

---

Louis Chauvel  
Observatoire Français des Conjonctures Economiques  
Institut d'Etudes Politiques de Paris  
Fondation Nationale des Sciences Politiques  
69, Quai d'Orsay  
75007 Paris  
fax: 33.1.44.18.54.54.  
E-mail: chauvel@ofce.sciences-po.fr

## **Educational Growth and Cohort Changes of Social Structure in France and United-States (1968-2000)<sup>(\*)</sup>**

**Working paper for Euresco conference, Kerkrade, 6-10 October 2001**

(preliminary version, not for quote)

### **Abstract**

*The aim of this paper is to underline the impact of educational and of labour market fluctuations on (male) birth cohorts born between 1910 & 1970 in United-States and France. These different cohorts entered in the labour force and have been socialised during different periods characterised by dissimilar contexts: they have known different school opportunities, different collective life-chances on labour markets and the further trajectories have been affected by the historical pattern. There have been important non-linear variations of the access probabilities to longer education ant to the highest social positions (for example in terms of access rates to EGP class I or I + II). Because the speed of growth of educational expansion and of higher social strata could be different, we can observe important variations of the "absolute" or "gross social value" of education (the probabilities of access to highest social classes for a given level of education).*

*For that purpose, age-period-cohort (APC) models are applied to show non linear trends by cohorts. Even if national specificity exists, age-period-cohort models show:*

- *the specific impact of national policies of education on the new young cohorts;*
- *the importance of market expansion or shortage for the transition after school of the different cohorts;*
- *the changes in the "social value" of education (in terms of access-probabilities to the higher strata).*

*Two large size samples of the 25 to 64 years old male population are constructed: a United-States Current population survey cumulative file (1968-2000) (N= 1113094), and a similar French Enquêtes Emploi (1969-2000) compilation (N= 1233829).*

---

<sup>(\*)</sup> I thank Mike Hout and his team at the Survey Research Center (University of California at Berkeley) for their help for the US file and Irène Fournier (LASMAS/CNRS) for the French data. 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*.

---

This paper assesses the birth cohort changes of the French and American male<sup>1</sup> social structure in terms of social class and in terms of level of education. It shows the importance of birth cohort<sup>2</sup> fluctuations for the analysis of the social stratification dynamics in France and in United-States. Thus, birth cohorts appear as an important descriptive variable for the analysis of social change<sup>3</sup>.

The first step here will be to analyse the cohort trends of progress in educational attainment. In spite of our usual linear idea of progress, the French and United-States empirical situations show important fluctuations by cohorts. In both nations, the early baby-boom cohorts are at the top of a wave of educational progress; following cohorts are submitted to educational stagnation or even to decreasing level of education. The second step of this paper consists in the evolution of social stratification system in terms of occupational groups or EGP style social class (Erikson, Goldthorpe et Portocarero, 1979) by age, period and cohort in France and in United-States. The most singular and striking result is the dynamics of higher service classes, which expanded from cohort 1909 through cohort 1950, and stagnates after. The third step is the analysis of correspondence between education and class. Two aspects should be analysed: on the one hand we have the correspondence in terms of absolute or gross rates of access to such or such social class by level of education; on the other in terms of relative or net association; both sides of the problem could be important.

### **Birth Cohorts, socialisation, and social history of welfare states**

In a previous papers for the 1998 Montreal meeting of RC28 (Chauvel, 1998b), I have presented some results of my work on stratification dynamics by birth cohorts in France<sup>4</sup>. The main factual results on France were:

- (1) The age-period-cohort decomposition of the expansion of the level of education is not linear; the progress is clearly marked by rapid expansions followed by steps of stagnation;
- (2) Globally, when they are estimated by cohort, the rates of access to various social groups, notably those at the top of the social hierarchy, evolve by steps;
- (3) The 'social value' of a given level of education, measured by the probability of becoming a member of the highest social strata, is neither stable nor linearly growing from a cohort to the other.

---

<sup>1</sup> Even if I consider here exclusively the male population, this paper is a fragment of a larger project comparing male and female destiny.

<sup>2</sup> The cohorts I utilise here are exclusively birth cohorts. The data I present are repeated cross-section samples, and, thus, I consider pseudo-cohorts. The expression « the 1967 cohort » qualifies those born in 1967 ; « the '60 cohorts », between 1960 and 1969; « the 1965-69 cohorts » those born between 1965 and 1969.

<sup>3</sup> Even if age and birth cohort hide more substantial explanations in terms of work experience and of year of entry in the labour market, but these two couples of variables are two highly-collinear sides of the same problem.

<sup>4</sup> A complete overview of my work on birth cohorts and social generations is in my book (in French): *Le destin des générations: structure sociale et cohortes en France au XX<sup>e</sup> siècle* (Chauvel, 1998c).

---

---

Very synthetically, in France, the 1945-49 cohorts, the first cohorts of the baby-boom, have benefited from a boom in their social opportunities compared to those of the 1935 cohort: an expansion of 50 % of the probabilities of access to higher education. A similar growth of the opportunities to joint social groups corresponding to EGP service class I + II appears<sup>5</sup>. Thus, it might be useful, for stratification change research, to insist more on cohort analysis. When cohort analysis is avoided, the risk is to miss the rhythm, the pace and the timing of social change, and to forget the analysis of the social historical patterns of social change.

The central hypothesis of cohort analysis (Ryder, 1965) is that the period of primary socialisation, during youth, implies decisive experiences and situations that the new cohorts, individually and collectively, will have to go through and endure the consequences for their entire adult life. Thus, social history (I mean a complex evolution of private and public decisions of investment in education, of economic environment at the arrival of young cohorts in the labour force, of offer of skilled workers and of demand for skilled labour, etc.) could imply permanent scars. Consequently, the analysis of the social stratification system by birth cohort and the comparison of birth cohort destiny could reveal important cohort fluctuations, which are the long-term consequences of the fluctuations of social history shared by specific cohort groups.

That hypothesis is not new in the Anglo-Saxon context of the middle term of the twentieth century. Some classical empirical research works since World War II have presented the hypothesis that history implies sometimes non linearities on cohort's social destination and destiny. Glass and Hall (1954), for example, asked these questions. The succession of specific economic periods, the crisis and the emergence of public interventionism — for education, research, but also for health, social services, etc. — could have had an impact on the destiny of cohorts, and the authors tempted to illustrate that hypothesis. Nevertheless, the survey used by Glass, which was simply one cross-section sample, could not be sufficient to separate age and cohort effects. In the United-States, the comparison of life cycles and mobility by cohorts proposed by Jaffe and Carleton (1954, chap. 5) showed the specificity of cohorts born near the year 1910, arrived in the labour force during the thirties and who met a social destiny less favourable than successors and predecessors. Blau and Duncan (1967, pp. 81-113, 177-188) located similar effects for that 1929 generation, whose first five or ten years in the labour market were more difficult than for the elder and the younger, implying a comparative handicap which characterised them during their whole life.

In his social history of poverty, stratification and mobility in Boston, Thernstrom (1973, pp.62-75) has found similar problems of shortened upward mobility for cohorts born near 1910. I insist on the hypothesis that the problem is not exclusively an economic issue: the 1929 crash and the depression of the thirties, which doomed the social destiny of the 1910 birth cohort, is not simply a problem in the “economic” sphere, endured by the young cohorts. The problem has two other aspects: public investment in education fluctuations and pro- or contra- cyclical policies of employment. The succession of periods of speed economic growth and of depressions certainly produce cohort fluctuations in the social stratification system, but stop and go policies in public investment in education causes also such fluctuations; accelerations and stalling of public employment produces similar effects. This paper is a step toward the assessment of that hypothesis, even if the comparison between France and United-States shows the complexity of the relation between education and class.

---

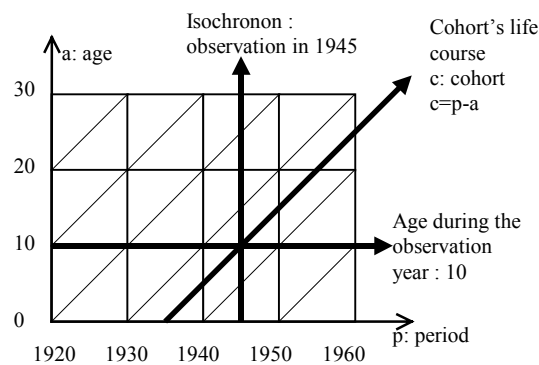
<sup>5</sup> A fourth conclusion, in terms of gross social mobility rates (hierarchical flows of upward and downward mobility) showed that, even if social fluidity is more or less stable from a cohort to the other, the probabilities of upward or downward mobility differ considerably from a cohort to the other.

---

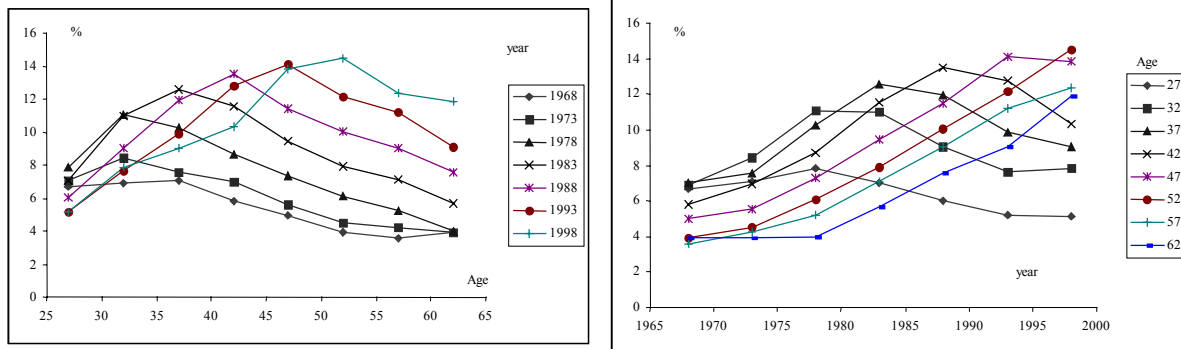
## Methods

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<sup>6</sup>. Some of them are graphical and others consist in model assessment.

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

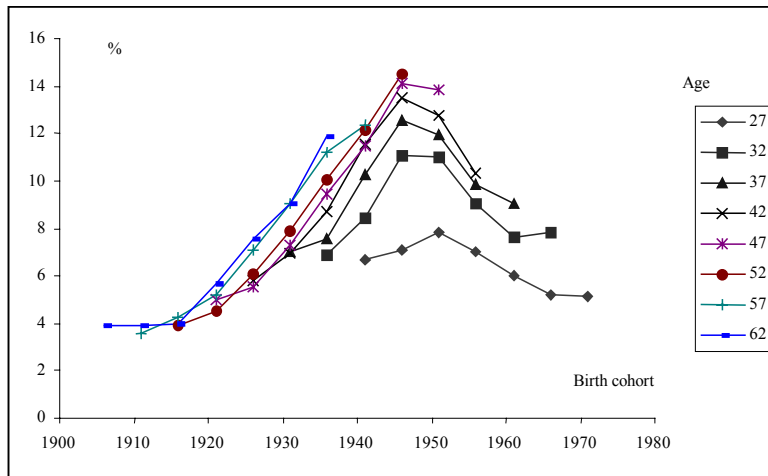


### 2a-Masters's degree (or more) in the US male population (left : age profile ; right : year profile)



<sup>6</sup> 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).

## 2b- Master's degree (or more) in the US male population (cohort diagram)



Source : US CPS 1968-1999 cumulative file ; male population; N=1113094.

In my Montreal paper (Chauvel, 1998b), 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 percent of Master’s degree holders), and where each curve represent a given age (figure 2b). If the classical “age” and “year” profiles provide no substantial information (figure 2a), 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). Here, if the curves at age 32, 37, 42, 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.

Here, from the 1905 cohort to the 1949 cohort, a steady growth of education appears. After, for following cohorts born after 1950, a rarefaction of MA degrees at any age is obvious. At age 32, 11,0% of the 1949 cohort holds a MA degree; for 1954 cohort, the proportion declines to 7,6%. At later stage of the life cycle, the differential remains stable: at age 37, the percent of BA holders has grown; for early baby-boomer, 11,9% holds a MA degree, and 9,1% for 1954 cohort. 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, 1998c, annex 2).

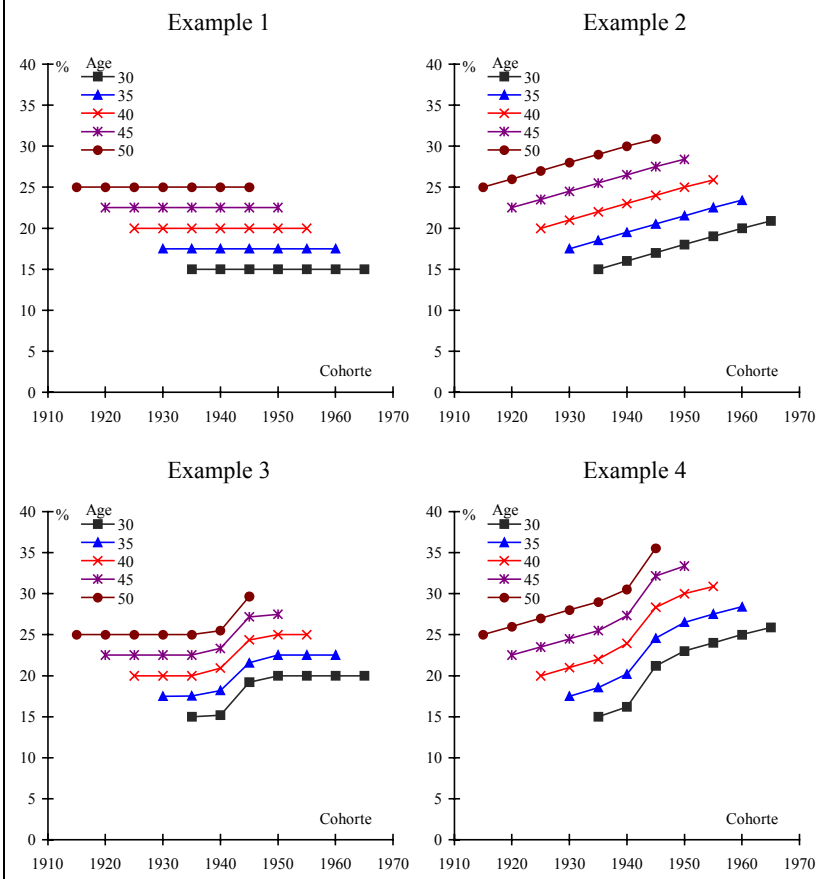
### Cohort diagram: theoretical examples

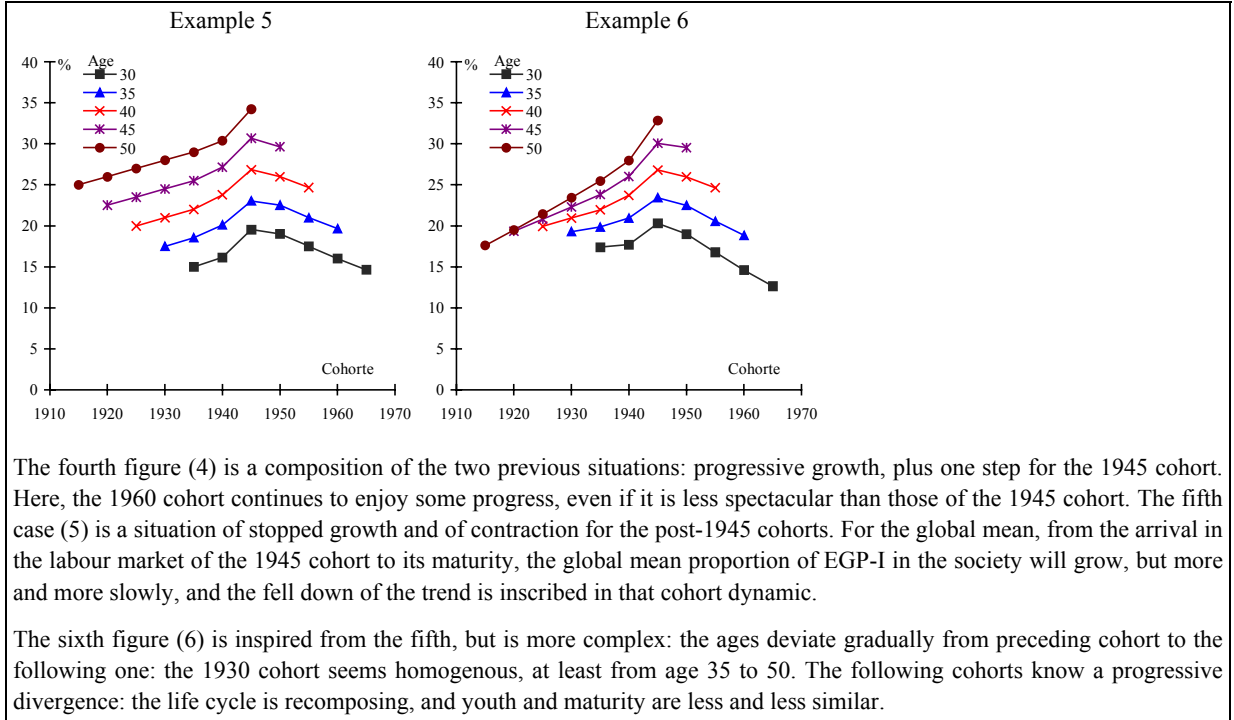
The cohort diagram is the representation, for successive cohorts (horizontally), of the value of a given variable — percentages of housing property, suicide rates, income, or the proportion of EGP-I etc. — (vertically) at different ages materialised by the curves which follows the cohorts at the same 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 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 cohort diagram : six theoretical cases





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).

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

Consider  $x_{\alpha\pi\gamma}$  a given proportion, measured for ages  $\alpha$ , periods  $\pi$  and cohorts  $\gamma$ ; 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 favourable 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.

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

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 ( $\alpha=1$ ) 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,  $\alpha=1$  refer to the 30-34 age group,  $\alpha_{\omega}=6$  to 55 to 59 age group.

## Data

Two large files have been constructed concerning United States and France. For these files, the strategy is the same. In any case, we need long term (some decades) cumulative files of cross-sectional samples containing 5 main variables: year= $p$ , age= $a$ , sex= $s$ , level of education= $e$  and social class= $k$  (occupation). Cohort= $c$  equals  $p-a$ . An almost perfect continuity in the coding scheme is required; that constraint could be difficult to fulfil for education and class.

### *The United States file*

The American file is a 1968-1999 United States Current population survey. The size of the extract containing men between age 25 and 64 is  $n=1113094$ . It is an annual file. I have added to the "Robert Mare and Christopher Winship extract file (1968-1992)" stored at NBER site ([http://www.nber.org/data/mare\\_winship.html](http://www.nber.org/data/mare_winship.html)) the corresponding variables of the 1993-1999 Current Population surveys from the BLS site.

The file has original codes concerning education (2 digits) and occupation (3 digits) requiring complex choices for a correct continuity of the series. First, the coding of education, which have been the same for four decades, have changed for CPS-1992 and after (see Mare (1995), for a complete overview of the same problems with the censuses). The use of annual CPS surveys shows that a common code is easy to find and satisfying: the continuity of annual series provides a good test. The second question is more difficult. The occupation codes are revised for any new census, and imputed some years later in the CPS. The major groups proposed by the Census Bureau (which is *a priori* presumably more or less continuous from a census to the other) conduct in fact to unsatisfying results; the 2-digits occupation



codes are also misleading<sup>7</sup>. The only solution is to go back to the 3-digits codes (present in the Mare-Winship extract), that I have recoded in a 1950-Census-style Occupational code, that I have recoded in 11 classes (EGP scheme). I have applied generally the same choices than Ganzeboom and Nieuwebeerta (1996). When these choices are imputed to the annual CPS file, the data shows no important step for the years of discontinuity in original codes. Some other problems have been solved, such as discrepancies in the 1981 sample, due to the disappearance of 80% of Californian residents; I have discarded the remaining Californians and replaced them by a proxy, which is half of 1980 Californians and half of 1982.

### *The French file*

The French file is a compilation of « *Enquête Emploi* » (1969-2000)<sup>8</sup> (size of the extract containing men between age 25 and 64 is  $n=1233829$ ). The educational code is not a problem: the French educational system is almost stable through the twentieth century, and very structured; the codes know no change. The occupational code is more problematic. The French statistical system<sup>9</sup> have created a specific code: the “catégorie socioprofessionnelle (CSP)” (Socio-occupational group). That code organises the social stratification system on a 6 main groups basis:

- at the top of the wage earners hierarchy: the “*cadres*” (≈EGP higher service class I, less large employers);
- at the bottom the “*employés*” (≈EGP routine white collar III) and “*ouvriers*” (≈EGP blue collar workers VI+VII);
- between these two extremities the “*professions intermédiaires*” (≈EGP lower service class II). The “*chefs d’entreprise*” and the “*agriculteurs*” are the two groups of self-employed.

The French CSP scheme is more or less structurally close to EGP scheme, even if, in the details, many choices are different; it could be used at least as a proxy of EGP class scheme. Considering that I will focus in my paper on the Service class I + II, I will not insist on the details of the differences between CSP and EGP. The two important aspects of my recodes are that: on the one hand, in the PCS scheme, since 1982<sup>10</sup>, the “*contremaîtres*” (≈foremen, EGP V) are in “*professions intermédiaires*” (≈Service class II); here, for this comparison, the “*contremaîtres*” have been declassified from that lower service class to blue collar workers. The second aspect is that I have added the “large employers (10 and +)” to the “*cadres*” for a better assimilation to EGP service class I. A better codification will follow, using previous propositions (Erikson, Goldthorpe, König, Lüttinger, Müller, 1989; Brauns, Haun, Steinmann, 1997).

---

<sup>7</sup> It is why I have abandoned the Moffitt (1993) extract of CPS 1968-1992, where occupation is coded on 2 digits.

<sup>8</sup> These surveys were obtained from LASMAS-IDL-IRESO (CNRS), and extracted with the help of Irène Fournier. *Enquête Emploi* is the French labour force survey, more or less equivalent to CPS.

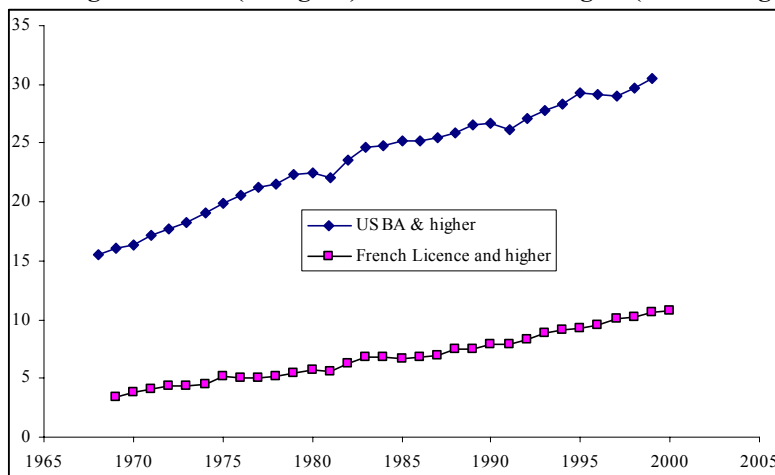
<sup>9</sup> See Desrosières et Thévenot (1988) for a quick explanation of this scheme.

<sup>10</sup> Another aspect of continuity problems appears in France when you consider the long-term file (F1). Since 1982, the French surveys had been coded according to the new nomenclature of « Professions et catégories socioprofessionnelles (PCS) ». That PCS nomenclature replaced the old « Catégories socio-professionnelles » (CSP between 1953 and 1981). The difficulty is to adapt the old CSP scheme (before 1982) and the new PCS scheme (after 1982). The solution is to joint the two digit codes considering the main statistical links (Seys, 1986), and to aggregate them in a 6 modality variable named « groupes socioprofessionnels » (GSP), and then to weight the groups before 1982 to nullify the gaps between the 2 nomenclatures.

### Cohort and level of education

The progress of the educational level seems to be linear, when we consider the entire population. If we consider, for instance, the complete male population between age 20 and 64, the proportion of BA degree (or more) holders (US) and of *licence* or more holders (= longer tertiary education in France) are growing almost linearly (figure 3). The regularity is obvious and there is no major fluctuation. The decline of high school dropouts in United-States and the decrease in France of those who stopped school before the French *baccalauréat* (selective exam at the end of secondary education) is very constant.

### 3- Bachelor's degree holders (or higher) and *Licence* and higher(cohort diagram)



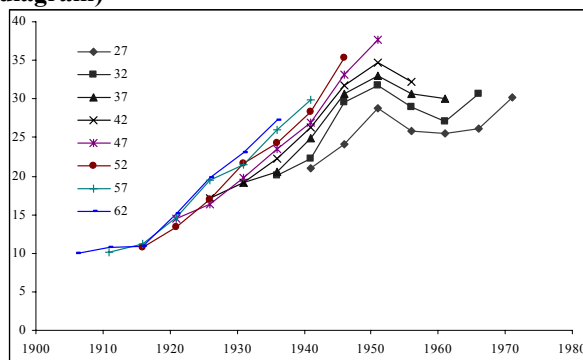
Source : US CPS 1968-1999 and F Enquêtes emploi 1969-2000 cumulative file

We will concentrate our attention to the top of educational pyramid. If now we analyse the trend of expansion of longer tertiary education by birth cohort, the trends become clearly hacked and problematic. If we compare French and United States trends (figure 3), we should say:

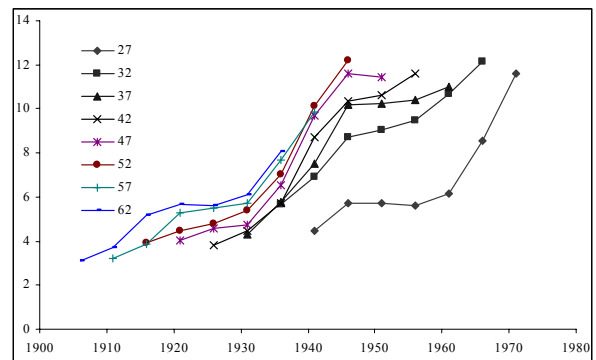
- 1- The French system of degree certification is clearly more selective, or, in other terms, underdeveloped, when it is compared to the American one.
- 2- The American system have known a long trend of accelerating progress since the 1890 cohort (slow before the 1910 cohort, and faster for the following ones), but that trend is stalling after the 1950 cohort, or even declining. The '70 cohort benefits from a new growth. Note here are the results pertaining to the United-States resident population; when the non-native population is excluded (15% or more in the population aged 30 to 35), the shapes are exactly the same.
- 3- The French system have known little growth prior to the 1935 cohort, and a boom in the probabilities of access to longer tertiary education occurred for the first cohorts of the baby-boom (a jump from 6% to 10% in the proportion of a cohort accessing to the higher stage of tertiary education). That growth corresponds to the first university boom, which resulted from massive public investment in education in the early sixties. The 1950-65 cohorts are stalling, and the following ones know a second university boom.

Even if the shape is not the same in France and United-States, the comparison shows that, in France and in United-States, the probabilities of enjoying longer education are clearly linked to cohort. In France, the cohort fluctuations corresponds to the national history of the educational expansion (Prost, 1996). For United-States, the period which goes from the GI's Bill (Benett, 1996) to the end of Johnson's *Great Society* have certainly been propitious to a continuing acceleration of the educational growth (Freeman, 1976). The succeeding period of stagnation or educational crunch have received little attention (an exception: Mare, 1995, p.164) and seems to have been recently discovered by social scientists (f.ex.: the economists Card and Lemieux, 1999).

**4-US1- Bachelor's degree holders (or more) (cohort diagram)**      **4-F1- Licence or more holders (cohort diagram)**



Note: age "27" is the average for 25-29 age group  
Source: US CPS 1968-1999 cumulative file – Male pop



Note: age "27" is the average for 25-29 age group  
Source: F Enquête emploi 1969-2000 cumulative file – Male pop

The analysis of long term data on educational and college investment could explain the stalling growth by the retrenchments of public spending (Chauvel, 2001). At the end of the seventies, the re-commodification of education implied for the new cohorts of young potential students a tight choice between the resort to borrowing (in a period of credit crunch) and the shortening of education. The long wage of progress in education thus stopped.

Is it possible to test the statistical significance of these cohort fluctuations? That is the purpose of APC models. In fact, the assessment of cohort effects could come from the comparison of simple models such as (AP, which assumes that there are no cohort effect), (APC), and (APC-R). To apply these models, we consider the following 5 years pace coding for a p and c parameters (figure 5).

### 5- Coding of c as a function of a and p for US1 file

p⇒ a↓		1	2	3	4	5	6	7
		1968-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000
1	30-34	6	7	8	9	10	11	12
2	35-39	5	6	7	8	9	10	11
3	40-44	4	5	6	7	8	9	10
4	45-49	3	4	5	6	7	8	9
5	50-54	2	3	4	5	6	7	8
6	55-59	1	2	3	4	5	6	7

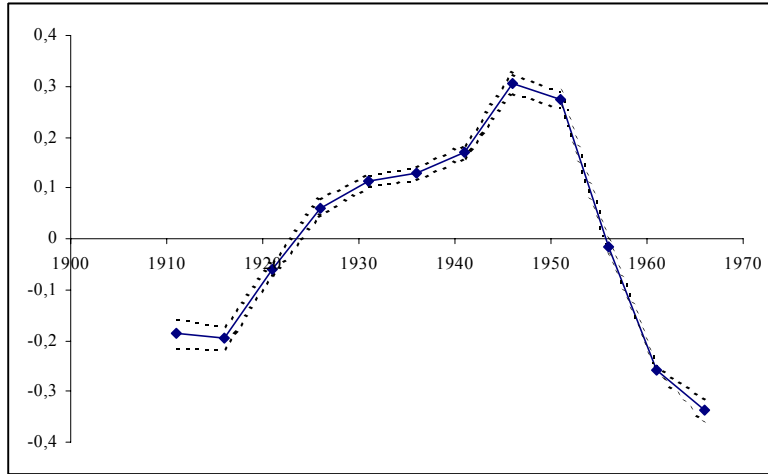
When the models are applied to the US data, the AP model is not sufficient to explain the variations of education, when APC is very satisfying: cohort delivers an important information. When cohort and period effects are simultaneously present, the explanation of education attainment is almost perfect. Thus, cohort fluctuations are an important aspect of educational attainment. The results of APC-R model suggest that the recovery effect could be ignored. The general shape of fast growth from 1915 cohort to 1950, and of decline after appears clearly. When we compare the actual data and those fitted by the APC model (figures 8), the result appears very satisfying. The results of the AP model show that with no cohort effect, the restitution of the general shape is not convincing: the AP model supposes that the growth of education is linearly shared by all cohorts, when the correct model should consider cohort inequalities in the access to longer education. 6-US- proportion of Bachelor's degree holders (or more) in the male population (APC models)

### 6-US- proportion of BA (or higher) in the male population (APC models)

#	Interactions	L <sup>2</sup>	Df	P	Bic (1)	Δ
Sample (N = 862613)						
1	A P	3052,19	31	<,0001	2628,49	23146,78
2	A P C	35,62	20	0,02	-237,73	1914,50
3	A P C - R	35,60	19	0,02	-225,38	1933,65

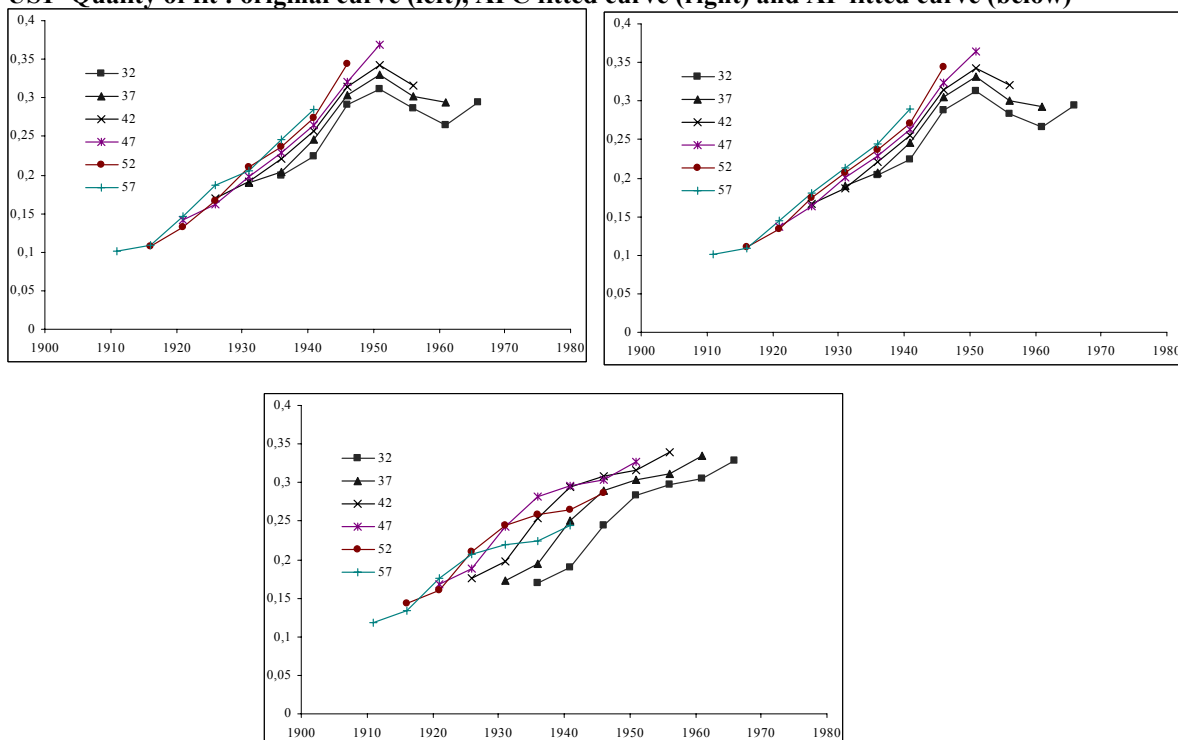
Note: (1) I use the Raftery's bic (1986), which had been created for completing the significativity criterion: in a large sample, any link, even the slightest, is significant, but not necessarily consequential. Raftery proposes a criterion of preferability : to what extent a model should be preferred to another ? With bic =  $-2 \log B = L^2 - (df) \log N$ , where N is the size of the total sample and df the number of the degrees of freedom of the model. Between two models, the least bic is preferable, when the difference exceeds 10.

**7- US1- Cohort coefficients: divergence from linear trend for Bachelor’s degree holders (or more) in the US male population (bootstrap evaluation of 95% confidence curve)**



Source: Source: US CPS 1968-1999 cumulative file – Male pop

**8- US1- Quality of fit : original curve (left), APC fitted curve (right) and AP fitted curve (below)**



Source: Source: US CPS 1968-1999 cumulative file – Male pop

In fact, the most interesting result is the variation of the coefficients pertaining to cohort in the APC model. The 95% confidence intervals have been simulated *via* bootstrapping. These coefficients show the importance of educational growth for pre-baby-boom cohorts and the decline, which happens for the following ones (relatively to the linear trend). If the coefficients for cohorts are statistically significant, they are substantial. I mean that with large samples, a result, which is statistically

significant, could be of little importance if the involved effect affects few percents. In fact, the gap between the linear trend and the 1946-1949 birth cohort exceeds +0,33; since these coefficients are homogeneous to logistic regression coefficients, such a gap means that some cohorts can be a third above (or below) the linear trend, in relative terms. The curve suggests that the GI's Bill really benefited to cohort 1921-1925. Prior cohorts were too old to participate to WWII, or even too old to go back to university. The ACP-R model shows a slight non-significative negative R effect (-0,05), with a standard error of 0,08. In other terms, cohorts that begin with lower educational achievement do not improve their situation later comparatively to others.

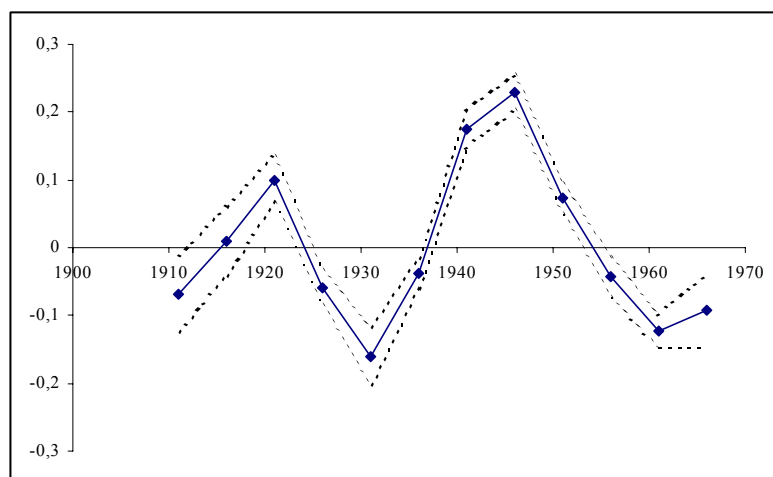
### *APC model and education in France*

We consider the same models for France. The comparison between the model where cohort is avoided and those where it appears as a categorical variable (and thus can reveal non-linear fluctuations) demonstrate the importance of cohort fluctuation. The APC-R Model can not improve the results of the APC one. Cohorts beginning less favourably do not better in later stages of life course.

### **9-F- proportion of *Licence* degree holders (or more) in the male population (APC models)**

#	Interactions	L <sup>2</sup>	Df	P	Bic (1)	Δ
Sample (N = 937488)						
1	A P	1223,90	31	<,0001	797,62	7274,31
2	A P C	58,46	20	0,001	-216,56	1556,08
3	A P C - R	57,70	19	0,001	-203,57	1533,78

### **10- F- Cohort coefficients: divergence from linear trend for *Licence* holders (or more) in the French male population (bootstrap evaluation of 95% confidence curve)**



Source: F Enquêtes Emploi INSEE 1969-2000 cumulative file – Male pop

The comparison between France and United States shows that the structure and the rhythm of educational progress differ. If early baby-boom cohorts benefited from an educational boom, the American trend had been much more progressive with a gradual growth for cohorts 1920 to 1950, and a continuous decay after (relatively to the trend). Clearly, if we consider the span of our evaluation, the American waves are longer, when the French ones oscillate rapidly. The French curve is much

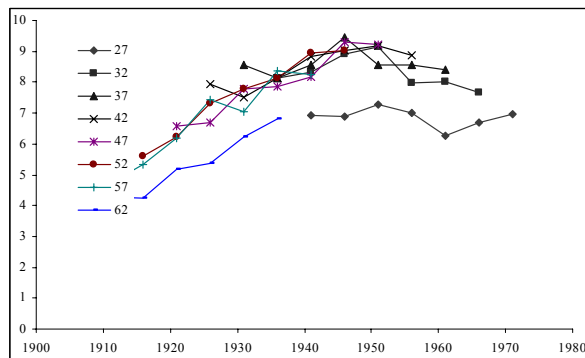
more hacked: the '30 cohorts benefited from less educational investment than the trend, the '40 cohorts benefited from a strong expansion. A progressive pause occurs then, with a new phase of progress for cohorts born after 1965. These fluctuations, which are as important as in the American case, follow the phases of the French educational policy, which implies important inequalities between cohorts, and of which the result could be important variation in further social class attainment of the different cohorts.

Even if further education schemes exist in both countries, there is neither substantial nor significant “recovery effect”: these schemes of training and life long education may give the same opportunities to any cohorts, whatever the initial situation was. Thus, cohorts beginning with a weak educational attainment generally do not catch up with the others.

### Cohorts and service class

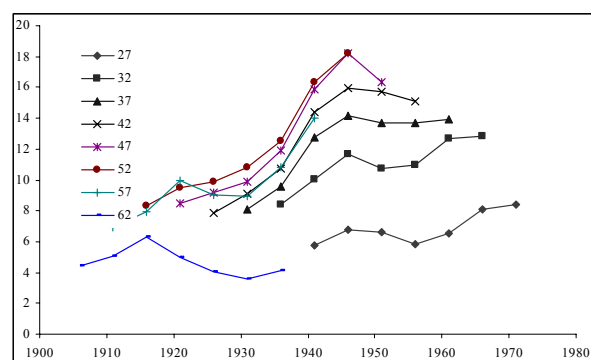
The same models could be applied to other variables, notably the probability of access to service class I or II. These models show that the same variations as above appear for the access to upper middle classes. When we analyse the cohort diagrams pertaining to service class I and I + II, the French situation clearly shows a strong cohort fluctuation (even: discontinuity) from the cohort 1935 to the 1945 one. The French history of social structure seems to be the slow progress of the '20 and '30 cohorts, then the fast expansion of middle and upper middle classes, and then a long stagnation. The younger cohorts seem to live a new trend of progress. The American history is different. Even if the fluctuations seem less important, a clear stagnation follows the progress of the '20 to '40 cohorts.

11- US Service class I (cohort diagram)



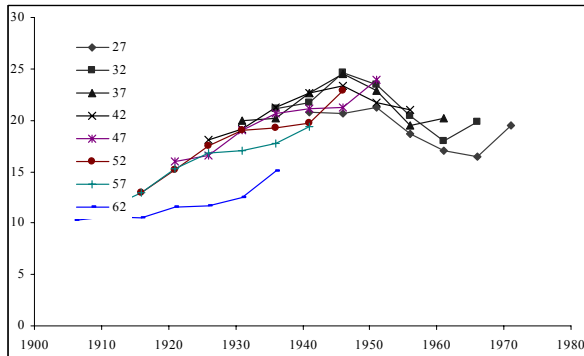
Note: age “27” is the average for 25-29 age group

11- F Service class I (cohort diagram)



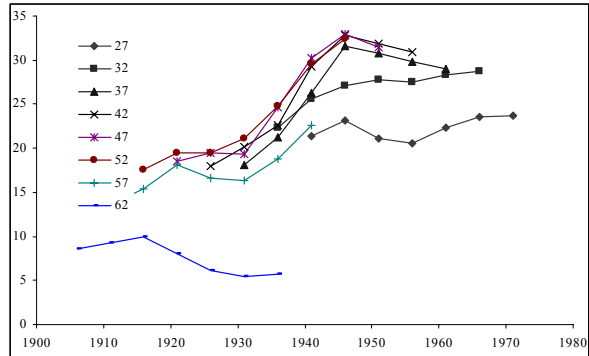
Note: age “27” is the average for 25-29 age group

**12- US Service class I+II (cohort diagram)**



Note: age "27" is the average for 25-29 age group

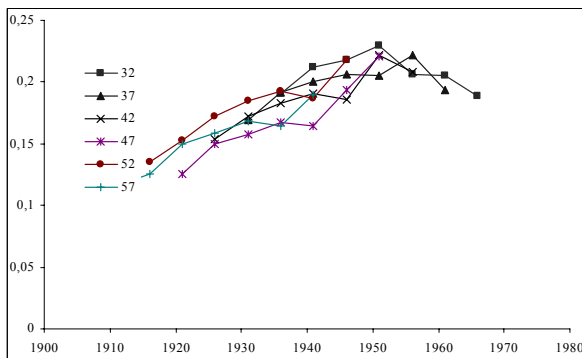
**12- F Service class I+II (cohort diagram)**



Note: age "27" is the average for 25-29 age group

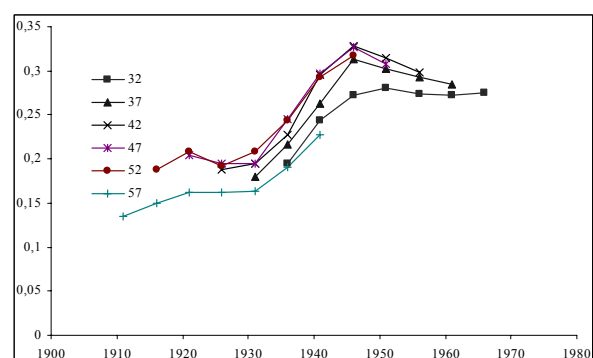
In France as in United-States, the shapes of the expansion, on the one hand, of the service class I and on the other that for I + II are more or less the same. If we test the significance of cohort effects, we find clear correspondence between cohort fluctuations in education and in class membership in terms of Service Class I + II. The analysis of catch up effect shows it is not absent but small: delays in the early career can not be perfectly caught-up. An interesting question is : what would have happened if there have been no cohort effect? The fits of the AP model answer that question: all age groups would have shared the deceleration of EGP I+II class growth, and, by definition, no clear cohort fluctuation could be observed. The actual data show that the deceleration was not shared but concentrated on the new birth cohorts entered in the labour force after the economical slow down of the second part of the '70: older continued to benefit from better positions acquired during their transition into the labour force during better periods of the '60.

**12b- US Service class I+II (cohort diagram) APC fit**



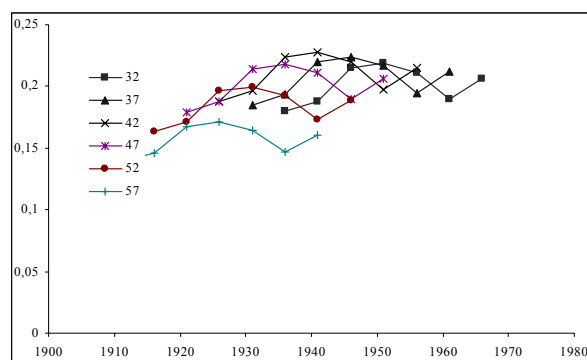
Note: age "27" is the average for 25-29 age group

**12b- F Service class I+II (cohort diagram) APC fit**

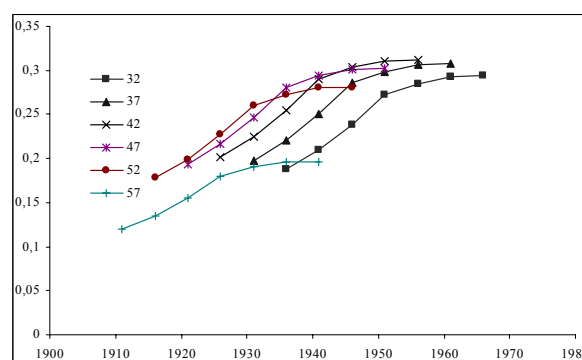


Note: age "27" is the average for 25-29 age group



**12c- US Service class I+II (cohort diagram) AP fit**

Note: age "27" is the average for 25-29 age group

**12c- F Service class I+II (cohort diagram) AP fit**

Note: age "27" is the average for 25-29 age group

When APC-R models are applied (figure 13), some difference appear when we compare France and the US: in France, cohort effects should be considered but no substantial nor significant R-catch-up effect can be found. In the United States, a slightly significant R effect is found, even if the bic criterion shows no decisive conclusion. The involved R coefficient is 0,59 with a standard error of 0,14. In other terms, given the design of the model, the R coefficient in the US shows that about the half of the delay in the early trajectory of cohorts could be caught up during the cohort life course. It means that cohorts enjoying favourable opportunities in early life course tend to keep their better situation, and those submitted to less advantageous early situation do not completely recover.

**13-US- proportion of EGP I+II in the male population (APC models)**

#	Interactions	$L^2$	Df	p	Bic (1)	$\Delta$
Sample (N = 862613)						
1	A P	1239,98	31	<,0001	816,29	12528,13
2	A P C	41,19	20	,005	-232,16	1989,25
3	A P C - R	30,04	19	,05	-229,64	1727,29

**13-F- proportion of EGP I+II in the male population (APC models)**

#	Interactions	$L^2$	Df	p	Bic (1)	$\Delta$
Sample (N = 937488)						
1	A P	2184,84	31	<,0001	1758,57	19010,95
2	A P C	150,59	20	<,0001	-124,43	3453,29
3	A P C - R	147,56	19	<,0001	-113,71	3454,81

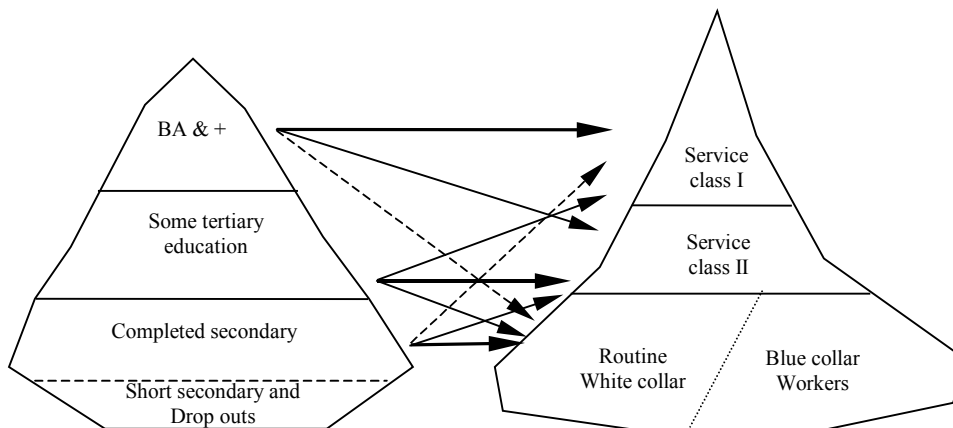
## Cohort and correspondence between education and class service class

### *Two hierarchies in relation*

One of the central questions for long term dynamics of social structure system is the correspondence between two moving pyramids. Very schematically, we can represent these two hierarchies as two pyramids: the educational system produces a hierarchy of positions that will be translated in the occupational system. The problem presented here is this one: if the educational pyramid knows intense changes from a cohort to the other, does the class pyramid know the same deformations by cohort, or could we detect cohort changes in the relation between education and class membership? Such an issue could illustrate the between cohorts inequalities of education in their consequence into class positions.

This question is connected with the over-education problem: if the educational pyramid knows a large upward shift when the class pyramid remains the same, a clear *dévalorisation sociale du diplôme* (a degree devaluation) could happen. Anyway, we can imagine an opposite move, if the education system is stable when the occupational structure knows an upward shift. Other situations could be imagined.

### 17- Correspondence between two pyramids

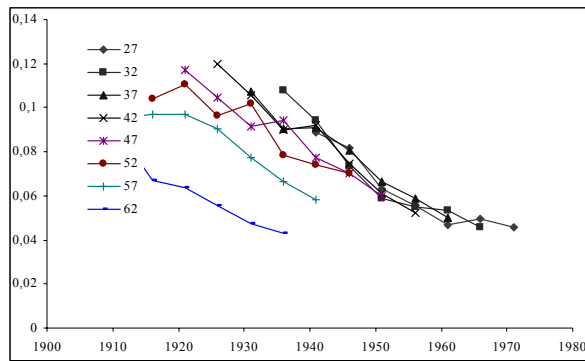


In fact, two complementary aspects are present here: on the one hand the absolute rates of translation from education to class, I mean the probability, for a given level of education, to go into such or such class; here is the absolute social value of education. On the other hand is the relative situation of the different levels of education in the competition for the best social positions, which can be evaluated *via* odd ratios, of which depends the relative value of education. An important devaluation of education in absolute terms (when degree holders are more common and the scarcity of upper class positions remains) could go with a growing relative value of degrees. It could be the case if, for instance, the recruitment of upper classes becomes more and more selective in the direction of the top of educational pyramid. I will concentrate here my development on the absolute aspect, because cohort changes affect strategically the marginal structure of education and class. These marginal evolutions, even if their sense is more or less conventional when we compare different countries, are a much more serious aspect of social stratification when we consider the long-term changes in a given country.

*An example: the certified end of long secondary education and service class I+II membership*

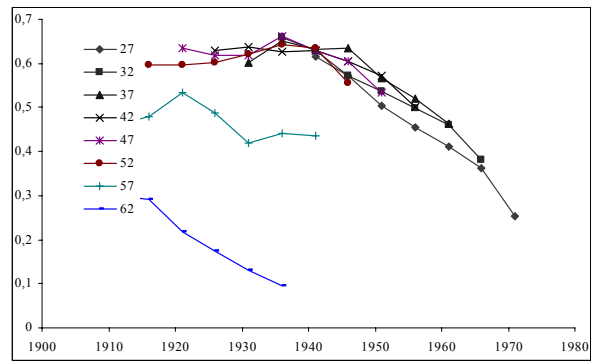
An important aspect of these cohort changes appears when we study the destination of the population whose level of education corresponds to a certified end of secondary education (12<sup>th</sup> grade of High School in United-States, *baccalauréat* in France). That level has known an important recomposition of its position in educational pyramid during the twentieth century. Clearly, the probabilities of access to service class I and II for secondary education graduates are less important in United-States than in France, where the considered population is smaller in France, for a similar proportion of social positions. The interesting aspect is elsewhere: in trends and the evolution by cohorts of the absolute social value of that educational level.

**18-US1- Service class I+II membership for 12<sup>th</sup> grade of High School (cohort diagram)**



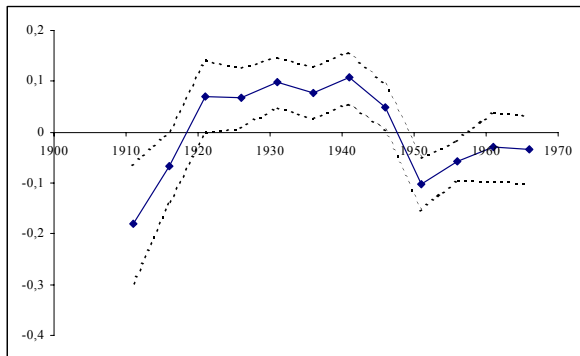
Note: age “27” is the average for 25-29 age group

**18-F2- Service class I+II membership for *baccalauréat* holders (cohort diagram)**



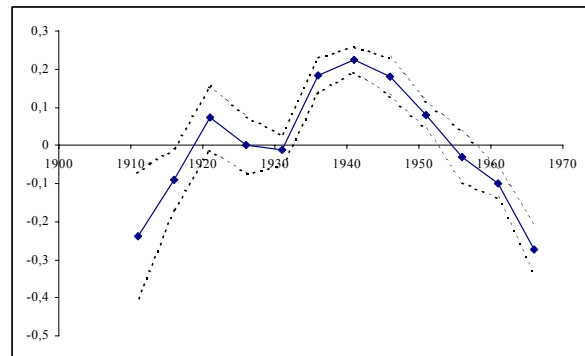
Note: age “27” is the average for 25-29 age group

**19-US1- Cohort coefficients: divergence from linear trend for Service Class I + II membership for 12<sup>th</sup> grade of High School (cohort diagram)**



Note: age “27” is the average for 25-29 age group

**19-F2- Cohort coefficients: divergence from linear trend for Service Class I + II membership for *baccalauréat* holders (cohort diagram)**



Note: age “27” is the average for 25-29 age group

This level of education experiences a progressive decline of its social value in terms of probabilities of access to the service class I + II. But in the two countries, the shape is not exactly the same. In United-States, the evolution is not very important (5 points change for half a century) and more or less linear. The American dynamics seems to be characterised by a relative stability (when compared to the French example) of the relation between education and access to service class I and II. The mutations of the educational system and of the class structure have been more or less parallel, and the movement of educational devaluation almost non-existing. As we can see, the “Thernstrom effect” of social decline of the young cohorts of the thirties is not a question of general decline of the value of

education, but of decline of education achievement of these cohorts, decline of education which is probably linked to the scarcity of economic means during the thirties. The progress in education (for 1920 to 1950 cohorts) have had its consequences on the class structure, and the ending of middle and upper middle class expansion (for post-1950 cohorts) was perfectly in phase with the educational break.

In France, the cohorts born before 1950 have known almost no devaluation of the baccalauréat. The fall of its value really comes after the 1950 cohort, with about 10% of decay between the 1955 cohort and the 1965 one. In other terms, the first cohorts who have experienced the first educational boom have not been submitted to the decline of the value of *baccalauréat*: the following ones, coming in the context of an educational stagnation, experienced that devaluation. The *r* coefficient is not statistically different from 0. In other terms, after the entry of a cohort in the class structure, there is no substantial modification of its position relatively to other cohorts during life course. In the French example, we have a very strange case: the *baccalauréat* of the 1945 cohort, which was twofold more frequent than for the 1935 cohort was not devaluated, when the *baccalauréat* of the 1955 cohort, as scarce as for those born ten years before, is devaluated. In other terms, the labour markets and the social process of status attainment seem to be clearly segmented by cohorts. When we develop a given level of education, elder cohorts, which have obtained this level of education when it was scarce and which have yet their position in the class structure, do not suffer from the diffusion and the social devaluation of this level of education.

<<<<<<<<<<<<<< NOT YET DEVELOPED HERE : >>>>>>>>>>>>>>>>

*Structural changes in the value of education: the relative decline in the value of education is mainly concentrated on the median steps of the educational pyramid, and less important at the top: thus, the relative value of education of higher grades increases, relatively to intermediate levels (short tertiary, completed end of secondary). But important cohort fluctuations should be considered.*

### **Discussion : cohort and social change**

The central result of this paper is that the last 30 years show an interesting pattern of cohort changes of social structure: the sociohistorical context of educational growth offers important opportunities in terms of human capital distribution to some cohorts and not to others. Simultaneously, the conditions of entry in the labour force (the context of skilled labour market growth or retrenchment) are strategic for new cohorts: the presented models shows that after age 30, for a given cohort, the level of education, the social position, the social returns to education, remain almost stable. In fact, one important result is that, when we analyse the collective life course of cohorts, there have been less changes in the shape of the life course (for education, class and social returns to education) than in the position of the entry point (before age 30) which clearly influence the remaining trajectory.

In other terms, after the very first years of the transition from school to work, no important catch-up effect can be observed: the educational distribution (which highly depends on public investment) freezes early, the competition for the highest social positions depends on the expansion of skilled employment, and for cohorts confronted with educational and/or economical slow down, long term difficulties appear. The political history of educational investment and the economical cycles could explain why, in France, younger cohorts with ever higher educational backgrounds experience the

destiny of *déclassés*: the stagnation of higher social positions in a context of educational expansion produces a phenomenon of overeducation.

Thus, the global trends of the social structure changes — expansion of education, growth of middle and higher strata, social value of diploma — as many other aspects<sup>11</sup>, could hide important fluctuations by cohort. This paper shows some important aspects of inequalities between cohorts, in terms of probabilities to enjoy longer education, to get into the higher social classes, to see one's educational level correctly valued in the occupational structure. Clearly, the dynamics of education is here in a central situation, and the shifts from the linear trend appear to have important effects on the social stratification system.

In fact, if these evolutions by cohorts were linear, there would be almost no inequality: that linearity allows prediction and each cohort could evaluate in advance its destiny. This paper shows that the cohort fluctuations (the divergence from the linear trend) are mostly substantial and durable; that means non-linear evolution of the social structure system (education and class) can appear. This means also a fundamental uncertainty for any social actor, public and private, students and employers: stop and go policies in education, for instance, produce difficulties to analyse the possibilities offered to different cohorts and the social value affected to the different levels of education. Few years of distance could imply diverging life chances.

Consequently, when a trend of change in social structure is analysed (education, Service class I+II expansion, etc.), its cohort dissection might be useful to evaluate the degree of participation of each cohort to that trend. The cohort decomposition might underline specific phenomena, fluctuations, accelerations and slowdowns which can define the specificity of cohorts; here, from the 1950 to 1965 cohorts, fifteen birth years, a social generation had experienced no substantial amelioration of its social destiny in terms of class, and problematic evolutions of education level. These results show that the downward swing of the so-called “X-generation” is not simply a journalistic hallucination, but also a measurable empirical problem of investment in human capital.

Therefore, cohort might be considered as an essential time for social change analyses (Ryder, 1965). In social generation research, the danger of super-interpretation is certainly important (Becker, 2000), but to forget cohort specificity could be a profound deficiency in social research. If the chances to have access to the highest social positions are fixed at 30 years old, if the collective life cycle of the cohorts continues to be stable, having the same shape and slope, the cohort would appear as the *true* social time of the changes in social stratification. The most important aspect is that, if cohorts keep the long-term scars of its early socialisation, cohort analysis is a very important aspect for the understanding of social history. The interest of that hypothesis is that it can be systematically confronted with international data: here is the very first steps in that direction.

### **Bibliography :**

- Baudelot C. et M. Gollac, 1997, « Le salaire du trentenaire : question d'âge ou de génération ? », *Economie et statistique*, 304-305, pp. 17-35.
- Becker H., 2000, « Discontinuous change and generational contracts », pp. 114-132, dans S. Arber and C. Attias-Donfut, *The Myth of Generational Conflict*, London, Routledge.

---

<sup>11</sup> The growth of wages (Baudelot et Gollac, 1997), of income (Legris et Lollivier, 1996 ; Chambaz, Maurin, Hourriez, 1996), of suicide rates (Chauvel, 1997), of dwelling property (Chauvel, 1998c), for the intensity of the link between social origin to education (Vallet et Thélot, 1999) etc.

- Blau P.M. et O.D. Duncan, 1967, *The American Occupational Structure*, New York, Wiley.
- Brauns, H., D. Haun and S. Steinmann, 1997, « Die Konstruktion eines international vergleichbaren Klassenschemas (EGP). Erwerbsstatistische Besonderheiten am Beispiel von Labour Force Surveys der Bundesrepublik Deutschland, Frankreichs, Großbritanniens und Ungarns. », Mannheimer Zentrum für Europäische Sozialforschung, Universität Mannheim (MZES), Arbeitspapiere Arbeitsbereich I, 22, 1997
- Card D. et T. Lemieux, 2000 : « Can falling supply explain the rising return to college for younger men? : a cohort-based analysis », *NBER working paper series*, n°7655.
- Chambaz C., E. Maurin, J.M. Hourriez, 1996, « Revenu et niveau de vie d'une génération à l'autre », *Revue économique*, 47, pp. 677-686.
- Chauvel L., 1997a, « L'uniformisation du taux de suicide masculin selon l'âge : effet de génération ou recomposition du cycle de vie ? », *Revue française de sociologie*, XXXVIII-4, pp.681-734.
- Chauvel L., 1998a, « La seconde explosion scolaire : diffusion des diplômes, structure sociale et valeur des titres », *Revue de l'OFCE*, 66, pp. 5-36.
- Chauvel L., 1998b, "Cohort changes in Education, Social Stratification and Mobility, the Case of France (1964-1995)", paper presented at the 1998 Montreal meeting of Research Committee 28 Social Stratification and Mobility, July 1998, Montreal, Quebec.
- Chauvel L., 1998c, *Le destin des générations, structure sociale et cohortes en France au XXe siècle*, Presses Universitaires de France, Paris.
- Chauvel L., 2001, « Un nouvel âge de la société américaine ? Dynamiques et perspectives de la structure sociale aux Etats-Unis (1950-2000) », *Revue de l'OFCE*, n°76, pp.7-51.
- Desrosières A. et L. Thévenot, 1988, *Les catégories socioprofessionnelles*, Paris, La découverte.
- Erikson R., J.H. Goldthorpe et L. Portocarero, 1979, « Intergenerational Class Mobility in Three Western European Societies : England, France, and Sweden », *British Journal of Sociology*, 30, pp. 415-430.
- Erikson R., J.H. Goldthorpe, W. König, P. Lüttinger, W. Müller, 1989, *The International Mobility Superfile (IMS) Documentation*, Casmin Projekt, Universität Mannheim, *Miméo*.
- Freeman R.B., 1976, *The overeducated american*, New York, Academic Press.
- Ganzeboom H.B.G. and P. Nieuwebeerta, 1996, *International Social Mobility and Politics File (P1145)*, Amsterdam, Steinmetz Archive - SWIDOC
- Glass D. and J.R. Hall, 1954, « Social Mobility in Britain : a Study of Inter-Generation Changes in Status », pp. 177-217, dans D. Glass (ed.), *Social Mobility in Britain*, London, Routledge and Kegan Paul.
- Jaffé A.J. and R.O. Carleton, 1954, *Occupational Mobility in the United States 1930-1960*, King's Crown Press, University of Columbia, New York.
- Legris B. et S. Lollivier, 1996, « Le niveau de vie par génération », *INSEE-Première*, 423.
- Mare R., 1995, « Changes in educational attainment and school enrolment », pp. 155-213, in R. Farley (dir.), *State of the Union : America in the 1990s*, New York, Russell Sage Foundation.
- Mason K.O., W.M. Mason, H.H. Winsborough et W.H. Poole, 1973, « Some Methodological Issues in Cohort Analysis of Archival Data », *American Sociological Review*, 38, pp. 242-258.
- Moffitt R., 1993, *Current Population Surveys : March Individual Extracts, 1968-1992*, (Computer file) ; ICPSR version. Madison, WI: University of Wisconsin, Institute for Research on Poverty (Producer). Ann Arbor, MI: Inter-university Consortium for Political and Social Research (distributor). Données obtenues auprès de la Banque de Données Socio-Politiques du CNRS (CIDSP/BDSP, CNRS-IEP de Grenoble)
- Prost A., 1998, « L'Education nationale depuis la Libération », *Les Cahiers français*, dossier : Le système éducatif, n°285, pp. 1-12.
- Raftery A.E., 1986, « Choosing Models for Cross-Classifications », *American Sociological Review*, 51, pp. 145-146.
- Ruggles S., M. Sobek et al., 1997, *Integrated Public Use Microdata Series: Version 2.0*, Minneapolis: Historical Census Projects, University of Minnesota.
- Ryder N.B., 1965, « The Cohort as a Concept in the Study of Social Change », *American Sociological Review*, 30, pp. 843-861.
- Seys B., 1986, « De l'ancien code à la nouvelle nomenclature des CSP. Etude méthodologique », *Archives et documents de l'INSEE*, 156.
- Thernstrom S., 1973, *The Other Bostonians: Poverty and Progress in the American Metropolis, 1880-1970*, Harvard University Press, Cambridge (Mass.).
- Thélot C. et L.A. Vallet, 2000, « La réduction des inégalités sociales devant l'école depuis le début du siècle », *Economie et statistique*, n°334, p.3-32.

Wilmoth J.R., forthcoming, "Age-Period-Cohort Models in Demography", in G. Caselli, J. Vallin, and G. Wunsch (eds.), *Démographie: Analyse et Synthèse* (<http://demog.berkeley.edu/~jrw/Papers/apc.pdf>)