Testing Cohort Effect Hysteresis with APC Models : Comparing Middle-Aged Suicide Rates in 16 countries

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Abstract

This paper assesses the stability of cohort effects in suicide rates age-period-cohort comparative analyses. Despite improvements in the APC methodology (Yang and al), two problems remain. The first one is the problem of linear versus fluctuant components of APC effects. No method can disentangle the linear components; anyway, the "detrended" fluctuations can be identified in an APCD model. The second problem relates to the durability of cohort effects over life course that can be either permanent or temporary: an APC-H a test "hysteresis" model is proposed. The suicide rates in sixteen WHO countries (periods 1970-1974 to 2005-2009 / ages 20-24 to 60-64) show the diversity of cohort dynamics. The models detect contrasted regimes of suicidity: for example, Finland and the Austria are more cohort-flat but Spain, Italy, Australia and the U.S. apparently show deep contrasts between cohort-specific suicide rates. Anyway, these cohort fluctuations are not stable over life course in Spain and in Australia (resilience) but are clearly remaining strong over life course in the U.S. and in Italy (hysteresis).

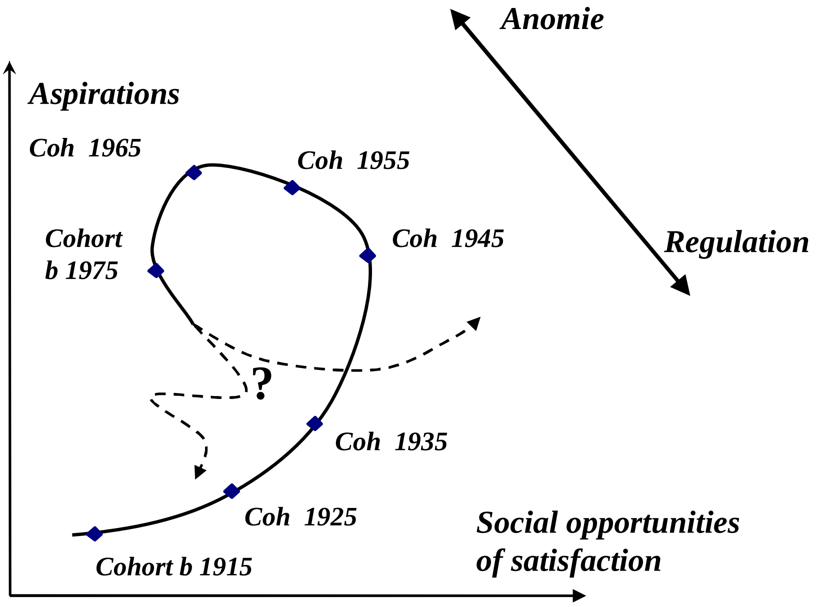
Introduction

Suicide and cohort socialization: suicide is understood here as a symptom of the potentially anomic consequences of an adverse context of socialization (Durkheim 1893, Halbwachs1930), scarcity of resource and less enjoyable social positions, material poverty and psychological consequences of relative deprivation, destabilization of models of socialization or of life perspectives.

On a substantial aspect of this work, we are interested in the degree to which suicide reflects social collective trauma in the way that birth cohorts have been socialized. Like many research in birth cohort, the implicit model is based on the hypothesis that early adulthood advert experience can have long term negative impact on the wellbeing of the pertaining cohorts.

In a very French expression, we call dyssocialization[1] the gap between the social expectations stabilized in early adulthood and the socioeconomic opportunities met in real life. Indeed, since Durkheim (1893) and Halbwachs (1930), and even Merton (1938) and his scheme of social anomie, we have known the dangers of this gap.

The "Folium of Descartes" curve of dyssocialisation



Today's generational transmission problem could come from a lack of correspondence between the values and ideas that the new social generation conceives and the realities it will really face. All the social generations of the 20th century experienced that lack of correspondence between aspirations and achievement: the early baby-boom generations were

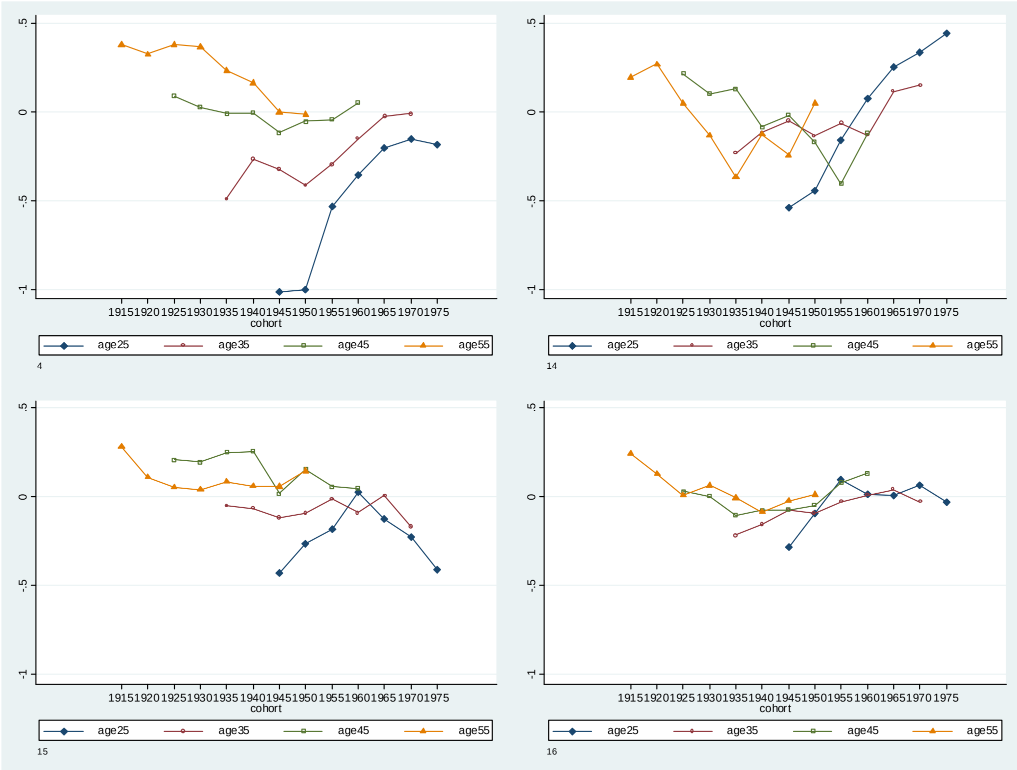
[1] The distinction between dissocialization and dyssocialization is essential (in Latin, the prefix dis- means "lack of", whereas in Greek, dys- means "bad", "difficult" or "not appropriate").

socialized in the context of their parents' values (scarcity, abnegation, submission to a society where work remain the central issue, lack of leisure) linked to the social history of the hard times of the thirties and after, but they finally experienced the "*Trente glorieuse*" and the period of fast growth that offered them comfort, affluence and opportunities for emancipation and leisure. But in this sense, dyssocialisation is not so problematic.

The gap could be more difficult for the current young generations experiencing shrinking opportunities. Apparently, the new generation benefits from longer educational careers and higher academic qualifications than its own parents did, but the intense devaluation in social and economic terms of their improved educational assets could provoke a cruel confrontation with reality (i.e. "lost illusions"). The psychosocial difficulties of the new generation (notably, violent behavior, incivilities of any kind, suicide, etc.) could be immediately linked to the gap between what young people suppose they deserve (comparing their parents' and their own education and social position) and what they are able to achieve (Chauvel, 1997). It is difficult to know the exact process, and the previous paragraphs are conjectural, but we detect strong cohort effects in some countries, where durable cohort-specific suicidal behavior are observed.

In this paper, we do not focus on the causal process, but on the stabilization of a diagnosis in terms of cohort effects. In this APC tradition I detect some difficulties: linear trends versus fluctuations. Durability (hysteresis) of the process, that could go with cumulative (dis)advantage in many countries, versus balance of compensatory effects or even a "cohort inversion" (Hobcraft et al. 1982); we can call "resilience" this effect declining pertinence of cohort.

Logged relative (yearly means=0) suicide rates in four contrasted countries (upleft: Spain; upright: New Zealand; downleft: Sweden; downright: the U.S.)



Two difficulties of APC

The difficulty number one is the role of long term linear trends identification in Age Period Cohort models. The extraction of the linear patterns of age-period-cohort remains unclear and the APC-IE intrinsic estimator (Yang et al. 2008) and the ensuing debate (O'Brien 2011) is an example of these difficulties. If the identification of age, period and cohort nonlinearities (or bumps) is not an issue, the linear trends obtained via the apc process generally do not contain meaningful information. So we must focus on fluctuations above and below the trend, and not on the linear dimension of the problem. The definition of a "detrended" cohort effect (over or below the linear trend) is the one solution in order to define the specificity of cohort behavior.

The difficulty number 2 is the stability of a cohort effect over life course. The issue of cohort effect stability over life course is generally hypothesized and not tested: are cohort fluctuations durable or temporary? We can examine the example of New Zealand and suicide: cohorts with a relatively very low degree of suicidity at age 25 could face inversion at age 55, conversely, some cohorts with high suicidity when young catch up with the trend later. Generally speaking we detect countries with stable cohort effects over life course (where the same birth cohorts are on the top or on the bottom of the suicidity waves) and others where strong youth suicidity does not go with higher risks of these cohorts at later age.

The general problem with usual APC models is that they suppose the durability of the cohort effect and in reality they are not designed to test this hypothesis. Is aging a cure against cohort trauma or do they let definitive scars?

In reality, cohort effects could increase or decrease over life-span, and APC-D (APC-Detrended) delivers “average” cohort effect over life course, not a diagnosis on its stability. The APC-H “hysteresis” model proposes a solution to this second problem.

Methods: Expression of the models

This contribution includes two steps/models. **APC-Detrended** The first one is a clarification of the usual APC model and focuses on the non-linear cohort effects when the linear trend is absorbed (APC-detrended coefficients or APCD). **APC-Hysteresis** The second step addresses the question of cohort effects stability over life-span: the detected cohort non-linearity can be either a) durable (*hysteresis*), b) specific moment in the early life of cohorts (resilience), or c) conversely a specific cohort trait that increases with age (after a process of cumulative advantages/disadvantages)? A second model (APC-Hysteresis, APCH) is designed in order to assess the general degree of hysteresis of cohort effects[2].

In this paper I process on the data a Poisson log-linear specification that matches with the modelling of suicide counts on subgroups of populations at risk defined notably by their age,

[2] Both APCD and APCH has been developed as STATA ado commands that can be downloaded with the usual ssc install apcd and ssc install apch orders. Since they are based on

period, cohort, etc. However, I provide here an OLS scripture and specification of the model (below the logged suicide rates is supposed to be a Gaussian distribution).

Following the usual notation of the APC accounting models (Yang et al., 2008), the dependant variable is the natural logarithm of the suicide rate $\log(r_{ijk})$ in the cell of i^{th} age from 1 to a, j^{th} period from 1 to p, and thus of the k^{th} cohort from 1 to a+p-1 where k=j-i+a. The term $\log(r_{ijk})$ can be expressed as $\log(d_{ijk}/n_{ijk})$ where d_{ijk} is the number of deaths by suicide in the cell, n_{ijk} is the population at risk.

The general APC model is: $\log(r_{ijk}) = \log(d_{ijk}/n_{ijk}) = \mu + \alpha_i + \beta_j + \gamma_k$ (1)

where the coefficients and vectors denote the constant (μ), and respectively the age effect vector (α_i), the period (β_j), and the cohort effects (γ_k). This expression (1) gives the principle but lacks precision before its identification[3]. The strategy of the APCD is to absorb the linear trends of time(s) in order to retain the detrended (Slope=0) vectors for cohort, period and age. To do so, two terms able to fit the time coefficients are introduced: α_0Rescale(i) and γ_0Rescale(k), where Rescale is the linear operator that transforms the index i = 1 to a in -1 to +1. The interest of this type of standardization will appear in the step of the APCH model. The coefficients α_0 and γ_0 will retain the linear trends of the APC that cannot be attributed in the general case to such or such time of age period or cohort.

Additional constraints are thus required in order to solve the "identification problem". At first, after Wilmoth (xxx) and Caselli (xxx), simple constraints such as $\Sigma\alpha_i=\Sigma\beta_j=\Sigma\gamma_k=0$ offer centred coefficients. We add three constraints Slope(α_i) = Slope(β_j) = Slope(γ_k) = 0, where Slope is the linear function that gives the linear slope of the pertaining coefficients, so that the

the STATA glm general linear model, they can handle ordinary least square (OLS), logit, Poisson loglinear specifications, notably.

[3] In the tradition of the Yang et al. Intrisic Estimator APC model, the identification problem is solved with the help of a principal component analysis of the three time variables age, period and cohort.

α_i, β_j and γ_k are detrended[4]. At last, the first (k=1) and the last (k= a+p-1) cohorts are excluded from the estimation in order to improve the confidence intervals of the parameters.

The APC-D Methodology

Here is an extract of another Working Paper:

CHAUVEL L., SCHRÖDER M. INEQUALITY BETWEEN BIRTH COHORTS OF THE 20TH CENTURY IN WEST GERMANY, FRANCE AND THE US)

The APC-IE (intrinsic estimator) of Yang Yang et al. (2008) provides another solution, in which the indetermination problem is solved by a Principal Component Analysis of the age, period and cohort vectors that reduces the linear trend of the three variables of time (age, period and cohort) to two dimensions. Yang et al. claim that this yields the intrinsic linear influence of each variable. However, O'Brien (2011) shows that theirs is an arbitrary choice, which fails to deliver substantive linear time trends. It therefore also fails empirical tests. For example, the APC-IE model detects strongly declining educational levels by age (not shown here, LIS Stata code can be provided upon request or uploaded into an annex), which is impossible, since educational levels are kept for life (one cannot lose a primary, secondary or tertiary education). Separate tests of the APC-IE and other specifications have shown that linear trends are neither meaningfully nor robustly measurable, but fluctuations *around* linear age, period and cohort trends can be estimated robustly. We therefore propose to use a model that focuses on non-linear cohort effects, which become visible after linear trends are absorbed. This is the APC-Detrended (APCD) model, which can be downloaded as a Stata ado file.[5] It is based on the STATA GLM General Linear Model with constraints specification: It can handle OLS Logit and Poisson models, among others[6].

The APCD model acknowledges that linear trends in APC models cannot be robustly attributed – it is impossible to know whether they stem from a cohort, or from an age plus period effect. Therefore, the model focuses exclusively on fluctuations of the effects of age, period and cohort around their respective linear trend. Thus, it absorbs linear trends to focus on *accelerations and decelerations* in age, period and cohort trends. Following the usual notation of APC models and OLS expressions, we consider a dependent variable y^{apc} (see above)and the independent variables age a, period p, and thus cohort membership c, where c=p-a, plus controls. To provide accurate controls, we consider j covariates x_j (which can be continuous or dummy variables). Including constraints, the model has the following expression:

$$\begin{cases} y^{apc} = \alpha_a + \pi_p + \gamma_c + \alpha_0 rescale(a) + \gamma_0 rescale(c) + \beta_0 + \sum_j \beta_j x_j + \varepsilon_i \\ \begin{cases} p = c + a \\ \sum_a \alpha_a = \sum_p \pi_p = \sum_c \gamma_c = 0 \\ Slope_a(\alpha_a) = Slope_p(\pi_p) = Slope_c(\gamma_c) = 0 \\ \min(c) < c < \max(c) \end{cases} \end{cases} \qquad \text{(APCD)}$$

β_0 denotes the constant, β_j are the coefficients of control variables, α_a is the age effect vector, π_p is the period vector and γ_c is the cohort vector. These vectors exclusively reflect the *non-linear* effect of age, period and cohort, because we assign two sets of constraints: each vector sums up to zero and the slope of each vector is zero.[7] The terms α_0Rescale(a) and γ_0Rescale(c) absorb the linear trends; Rescale is a transformation that standardizes the coefficients α_0 and γ_0: it transforms age from the initial code a_{min} to a_{max} to the interval -1 to +1. Finally, since the first and the last cohorts appear just once in the model (they are the oldest age group of the first period and the youngest age group of the last period), their coefficients are less stable; we obtain better estimates when they are excluded. With this set of constraints, the model becomes identifiable; it provides a unique

[4] Slope(α_i)=0 if and only if $\Sigma\ [(2i - 1 - a)\ \alpha_i] = 0$

[5] The APCD can be downloaded as a Stata ado file by typing "ssc install apcd" in Stata.

[6] Since APCD, like APC-IE, is based on a constrained general linear model procedure, it allows any kind of standard specification, including Ordinary Least Squares, Log, Logit or Poisson models; it also allows introducing control variables that could mediate cohort effects (gender, education, occupation, etc.)

[7] The constraint $Slope_a(\alpha_a)$=0 means the trend of the age effect is zero and is true only if $\Sigma_a\ [(2a - a_{min} - a_{max})\ \alpha_a] = 0$. This constraint is easily expressed as a linear equation of coefficients.

solution. We focus first on the detrended cohort effect (DCE) coefficients γ_c that deliver the main diagnosis in terms of cohort. These coefficients γ_c are all zero when cohort effects are absent: all cohorts behave accordingly to their age and period characteristics, with no cohort-specific behavior. In this case, APCD provides no improvement compared to the age and period model (AP) that consists of:

$$\begin{cases} y^{ap} = \alpha_a + \pi_p + \alpha_0 rescale(a) + \pi_0 rescale(p) + \beta_0 + \sum_j \beta_j x_j + \varepsilon_i \\ \begin{cases} \sum_a \alpha_a = \sum_p \pi_p = 0 \\ Slope_a(\alpha_a) = Slope_p(\pi_p) = 0 \\ \min(c) < c < \max(c) \end{cases} \end{cases} \qquad \text{(AP)}$$

If at least one γ_c coefficient is significantly different from zero however, this indicates that some cohorts are above or below the linear trend, having a specific behavior that cannot be reduced to a simple linear combination of age and period. In this case the AP model is not sufficient, as some cohorts received more or less than their expected share after period resources have been distributed in accordance to stable age structures. Comparing the BIC (cf. Raftery 1986) of the two (AP) and (APCD) models offers another criterion for or against the inclusion of cohort effects.

As disposable income is our dependent variable, there are substantive reasons to focus on deviations from a linear trend. For example, when disposable incomes increase by a rate of 1 percent per year, and cohort disposable incomes also increase by 1 percent per year, our model would detect no cohort effect. And indeed there is no cohort effect in the sense that each cohort profits from the same linear trend in the same way. A second substantive reason to look at deviations from linear trends is that expectations about disposable incomes conceivably adapt to a linear trend. No one is surprised if the living standards of one cohort after another increase with the general trend in living standards.[8]

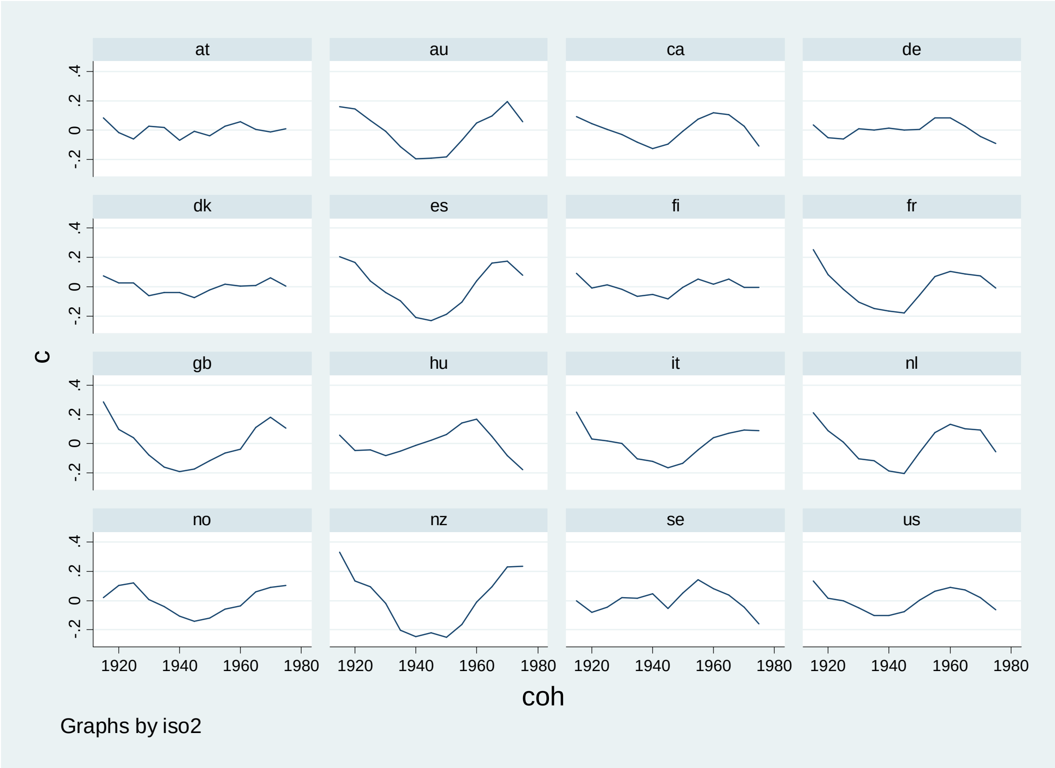
The APCD provides a diagnosis in terms of relative intercohort differences: did a certain cohort receive its relative share of period variations? However, it is also legitimate to ask about absolute progression: for example, even if the latest cohorts face a relative slow down, they might enjoy better positions in absolute terms (compared to the fate at the same age of former cohorts). For example, one cohort might be below the trend of increasing disposable income relative to the preceding one, but when a positive trend is stronger than a negative cohort effect, the later cohort's living standard has still increased. That is, if incomes grow by 2 percent, and a later cohort has 1.5 percent higher disposable incomes, it is below the trend but still better-off than the preceding cohort. Contrary to this, when a negative cohort effect is stronger than the positive linear effect, the *absolute* living standard of a later cohort decreases. While the APCD thus measures relative deprivation (cohorts not receiving the same share of economic growth), we need another model to measure absolute deprivation (cohort-based decreases in disposable income).

Under these specifications, APCD is a bump detector of suicide, after the suppression of linear trends. Significance tests and international comparison will help us to detect significant divergence in the suicidal behavior of different birth cohorts. The imputation of the APCD model to 25 to 64 year old on the period 1970 to 2005 detects suicidity bumps:

Data

We have reworked the suicide data coming from the World Trade Mortality by causes database WHO-mortality so that we retain for these 16 countries (aus aut can esp fin fra gbr hun dnk ita deu nld nor nzl swe usa) the deaths and the relevant populations at risk on 5 years age groups and on 5 years period groups from 1970-4 to 2005-9 and for age groups 20-4 to 75-79. We consider first the data on the sole male population.

Cohort APCD coefficients of 16 countries (ISO codes of countries)



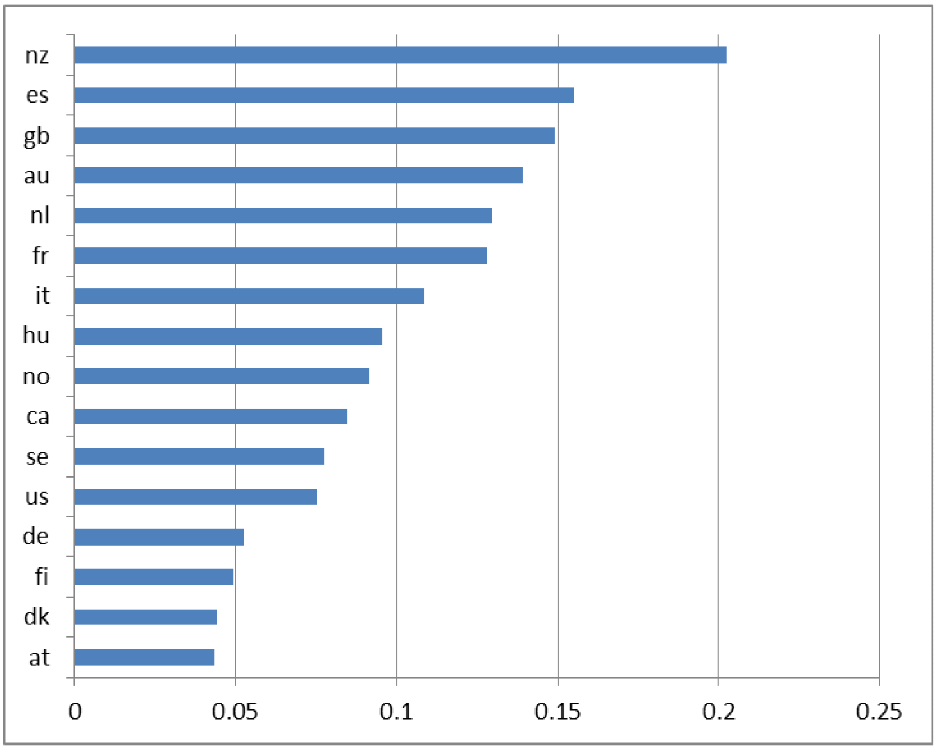
25 to 64 year old on the period 1970 to 2005
Note: the coefficients are interpretable in terms of proportion of suicides over or below the linear trends: In the U.S., the cohort 1960 experienced almost a 10% increase (c=.088) of suicide above the linear trend (= if there had been no cohort specificity in suicide rates).

The standard deviation of the (detrended) cohort effect coefficients (SDDCE) in the country is a measure of the degree of "cohort contrasts' in suicide rates. On this cohort span, several English speaking countries are on the top of the ranking of cohort fluctuations (the U.S. being a relative exception, being in the lower tier of the distribution), with Netherlands and "Latin Europe", where cohort bumps have been intense. On the opposite of the ranking, Germany,

[8] This "long-term generational progress" hypothesis argues that we expect later cohorts to benefit from technical,

Austria, countries of Nordic Europe are characterized by flatter cohort trends. In these countries a cohort analysis is not so relevant.

Cohort APCD coefficients standard deviation of 16 countries (ISO codes of countries)



25 to 64 year old on the period 1970 to 2005
Note: the standard deviation of the APCD detrended coefficients is a measurement of the relevance of cohort dynamics of suicide. In the U.S., we can expect a 8% average deviation of cohorts to the reference situation where no cohort bumps were to be expected.

Anyway, intensity of cohort effects does not mean durability: it is well possible that such effects do not hit all the age groups we analyze. A strategy to detect the degree of stability of cohort effects over life course is to divide the analysis in two parts: one for the juniors and for the seniors, of the same birth cohorts: we compare the APCD coefficients for two populations:

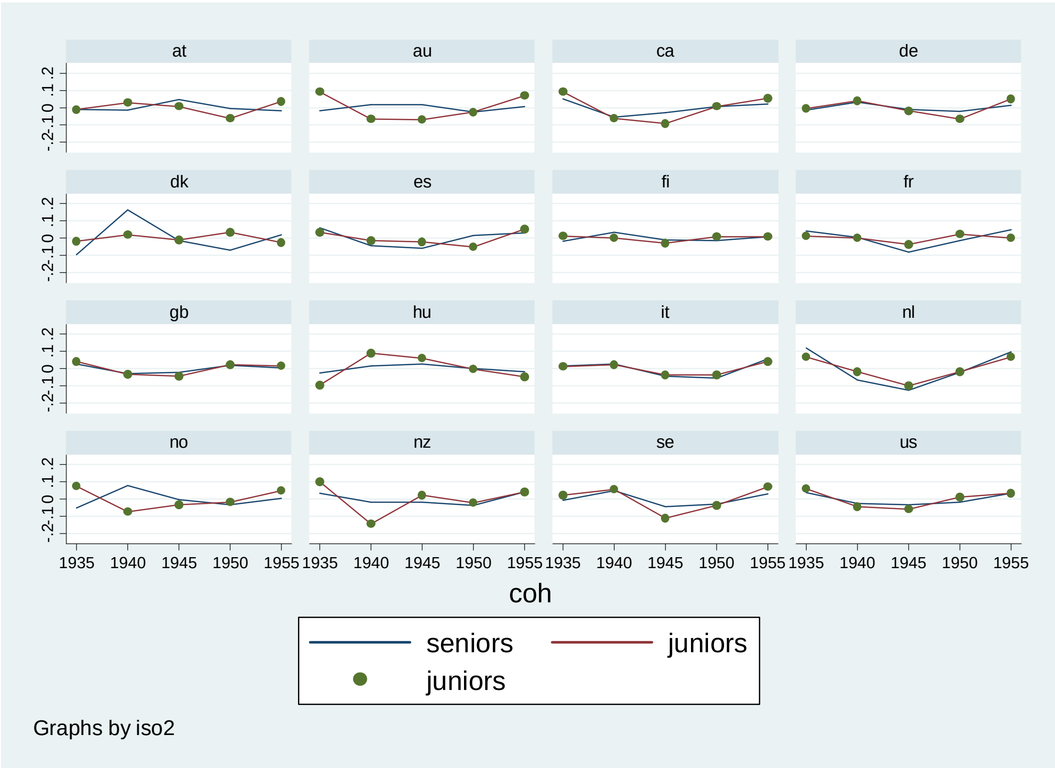
- “juniors” The 25 to 44 year olds of periods 1970 to 1989
- “seniors” The 45 to 64 year olds of periods 1990 to 2009

economic and social progress that has taken place in the past. Immanuel Kant (1784) was the first to underline this.

These two age x period span groups pertain to the same cohort span of 1924 to 1964 birth cohorts populations. The APCD models on the two populations of "juniors" and then "seniors" provide the possibility of comparing cohort effects on younger and elder populations. Thus, since we make use of the same methodology on the same cohorts but different age groups, we expect that, if cohort effects merit their name, the correlation between the different series is good. The reality diverges somehow from that expectation.

Cohort APCD coefficients of 16 countries (ISO codes of countries)

for the junior (scattered lines) and senior (simple lines) age groups



juniors: 25 to 44 year olds of periods 1970 to 1989
seniors: The 45 to 64 year olds of periods 1990 to 2009
Note: In the U.S. the cohort bumps and fluctuations are similar for the young and the old

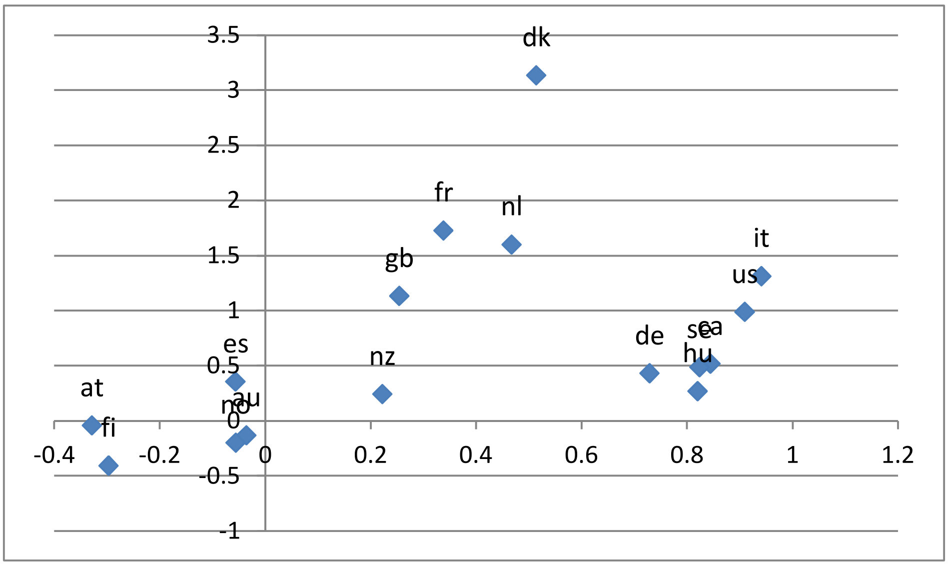
In some countries, the shapes are well converging such as Italy, the U.S., Great Britain, even France, may be; in other countries, known for intense cohort effects based on the APC (or also APC-IE or also HAPC-CCREM methodologies) such as New Zealand or Australia, the two series for juniors and seniors diverge completely. In other words, in some countries, we observe normal cohort effects that are durable over life course and in others some strong cohort effects do not meet with criteria of stability. In reality the cohort bumps we detect via the traditional tools are a mean effect, similar to a permanent life-course average, and is not necessarily pertaining to a true long term effect. This long term stable durable nature is called hysteresis, a notion imported from physics to describe the permanence of an effect potentially well after the end of its initial cause.

In a more descriptive way, we can express what we have in mind when we speak of a real cohort effect in a comparative context (provided that we have checked the standard deviation of the cohort effects showed they are relevant):

1- The cohort effect structure must be stable over time, with a correct R-square between the junior and the senior series

2- The cohort effect intensity must be stable (the coefficient of the linear regression of the senior series by the junior series must be high)

Stability of the structure of the cohort effect (r-square between the senior series and the junior) on the X axis and stability of intensity of the cohort effect (linear coefficient of the regression of the senior series by the junior)



In this descriptive diagnosis we have several conclusions: in the U.S. and in Italy, the cohort effects are stable in structure (r2>.9) and unchanged in intensity. In some countries (Denmark, France, Netherlands, Great Britain), the structure of the cohort effects changes some but increased in intensity: the logged gaps are smaller for the young than for the seniors. In Germany, Canada, Hungary and Sweden, the cohort effects are well correlated but show a certain decline in intensity over life course (smaller hysteresis). The countries with the initially highest detected cohort effects (Australia, New Zealand and Spain) show no relevant cohort structure: either the structure of the cohort effect is unstable or the effect vanishes over life course.

The conclusion of this descriptive part is that the standard APC-D models must be backed by a test of the degree to which the detected effects are durable over life course. This is the purpose of the APC-H hysteresis model.

From APCD to APCH: assessing hysteresis

The detection of a significantly non-zero γ_k means that the pertaining cohort effect can be defined as a specific divergence of the cohort relatively to the trend averaged over (observed) life course. However, this cohort effect can be either stable or variable over life-span. This aspect should thus be tested. The solution is to catch a “hysteresis” coefficient h in order to make the difference between various configurations:

- *“Hysteresis”* defines the case of stability of cohort effect over age-span (this is a real cohort effect).
- “Resilience” (or even “cohort inversion” (Hobcraft et al. 1982)) means that the cohort effect decreases in intensity or even vanishes over life-span.
- In a configuration of “cumulative (dis-) advantages”, the cohort effects might increase over age-span.

In order to test the type of configuration, a solution is to introduce in the APCD model a specific non-linear interaction, h-hysteresis, between the estimated cohort effect DCE and the rescaled age (Rescale(i): from -1 for the younger age group to +1 for the elder one). The h coefficient will be 0 in case of linear stability of the cohort (“true” cohort effect)), +1 in case of increase of the cohort effect from nil to a maximum over age span, and -1 in case of complete vanishing of the cohort effect for the elder age group.

Because of the non-linear type of interaction involved here, the estimation of the DCE coefficient and of the h coefficient cannot be simultaneous. The strategy here is to build an iterative process of estimation where at step (n) we alternate a first substep (n_α) with the estimation of the h(n_α) as an interaction between rescaled age and the DCE(n_β-1) that had been estimated in the previous step; and then a second substep (n_β) where the DCE(n_β) is estimated on the base of the estimate of h(n_α) and the interaction between rescaled age and DCE(n_β-1). At step (1), h(1_α) is estimated with the results DCE(0_β) of the initial APCD model.

$$
(n,a)\begin{cases} y^{apc} = \alpha_a + \pi_p + \hat{\gamma}_c^{(n-1)} + H(rescale(a) * \hat{\gamma}_c^{(n-1)}) + \alpha_0 rescale(a) + \gamma_0 rescale(c) + \beta_0 + \sum_j \beta_j X_j + \varepsilon_i \\ \begin{cases} p = c + a \\ \sum_a \alpha_a = \sum_p \pi_p = 0 \\ Slope_a(\alpha_a) = Slope_p(\pi_p) = 0 \\ \min(c) < c < \max(c) \end{cases} \end{cases}
$$

$$
(n,b)\begin{cases} y^{apc} = \alpha_a + \pi_p + \gamma_c + \hat{H}^{(n)}(rescale(a) * \hat{\gamma}_c^{(n-1)}) + \alpha_0 rescale(a) + \gamma_0 rescale(c) + \beta_0 + \sum_j \beta_j X_j + \varepsilon_i \\ \begin{cases} p = c + a \\ \sum_a \alpha_a = \sum_p \pi_p = \sum_c \gamma_c = 0 \\ Slope_a(\alpha_a) = Slope_p(\pi_p) = Slope_c(\gamma_c) = 0 \\ \min(c) < c < \max(c) \end{cases} \end{cases}
$$

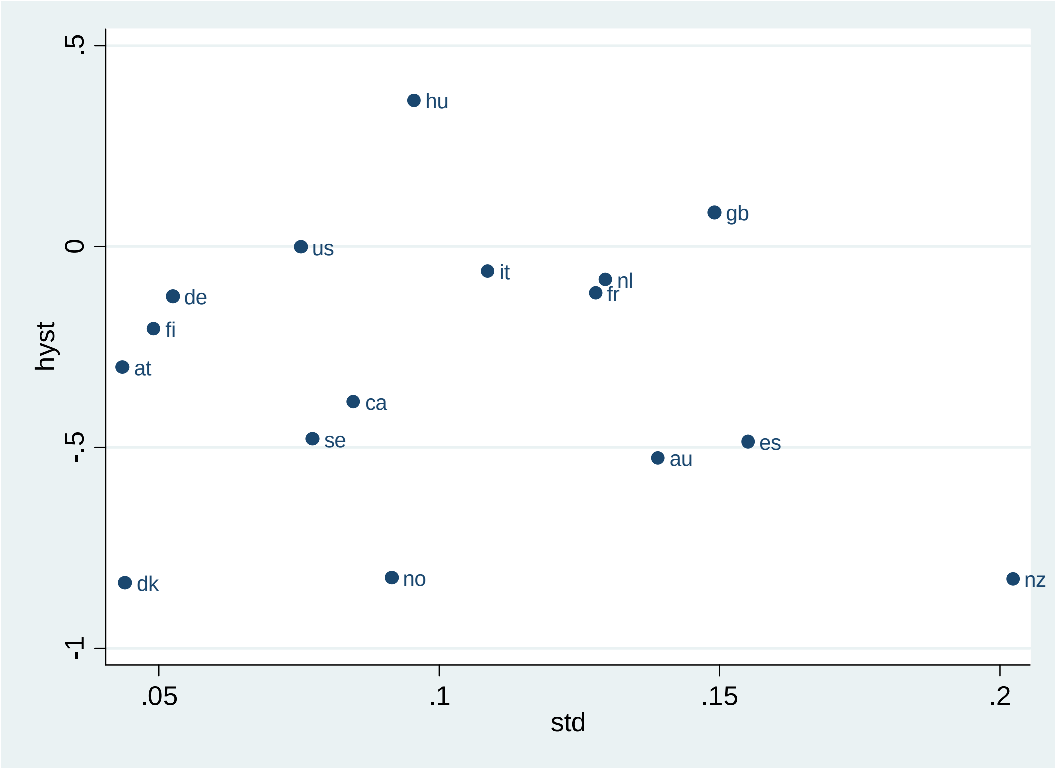
This iterative process of estimation converges towards a unique result of an appropriate final DCE and of a final hysteresis coefficient h. The standard error of h and BIC differences of the models are able to assess if APCD is better than AP, and if APCH is to be preferred to APCD.

Results of the models

A solution to the problem of stability assessment is the APC-H model which delivers an h-coefficient that gives a diagnosis in terms of stability increase or decrease of the DCE cohort effects. When h is negative and close to -1, the pertaining cohort effects diminish and may converge to nil over life course. We develop this model on the age x period span of age groups 25-9 to 60-4 and period groups 1970-5 to 2005-9.

A simple measure of the intensity of cohort fluctuations is the standard deviation of the (detrended) cohort effect coefficients (SDDCE), and the h-coefficient of the APCH is a measure of hysteresis.

The SDDCE (X axe) and h (Y axe) plot in 16 countries



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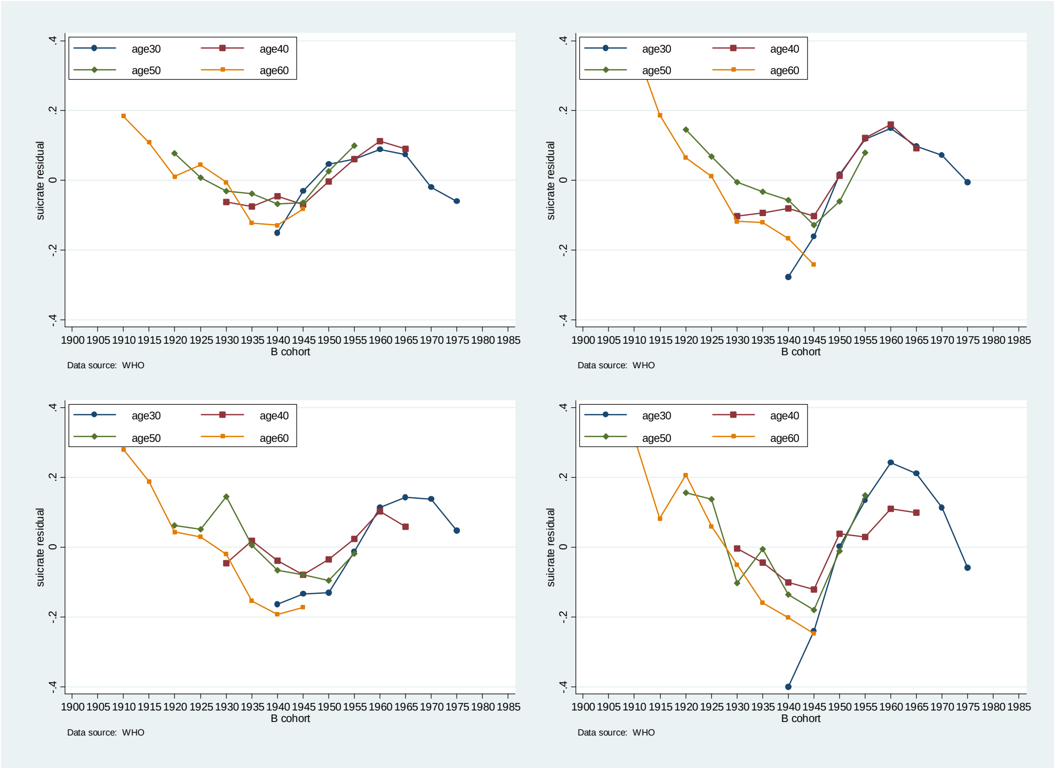
The SDDCE and h plot shows the difference between countries with weak cohort effects (left) and stronger cohort effects (right). Below the base line (notably New Zealand) are countries where the cohort effects decline over life course. Anyway, the values of h for Norway and Denmark are meaningless since these are countries with weak cohort effects. On the base of this graph, we can exclude from cohort analyses countries such as New Zealand, Spain, Australia, Norway, Canada, Sweden, and Denmark because the cohorts effects are either strongly declining over life course or too weak. In Germany, Finland and Austria, cohort effects can be analyzed but are expectedly weak. In the U.S., Hungary, Italy, France, Netherlands and Great Britain, the cohort effects are both meaningful and stable.

If we go back to descriptive statistics, we can materialize the cohort effects, when they exist, on the base of the residuals of the logarithms of the suicide rates after their regression by categorical age and year groups by country. These residuals, when they are stable by cohort groups, reveal true cohort effects. If not we are facing non stability in cohort effects.

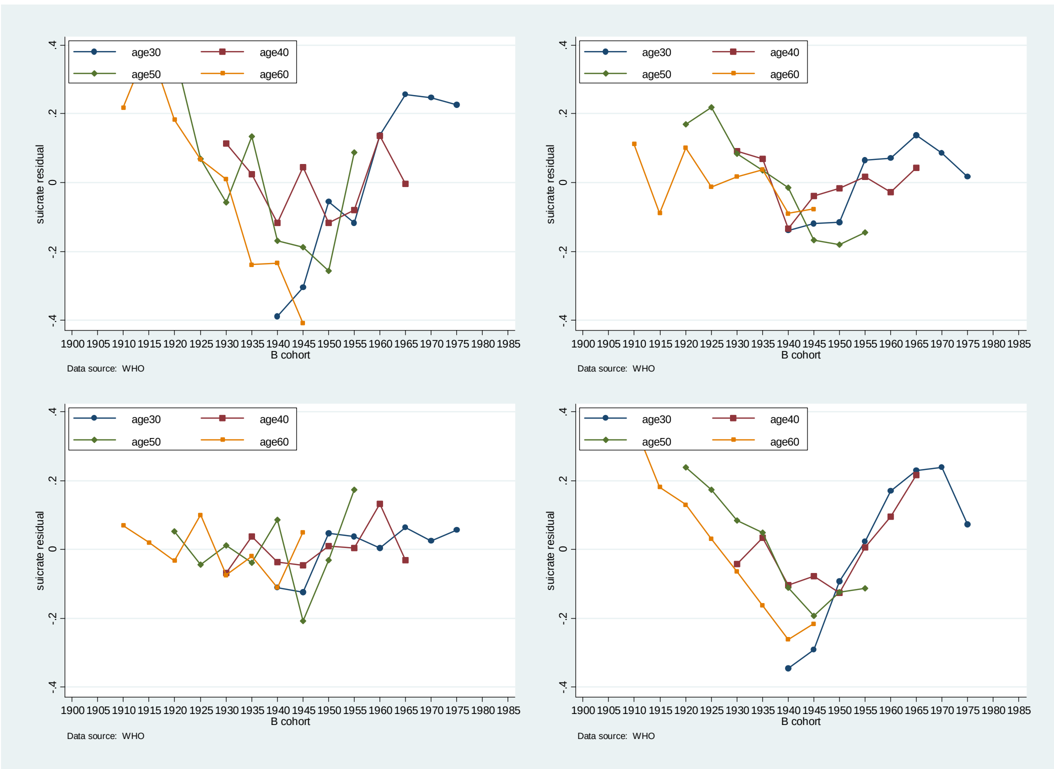
Residuals of the logarithms of the suicide rates after their regression by categorical age and year groups – U.S.

We are thus able to show the difference in the structure of countries with strong effective cohort effects (The U.S., France, Italy and Netherlands), and for countries where the relevance of cohort analysis is less obvious (New Zealand, Norway, Denmark and Spain). In this latest case, cohort effect is not completely irrelevant, but it is perfectly flat for the age group 40-44 year old even if it was particularly strong for the same cohorts in younger age groups.

Residuals of the logarithms of the suicide rates– U.S., France, Italy and Netherlands



New Zealand, Norway, Denmark and Spain



Discussions

Cohort suicidity international comparison shows the extreme variability in shape and intensity of the phenomenon over the last decades. It is not simply a question of intensity (of gaps between tops and bottoms of the DCE), but of intra-cohort dynamics as well: in some countries, the cohort effects are steady and durable over life course (Italy) and in other countries, we notice a strong decline in the intensity of the cohort effects (New Zealand). The h coefficient in the APC-H is able to offer a diagnosis in terms of “true” cohort effects (when h is close to 0) and of “apparent” or unsteady cohort effects, that are declining over time (when h is negative, and takes values close to -1). This index offers a measurement of the degree of relevance of APC methods. Some countries, such as New Zealand, are in appearance the object of very strong cohort effects that vanish indeed over time, and the h coefficient detects this instability. Conversely, less intense cohort effects, such as in the U.S., appear as very stable over time.

Now that we dispose a tool able to detect robust cohort effects of cohorts in suicide and we know the countries where the analysis is meaningful, we can try to correlate cohort effects to the context when a cohort is 20 year old. An increase of cohort suicide rates in the cohorts that faced economic slowdown at age 20 can be observed.

References

Becker H.A. (2000) “Discontinuous Change and Generational Contracts”. Pp. 114 - 132 in: S.Arber, C. Attias-Donfut (Eds), *The Myth of Generational Conflict. The Family and State in Ageing Societies*, Routledge, London /New York.

Chauvel L., 2001, “Education and Class Membership Fluctuations by Cohorts in France and United-States (1960-2000)”, presented at the Mannheim workshop of the International sociological association Research committee 28 (Stratification and social mobility), mimeo, http://www.louischauvel.org/MANNHEIM.pdf

Ellwood D. (1982) “Teenage Unemployment: Permanent Scars or Temporary Blemishes?”, in Richard B. Freeman and David A. Wise, *The Youth Labor Market Problem, Its Nature, Causes, and Consequences*, National Bureau of Economic Research Conference Report, Chicago : University of Chicago Press.

Freeman, R.B. (1976) *The overeducated American*. New York: Academic Press.

Gangl, M. (2004) “Welfare states and the scar effects of unemployment: a comparative analysis of the United States and West Germany.” *American Journal of Sociology* 109 (6), 1319-1364

Hastings, D.W. and L.G. Berry (1979) *Cohort Analysis: a Collection of Interdisciplinary Readings*. Oxford, OH: Scripps Foundation for Research in Population Problems.

Hobcraft J., J. Menken, and S. Preston. 1982, “Age, Period, and Cohort Effects in Demography: A Review.” *Population Index* 48:4–43.

Mannheim K.,1928, “Das Problem der Generationen“, *Kölner Vierteljahres Hefte für Soziologie* 7: 157-85, 309-30.

Mason W.M. and S.E. Fienberg, 1985, *Cohort Analysis in Social Research : Beyond the Identification Problem*, Berlin, Springer Verlag.

Raftery A.E., 1986, “Choosing models for cross-classifications”, *American Sociological Review*, 51, 145-146.

Ryder, N.B. (1965) “The Cohort as a Concept in the Study of Social Change.” *American Sociological Review*, 30: 843-861.

Wilmoth J.R., 2001, “Les modèles âge-période-cohorte en démographie.” In: G. Caselli, J. Vallin and G. Wunsch (eds.), *Démographie: Analyse et Synthèse. I. La Dynamique des Populations*, Paris: INED, pp. 379-397.

Yang Y., S. Schulhofer-Wohl, W. Fu, and K. Land. 2008. “The Intrinsic Estimator for Age-Period-Cohort Analysis: What It is and How to Use it?” *American Journal of Sociology*, 113: 1697-1736.

Yang Y., Fu W.J. and Land K.C. (2004) “A Methodological Comparison of Age-Period-Cohort Models: The Intrinsic Estimator and Conventional Generalized Linear Models”, *Sociological Methodology*, Vol. 34, (2004), pp. 75-110

Yang Y. and Land K.C. (2006) “A Mixed Models Approach to Age-Period Cohort Analysis of Repeated Cross-Section Surveys: Trends in Verbal Test Scores”, *Sociological Methodology*, 36:75-97.

Yang Y. and K. Land (2008) “Age-Period-Cohort Analysis of Repeated Cross-Section Surveys: Fixed or Random Effects?”, *Sociological Methods and Research* 36: 297-326.

Yang Y. (2008) “Social Inequalities in Happiness in the U.S. 1972-2004: An Age-Period-Cohort Analysis”, *American Sociological Review* 73:204-226.