the 60-79 age group relative to the 20-59 age group went from 0.88 in 1979 to 1.11 in 2011.

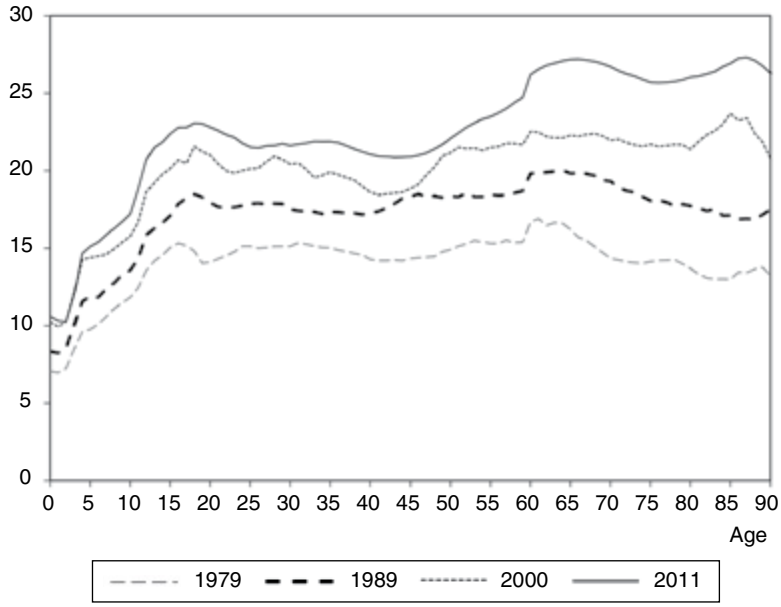
At the same time, the ratio between those two age groups for public consumption went from 1.49 to 1.46. This result might seem surprising, because public spending related to health is accounting for an increasing share of the total consumption of 60-79 year-olds (13.3% in 1979, 15.3% in 2000 and 15.4% in 2011). However, public spending on health is also occupying an increasing share for adults aged from 20 to 59 (7% in 1979, 7.1% in 2000, and 8.3% in 2011), resulting in a tendency for the relative ratio of public consumption between these two age groups to remain stable.

At aggregate level, the increase in the length of life that can be observed throughout the period is reinforcing the share contributed by for the high ages to total consumption. People aged 60 and over accounted for 18.1% of private and public consumption in 1979, 20.8% in 1989, 23% in 2000, and 27.9% in 2011. This significant increase at the very end of the period results from the fact that the cohorts born from 1946 to 1950 were at least 60 years old in 2011. As the baby-boom cohorts grow older, the mode of the aggregate profile is shifting rapidly rightwards[18]. Since the aggregate profiles are deformed due to time-related variations in the individual

18. *Figure C2-5 of the on-line supplement C2.*

Figure V
Variation in total consumption spending over age – per capita profiles – France 1979-2011

Amount in real terms (in thousands of 2011 constant euros)



Reading note: in France, mean public and private consumption at the age of 60 went from 16,680 euros in 1979 to 19,821 euros in 1989, to 22,527 euros in 2000, and to 26,197 euros in 2011 (in real terms, 2011 constant euros).
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 1979, 1989, 2000 and 2011 French Household Expenditure Survey (Insee, Budget de famille), 2008 French Household Disability and Health Survey (Drees, enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 1992 and 1998 Irdes Health and Welfare Surveys (Irdes*, enquêtes Santé et Protection Sociale*), 2000, 2002, 2004, 2006, and 2008 permanent samples of people insured under state health insurance schemes, and data from public statistics, calculations by the authors.*

profiles and to demographic changes, the effects related to the increase in the length of life can be neutralised by thinking in terms of an unchanged population structure (Lee & Mason, 2011).

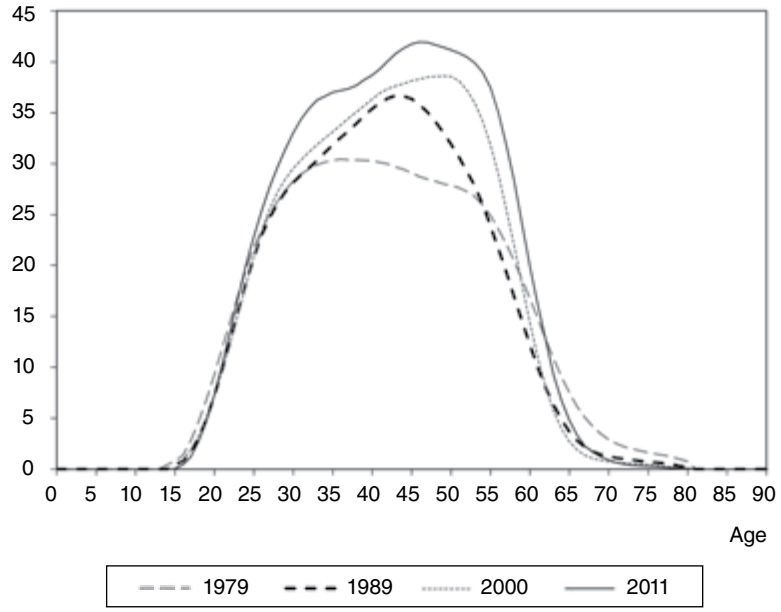
The mean age $\overline{a}_C$ at which one euro is consumed in France for the various years analysed is such that $\overline{a}_C = \sum aC(a) / \sum C(a)$ where $C(a)$ is the aggregate consumption at age a computed for the age structure of the population for that year. That age increased by 17.5% over the period as a whole (36.8 years in 1979, 38.5 years in 1989, 40.5 years in 2000, and 43.2 years in 2011). This rise appears much more moderate when the calculation of the mean age is based on the age structure of the population for the year 2011. Net of the effect of the increase in the length of life, the mean age at which one euro is consumed went from 41.6 in 1979 to 43.2 in 2011, i.e. a rise of only 3.9%. This would thus suggest that the demographic effect is the main factor in explaining the rise in the mean age at which one euro is consumed.

The main change observed for income relates to the marked reduction in the share contributed by the self-employed, in particular at the beginning of the period (Table 2). In 1979 and 1984, self-employment income accounted for more than 13% of labour income. This proportion was only 7.7% in 2000 and in 2005, and even 6.8% in 2011. Labour income was multiplied by more than 1.5 from 1979 to 2011. In addition to the higher levels of income at each age over time, at least for the ages from 25 to 55, the individual age profiles have been transformed (Figure VI). The modal age has varied significantly in 30 years by shifting rightwards[19]. In 1979, the mean labour income was higher at the age of 36. In that year, individuals aged from 30 to 39 earned, on average, 20% more than 50-59 year-olds. In 1989, the modal age had risen to 43 years, and the highest-earning age group was the 40-49 one. The modal age continued to rise in 2000 (49 years), but then fell back to 46 years during the year 2011. Overall, the profiles tended gradually to become more vertical, both at the beginning and at the end of working life.

19. The modal age corresponds to the cohort born in 1943 for the year 1979, to the cohort born in 1946 for the year 1989, to the cohort born in 1951 for the year 2000, and to the cohort born in 1965 for the year 2011.

Figure VI
Variation in labour income over age – per capita profiles – France 1979-2011

Amount in real terms (in thousands of 2011 constant euros)



Reading note: in France, mean labour income at the age of 40 went from 30,281 euros in 1979 to 38,690 euros in 2011 (in real terms, 2011 constant euros).
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 1979, 1989, 2000 and 2011 French Household Expenditure Survey (Insee, Budget de famille*) and data from public statistics, calculations by the authors.*

At aggregate level, the rise in the modal age observed for the individual profile for income, and the ageing of baby-boom cohorts have led to an increase in the ages at which most of the labour income is received. The modal age associated with the highest aggregate income went from 31 in 1979 to 49 in 2000[20]. In 1979, the five-year age group that contributed the most to the total aggregate income corresponded to the 30-34 age group (with a proportion of 15%). Since 1996, the modal age group has been represented by the 45-49 age group (17% in 1996 and 15.7% in 2011). The mean age at which one euro is earned rose between 1979 (40) and 2011 (42.6), by 6.5%. This increase is due above all to the change in the age structure of the population over the period. For the age structure of the French population in 2011, the rise in the mean age at which one euro is earned is very small, going from 42.1 in 1979 to 42.2 in 2000.

A generational analysis

The variations observed from 1979 to 2011 would suggest that the resources have been shifting in favour of the older individuals in France. Although private and public consumption has increased at each age over time, it is the over 60s who have had the highest levels of consumption since 2000. In 1979, the cumulative amount of the deficit during the young ages was twice as high as during the high ages. This ratio then decreased considerably, going to 1.4 in 1989 and 1.1 in 2000. In 2011, the cumulative amount of deficit in old age exceeded by 7.8% the cumulative amount in youth.

These resource reallocations across the ages are, in part, attributable to changes in the age structure of the French population. At aggregate level, the magnitude of the total lifecycle deficit for any given year increases mechanically as the number of old people increases. The effect of this demographic factor is neutralised by applying the age structure of the population as observed in 2011. If the age structure of the population in 1979 had been as in 2011, then the cumulative amount of total deficit at the young ages would have been only 22.3% greater than the cumulative amount in old age. The total deficit that characterises youth would have been relatively lower than the total deficit for old people as of 1984 (– 3.7%) and would have been significantly lower in 2005 (– 9%) and in 2011 (– 7.8%).

The issue of interest is then to determine whether that resource reallocation between age groups at a given date, and taking place gradually towards the highest ages, changes the relative situations of the various generations. By definition, the lifecycle deficit approach consists in comparing, at a given date, different ages, and therefore different generations. Constructing the NTA for France over three decades makes it possible to shed new light at generational level through the formation of cohorts. According to the age profiles of lifecycle deficit for the cohorts born from 1900 to 2000 (with spacing of 10 years between each cohort), superposing the various curves by generation does indeed yield a gap that generally has the shape of a lower–case v (Figure VII). This observation is not surprising insofar as individuals do not have any labour income at the beginnings and at the ends of their lifecycles, regardless of the period in question, even if the length of those episodes varies depending on the generations.

Analysing the situations of the successive cohorts shows that the most noticeable intergenerational gaps are observed at the high ages. Comparing the cohorts born in 1900, 1910, 1920, and 1930 shows that the level of deficit has increased rapidly at the various end-of-life ages. At the age of 80, the level of deficit of a person born in 1900 was 13,850 euros (in real terms, 2011 constant euros). At the same age, this level was 29% higher for the generation born in 1910, 54.2% higher for the 1920 generation, and 90% higher for the 1930 generation. This rapid increase can also be observed at the age of 65. The level of deficit at that age for the 1940 cohort was 16% higher than for the 1930 cohort, the rise being by 34.1% between the 1930 and 1920 cohorts.

These variations are solely due to the dynamics of consumption, given that income is very low after 60 years and zero after 80 years. The rapid growth in consumption by a generation at high ages could be explained by three assumptions: a considerable reduction in the rate of saving from one generation to another, the rise of the pay-as-you-go pension system, or the increase in asset income. The first assumption can be discarded from the outset, because the generations born between the first and second World Wars are characterized by a high level of savings (Mathé et al., 2012).

The other two explanations would appear more plausible for explaining the large increase in

20. *Figure C2-6 of the on-line supplement C2.*

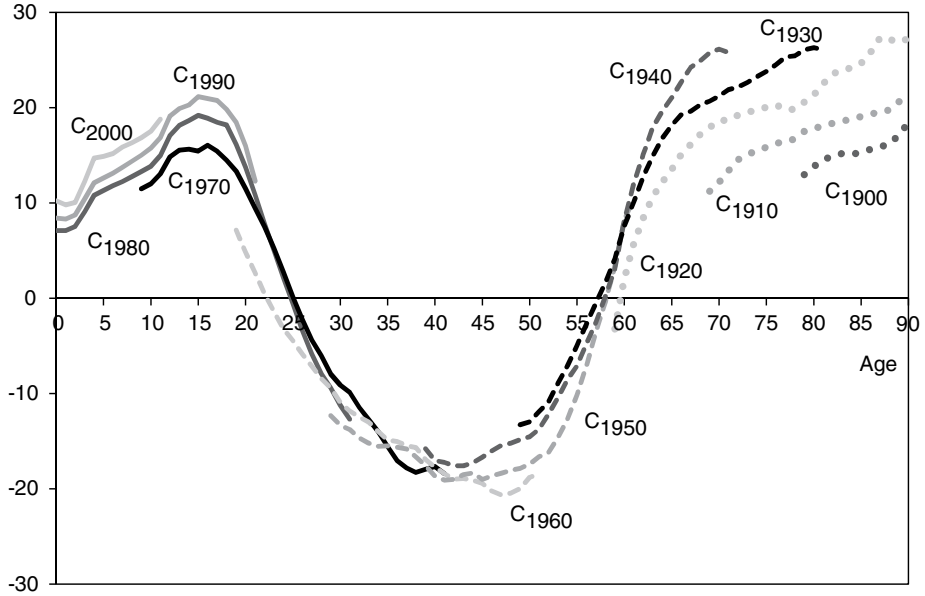
the level of consumption from one generation to another at the high ages. Firstly, the retirement pensions improved considerably from one generation to another. Their mean amount thus progressed faster than the labour income in the economy as a whole, almost continuously from the generations 1939 to 1947 (COR, 2014). Secondly, the level of wealth is increasingly concentrated at high ages (Arrondel et al., 2014), resulting in an increase in the level of asset income over the generations (Navaux, 2016). In addition, a clear break appears for the 1920 and 1930 cohorts when consideration is given to the age at which the deficit becomes strictly positive at the end of the working life. It is 60 for the 1920 cohort and 58 for the 1930 cohort, reflecting the reduction in the retirement age implemented in April 1983 and the rolling-out of the pre-retirement schemes (Burricand & Roth, 2000).

At the young ages, the amounts of the deficit at any given age have also tended to increase with the successive generations. At the age of 10, the amount of the deficit per capita that was, on average, 12,027 euros for the 1970 cohort has increased: + 15.3% for the 1980 cohort, + 31.1% for the 1990 cohort and + 45.9% for the 2000 cohort. The order of magnitude of these increases appears smaller in comparison with the earlier generations, in relation to the increasing weight of public health spending that primarily benefits the elderly, and in relation to per capita private spending that increases more rapidly at the high ages. There is also a break between the 1960 cohort and the 1970 cohort. For the former, the gap between consumption and labour income becomes negative at the age of 23, while for the 1970 cohort, it becomes negative at 26. This shift might be due to the increase in the number of years of study or to the economic context of the time that mades access to employment more or less easy.

The total consumption increases to a much larger extent with age at cohort level in comparison with the profile obtained for the various years of observation (Figure VIII-A). The cohorts born in 1940 and in 1950 have seen their mean amount of consumption multiplied by more

Figure VII
Variation in lifecycle deficit by birth cohorts – per capita profiles – France 1979-2011

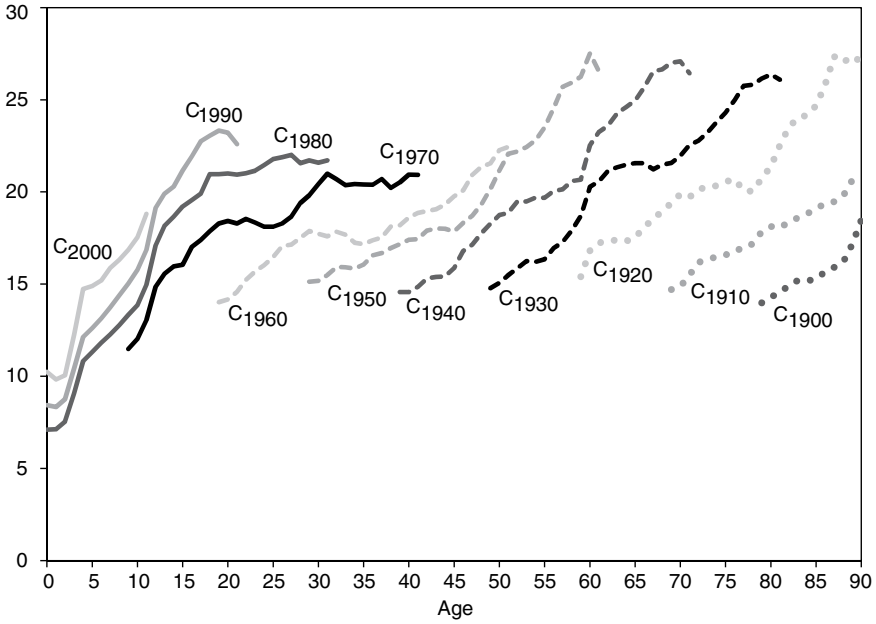
Amount in real terms (in thousands of 2011 constant euros)



Reading note: in France the mean annual lifecycle deficit at the age of 75 went from 15,866 euros for the generation born in 1910, to 20,064 euros for the generation born in 1920, and to 23,811 euros for the generation born in 1930 (in real terms, 2011 constant euros).
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 1979, 1989, 2000 and 2011 French Household Expenditure Survey (Insee, Budget de famille), 2008 French Household Disability and Health Survey (Drees, enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 1992 and 1998 Irdes Health and Welfare Surveys (Irdes*, enquêtes Santé et Protection Sociale*), 2000, 2002, 2004, 2006, and 2008 permanent samples of people insured under state health insurance schemes, and data from public statistics, calculations by the authors.*

Figure VIII-A
Variation in consumption by birth cohorts – per capita profiles – France 1979-2011

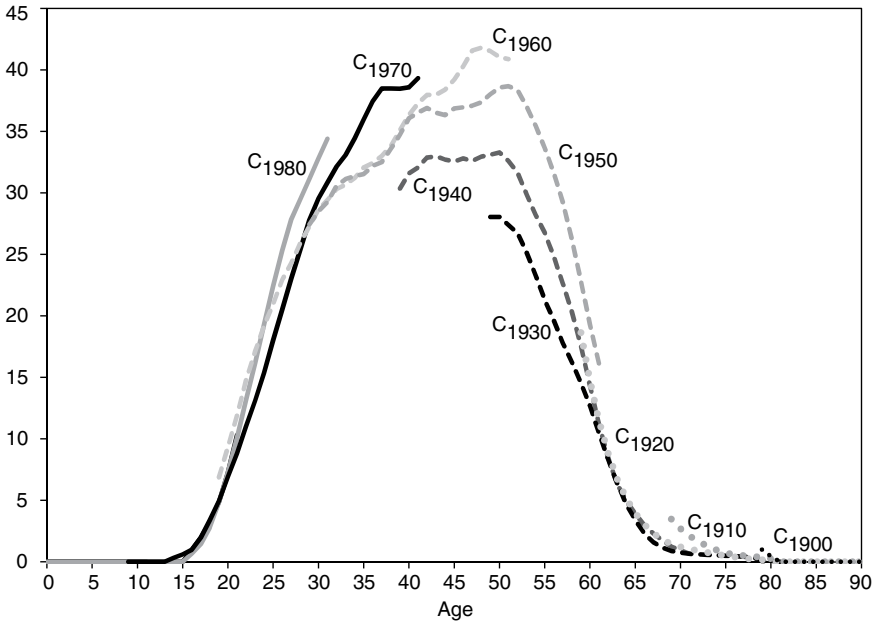
Amount in real terms (in thousands of 2011 constant euros)



Reading note: in France the mean annual public and private consumption at the age of 75 went from 16,576 euros for the generation born in 1910, to 20,550 euros for the generation born in 1920, and to 24,292 euros for the generation born in 1930 (in real terms, 2011 constant euros).
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 1979, 1989, 2000 and 2011 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 1992 and 1998 Irdes Health and Welfare Surveys (Irdes*, enquêtes Santé et Protection Sociale*), 2000, 2002, 2004, 2006, and 2008 permanent samples of people insured under state health insurance schemes, and data from public statistics, calculations by the authors.*

Figure VIII-B
Variation in labour income by birth cohorts – per capita profiles – France 1979-2011

Amount in real terms (in thousands of 2011 constant euros)



Reading note: in France, mean annual labour income at the age of 75 went from 710 euros for the generation born in 1910 to 486 euros for the generation born in 1920 and to 481 euros for the generation born in 1930 (in real terms, 2011 constant euros).
Coverage: Metropolitan France and French Overseas Départements*.*
Source: 1979, 1989, 2000 and 2011 French Household Expenditure Survey (Insee, Budget de famille*) and data from public statistics, calculations by the authors.*

than 1.5 between the ages ranging from 40 to 60. The relative situation of the generations in questions has thus improved. If consideration is given to the way consumption changes from age 30 to age 40, the mean amount has increased by 14.7% for the 1950 cohort, by 5% for the 1960 cohort, and by 2.5% for the 1970 cohort. In other words, although the more recent generations are characterised by higher consumption earlier in the lifecycle, the improvement has been taking place at a decreasing pace.

The age profiles for labour income that are obtained from a representation of the cohorts are very close to those obtained from the cross-cutting analysis (Figure VIII-B). Here too, we can clearly see an improvement in the mean income at each age for the successive cohorts[21]. Although the profiles of the 1920, 1930, and 1940 cohorts tend to coincide for the ages from 60 to 65, the curve is somewhat shifted rightwards for the 1950 cohort who are going to have to work for longer. This explains the rise in the mean labour income at the ages close to retirement. The growth in labour income from one generation to another, that is very visible for the generations from 1930 to 1950 seems to have been momentarily interrupted between the 1950 and 1960 generations. Thus, up until the age of 40, the labour income for the 1950 and 1960 generations are identical in real terms (constant euros[22]), the growth resuming for the latter generation only after that age. The situation improves for the 1970 and later generations for whom the growth in labour income at each age resumes, even though that growth is slower than for the 1940 and 1950 generations[23].

Overall, these results shed light on the issue of intergenerational equality insofar as the generations preceding the baby boom appear to have benefited more in terms of consumption, and the baby-boom generations have enjoyed an increase in labour income between 50 and 60 years. However, in order to really understand how consumption and labour income vary from one generation to another, it is necessary to distinguish the effect that should be attributed to the birth cohort from the effects due to age or to the period of observation of the cohorts. D'Albis and Badji (in this issue) propose such an analysis and show that the relative situation of the cohorts born from 1901 to 1979 has improved and, in particular, that the baby-boom generation has not enjoyed a standard of living higher than the standard of living of the generations born in the 1970s.

France in a position similar to its European neighbours

The lowercase v-shaped age profile that has been highlighted in France for lifecycle deficit should be universal because survival requires consumption at each age while labour income is received only during working-age adulthood. However, this does not exclude the possibility of cross-country variations, e.g. in the number of years spent in a deficit situation at the various ages[24]. On the basis of the data available from the international NTA Project, the situation of France in 2005 is compared with the situations of the following countries: Germany (2003), Spain (2000), United States (2003), Finland (2004), Italy (2008), Japan (2004), United Kingdom (2007), and Sweden (2005). The comparison relates to the age profiles of private and public consumption and of labour income that are presented at individual level.

For the European countries, two distinct age profiles appear for total consumption (Figure IX-A)[25]. After a phase of quite fast growth in consumption at the young ages, and then a certain degree of stability during the working–age adult period, the countries of Northern Europe and of Southern Europe diverge at about the age of 75. For the North, the level of total consumption increases significantly at high ages, in particular in Sweden and in Finland. The most likely explanation for this is that it is due to the public spending devoted to dependency at such advanced ages (Fürnkranz-Prskawetz & Hammer, 2012). Conversely, the profile in France is similar to the profile observed in Germany, Spain, and Italy as from the age of 60. The total consumption profiles remain relatively stable during the period of old age, including after the age of 75. In this respect, the situation of France differs from the situation observed in Japan, and even more so from the situation in the United States, where it is the private health and dependency spending that can explain the very high growth

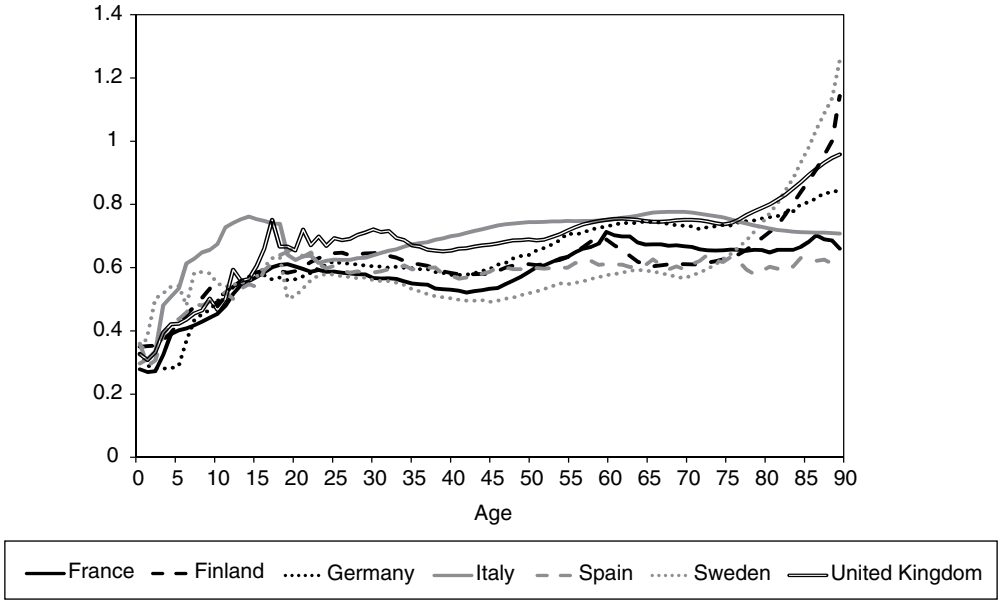
21. The particular situation of the 1910 cohort can be explained by a much later age of leaving the labour market, leading to mean labour income that is higher for the older ages.
22. Stability in "real terms" (constant euros) actually means a decline if account is taken of the general growth in income.
23. This observation echoes the one made by Clerc et al. (2011).
24. This is higher in a country in which the younger generations find it difficult to access the labour market or in which the older ones retire at an early age. A high life expectancy also increases the number of years in a situation of deficit at high ages.
25. Following the recommendations of Lee and Mason (2011), the profiles of this section have been normalised on the mean labour income for people aged from 30 to 49 in order to facilitate international comparisons. At each age, the per capita value is divided by the mean labour income of the 30-39 age group.

in consumption as from the age of 85 (Chawla et al., 2011).

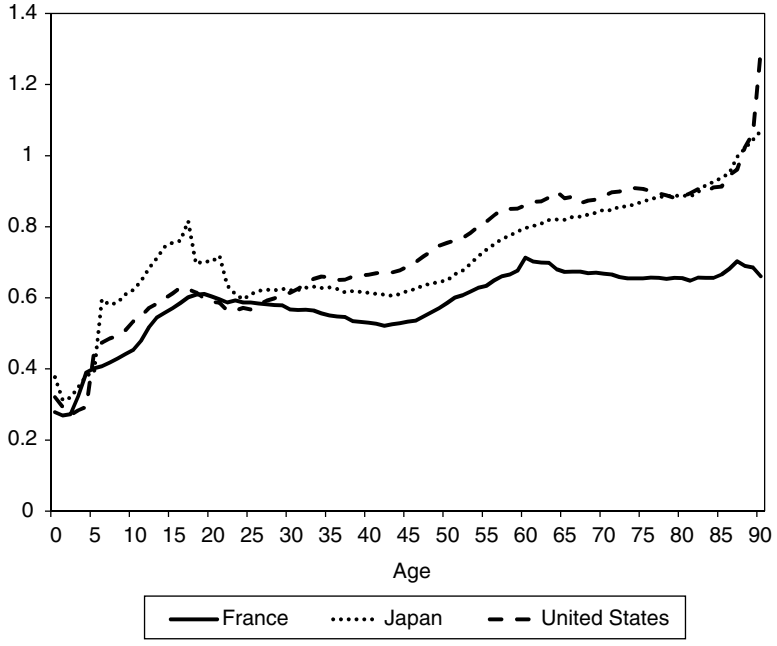
For labour income, the age profiles differ depending on the age span during which the income is received and the growth in the income due to the effects of seniority. In Europe, only the United Kingdom differs from the other countries at the beginning of working life, and then the income is, on average, significantly

Figure IX-A
International comparison of total consumption by age – per capital profiles

Amount (normalised on the mean income of the 30-49 age group)



Amount (normalised on the mean income of the 30-49 age group)

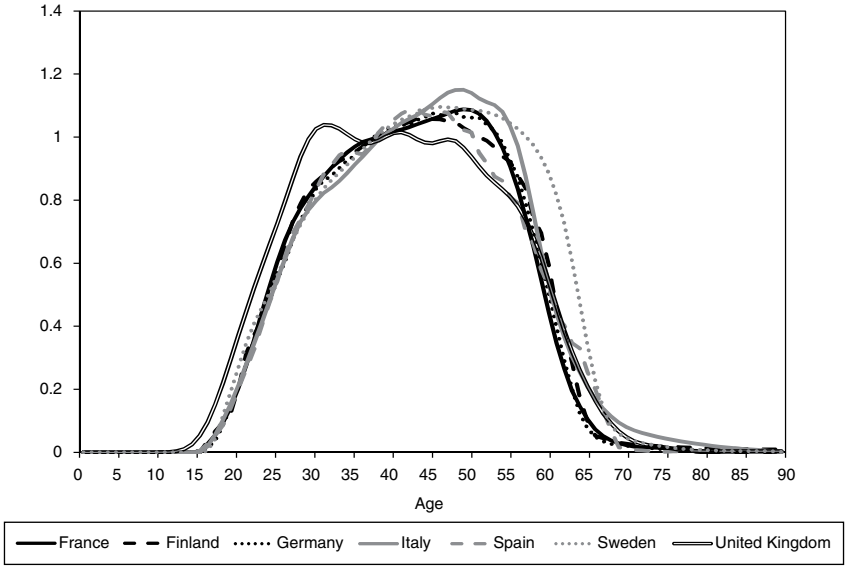


Reading note: In France, mean public and private consumption at the age of 60 accounted for 71.3% of the mean labour income received from the ages 30 to 49 for the year 2005.
Source: for France, 2005 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 2004 and 2006 permanent sample of people insured under state health insurance schemes and public statistics data, authors' calculations; for the other countries, international data from the National Transfer Accounts.*

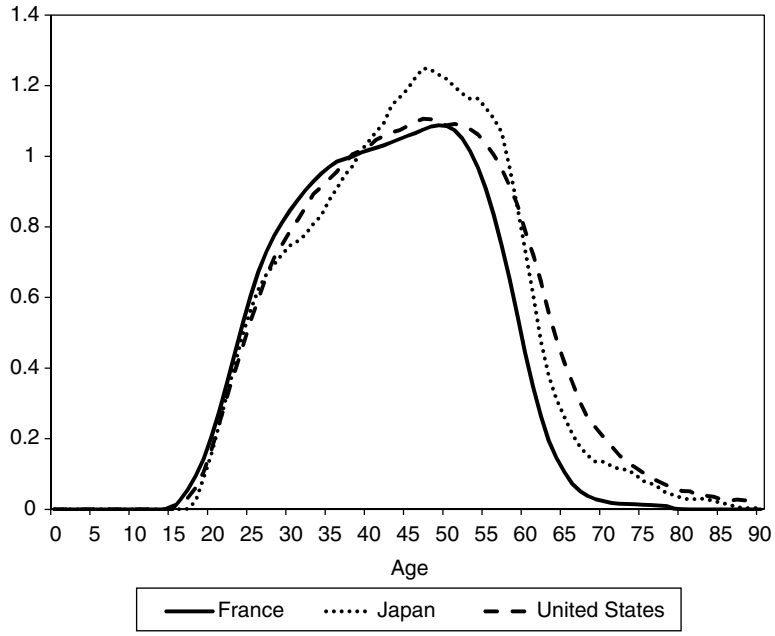
higher until the age of 30 (Figure IX-B) Beyond the age of 30, income tends to decrease slightly with age. This result contrasts with the situation observed in Italy, in France, or in Germany, where the income rises from the age of 30 to about the age of 50. The effects of seniority seem to be the largest in France and in Italy. Beyond the age of 60, France is one of the countries in which labour income is the lowest, in contrast to Sweden, where people leave the labour market later. Internationally, the levels of labour income at high ages are much higher in the United States than in France, in particular in the 60-65 age group.

Figure IX-B
International comparison of labour income by age – per capita profiles

Amount (normalised on the mean income of the 30-49 age group)



Amount (normalised on the mean income of the 30-49 age group)

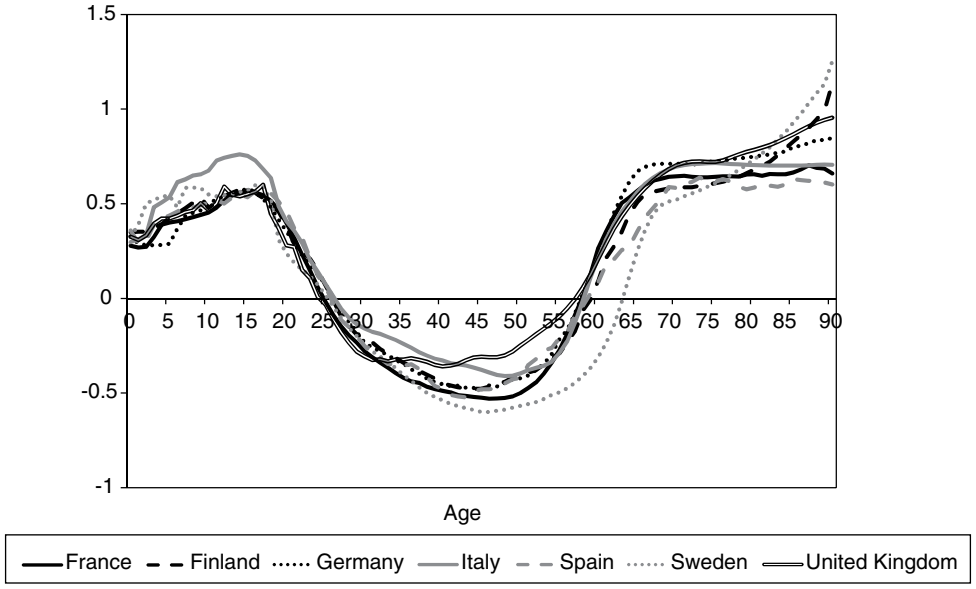


Reading note: In France, mean labour income at the age of 60 accounted for 44.4% of the mean labour income received from the ages 30 to 49 for the year 2005.
Source: for France, for France, 2005 French Household Expenditure Survey (Insee, Budget de famille*) and data from public statistics, calculations by the authors; for the other countries, international data from the National Transfer Accounts.*

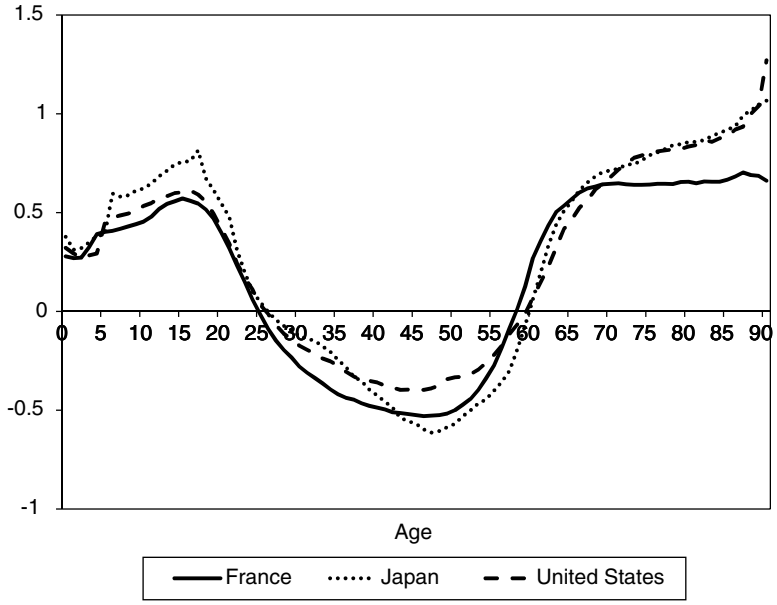
At international level, the lifecycle deficit age profiles are very similar (Figure IX-C). For all of the European countries in question, the differences are very minor until about the age of 30. The gap between consumption and labour income doubles for most countries between the ages of 0 and 18, and the first age at which that gap becomes negative varies between 25 (France and the United Kingdom) and 27 (Germany and Italy). The levels of maximum surplus are lower in Spain and in Italy. The gap becomes positive again at the age of 58 in

Figure IX-C
International comparison of the lifecycle deficit by age – per capital profiles

Amount (normalised on the mean income of the 30-49 age group)



Amount (normalised on the mean income of the 30-49 age group)



Reading note: In France, mean lifecycle deficit at the age of 60 accounted for 26.9% of the mean labour income received from the ages 30 to 49 for the year 2005.
Source: for France, 2005 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 2004 and 2006 permanent sample of people insured under state health insurance schemes and public statistics data, authors' calculations; for the other countries, international data from the National Transfer Accounts.*

France, Germany, and the United Kingdom, at the age of 59 in Italy and Spain, 60 in Finland, and 64 in Sweden (Table 4). Combined with cross-country variations in life expectancy, the total number of years in a deficit situation at high ages ranges from18 years for Sweden to 24 years for Italy. In the United States, the number of years in deficit for old age is also 18 years whereas it is 23 years in Japan due to the difference in life expectancy (82 for Japan, and 77 for the United States).

The comparison highlights similarities in the age profiles for total consumption and for labour income in the developed countries selected. During their life, each individual is in a surplus situation from the age of 24-26 to the age of 58-60 depending on the countries (except for Sweden). Although these variations in the threshold ages might appear limited, they are nonetheless quite substantial considering the average life span in those countries. In 2008, the number of years for which consumption exceeded labour income was 59% greater than the number of years spent in a surplus situation in Italy. Conversely, this difference was only 16% for Sweden in 2005 and 29% for the United States in 2003. France was in an intermediate situation, with a number of years in deficit 45% greater than the number of years in surplus.

* *
*

Implementing the first phase of the NTA for France has made it possible to show that the levels of consumption and of labour income have improved for all of the generations when they are compared at the same ages. The levels of consumption increased more rapidly from the age of 40 and above all after 60, and the rise in income was mainly enjoyed by the generations who were aged from 50 to 60 in the period from 1979 to 2011, without however calling into question the improvement in the standard of living from one cohort to another. Finally, the period for which labour income exceeds private

Table 4
Characterisation of the lifecycle deficit at individual level – international comparison

	France	Finland	Germany	Italy	Japan	Spain	Sweden	United Kingdom	United States
	2005	2004	2003	2008	2004	2000	2005	2007	2003
Life expectancy at birth	80	79	78	82	82	79	81	79	77
Youth – last age at which $C > Y^L$	24	25	26	26	25	25	25	24	25
Youth – number of years for which $C > Y^L$	25	26	27	27	26	26	26	25	26
Old age – first age at which $C > Y^L$	58	60	58	59	60	59	64	58	60
Old age – number of years for which $C > Y^L$	23	20	21	24	23	21	18	22	18
Total number of years for which $C > Y^L$	48	46	48	51	49	47	44	47	44
Total number of years for which $C < Y^L$	33	34	31	32	34	33	38	33	34
Ratio of years of $C > Y^L$ to years of $C < Y^L$	1.45	1.35	1.55	1.59	1.44	1.42	1.16	1.42	1.29
Ratio of years of $C > Y^L$ to life expectancy	0.60	0.58	0.62	0.62	0.60	0.59	0.54	0.59	0.57
Mean age at consumption of one euro	41.9	42.1	44.8	44.2	45.7	40.6	42.6	42.5	41.4
Mean age at production of one euro	41.9	43.0	42.1	43.3	45.0	40.8	44.1	40.8	43.6

Reading note: In 2005, the last age at which consumption is greater than labour income during youth is 24 in France and 25 in Sweden.

Source: for France, 2005 French Household Expenditure Survey (Insee, Budget de famille*), 2008 French Household Disability and Health Survey (Drees,* enquête Handicap Santé Ménage*), and 2009 French Institutions Disability and Health, Survey (Drees,* enquête Handicap Santé Institutions*), 2004 and 2006 permanent sample of people insured under state health insurance schemes and public statistics data, authors' calculations; for the other countries, international data from the National Transfer Accounts.*

and public consumption has tended to shrink, mainly because of the increase in the mean length of life. These findings raise questions about the way in which this lifecycle deficit is funded each year, and that will be the subject of the next phase of the NTA Project.

This is an important issue in a context when the population aged 60 and over should account for more than one-third of the French population as of 2060, according to Insee projections (Blanpain & Buisson, 2016). Understanding how the lifecycle deficit is funded requires age profiles to be calculated for asset income net of savings and for private and public transfers whose increasing weight has recently been emphasised for France (*Conseil des Prélèvements Obligatoires*, 2008; Piketty, 2011) After determining the funding of the NTA, it will be possible to compare the weight of each type of funding for non-working young people and for retirees.

These data are useful for proposing new information for diagnostics on the issue of intergenerational inequalities, the central utility of the NTA method being to incorporate all of the public and private flows between the generations. Although much research has been done in France into indicators of fairness between generations, each piece of research usually focuses on a single dimension, be it labour income (Chauvel & Schröder, 2014), public transfers or private transfers (Spilerman & Wolff, 2012; Arrondel et al., 2014). However, implementing intergenerational comparisons will still find itself constrained by the available data, which currently make it possible to reconstruct only portions of the lifecycle for each generation. □

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