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Drowning by numbers: Social Value of Education and Overeducation: An Assessment of the 'Easterlin Effect' in a Comparative Perspective (France, Germany, the United-Kingdom and the United-States) (*)

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Abstract

This paper underlines the (unsystematic) link between the size of birth cohorts and their educational-occupational achievement. From a standard interpretation of Easterlin's theory of cohort dynamics, the size of a birth cohort is inversely proportional to its socio-economic success. Large size cohorts (ex: the "baby-boom generation") could suffer from the overwhelming competition on the labour market that their overcrowding members launch for the conquest of the most valuable social positions, which are relatively scarcer. Conversely, smaller birth cohorts could benefit from the scarcity of candidates in competition for a relatively large number of valuable social positions.

Translated in the terms of a sociology of educational stratification, that theory has two sides. A first order Easterlin theory could suppose the negative link between cohort size and the life chances of the cohort (percent in higher educational and social positions). A second order Easterlin theory could be directly linked to "educational overcrowding". If we suppose the

(*) I thank Mike Hout and his team at the Survey Research Center (University of California at Berkeley) for providing me useful information on the US CPS files and Irène Fournier (LASMAS/CNRS) for the French data. I thank Bernhard Schimpl-Neimanns, ZUMA, Mannheim, for the access to German data and Essex Data-Archive staff for the UK sources. That paper is a part of a larger research on cohorts and life cycle recompositions of work, which is supported by the French *Ministère de la recherche*. I am also indebted with Jaap Dronkers and Henk A. Becker for earlier comments and interrogations on aspects such as ethnical and gender effects I will have to analyse later.

labour market is educationally specific and segmented, the fast expansion of higher education could provoke a declining return to education (ex.: a diminishing probability of access to higher social strata). "Overeducation" could result from that excessive expansion of tertiary educated population.

When we test such theories, we discover that cohort size certainly plays a role in the processes of stratification change, but demography could be a secondary parameter when compared to other aspect such as the context of investment in the newer generations, like interest rates.

0- Intentions

This paper analyses the long-term cohort fluctuations of access to higher education and their consequences on hierarchical occupational position. It assesses the consequences of the last decades growth of (higher) education on the social value of grades. One of the aim is to assess the idea of an "overeducation" process (Freeman, 1976) where the return to education could decline in overeducated nations. Here, I will avoid an analysis in terms of "economic" return of education (in terms of income) to concentrate on an analysis in terms of hierarchical social positions (say the service class, in the EGP Erikson-Goldthorpe-Portocarero class scheme) in 4 countries.

For France (Chauvel, 1998a, 1998b[2002]) and for USA (Chauvel, 2001a, 2001b), I have yet assessed the aspect of social returns to education. In these papers, my argument is this: social stratification system shows dramatic cohort fluctuations, which are durable cohort positive or negative lags effects, relatively to the long term cohort trend (see the annex of this paper); in other terms, cohort fluctuations are advances and delays that characterize some cohorts relatively to the former or the followers. In France and in USA, when we analyse series of cross sectional surveys concerning education and occupation, their age-period-cohort analysis confirms accelerations and slow downs in the education expansion and in the higher service class access of different birth cohorts. Some cohorts benefit from much higher positions than previous ones when young, and their further positions will be in the continuity of their previous positions. Other cohorts know difficulties when they enter the labour market, and they never really catch up later.

The main result is that, in France and in USA, the first cohorts of the baby-boom (born between 1945 and 1950 or 1955) are at the top of a wave of education expansion, but have suffered from no substantial overeducation effect (no clear decline in the return to education in social terms). However, the French post-1955 birth cohorts have known a decline in the return of education, and the American post-1955 birth cohorts a fall in the enrolment rates (Card and Lemieux, 2000, show the same educational slow-down), that could have prevented a decline of the social value of education (relatively to the virtual situation of a continuous growth of education). The result was that, for the two countries, the cohort trend of expansion of the service class is stalling for the late baby-boomers (born after 1955 or 1960): the rhythm

of change of the social stratification system is thus slowing down, with less higher class expansion.

These evidences of cohort dynamics and fluctuations are robust (different national microdata sources offers the same results), but I have never analysed the demographic aspect of the relative size of the different cohorts. The size of the baby-boom cohorts could explain the slow-down in their social achievement, compared to the previous ones. I assess here that hypothesis, and mention another explanation which transit by the fluctuations of investment in newer cohorts.

1- An Easterlin-like cohort theory of status attainment

The birth cohort analysis of social change, a generation after Ryder (1965), is still a major issue, notably for social stratification analysis. The main hypothesis of the cohort theory of social change is that the period of socialisation (say the period between the end of school to the stabilisation in adulthood) will have long term impact on cohort's life-course. Richard A. Easterlin contribution to cohort analysis is a broad theory linking the size of a cohort to its further achievement (Easterlin 1961, for the first ideas, mainly on fertility; 1993, for economic and social issues). His first analyses were devoted to fertility analysis, in the demographic tradition of Whelpton (1949), but he extended his theory to many other aspects of socio-demographic life: divorce, income, political alienation, suicide, etc.

Easterlin mentions two different arguments. The first is that the members of large size cohorts will be submitted to a severe competition in any aspects of their economic life (notably for the access to the most valuable social positions), implying relative restrictions, a multiplication of selection filters, the scarcity of resources, etc. when the small cohorts will avoid many of these problems. The second argument, linked to socialisation, is more complex: since the children of smaller cohorts are numerous (Easterlin suggests a selfgenerated demographic cycle), the wellbeing of the fathers implies the higher aspirations of the children, who will be confronted with scarcity and restriction. I will simply insist on the first one, which is a cohort translation of the Malthusian idea that when people are numerous, the places are limited and the achievement poor.

For a sociology of stratification and long-term dynamics of education, the Easterlin theory could have two sides:

- A *first order Easterlin theory* could suppose the negative link between cohort size and the life chances of the cohort (proportion in higher educational and social positions). Larger cohorts could have difficulty to enter selective institutions of higher education, if we suppose that these institutions are not indefinitely extensible. Higher social positions are also scarce and large size cohorts could suffer from too rare slots in higher classes.
- A *second order Easterlin theory* could suppose the negative link between the size of the graduate-population of a cohort, and the "social value" of their grades. That "social value"

of diplomas is defined in terms of absolute probability of access of their holders to the higher social (occupational) positions[1]. That hypothesis is directly linked to an idea of "educational overcrowding". Then, an overeducation phenomenon could appear (Freeman, 1975), linked to the relative abundance of highly skilled candidates and to the relative scarcity of available positions. If we suppose the labour market is educationally specific and segmented, the fast expansion of higher education could provoke a declining return to education (ex.: a diminishing probability of access to higher social strata).

Booth aspects will be assessed here. For the American society, the Easterlin hypothesis could be apparently convincing: the baby boom cohorts have known a decline in the social value of their education. When we compare the American experience to those from Europe, we discover that the situation is much more complex.

First, we have to describe the large differences between the national demographic dynamics: the "baby-boom" have had very different shapes in the different countries. Second, the educational achievement dynamics are rather distinct from a country to another. Third, the size of the higher social classes that a cohort meets evolves with national specific trends. The consequence of the relation between these different aspects is that the cohort size is a subsidiary aspect of the dynamics, when the context of investment in education (the real interest rates, for example) could be the main aspect.

2- Methods

We analyse here series of large size cross-sectional surveys such as census and labour force surveys extracts. We link here cohort size and cohort achievement by the extraction of cohort-specific effects of fluctuations of these demographic and social variables.

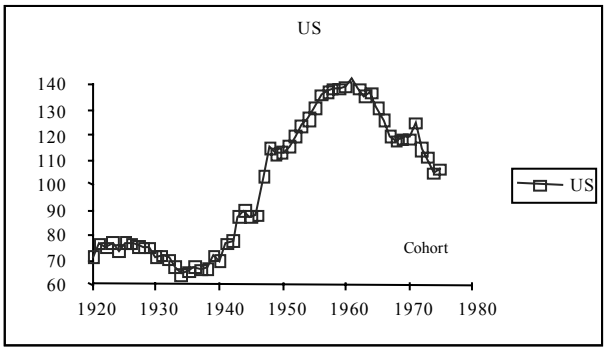
The yet mentioned papers (Chauvel, 1998a, 1998b[2002], 2001a, 2001b) have shown the existence of cohort-fluctuations on different aspects such as educational attainment and class membership. Cohort fluctuations are non-linear evolutions of different variables that follow birth cohorts. The most evident variable which shows clear cohort fluctuations is cohort size: even if collective demographic events could modify some aspects (immigration, wars, etc.), between age 25 and age 59, still immigration effects are generally light and death rates are not yet so intense, it is possible to describe the age-period-cohort dynamics of a population as the composition of a small age effect after age 55 (death), a period effect linked to the relative size of the different yearly samples which are used, and a cohort effect (empirically, the greatest) which result from baby-booms, baby-crashes and more generally the former demographic history.

Consider for instance the sample size of US *Current Population Surveys* data, by age and year from 1978 to 1999. Still age and years are separated by 3-years intervals, birth cohorts

[1] We could have defined that value in relative terms, comparatively to the corresponding probabilities for those who have not these diplomas.

appears in diagonal. Different techniques could show the cohort effects of that table (table $N=N_{\alpha\pi}$, where α defines the index pertaining to age and π to period).

1-a US cohort size profile



Note : 100= average size of cohorts born between 1920 & 1975
Source: *Current population survey* cumulative file 1968-2000

The first method is a combination of graphical and matrix methods: it consist in the detrendization (de-periodation and de-"agization") of that table N. To analyze the evolutions in multiplicative terms, lets consider the table $LN_{\alpha\pi}$ =log($N_{\alpha\pi}$). To de-trend that table, we consider the $LN'_{\alpha\pi}$ table $LN'_{\alpha\pi} = LN_{\alpha\pi} - \underset{\alpha}{A}(LN_{\alpha\pi}) - \underset{\pi}{A}(LN_{\alpha\pi}) + \underset{\alpha\pi}{A}(LN_{\alpha\pi})$, where $\underset{\alpha}{A}(LN_{\alpha\pi})$ is the non weighted average for all α of $LN_{\alpha\pi}$.

1b- Example of cohort effects: age/period sample size of US Current Population Surveys data (table N and LN')

table N

Period⇒ Age⇓	1978	1981	1984	1987	1990	1993	1996	1999
27	15563	26210	25806	24460	22762	20990	17089	10821
30	15013	24829	24563	24860	23835	23120	18749	11482
33	12440	23584	23388	23580	23827	23575	20059	12033
36	11676	19926	22421	22130	22898	23287	20678	12812
39	10253	18053	18582	21313	21206	22048	20395	13015
42	9472	15689	16730	17487	19961	20368	18924	12596
45	9059	15267	14691	15485	16620	19213	17464	11954
48	9514	14654	13964	13620	14663	15863	16404	10727
51	9684	15339	13835	13124	13099	14253	13489	10285
54	9868	15431	14094	12273	12082	12307	12153	8215
57	9521	15209	14035	12845	11726	11340	10412	7013

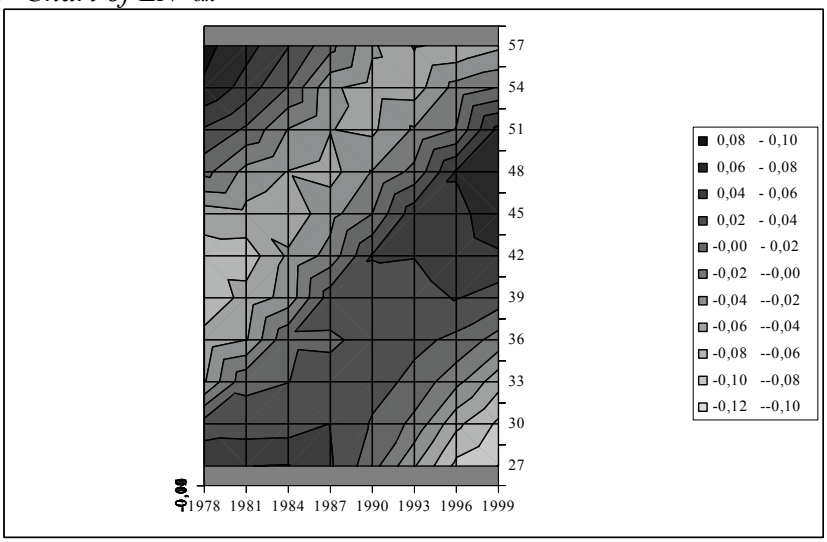
Table LN'

Period⇒ Age⇓	1978	1981	1984	1987	1990	1993	1996	1999
27	0,055	0,060	0,060	0,042	0,007	-0,038	-0,085	-0,100
30	0,030	0,027	0,030	0,040	0,018	-0,005	-0,054	-0,084
33	-0,041	0,016	0,020	0,028	0,029	0,014	-0,014	-0,052
36	-0,052	-0,041	0,017	0,016	0,028	0,025	0,015	-0,009
39	-0,077	-0,052	-0,032	0,032	0,026	0,033	0,041	0,030
42	-0,070	-0,071	-0,036	-0,012	0,041	0,040	0,050	0,057
45	-0,051	-0,045	-0,055	-0,027	-0,000	0,053	0,053	0,073
48	0,006	-0,027	-0,041	-0,047	-0,019	0,005	0,062	0,061
51	0,038	0,016	-0,021	-0,039	-0,044	-0,017	0,001	0,067
54	0,077	0,050	0,018	-0,037	-0,048	-0,049	-0,013	0,001
57	0,085	0,068	0,040	0,006	-0,037	-0,061	-0,056	-0,044

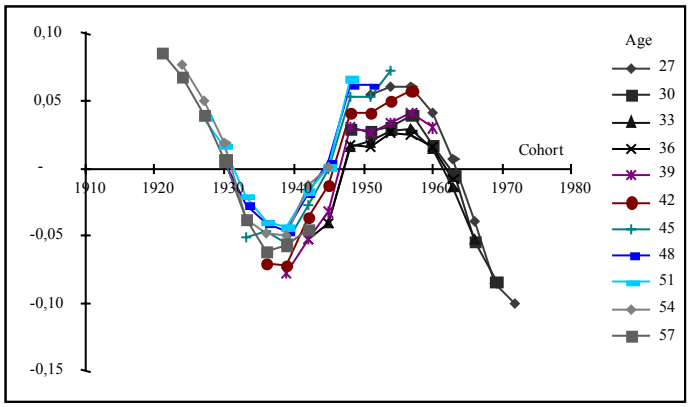
When we represent the $LN'_{\alpha\pi}$ matrix, a clear cohort effect appears, with a boom for those who are 30 in 1978, 33 in 1981, etc. which is the cohort born in 1948. Here, a cohort effect is rapidly assessed. The values of LN' are in fact the excess and the loss of log-size when the table is de-trended for age and period effects. These excesses and the losses follow the

cohorts, define a cohort effect: considering the inter-periodic trend of growth, US cohorts born in 1921 are in excess: +0,085 means that the log(N) is 8,5% higher than expected, then N is exp(0,085)=8,8% above the trend. The cohort fluctuation appear clearly on the cohort diagram 1d.

1c- Chart of LN'$_{\alpha\pi}$



1d- Chart of LN'$_{\alpha\pi}$ - cohort diagram



The second method is based on models. A solution here is to analyze the residues of the (AP) age-period model here:

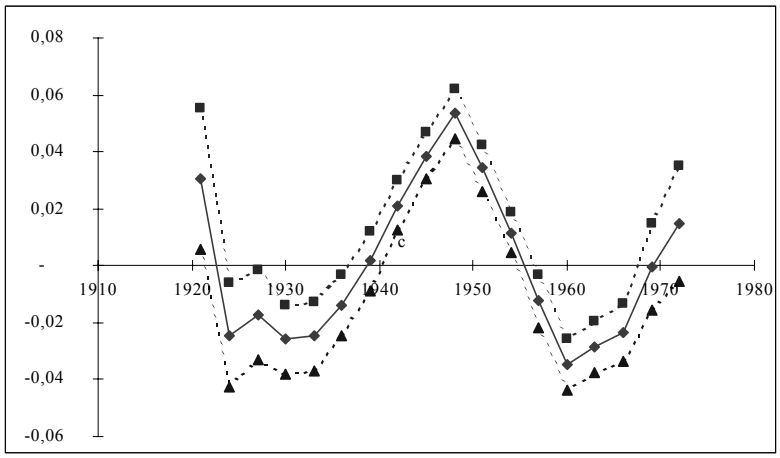
$$\text{(AP):} \left| \begin{array}{l} \log(n_{\alpha\pi}) = cst + a_\alpha + p_\pi \\ \sum_\alpha a_\alpha = \sum_\pi p_\pi = 0 \end{array} \right.$$

and to analyze if their cohort component is not null, that is to assess that the (AP) model do not fit correctly when the (APC) do better, where (APC) is:

$$\text{(APC):} \begin{vmatrix} \log(n_{\alpha\pi}) = cst + a_\alpha + p_\pi + c_\gamma \\ \sum_\alpha a_\alpha = \sum_\pi p_\pi = \sum_\gamma c_\gamma = 0 \\ slope(c_\gamma) = 0 \end{vmatrix}$$

If the (c_γ) coefficients significantly differ from zeros, a cohort effect is found. See the annex for the assessment of a durable cohort effect with no catch-up effect. Note that when a cohort effect exist, the residues of (AP), the cohort effect coefficients (c_γ) of (APC) and the LN' chart cohort diagram have all the same shape.

6-e-bis Example of bootstrap confidence interval analysis for US service class growth profile (similar to 6-e below)



Note : the service class growth profile describes the excess and the loss of the logit(p) = log(p/(1-p)) of the proportion p of EGP service class I+II population relatively to the linear trend

3- Data and codes

Our aim is the measurement of fluctuations of cohort size, higher education access and social-occupational structure in four countries: France, (West) Germany, The United Kingdom and the US. We have to analyze repeated cross-sectional large size surveys extracts.

2- Data sources

France: yearly extracts of *Enquêtes Emploi* 1978-2000; (LASMAS/CNRS source) for the French data; N= 962 141	Germany: Scientific Use File of the German *Mikrozensus* 1997, 1993, 1987, 1982, 1976, by ZUMA, Bernhard Schimpl-Neimanns, Microdata Dept., Mannheim; N= 1 258 916
United Kingdom: extracts of 1979 1983 1987 1990 1993 1996 2000, *Labour force surveys* (LFS), accessed via Essex Data-Archive, project 'cohort and stratification' #6430; N= 500 553	United-States: yearly extracts of *Current population surveys* 1978-1999; NBER – Mare-Winship extracts, completed with ferret.bls.census.gov site; N= 1 445 352

We code class and diploma in 3 hierarchical groups:

- class is coded 1 for higher service class, 2 for lower service class, 3 for other positions;
- education is coded 1 for longer tertiary attainment (France "*licence*" and more, the UK first degree and higher and corresponding professional institutes, US Master's degree or more), the German coding is less clear, but we code there "*Hochschule*"; education is coded 2 for shorter tertiary attainment (France "*premier cycle, BTS, DUT, etc.*" and more, the UK grades of further higher education such as technicians, HNC BTEC, Nursing qualifications, etc. US Bachelor's degree), the German coding is less clear, but we code there "*Fachhochschule, Ingenieurschule*".

That coding allows an analysis in terms of higher/intermediate/routine occupational position; in terms of diplomas, we have the corresponding positions. For this paper presented here, we will simply analyze the opposition between (1+2) and (3), I mean service class I+II *versus* other, and tertiary education *versus* secondary.

3- Code scheme and distribution

France				
Class⇒ Diploma⇓ row %	Higher SC	Lower SC	Other	Total
longer tert.	69,1	19,2	11,7	6,8
shorter tert.	16,4	61,9	21,7	7,1
Other	3,8	11,3	85,0	86,2
Total	9,1	15,4	75,5	100,0
Germany				
Class⇒ Diploma⇓ row %	Higher SC	Lower SC	Other	Total
longer tert.	41,0	35,6	23,4	6,9
shorter tert.	32,7	29,9	37,3	3,8
Other	1,2	8,6	90,1	89,3
Total	5,2	11,3	83,5	100,0
UK				
Class⇒ Diploma⇓ row %	Higher SC	Lower SC	Other	Total
longer tert.	25,4	47,6	27,0	9,4
shorter tert.	9,3	48,7	42,0	6,6
Other	1,2	12,3	86,5	84,0
Total	4,0	18,0	78,0	100,0
US				
Class⇒ Diploma⇓ row %	Higher SC	Lower SC	Other	Total
Longer tert.	30,1	52,4	17,5	7,7
Shorter tert.	10,3	51,0	38,7	17,3
Other	1,2	16,9	81,9	75,0
Total	5,0	25,6	69,5	100,0

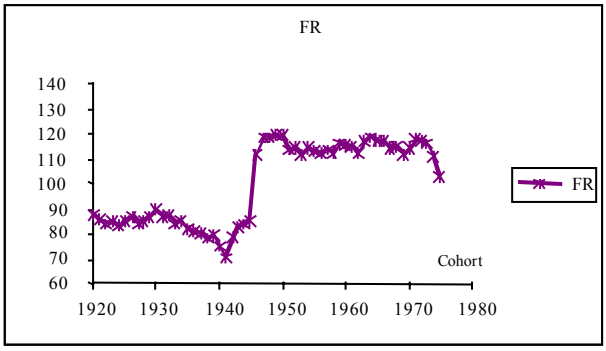
Some transformations have been implemented to these samples to provide a common grid of analysis embracing the 1978-2000 period and the 25 to 59 age classes. The French and the US data are yearly surveys, and provide the complete information on any useful aspect. The German and the UK surveys are periodically repeated cross-sectional data, with about a 5 years pace for Germany and 5 for the British ones. The strategy is here to cut these samples in 7 subsamples probabilistically re-affected to the 3 preceding and following years neighboring the actual period.

Then, it is possible to dispose or simulate similar yearly cross-sectional surveys for four countries. For the convenience of the data, we consider a 3 years-pace grid, considering the years 1978, 1981,…, 1996, 1999, and at age 27, 30, 33,…, 54, 57; thus, age 27 is the average of age 26, 27, 28; year 1996 is the average of 1995, 1996, 1997. That grid allows the analysis of birth cohorts born between 1921 and 1972, each 3 years, with 18 cohort points. The cohort time series that we will analyze will be yearly series of 3 years mobile average results.

4- Evidence of demographic fluctuations

The Easterlin effect occurs when large size cohorts experience an overcrowding problem, say when there are more candidates than valuable positions to be filled. In other terms, an Easterlin effect is defined by a negative relation between the relative size of a cohort and the proportion of people in that cohort who access valuable social positions.

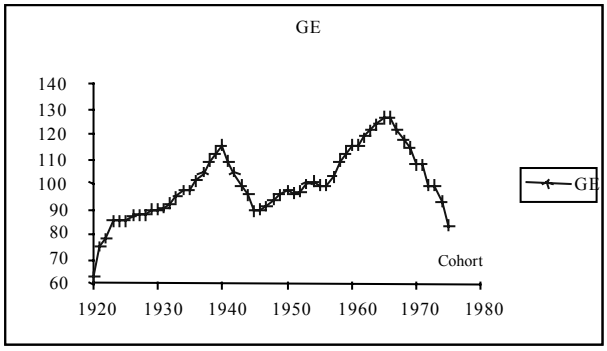
4-a French cohort size profile



Note : 100= average size of cohorts born between 1920 & 1975

Source: Enquête emploi 1969-2000 cumulative file

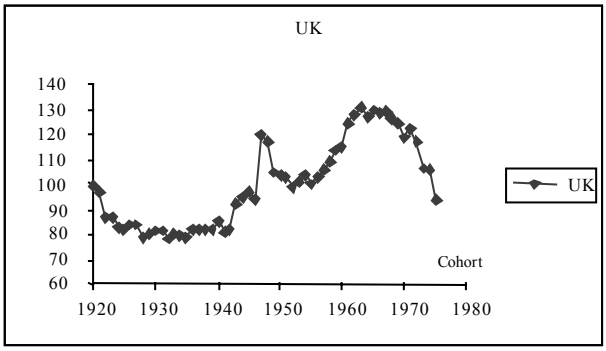
4-b West-German cohort size profile



Note : 100= average size of cohorts born between 1920 & 1975

Source: Mannheim Mikrozensus (1% extracts) 1976, 1982, 1987, 1993, 1997.

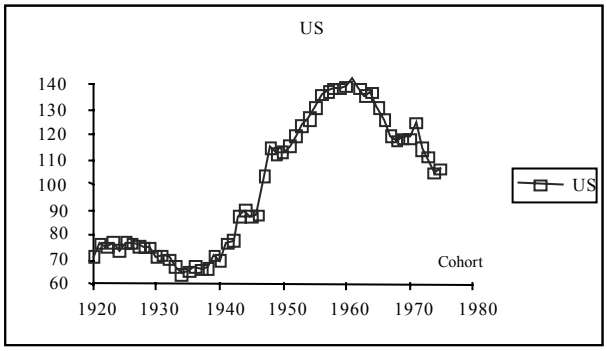
4-c United Kingdom cohort size profile



Note : 100= average size of cohorts born between 1920 & 1975

Source: Labor force surveys 1975, 1983, 1990, 1993, 2000

4-d US cohort size profile



Note : 100= average size of cohorts born between 1920 & 1975

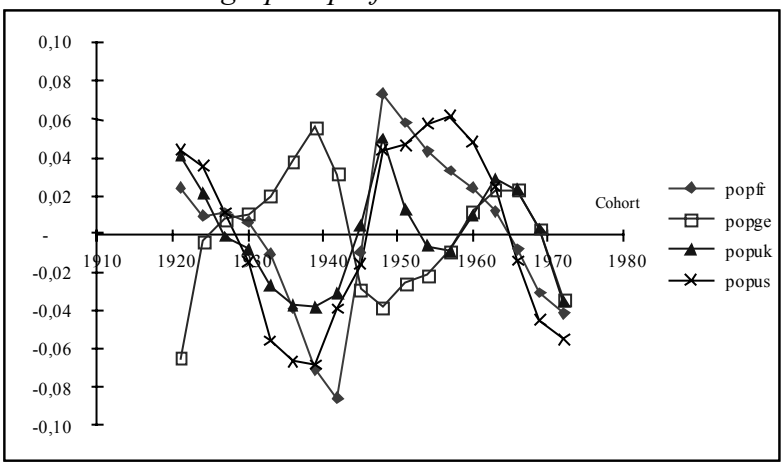
Source: Current population survey cumulative file 1968-2000

The interest of an international comparison is this one: the demographic dynamics of the different occidental countries do not coincide at all, even if they have close patterns. In any country, the cohorts born during the 1960' are the largest; those born during the 1920' are

scarcer. However, national differences appears. France is specific with a step dynamics: the size of birth cohorts appears to be flat for long periods: the pre-WWII period and the long-baby boom are clearly separated. Germany is quite different: the 1930' seem to have been a baby-boom, when the cohorts born in the 1950' are scarce; a second baby-boom occurs during the 1960'. In The United Kingdom, the real baby-boom appears very late, in the 1960', even if a little peak appear for birth cohort 1948. For the US, the 1930' are a floor and the birth-year 1960 a top. Thus, each country has a specific cohort size profile, which is an important aspect of our assessment of Easterlin effect.

The comparative analysis of de-trended cohort profile show that the "baby-boom" is a very distinct notion from a country to another. Even if the post-1965 dynamics are the same, the century profile is clearly different in the four countries. The German dynamics are the most distinct with the scarcity of 1945-1955 cohorts, and the relative abundance of 1930-1940 ones.

4-e The four countries demographic profile



Note : the demographic profile describes the excess and the loss of log-population by cohort relatively to the linear trend

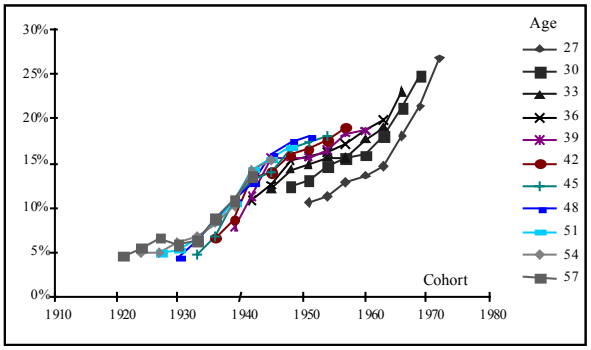
5- Waves of Education class and return to education

A central finding of this paper is the unstable growth of the educational assets. We could imagine that educational expansion is a linear trend. Actually, important cohort fluctuation occurs, which depend on the considered nation.

The analysis of the educational expansion shows that, in most countries, the growth have not been linear, but have known large fluctuations. For the four countries, the 1945-1950 birth cohorts are at the top of a wave of educational expansion that stalls or even is reversed for the cohorts born in the 1960's. In fact, the lowest amplitude of the waves (around the trend) is observed for the UK, with a variation of less than +/- 0,05 of the logit(p) = [log(p/(1-p))] of the tertiary educated population. In the other countries, the variations of the logit of that

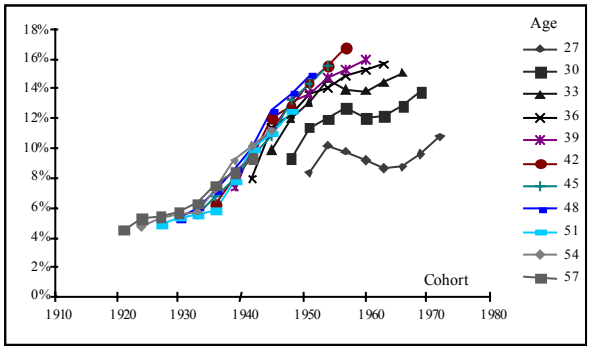
population is closer to +/- 0,1. For the most recent cohorts, the UK has known the same evolutions than the other countries: relative decline for cohorts born in the 1960's, and a new acceleration after the 1970 birth cohort[1]; for pre-1945 cohort, there is no important fluctuation. The US has known a clear dynamics of fluctuation with a dramatic acceleration of educational attainment for the cohort born in the 1940's. France and Germany present the same shape of evolution, with two *minima* (for the 1930 and the 1960 birth cohorts) and a maximum for 1945. For France, as for the UK, a new maximum is in preparation for the 1975 cohort.

5-a French pct. of tertiary education



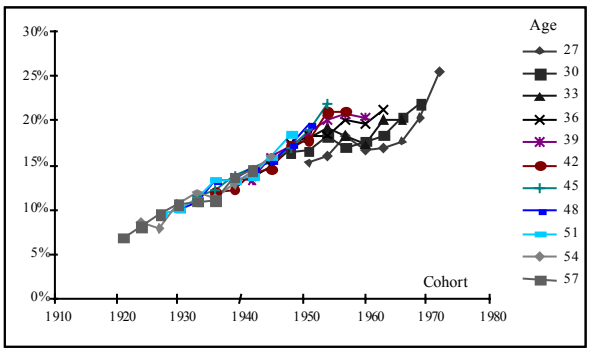
Note : *Diplômes 1e cycles* and higher; age 27 = average (26,27,28)

5-b West-German pct. of tertiary education



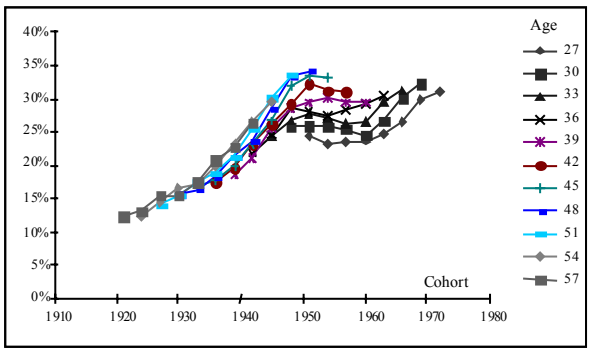
Note : *Fachhochschule Hochschule* and higher

5-c United Kingdom pct. of tertiary education



Note : First degree and higher

5-d US pct. of tertiary education



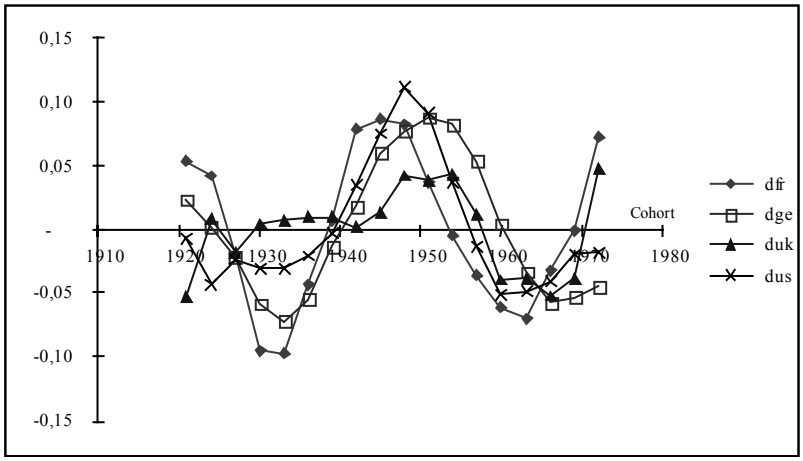
Note : BA and higher

This result shows the historical fluctuations of university growth in these different countries. Some birth cohorts are about age twenty when the access to university is easier, and other when retrenchments are initiated. The explanation of these booms could be complex. Public and private investment in education could depend on many different parameters: parents wealth, interest rates, easier access to credit, fiscal surpluses, States decision to invest, foundations strategies for educational investment, etc. For the US, we could also mention the Vietnam War, which could have been an unattended implicit incentive for tertiary education

[1] The consequences of this educational boom, which affect the generation born in the early 1970' can not yet be (...)

(Card and Lemieux, 2001). In fact, even in European countries, the fluctuations are generally similar, even if the participation to Vietnam War is evidently not an argument…

5-e The four countries educational growth profile



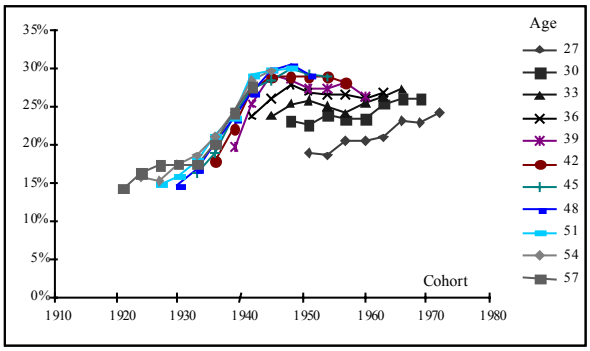
Note : the educational growth profile describes the excess and the loss of the logit(p) = log(p/(1-p)) of the proportion p of tertiary educated population relatively to the linear trend

Beyond education, service class membership could have known other types of fluctuations. When we analyze service class by age period and cohort, we could imagine that no clear cohort effect could appear, because of the competition of different age groups on the labor market for the access to the most valuable social positions. In periods of economic expansion, the promotion of older cohorts could go with earlier access of the young to these positions; in periods of retrenchment, the reverse dynamics could occur similarly for the seniors and the young.

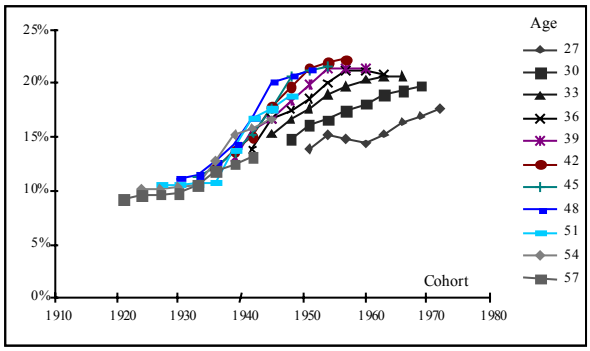
In fact, the cohort fluctuation dynamics of service class access is very clear in three of the four countries. Even if in the UK no clear cohort fluctuation occur — if we de-trend de-age and de-period the data, the cohort residue is almost nonexistent —, France, West-Germany and the US have known large cohort-fluctuations. Even if France has the most intense fluctuation range, a clear common pattern of slower expansion of higher class appear for cohort 1930 and cohort 1960 and of acceleration for the 1945-1950 cohorts. These fluctuations in higher social position attainment by cohorts globally correspond to those pertaining to educational expansions. Two questions could appear: do these class fluctuations directly result of educational expansion? — in that case, no overeducation process could appear — Or do the class fluctuations less intense than educational ones? — in that case, the cohorts which have benefited from educational expansions could lack available positions in the higher strata of the social structure.

assessed clearly.

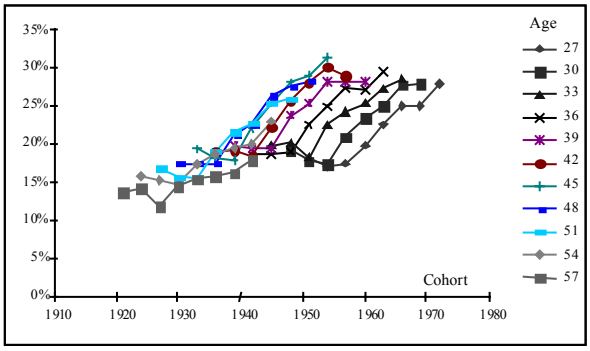
6-a French pct. of EGP service class I+II



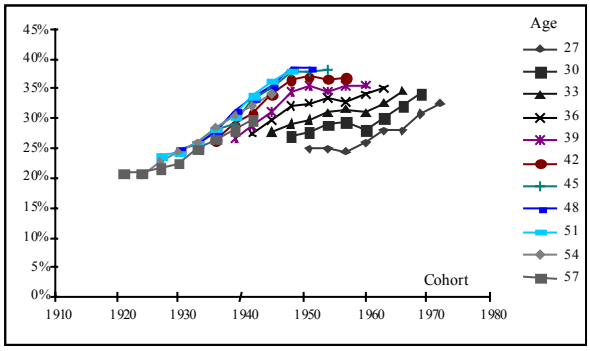
6-b W-German pct. of EGP service class I+II



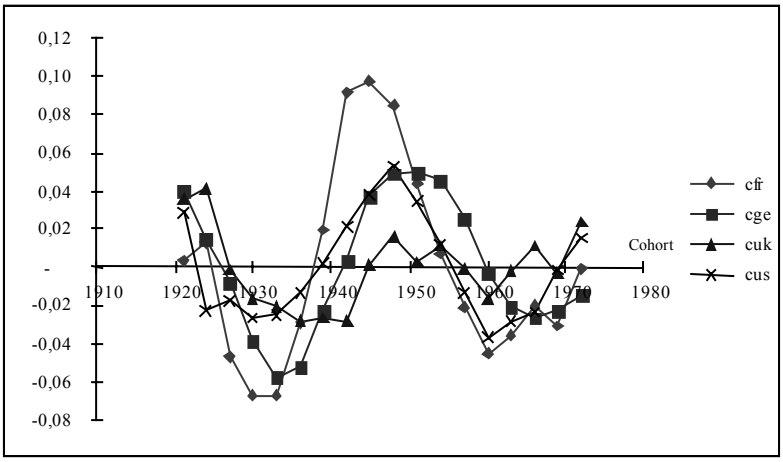
6-c UK pct. of EGP service class I+II



6-d US pct. of EGP service class I+II



6-e The four countries service class growth profile

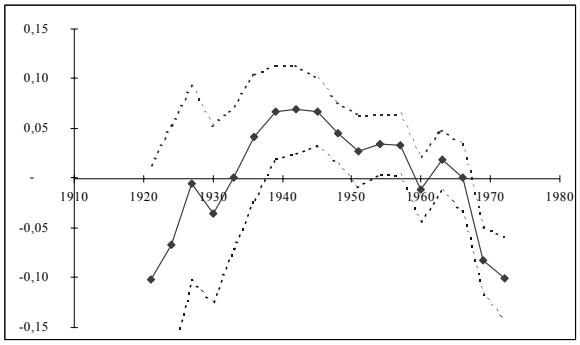


Note : the service class growth profile describes the excess and the loss of the logit(p) = log(p/(1-p)) of the proportion p of EGP service class I+II population relatively to the linear trend

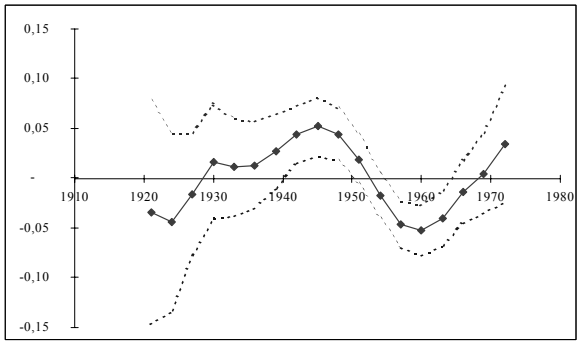
Let us consider now the proportion of tertiary educated population accessing the service class. The decline of that proportion could be interpreted as a decline of the absolute value of

education in social terms[2]. The decline of this "social return to education" could be the result of an "overeducation" process where the grade supply is in excess compared to the demand of highly qualified workers. Here as elsewhere, we simply consider the fluctuation-parameter and not the long term linear trend.

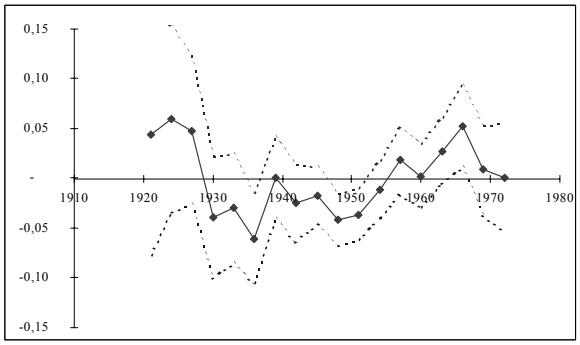
7-a French return to education profile



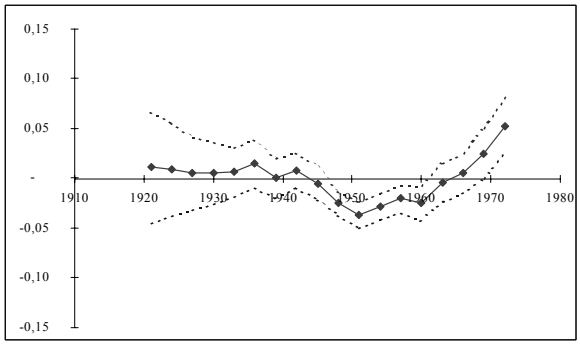
7-b W-German return to education profile



7-c UK return to education profile



7-d US return to education profile



Note : the social return to education profile describes the excess and the loss of the logit(p) = log(p/(1-p)) of the proportion p of tertiary educated people accessing the EGP service class I+II, relatively to the linear trend; the 5% confidence curve has been computed with 100 iterations bootstraps.

The shapes of the return to education curves are very diverse: in France the inverted U curve shows the better position of the early baby-boom cohorts; in Germany, newer generations improve their return to education; in the UK, no clear trend appear; in the US, the 1950-1960 birth cohort is below the trend.

The question here is to link these shapes to something known. For France, we find the shape of the curve yet seen in a previous paper (Chauvel, 1998a): the early baby-boom, even if they are and overabundant well educated generation, know no decline of its return to education. For Germany, the large 1960 cohort knows a decline, but the abundant 1935 birth cohort not.

[2] We can define the relative value of a given level of education by the odds of the access of its owners to higher social positions, compared to other levels of education.

In the UK, nothing is really clear, and for the US, the return to education evokes the reverse curve of the cohorts size. More systematic views could be obtained.

6- Linking waves of education, class and return

The question is now to link cohort size with educational and social achievement. A "first order" Easterlin effect imply a negative correlation between cohort size and educational and/or social achievement. A "second order" Easterlin effect supposes a negative correlation between the educated population size (by cohort) and social return to education. Our comparison shows that these simple ideas have no clear empirical validation.

Linear correlation of cohort series of seven variables

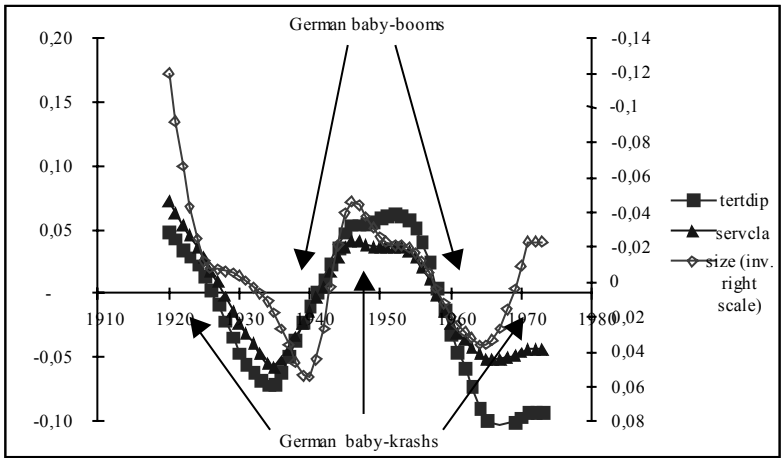
France	Size	Sizeeduc	Tertdip	Servcla	Socreturn	GDPcapita	Intrestrates
Size	1,00	0,63					-0,48
Sizeeduc	0,63	1,00	0,74	0,69			-0,68
Tertdip		0,74	1,00	0,86			-0,41
Servcla		0,69	0,86	1,00	0,41		-0,60
Socreturn				0,41	1,00	0,36	-0,56
GDPcapita					0,36	1,00	-0,52
Intrestrates	-0,48	-0,68	-0,41	-0,60	-0,56	-0,52	1,00
W Germany	Size	Sizeeduc	Tertdip	Servcla	Socreturn	GDPcapita	Intrestrates
Size	1,00		-0,57	-0,74			
Sizeeduc		1,00	0,74	0,53			-0,41
Tertdip	-0,57	0,74	1,00	0,95			-0,51
Servcla	-0,74	0,53	0,95	1,00			-0,47
Socreturn					1,00	-0,47	-0,42
GDPcapita					-0,47	1,00	-0,49
Intrestrates		-0,41	-0,51	-0,47	-0,42	-0,49	1,00
UK	Size	Sizeeduc	Tertdip	Servcla	Socreturn	GDPcapita	Intrestrates
Size	1,00	0,57	-0,42	0,67	0,45		
Sizeeduc	0,57	1,00	0,49	0,58			-0,79
Tertdip	-0,42	0,49	1,00		-0,54		-0,57
Servcla	0,67	0,58		1,00	0,52		
Socreturn	0,45		-0,54	0,52	1,00	0,39	0,57
GDPcapita					0,39	1,00	0,59
Intrestrates		-0,79	-0,57		0,57	0,59	1,00
US	Size	Sizeeduc	Tertdip	Servcla	Socreturn	GDPcapita	Intrestrates
Size	1,00	0,86			-0,64	-0,36	-0,36
Sizeeduc	0,86	1,00	0,70	0,55	-0,72		-0,69
Tertdip		0,70	1,00	0,89	-0,44		-0,88
Servcla		0,55	0,89	1,00			-0,82
Socreturn	-0,64	-0,72	-0,44		1,00		0,48
GDPcapita	-0,36					1,00	
Intrestrates	-0,36	-0,69	-0,88	-0,82	0,48		1,00

Note : only highly significantly (1%) different from 0 correlation coefficients are represented

Size	Profile of the cohort size
Sizeeduc	Profile of the cohort size of the educated population (Size x Tertdip)
Tertdip	Profile of the educational profile (logit of tertiary educated pop)
Servcla	Profile of higher class (logit of EGP I+II)
Socreturn	Cohort profile of social return to education (logit of EGP I+II for tertiary educated pop)
GDPcapita	Average GDP per capita real growth between age 25 and 30. Source: Alan Heston, Robert Summers and Bettina Aten, *Penn World Table Version 6.0*, Center for International Comparisons at the University of Pennsylvania (CICUP), December 2001
Intrestrates	Average real Long term interest rates between age 20 and 29: Source : OECD, National Accounts. Available since birth cohort 1935

Let us consider the 4 national correlation matrix between 7 variables describing the annual cohort context (size, economic growth, interest rates when young) and the cohort profile of achievement (education, class attainment and social return to education). A first order Easterlin effect would appear with a negative correlation between "size" (cohort size) and at least one of the variables "tertdip" or "servcla" (resp. educational profile and service class growth). Such a negative correlation appears only for Germany and partially for education in the UK[3]. The reason of this German exception is striking but clear (fig. 8): like in many countries, the "early baby-boom" generation has been favored in terms of educational or/and class growth; in Germany and nowhere else, that generation is not abundant but scarce, and it is why in the German exception, a negative correlation exists between cohort size and educational/class profiles. The German exception underlines the low prediction power of the first order Easterlin theory. In any other country, the "early baby-boom" (birth: 1945-1950) benefits from educational expansion (and thus higher class access), when Easterlin's theory would predict retrenchment. Number does not count so evidently.

8- Educational, class profile and cohort size in Germany

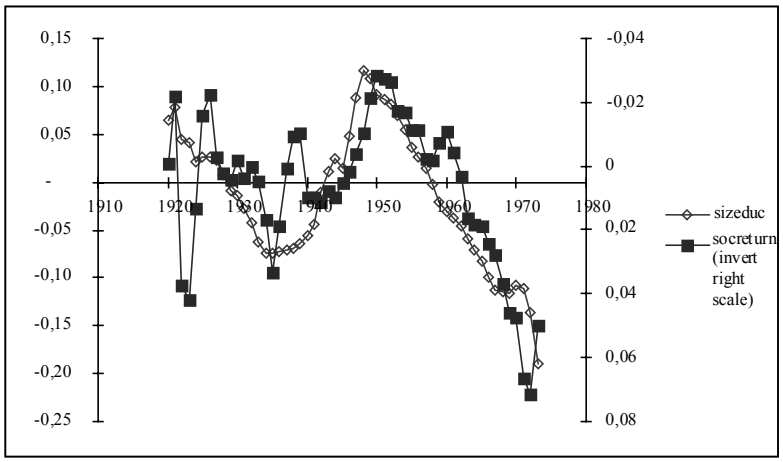


We can also mention a "second order" Easterlin effect of overeducation (overcrowding of educated population relatively to available positions in service class). In the American context, the overlapping of educational expansion (which culminates for cohorts 1945-1950)

[3] But there the link is ambiguous, because no negative link between size and higher class access appear.

and the demographic effect of the baby-boom (of which the climax is in 1950-1960) is contemporary to the deterioration of the social returns to education. Conversely, since cohort 1960, the lack of educational expansion and the end of the baby-boom produces the relative scarcity of candidates for higher positions (fig. 9). Nevertheless, the US is more an exception than an example of a universal rule. The second order Easterlin effect does not seem to be so convincing.

9- Educated population overcrowding and return to education in the US



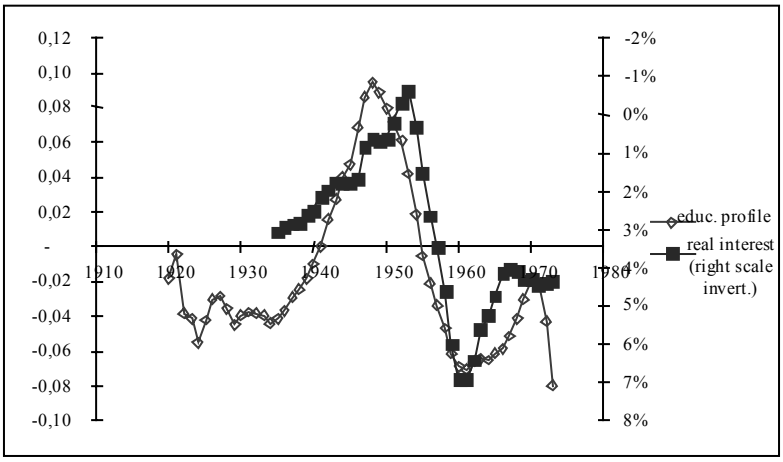
7- Conclusion on cohort investment: an alternative explanation of booms and crashes

There is no clear Easterlin-like demographic explanation of education and higher class expansion and retrenchments. In many countries, the abundant 1950 birth cohort (the early baby-boom, for France, the UK and US) has known no decline of education nor higher class access, or even an expansion. That means in some countries, the early baby-boom could have received great investments in education, and some kinds of support to enter the labor market with no decline of the social return to education.

A more convincing explanation of this early baby boom exception (or exceptional acceleration) could rely on an other process. The question is to explain why is had known first a considerable acceleration of its educational achievement and second a better access to higher social classes. An alternative explanation could rely on social investment in newer generations. Consider the long term real interest rates, which are gauge of the difficulty of investment in future and acquisition of costly resources (such as human capital and education); which are also the gauge of the limitation of the State in its capacity to finance for instance newer institutes, universities, etc. The lower are these long term real interest rates, the easier is the access of household to credit, and the greater the capacity of the states to invest in human capital. When demographic data are absolutely not systematically convincing for the explanation of educational access, the variations of the real interest rates shows that the economic effort that investment in human capital needs have never been so low than at the end of the sixties. After university, the period of the early seventies was also an era of massive recruitment in many public services and new technology companies of that epoch,

dynamics that explain why that highly educated numerous generation of the early baby boom has not known important decline in the value of its education. More than demography, the history of the twentieth century changes in the organization and regulation of the capitalism (of which the long term real interest rates are a major symptom and cause) could be a major explanation of the social stratification system changes.

10- Real interested rates and Educational profile in the US



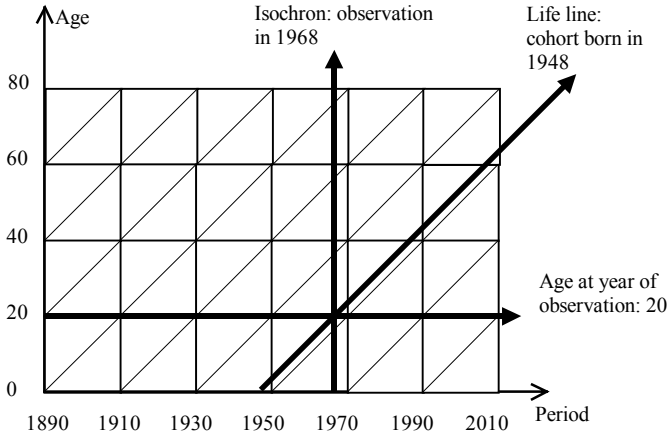
Annex : cohort analysis of social change

The basic instrument for cohort analysis is the Lexis diagram, which presents simultaneously the three chronological dimensions: period, age and cohort (figure 1). It presents notably the perfect colinearity between the three dimensions, which is the source of many methodological difficulties, but further reflection on the detection of cohort fluctuations could offer a solution. Many methods of age-period-cohort analysis exist[4]. Some of them are graphical and others consist in model assessment.

In my Montreal paper (Chauvel, 1998a), I have presented some graphical methods, particularly the "cohort diagram" which presents, on the horizontal axis, the birth cohort, on the vertical one, a given indicator (ex. the proportion of higher + lower service class in France), and where each curve represent a given age (figure 3). If the classical "age" and "year" profiles provide no substantial information (figure 2), the cohort diagram shows that, at any age, 1945-1950 cohorts have enjoyed better education opportunities than previous ones (which is consistent with an idea of social progress) and following ones (that is much more unusual).

[4] In (Chauvel, 1997 and 1998b), I have presented the most classical literature on APC models. A good recent presentation of the APC problems is : Wilmoth (forthcoming).

1- Lexis-Becker-Verweij-Pressat diagram (Pressat style)



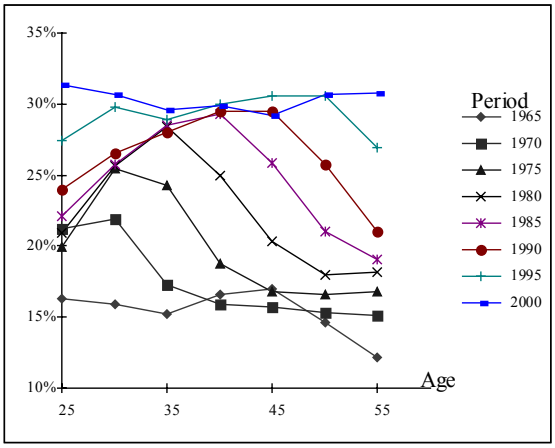
Here, if the curves at age 30, 35, 40, etc. presents parallel or similar shapes, and identical fractures revealing the same cleavages between the same cohorts at different ages, a cohort effect could be a correct hypothesis. Here, for the percent of Master's degree (or more) holders in the male United-States population, we find:

(1) an age effect (the curves for the elder are above those of younger) which signals the effect of further education;

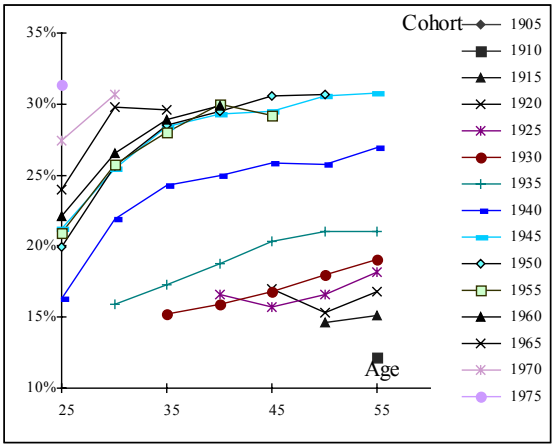
(2) a cohort fluctuation which reveals that the progression of education by cohort is not linear.

2- Proportion of service class positions (« cadres et professions intermédiaires ») by age and cohort

Lexis Age / Period

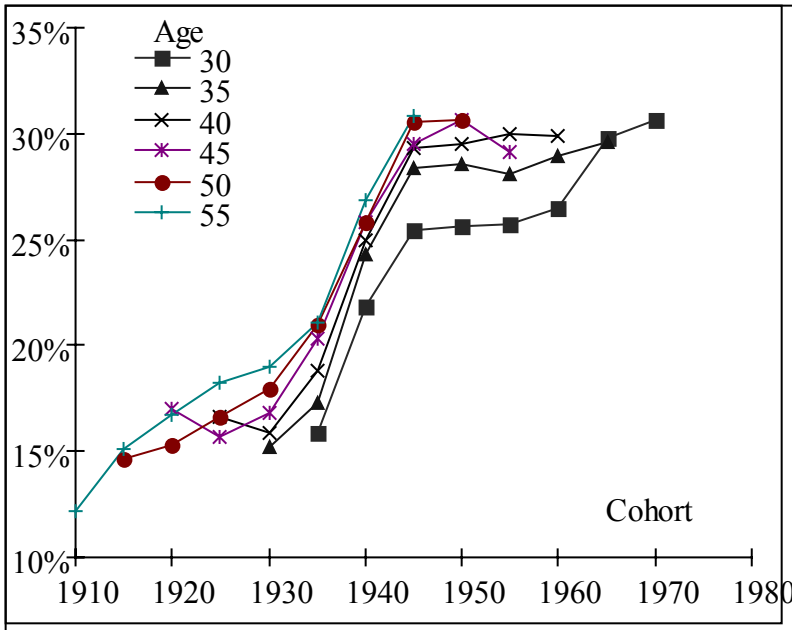


Lexis Age / cohort



Source : compilation Enquêtes FQP - Enquêtes Emploi (1964-2000).

3- Proportion of service class positions (« cadres et professions intermédiaires ») by age and cohort : cohort diagram



Source : compilation Enquêtes FQP - Enquêtes Emploi (1964-2000).

Here, from the 1910 birth cohort to the 1935 cohort, a slow growth of the proportion in service class appear. After, for the following cohorts born between 1935 and 1945, a cohort-boom appear, with an expansion of 10 points more (on 15%) of the service class at age 30. That boom at age 30 is still present for these cohorts at age 50: early career benefits and handicaps have long term consequences on cohort evolution. For cohorts born in 1960, no progress is measured on the 1945 one: we have here a clear cohort fluctuation in social stratification change. The gap remains stable. The cohort diagram is may be the most convenient graphical representation of cohort effects for a descriptive research. Other 3-dimensional graphs could be interesting, but I shall refer to my book (Chauvel, 1998b, annex 2).

Cohort diagram: theoretical examples

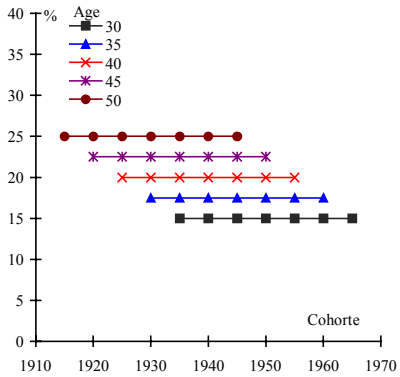
The cohort diagram is the representation, for successive cohorts (horizontally), of the value of a given variable — percentages of housing property, suicide rates, income, or the proportion of EGP-I etc. — (vertically) at different ages materialised by the curves which follows the cohorts at the same age. On series of hypothetical examples, we may understand the logic of that diagram.

The first one (1) represents a society where the reproduction is perfect, with no collective progress: the successive cohorts knows the same position at the same age, identically, with the same age effect (15 % of EGP-I at 30 years old for the cohort born in 1935 as in 1965). Similarly, whatever the birth cohort, the proportion of EGP-I goes from 15 % at age 30 to 25 % at age 50. The second example (2) presents the case of a regular and linear trend of social progression, equally distributed by any cohort : from a previous cohort to the later, at the same age, the part of EGP-I is increasing ; for the 1935 cohort, 15 % of

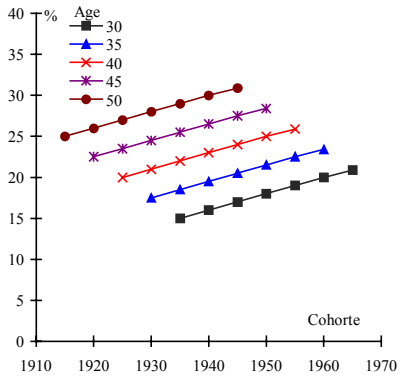
EGP-I at age 30 and 21 % for the 1965 cohort. Clearly, in a linear equally shared by cohort trend, any new cohort should experience a better destiny than the previous ones at the same age.

The cohort diagram : six theoretical cases

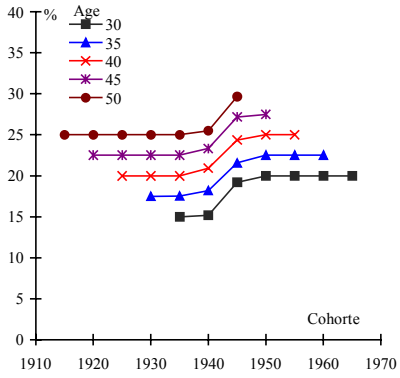
Example 1



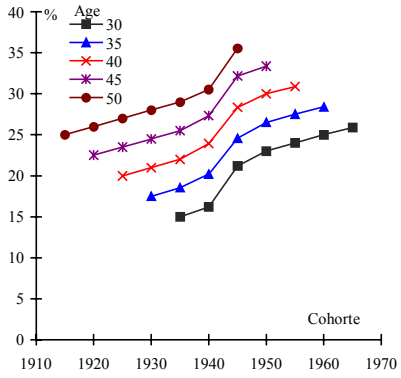
Example 2



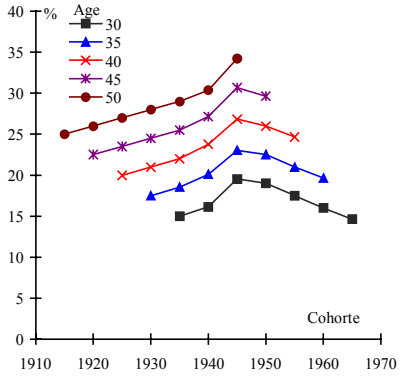
Example 3



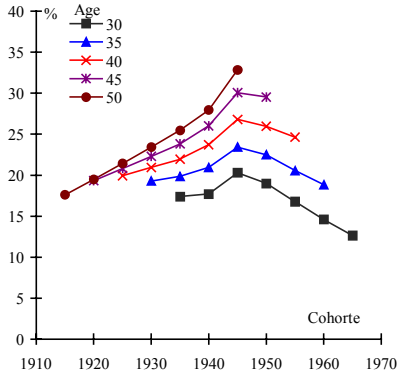
Example 4



Example 5



Example 6



The third figure (3) reveals a very different pattern: the progress is, but it is entirely concentrated on one cohort: the 1945 cohort. It is a step progression. The cohorts born before know a first model of society with 20 % of EGP-I at age 40; those born after a second model, with 25 % at the same age. Evidently, the interpretation could be ambiguous: if the 1960 cohort benefited from the progress that the 1945 cohort initiated, the privilege of the 1945 cohort was to be the first to benefit from an higher proportion of EGP-I in a society where elders had a lower proportion of EGP-I. People born in 1960 have exactly the same position as their close elders at the same age. Here, a long-term social progress exists: with the replacement of old cohorts by new cohorts, the proportion of EGP-I increases. But that progress is not regularly distributed between cohorts. To be member of the 1945 cohort is the best, but for the 1940 cohort, the situation is distressing. For the 1960 cohort, clearly, it

is not possible to understand, by one's personal experience, the signification of that social progress of which the elders of the 1945 cohort talk about.

The fourth figure (4) is a composition of the two previous situations: progressive growth, plus one step for the 1945 cohort. Here, the 1960 cohort continues to enjoy some progress, even if it is less spectacular than those of the 1945 cohort. The fifth case (5) is a situation of stopped growth and of contraction for the post-1945 cohorts. For the global mean, from the arrival in the labour market of the 1945 cohort to its maturity, the global mean proportion of EGP-I in the society will grow, but more and more slowly, and the fell down of the trend is inscribed in that cohort dynamic.

The sixth figure (6) is inspired from the fifth, but is more complex: the ages deviate gradually from preceding cohort to the following one: the 1930 cohort seems homogenous, at least from age 35 to 50. The following cohorts know a progressive divergence: the life cycle is recomposing, and youth and maturity are less and less similar.

For a better assessment, notably in terms of statistical significance, many models have been proposed. Since the Mason, Mason, Winsborough et Poole (1973) APC model, the problem of collinearity have produced a long discussion. Because c = p – a, a linear upward cohort effect formally corresponds to the combination of an upward period effect and of a downward age effect. In case of long term trend progress, any new cohort will benefit from better periods and, with age, any cohort will benefit from next (and thus better) periods during life course, and thus, a regular linear age-period-cohort intertemporal trend of progress can not be identified to any separate social time. Thus, no model could distinguish pure age, period and cohort effect *when a linear long-term trend is involved*. But when the effects are not linear (and are not another type of complex interaction between two chronological dimensions), the separation is possible. In fact, if we are interested only in cohort fluctuations, and not in long term linear progress, it is possible to introduce a new constraint in the original APC model to find an accurate solution. In other terms, we are interested here in the deviation of cohort effect from the long-term linear trend, and not in the linear trend itself (linear trend which constitutes the problem of multi-collinearity).

$$(1)\begin{cases} \ln\left(\dfrac{x_{\alpha\pi\gamma}}{1-x_{\alpha\pi\gamma}}\right) = cst + a_\alpha + p_\pi + c_\gamma \\ \begin{cases} \sum_\alpha a_\alpha = \sum_\gamma c_\gamma = \sum_\pi p_\pi = 0 \\ \sum_\gamma \left(\gamma - (\alpha_\omega/2 - 1)\right)c_\gamma = 0, \text{ if } \alpha_\omega, \text{ the number of cohort groups, is an even number} \\ \sum_\gamma \left(\gamma - ((\alpha_\omega - 1)/2 - 1)\right)c_\gamma = 0, \text{ if } \alpha_\omega, \text{ the number of cohort groups, is an uneven number} \end{cases} \end{cases}$$

Consider $x_{\alpha\pi\gamma}$ a given proportion, measured for ages α, periods π and cohorts γ; we want to separate age, period and cohort effects. We can express the logit of x as a classical categorical APC model. The three first constraints assign to zero the sum of coefficients of each variable; the last two lines assign the coefficients pertaining to cohort to a zero trend curve. With that constraint, the problem of colinearity is diverted: the one aspect revealed by the coefficients pertaining to cohort groups consists in the deviation from the intertemporal intergenerational trend of growth. If cohort fluctuations significantly exist, the pertaining coefficients will significantly diverge from zero.

A central question is constantly addressed to APC models, and to cohort effects in general: if a cohort fluctuation is discovered, is it a permanent one, embracing the whole life of the cohorts, or a transitory one? In other terms, do cohorts suffering from a less favorable beginning catch up with the others or not? Are early handicaps followed by recovery? I propose a model for the assessment of such recovery effects.

$$(2)\begin{cases} \ln\left(\frac{x_{\alpha\pi\gamma}}{1-x_{\alpha\pi\gamma}}\right) = cst + a_\alpha + p_\pi + \left(1-\left(\frac{\alpha-1}{\alpha_\varpi-1}\right)r\right)c_\gamma \\ \{\text{same constraints as (1)} \end{cases}$$

That model results from the previous one by adding a coefficient, r, pertaining to recovery effects. If r=0, we have a standard APC model; if r=1, a decrease at the beginning of life (α=1) for a given cohort will progressively diminish and disappear completely at final age ($\alpha=\alpha_\omega$). For r=2, the early handicap will be followed by even better positions after the midterm of life. We can imagine examples with even greater r. But r could be negative, also, if early handicaps greaten during life course. In further models, we will consider social and educational position of male population from age 30 to age 59, thus, α=1 refer to the 30-34 age group, α_ω=6 to 55 to 59 age group.

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