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Contributions of Fertility analysis on a monthly basis and others aspects of infra-annual variations of live births

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The HFD and the HFC collections are both very useful and irreplaceable (indispensable) tools for fertility analysis for the substantial efforts to ensure comparability of data and indices across Europe.

It is a very rich database for all aspects relating to annual or cohort measurements, but analysis at infra-annual, especially monthly level, has been neglected untill now.

As we will see latter, using a specify methodology, collection of monthly figures enables to estimate TFR several months or years before the age-specific fertility rates become available. It is also possible to compute the monthly TFR, based on the total monthly number of events; the figure could be obtained very fast, in a few weeks after the end of a calendar month[1].

1) Computation of monthly TFR

Without enter in detail in the methodology used to compute monthly indicators, we can say that it is based on seasonal adjustment of monthly figures, combine with decomposition, on a monthly basis, of the average size of the cohorts at risk[2]. First term defines the numerator and the second one is the monthly denominator.

Total Fertility Rate I^n of year *n* is the sum, over all the ages of the fecundity period (ages 15-49), of age specific fertility rates:

$$I^n = \sum_{i=15}^{49} f_i^n$$

So, the ratio G^n of the annual number of live births N^n to total fertility rate I^n is the weighted average of number of women F_i^n at the diverse fertility ages, the weighting coefficient at age *i* being the age specific fertility rate f_i^n at age *i* observed on the same year *n*:

$$G^n = \frac{N^n}{I^n} = \frac{\sum_{i=15}^{49} N_i^n}{\sum_{i=15}^{49} f_i^n} = \frac{\sum_{i=15}^{49} f_i^n F_i^n}{\sum_{i=15}^{49} f_i^n}$$

Or:

$$N^n = I^n \, . \, G^n$$

[1] For details, see Calot, G. and Nadot, R. (1977). Combien y aura-t-il de naissances dans l'année. *Population*, 1977 (special issue): 185-230; Calot, G. (1978). Pour une estimation rapide de l'indicateur conjoncturel de la fécondité. *Population* 1978(3): 705-716; and Calot, G. (1981). L'observation de la fécondité à court et moyen terme. *Population* 1981(1): 9-40.

[2] Calot, G. (1984). Une notion intéressante : l'effectif moyen des générations soumises au risque. I. Présentation méthodologique. Population, 1984(6): 947-976; and Calot, G. (1985). Une notion intéressante : l'effectif moyen des générations soumises au risque. II. Quelques exemples d'application. Population, 1985(1) : 103-130.

At the monthly level, it is exactly the same, but *m* is the month instead of *n*, which is the year:

$$G^m = \frac{N^m}{I^m} \text{ and } I^m = \frac{N^m}{G^m}$$

But, it is necessary to interpolate, on a monthly scale, the average size of cohorts at risk, which is only knew on an annual basis. *This operation is facilitated by the smoothness of this average size*. Agreeing that the twelfth of the annual value is the typical monthly value of the year, which is halfway between June and July, we can define a smooth curve through these typical values, and then read the values of each month the smooth curve thus determined.

For that, a 5-degree polynomial curve was adjusted on six consecutive typical points (June-July of the year $n + 1$ to $n + 6$) and for the twelve months of the middle period (which runs from July $n + 3$ to June $n + 4$), it has hired monthly readings on the adjusted polynomial curve.

Due to the high degree of used polynomials, adjusted monthly curve passes exactly through the typical annual values observed and fittings centrally period to the next are seamless, both in terms of values of derivatives of order 1 or 2. It is only at each end of the study period that are kept also, at least temporarily, monthly values red on the adjusted polynomial curve for the respective months prior to the first central period and after the last central period. When subsequently further information is available, we will review the values for new central periods. Furthermore, in order to improve the quality of the adjustment for the months of the recent past or near future, it may proceed, prior to the monthly interpolation, to an extrapolation of annual values[3].

2) Monthly TFR

a) Baby boom and WW2[4]

Baby boom is often described as an outgrowth, unexplained, in the secular fertility trend. It would have begun at the end of WW2 and it would, somehow, a consequence: the Liberation and the end of the war, by the climate of optimism, the necessities of reconstruction and the prospects of entry into a new era that opened, would have to amplify and extend, so as marked and unexpected, the high levels of fertility caused by the recuperation of births and marriages postponed by war and the regularization of situations caused by it.

The idea that the resumption of fertility is took place after the war or, at least, is not earlier, is far from being confirmed by analysis, even if it is widespread.

Indeed, if in many countries, as in France, fertility increased, and even strongly, during the war, it is at the middle of the 1930s that fertility reached its lowest point in most of the countries for which reliable information is available. Our feeling is that baby boom was known to happen that war occurs or not. This is suggested by analysis of situation of countries that have escaped to hostilities, such as Sweden and Switzerland. If the war had not triggered, it is likely that it would nevertheless occurred, earlier of few years, but according to comparable terms and similar size.

Fertility of European countries reached its minimum somewhere in the 1930s, in the pursuit of the secular trend, probably accentuated by the economic crisis. If we except the case of Germany, which saw, for the reasons known, a strong increase in fertility between 1934 and 1941, the low point of TFR lies in 1933 in England and Wales, Austria, Denmark,

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[3] This is very usefull when few monthly values are not yet available and that you want to get an estimate of the annual TFR, or when ASFR are available only several years after the number of évents.

[4] Sardon, J.-P. and Calot G. La reprise de la fécondité au milieu des années 1930, phénomène non perçu des observateurs du temps ?, Colloque « Adolphe Landry : économiste, démographe et législateur », Corte, 3)6 septembre 1997.

Finland and Sweden, in 1935 in France, Belgium and Norway, in 1937 in the Netherlands, Switzerland and Czechoslovakia. This reversal of trend is not unique to Europe; it is observed at the same period in the United States, Australia and New Zealand.

The evolution of fertility in France during the period 1930-1955, compared to that of each of ten European countries, for which the necessary information is available, helps to better identify the fundamental movement which, beyond cyclical variations caused mainly by the war, behind the own developments in each of these countries (Figures 1A, 1B and 1C).

The comparison of changes in the monthly TFR in France and, successively, Austria, Belgium, Denmark, Finland, Italy, Norway, Netherlands, Sweden, Switzerland and Czechoslovakia, shows, except for the war period 1940-1945, quite a parallelism. French indicator exceeds, before and after the war, those from Austria, Belgium, Denmark, Norway, Sweden and Switzerland, while it is lower than in the Netherlands, Finland and Czechoslovakia. The Italian fertility indicator, which was higher than that observed in France, becomes lower after the war. But beyond these level differences, these curves show the same trend. In particular, the situation of non-belligerent countries during the last war, Sweden and Switzerland, provides a relevant reference to what would have been the course of fertility in France, for example, if the war had not occurred.

Comparison of fertility trends in France and in every country, in addition to quite a parallelism it highlights, used to assess the effectiveness of French family policy. Indeed, although some voices are raised to give as proof of the ineffectiveness of this policy that fertility had risen everywhere, even in countries that had not taken any action, can be seen on graphs that gap between French monthly TFR and each of its European counterparts grew when the gap was positive and decreased otherwise. Thus the French fertility level that was before the war, approximately equal to the Belgian one surpasses it by 0.44 child per woman during the period 1946-1955.

Figure 1A. FRANCE comparée à BELGIQUE, PAYS-BAS, ANGLETERRE-GALLES et DANEMARK, 1930-1955
Evolution de l'indicateur conjoncturel mensuel de la FECONDITE
Données corrigées des variations saisonnières et données lissées par moyenne mobile Hoem

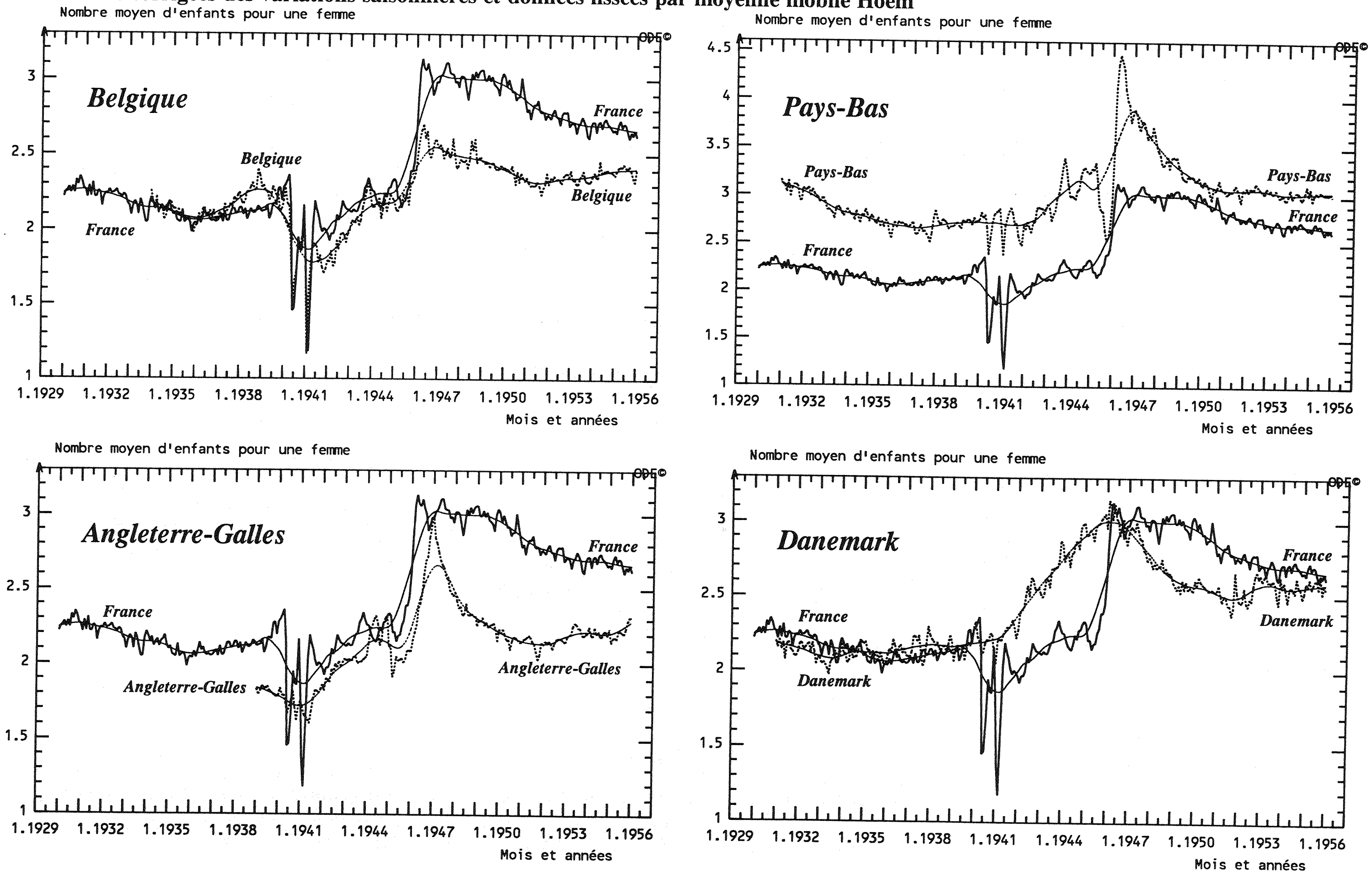


Figure 1B. FRANCE comparée à FINLANDE, NORVEGE, SUEDE et SUISSE, 1930-1955
Evolution de l'indicateur conjoncturel mensuel de la FECONDITE
Données corrigées des variations saisonnières et données lissées par moyenne mobile Hoem

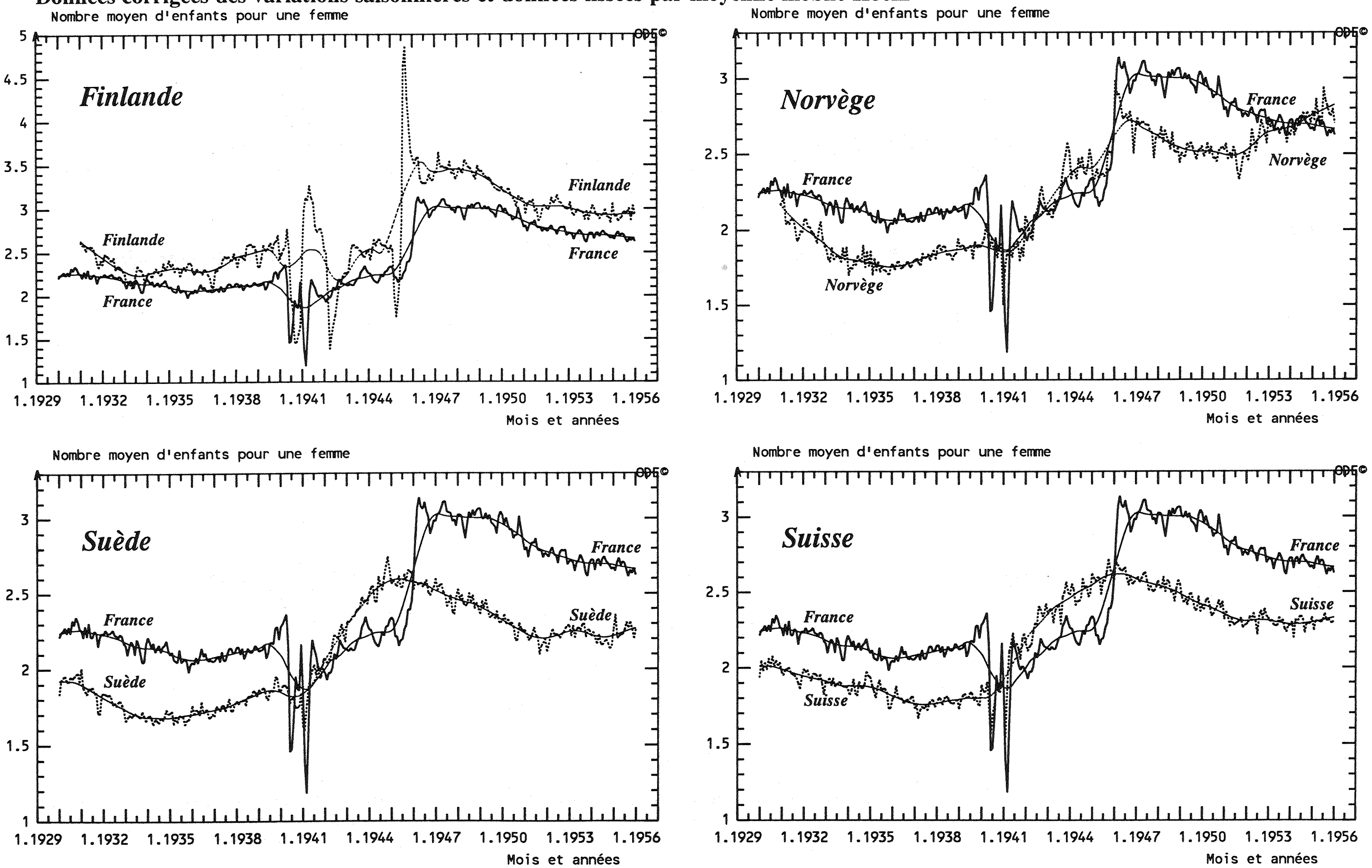
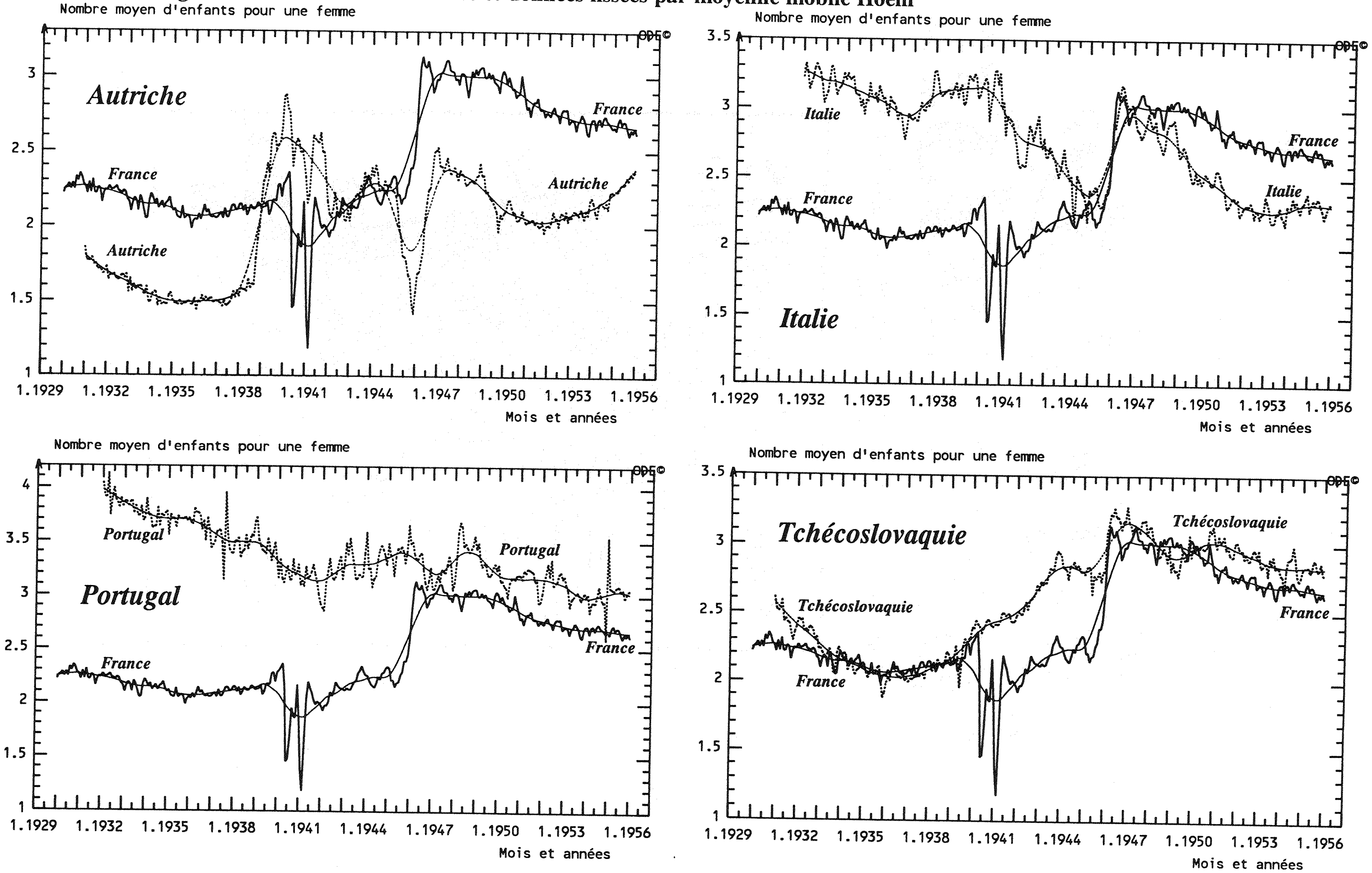


Figure 1C. FRANCE comparée à AUTRICHE, ITALIE, PORTUGAL et TCHECOSLOVAQUIE, 1930-1955
Evolution de l'indicateur conjoncturel mensuel de la FECONDITE
Données corrigées des variations saisonnières et données lissées par moyenne mobile Hoem



b) The Berlin Wall fall and fertility trend in Eastern Europe[5]

Monthly total fertility rates can be used to highlight influence of some specific events able to modify, even very temporarily, couple's behaviour. In the following pages we will see some diverse examples.

The first one is a major political upheaval of the last decades.

The 1990s marked a break in fertility evolution of Eastern Europe. Everywhere fertility collapses, very heavily in the former GDR and Romania, somewhat less strongly elsewhere. Only the countries of the breakup of the former Yugoslavia escape this sharp fall. although the fertility rate in Slovenia is falling rapidly since the late 1970s. Fertility even know, since 1993, a recovery in Croatia, thus erasing the momentary fall of 1991 and 1992.

The States of the former Union Soviet, whose fertility knew some recovery since ten years, were the most affected by this fall, with Romania and the former GDR. In this last country, TFR after a fall to less than 0.8 children per woman in1993 and 1994, rises and exceeds 1.0 again in 1997.

The availability of monthly live births for some countries allows the calculation of monthly TFR that allow to date with greater precision these reversals of fertility conditions (Figure 3) and, consequently, to go up, taking into account the duration of pregnancy (5), the events that cause the observed changes.

The review of the evolution of the monthly total fertility rate, of the only nine countries for which we have it for the recent period, confirms the diversity of situations. Thus the Federal Republic of Yugoslavia (Serbia, Kosovo, Vojvodina and Montenegro) records only relatively small variations in the TFR, while at the opposite the former GDR and Romania saw their fertility rate lose in few months, respectively, 0.7 and 0.6 children per woman in 1991 and 1990. Elsewhere, regardless of its previous evolution, the indicator drops rapidly at a relatively neighbour pace, except in Russia, where the decline in fertility is much faster.

But, as it is not a paper on fertility trends in Eastern Europe at that time, we will focus on only some countries with very rapid changes in accordance with political or legislative events.

German Democratic Republic

It is, undoubtedly, in the former GDR that political transformations are most printed their mark on the course of fertility. Suddenly after stabilizing at 1.55 children per woman in mid-1989 to mid-1991 TMFR collapses from November 1990 (from February 1990 in term of conception) as to go down 1 children per woman in April 1991. The fall continues until June 1991 (0.94), then the seed of decline is reduced somewhat, the indicator reached 0.85 in spring 1992, 0.80 in early 1993, and its minimum, 0.77, at the turn of 1993 and 1994.

If one traces this evolution in terms of conceptions, it appears that almost all of the decline took place between the fall of the Berlin Wall (November 9, 1989) and reunification (October 3, 1990), that is before the development of unemployment and the disintegration of the social protection system dependent on companies. After reunification, the decline continues but at a much slower pace.

The suddenness and magnitude of this drop are indicative of the tensions then stir the East German couples. Despite the high hopes placed by the population in the opening of borders with the Federal Republic and beyond dizziness that followed, the fall of the Wall meant for East Germans the disappearance of the world they had always known with all the landmarks that tied it.

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5 Sardon J. -P., Fécondité, bouleversements politiques et transition vers l'économie de marché en Europe de l'Est. In: Espace, populations, sociétés, 1998-3. Les mutations démographiques en Europe centrale et orientale – Population Transformations in Central and Eastern Europe. pp. 339-360.

Czech and Slovak Republics

The period opened by the Velvet Revolution that ended, November 18, 1989, the socialist system, and decommissioning, on 30 November, the Iron Curtain between Czechoslovakia and Austria was, undoubtedly characterized by a certain euphoria if we judge by the sudden rise in the birth rate nine months after the events and maintaining it for some months, at a high level in the Czech Republic as in the Slovak Republic. The reform of economic structures is carried out in difficult conditions far less than in other Eastern European countries; it is not until the end of 1991 as unemployment raises somewhat. But the deterioration of relations between the two entities resulted in the partition of the country into two autonomous republics, which took effect from I January 1993.

This partition seems to coincide with an accentuation of the decline in fertility rate in each country. It is, indeed, from October 1993, that is to say, with the conceptions of the after division, that fertility decline, which was accentuated at the beginning of 1991, experiences a temporary acceleration until the middle of 1994, leading to a decrease of 0.3 children per woman in 9 months. It is true that the sharp decline in trade between the two countries has led to this moment a contraction of the economy. Since then, trends, which were very parallel, diverge somewhat, the fertility decline being more marked in the Czech Repub1ic.

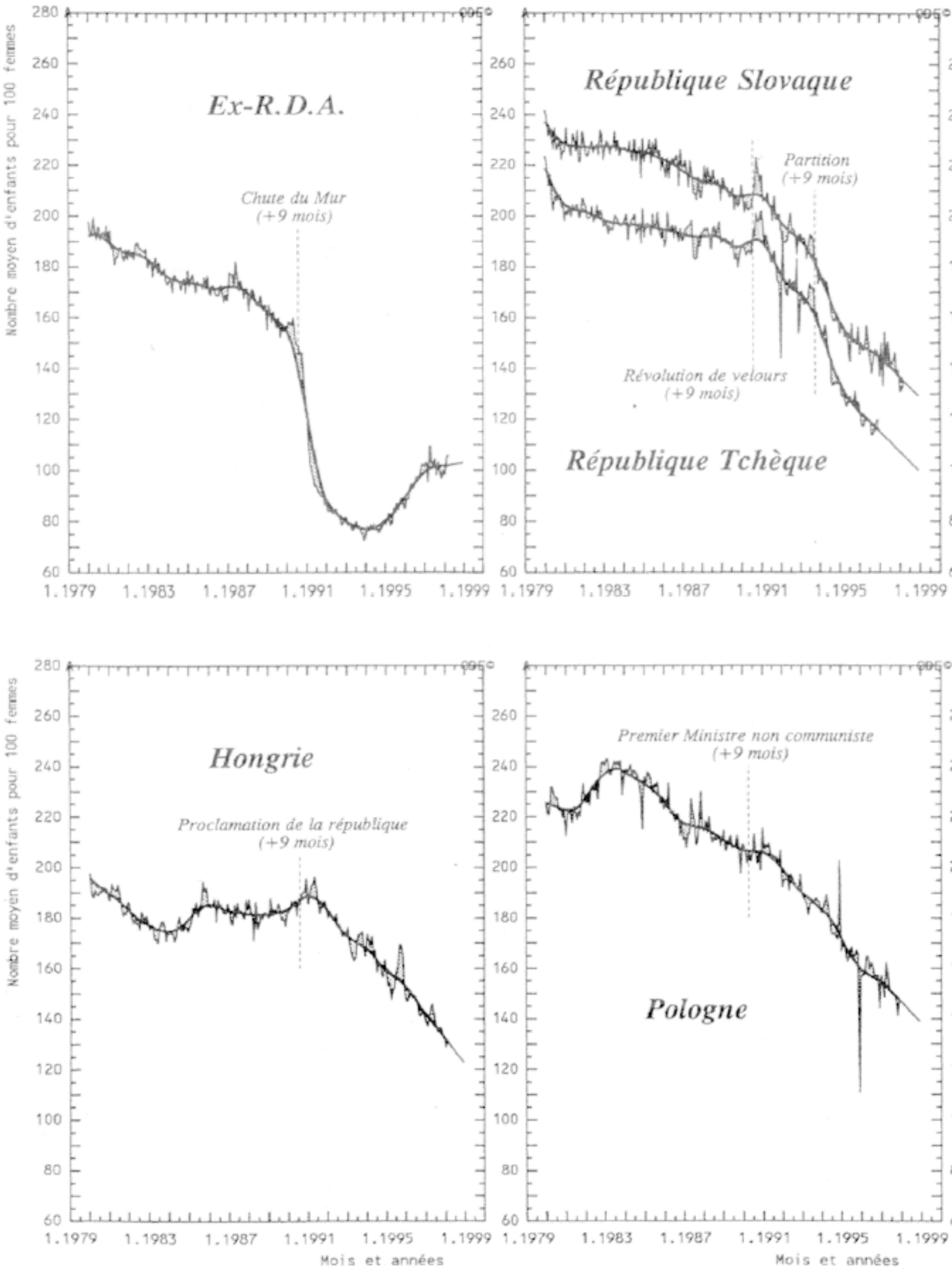
Romania

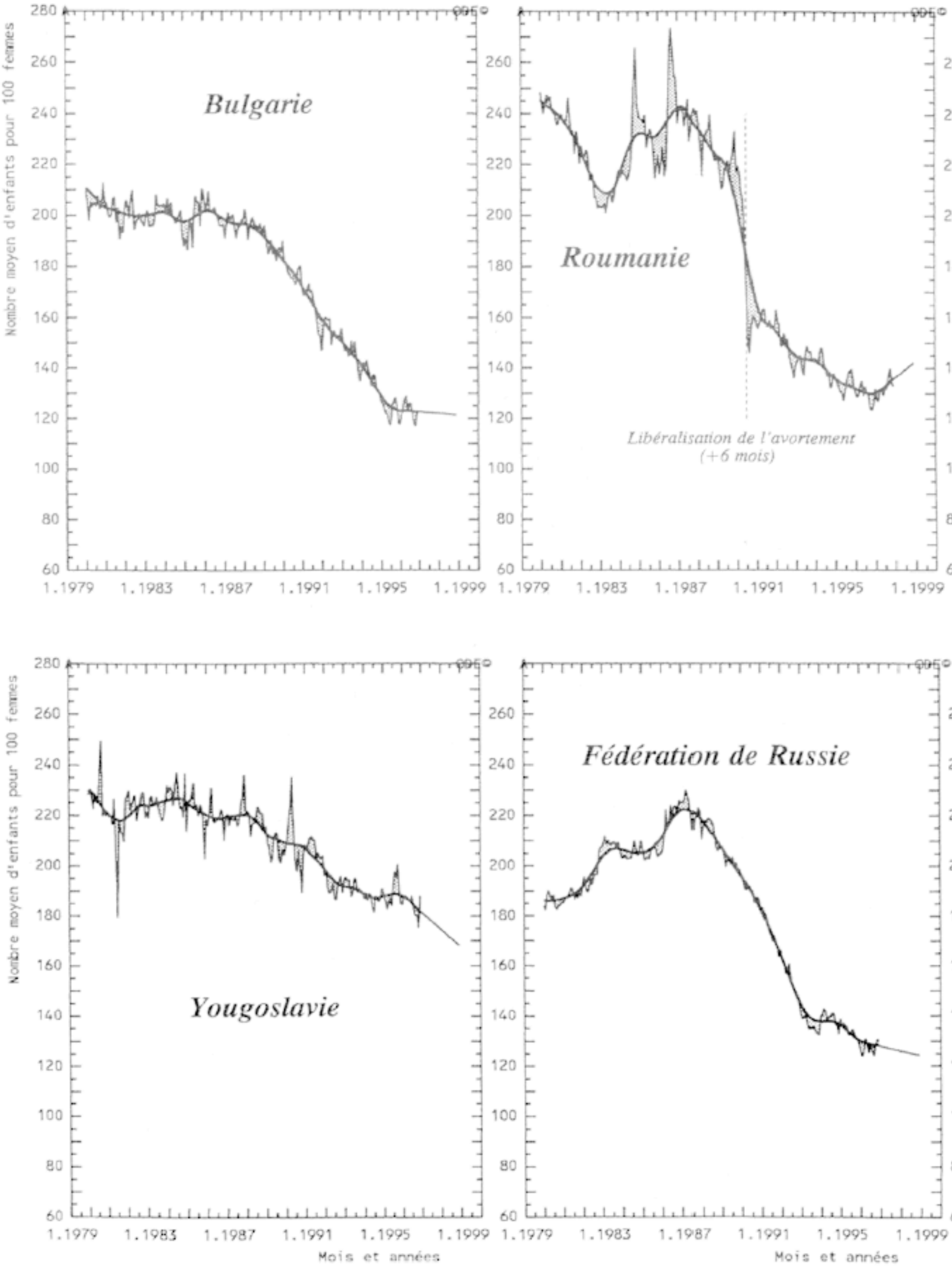
If, in Romania, the December 1989 revolution that overthrew the Ceausescu regime, affects fertility curves, it is because one of the first measures taken was the liberalization of the abortion on 26 December 1989 by the repeal of the famous Decree 770 of 1966. It was highly symbolic in a country where abortion was about the only form of birth control and in which political power had never ceased, since 1966, to restrict its use to regulate population growth, as in June1973, in March 1984 and 1986 with successive reinforcement of the implementation of decrees against abortion. Note, however, that despite the 1966 decree the number of legal abortions still exceeded 200,000 in 1967.

The repeal of the 1966 decree had immediate effects, the total fertility rate from 2.06 in May to 1.93 in June, 1.70 in July and 1.50 in August. The sharp decline in births and July reflects, no doubt, increase of use of abortion among women became pregnant in October and November, the first eligible under the new law authorizing the interruption up to 12 weeks of pregnancy.

With the repeal, the TFR seems clear the outgrowth caused, between 1984 and 1989, by the reactivation of the 1966 decree, the index regaining a level close to the one that could be observed today by considering the trend in the late 1970 and early 1980. Since late 1996, the fertility rate appears to be stabilizing at around 1.3 child per woman and might even raise a little, if we judge by the trend over the year 1997.

The suddenness of the decline in births 7-8 months after the repeal of the 1966 decree, suggests that, despite the massive recourse to clandestine abortion, some women preferred to carry their pregnancy to term rather than confront the risks of clandestine operations. It is undeniable that the total number of abortions has increased, due to liberalization, about 100 000 (approximately 10 %) in 1990, 200,000 in 1991 and 250,000 in mid-1990s.


Ex-R.D.A.
Chute du Mur
(+9 mois)
République Slovaque
Partition
(+9 mois)
Révolution de velours
(+9 mois)
République Tchèque
Hongrie
Proclamation de la république
(+9 mois)
Pologne
Premier Ministre non communiste
(+9 mois)
Nombre moyen d'enfants pour 100 femmes
Mois et années
1.1979
1.1983
1.1987
1.1991
1.1995
1.1999


Nombre moyen d'enfants pour 100 femmes
Bulgarie
Roumanie
Libéralisation de l'avortement
(+6 mois)
Yougoslavie
Fédération de Russie
Mois et années

c) Flu epidemics[6]

Flu epidemics, as amazing as it sounds, can print their marks on fertility trend and comparison of monthly TFR across a continent allows tracing the routes and the timing of each of these epidemics. Indeed, if it is well known that flu epidemic kill eldest people, it is generally ignored that it can also prevent children born, even if Doctor Jacques Bertillon[7] has demonstrated this phenomenon at the beginning of the 20th century.

Most of the European countries recorded a significant decline in fertility in July and August 1958, i.e. nine months after the flue epidemic of winter 1957, named “Asian flu” or “Hong Kong flu”. This epidemic reached France in October 1957, where it caused deaths in almost 1500 and reached its climax in November with 4000 deaths and then decreased virulence to disappear during the first trimester 1958.

In July and especially August 1958, Monthly TFR decreased by 5-6%. The detailed analysis of data shows the dissemination map of the epidemic. The epidemic seems to have declared in Central Europe (Hungary, FRG, GDR and Austria) where, since June, fertility indicator decrease by more than 4%, before going to England and reaching the rest of western and Scandinavian Europe.

At its climax, this epidemic led to a reduction of monthly indicator by 0,15 to 0,36 child by woman. Sweden and England were places where influenza events on fertility were most attenuated. Eastern Europe states were the most severely affected (Hungary, Czechoslovakia and, at a lesser extend, GDR) followed by the Central Europe ones (Austria, Switzerland) and Finland.

In order to define mechanisms connecting flu epidemic and fertility decrease, three phenomena could be evoked:

- Decrease in the frequency of sexual intercourse under the influence of the disease;
- Decrease male and/or female fecundity because of fever caused by influenza;
- Increase in foetal mortality when mother got the illness.

In some countries, as France or Switzerland, appears, in the months following the epidemic, a fertility increase that could be a recovery of births that did not take place because of the epidemic.

One of the last effects of influenza on fertility could be seen in singularity of year 1971, even if the evidence is not totally made. Indeed, in 1971, TFR of northern and western European countries record for slower decline in fertility (England and Wales, Norway, FRG, Switzerland) or temporary recovery (Denmark, France and Sweden). Only Austria, Finland and Eastern Europe countries, except GDR that looks like the other Germany, do not follow that trend.

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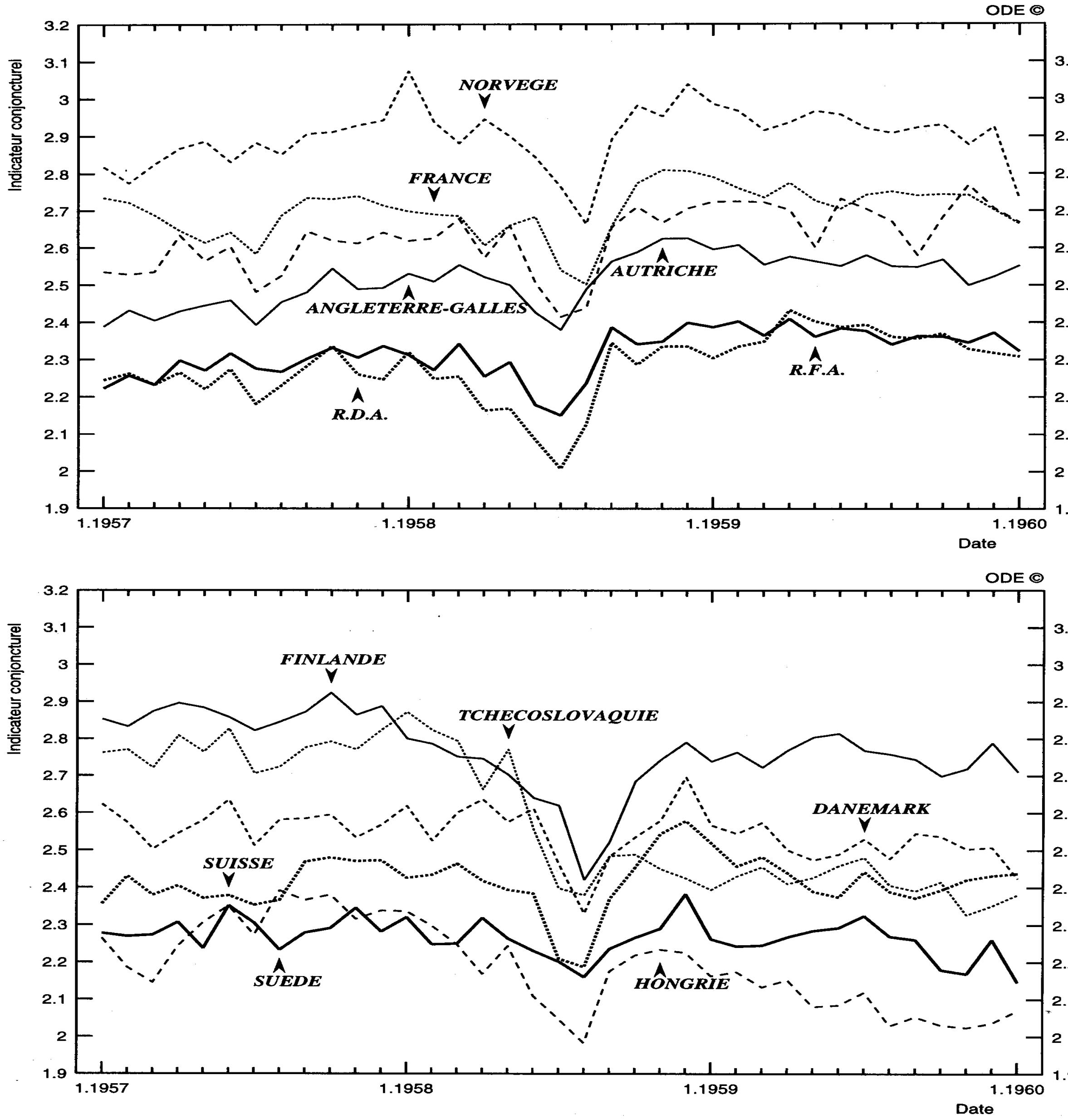
[6] See Sardon J. -P., Influence des épidémies de grippe sur la fécondité, in La population de la France, Evolutions démographiques depuis 1946, Tome 1. CUDEP, 413-417.

[7] J. Bertillon, « La grippe à Paris en 1889-1890 », in *Annuaire statistique de la ville de Paris*, année 1890, pp.101-131

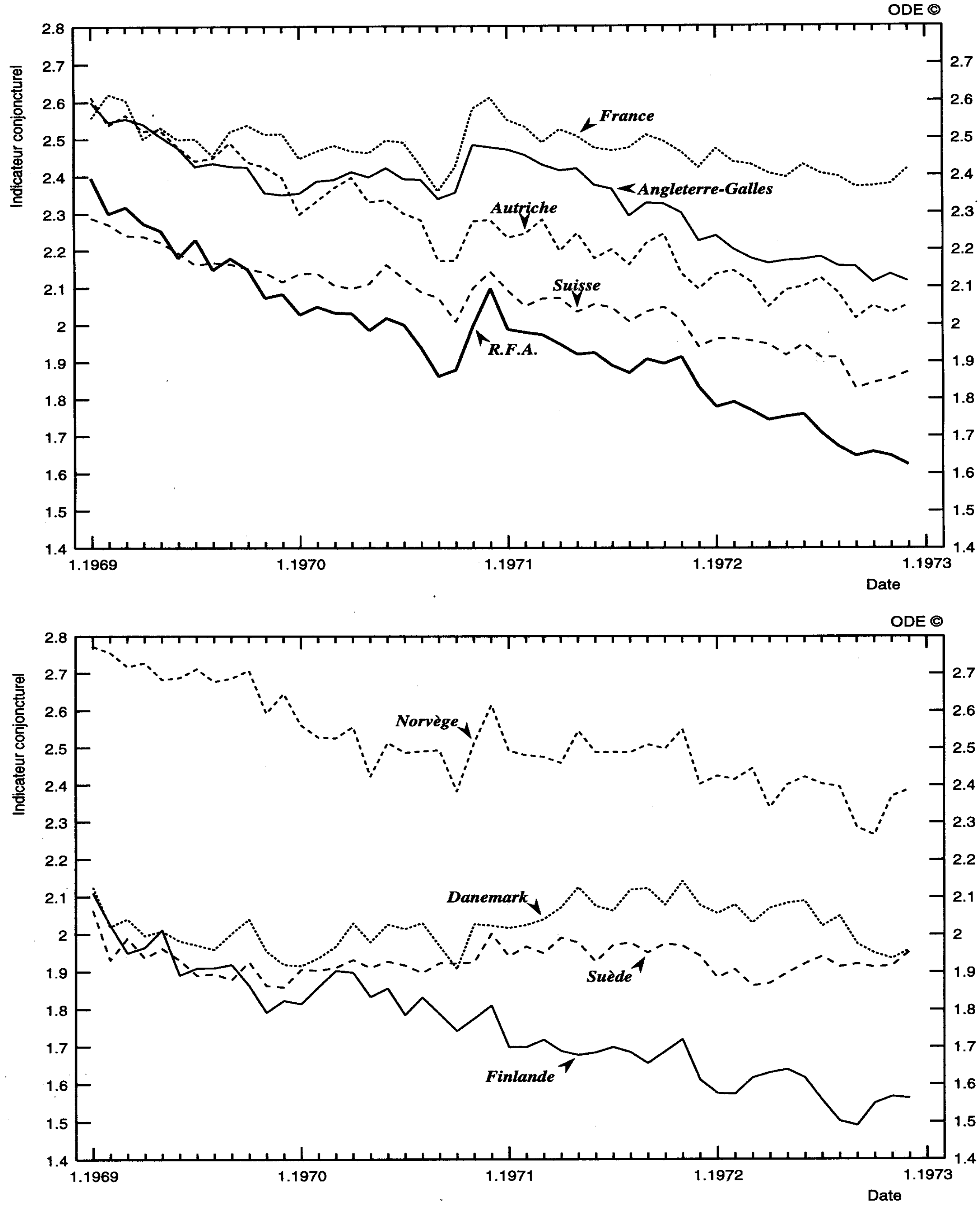
Figure 1: 1957 Hong Kong flu effects on fertility



In all these countries, this pause in the movement of fertility decline is due to a stop in the decline or a recovery rates at all ages. So, it seems that it is a common phenomenon in most European countries. Even if in most of the European countries fertility has followed the same trend since the middle of the 1960s, it is astonishing to find this pause in 1971, whatever the fertility level of that time[8].

[8] Au début des années 1970, elle s'étage, en effet, de 1,8 à 2,5 enfants par femme.

Figure 2: Monthly TFR in some European countries during years 1969-1972



The analysis of the monthly fertility development[9] clarifies better the way this pause appeared and helps to determine the TFR inflection dates (figure 2).

In Austria and Finland, where annual TFR does not show any pause in 1971, monthly indicator reveals a rustling whose scale has not been sufficient to affect the annual indicator.

England and Wales, France and FRG show parallel monthly trends during years 1969-1972. In these three countries, fertility increases in July-August 1970 to peak in February

[9] Smoothed to remove random fluctuations.

1972 and, then, resumes its decline, note, however, that in England fertility decrease stops in January 1970.

In Austria the evolution was very similar to that of the three previous countries, but with a shorter pause from November 1970 to February 1971.

Elsewhere, the trend is less clear. Fertility decreases is slowed in Switzerland from February 1970 to February 1971. In Sweden, fertility increases from January 1970 to May 1971. In Norway, it stabilises from September 1970 to August 1971. In Denmark, after stabilisation of period February-December 1970, a recovery takes place until August 1971 before a new stabilisation till May 1972. In Finland, there were two short phases of stop falling, from December 1969 to June 1970 then from May to September 1971.

In order to explain this pause in fertility decline, common to number of countries, media campaign on consequences of the use of contraceptive pills, high-dose at that time, has been evocated. But it seems that explanation must be sought elsewhere, and no doubt, again, at least in part in the impact of flu epidemics.

Indeed, during last trimester 1970, were visible on fertility the consequences of the last major flu epidemic of December 1969. The number of live births and 1970 TFR were generally lower than those of the previous year. The small recovery generally observed after epidemic (births during the first months of 1971) produced an increase of births in 1971 compared to 1970.

If this explanation appears the only valuable for some countries as Austria, Switzerland or Germany, it is not fully sufficient for others such as France an England, where fertility is higher than before epidemic, or Norway and Denmark, where, during whole 1971, fertility was stable or a little bit increasing. For these two last countries, it is probably a local and momentary pause in fertility decline. For the two first, it could be a recovery during a longer period or only random variations.

These few examples show that the change of time scale – switching to a finer cutting – brings a wealth of additional information. It can highlight new information, such as consequences of flu epidemics, which might seem anecdotal, at least for fertility analysis, if they did not cause fractures in TFR trend as in 1971. The ignorance of these events could result in misinterpretation. Likewise, monthly indicators analysis leads to better comparisons between fertility developments in different countries and to highlight, more precisely, parallelism and the starting point of behavioural changes.

3) Seasonal variations

When monthly figures are available, and it is the case in all European countries, and aside monthly TFR, it is also possible to analyse the seasonal variation of live births and, even, to decline this analysis by birth-order[10]. But, these variations are well known and it is not the place here to present once again seasonality of fertility.

4) Weekly variations[11]

For these two last examples, numbers of events classified by day of occurrence is needed, bit as we can see latter by the number of countries analysed, these data are often available in national statistical offices because this table is often used for controlling the data classified according to some other variables.

The idea of wishing to analyze the daily rhythm of birth can seem strange to the extent, if it is known that some seasons are more conducive to births, there is little reason to think that some day may be more favourable than others. Although periodically, we read or hear that the days of full moon would promote deliveries and thus births. But this has never been demonstrated, quite the contrary.

Table 1. Daily coefficients of live births
in some European countries

Country	Germany	Austria	Belgium	Denmark	Spain	Finland	France	Greece	Hungary	Ireland	Italy
Year	1988	2003	2002	1980	2000	2002	2002	2003	2003	2003	2001
Monday	101	104	112	101	102	106	106	105	101	98	104
Tuesday	106	103	124	109	107	107	110	109	108	112	112
Wednesday	106	105	113	107	108	106	107	111	110	112	107
Thursday	103	104	116	106	106	108	107	108	109	114	107
Friday	105	107	113	106	106	108	107	118	110	108	106
Saturday	93	89	62	89	90	84	86	89	82	81	91
Sunday	86	87	61	82	81	80	78	58	80	74	72

Country	Luxembourg	Norway	Netherland	Poland	Portugal	Czech republic	Sweden	Switzerland	United Kingdom
Year	1996	2003	2003	2003	2003	2003	1996	2003	2003
Monday	97	103	106	103	99	103	102	100	107
Tuesday	111	106	108	110	107	109	108	109	108
Wednesday	109	106	107	108	112	108	106	109	108
Thursday	112	105	106	106	108	107	107	107	108
Friday	119	103	105	108	105	108	102	108	109
Saturday	83	90	85	85	90	86	88	87	83
Sunday	69	87	82	80	79	79	86	86	77

The analysis of contemporary daily data highlights, throughout Europe, a decline in births over the weekend. Stronger or weaker depending on the country, this reduction in births on

[10] Prioux, F. Mouvement saisonnier des naissances : Influence du rang et de la légitimité dans quelques pays d'Europe occidentale. *Population*, 1988(3): 587-610.

[11] Sardon, J.-P. Le rythme journalier des naissances, in La population de la France, Evolutions démographiques depuis 1946, Tome 1. CUDEP, 367-370.

Saturdays and, even more, on Sunday may exceed 30 % as in Belgium, Greece and Luxembourg (Table 1).

There is indeed a daily rhythm of birth within the week, as there is a circadian rhythm (that is to say inside the day). Thus, at certain times, more births are observed. In particular between 1 and 2 AM, the frequency of unprovoked deliveries is four times stronger than between 1 and 2 PM[12]. Similarly, some day saw their birth rate stand at much lower levels than others.

Figure 1. Austria, 1945-2003, daily coefficients of live births

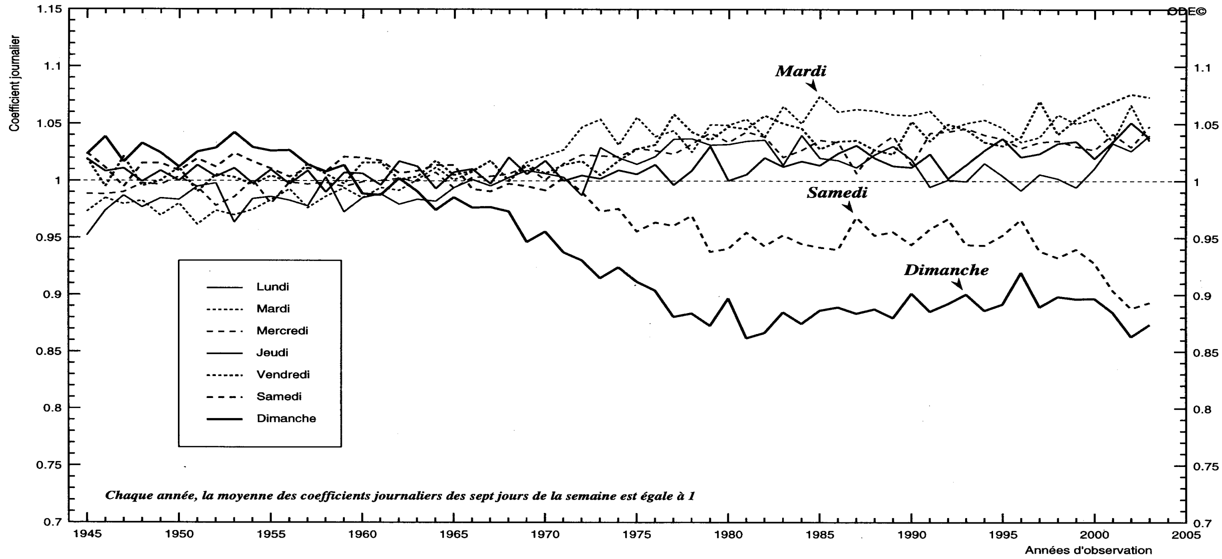
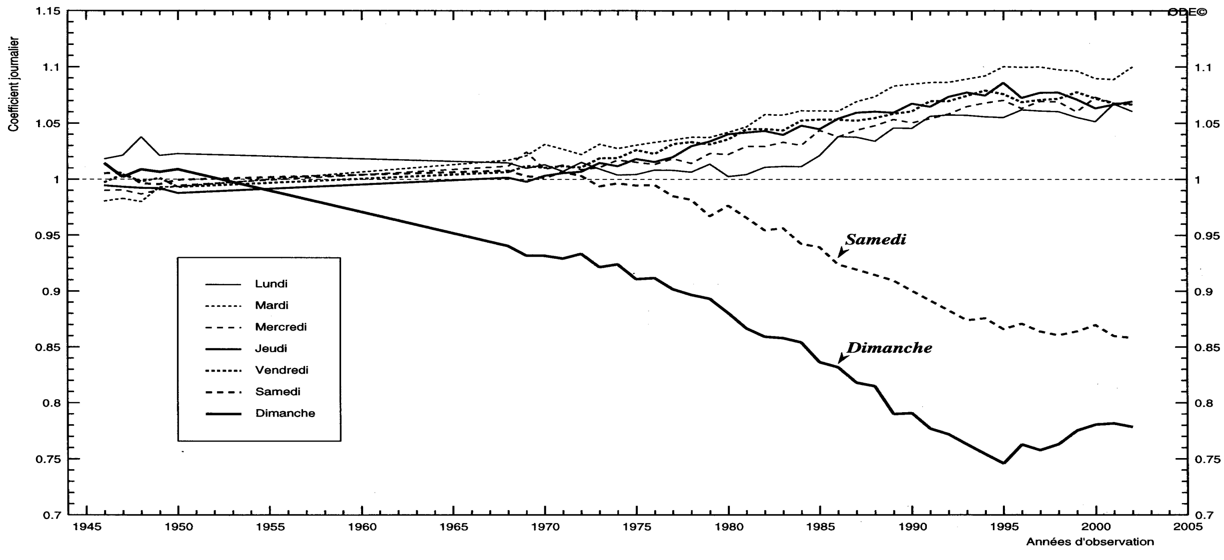


Figure 2. France, 1946-2002, daily coefficients of live births
(Data non available from 1951 to 1967)



12 Gauquelin M.F., L'heure de naissance, *Population*, 1959, 4, pp 683-702 et d'Armagnac-Mathias J., La modification du rythme des naissances: un phénomène récent ?, *Population*, 1990, 3, 657-661.

This frequency of births, significantly lower on weekends, betrays a relatively common practice: the initiation of deliveries and their programming, and increased the frequency of caesarean sections.

The "natural" daily rhythm is known through statistics of births that provide for the period 1946-1950 in France, and since 1946 in Austria, their daily distribution. At that time, when no medical intervention was indeed disrupt the natural progression of the birthing process, the frequency of births at the weekend was slightly above average frequency[13].

Daily statistics of Austria, the only available for the entire post-war period, depict accurately the terms of the introduction of the outbreak of births (Figure 1). Initially, these new practices have led to a gradual decrease in the number of births on Sunday and, to a lesser extent and with ten years of shift, they affected births on Saturday. In correlation with this scarcity of births at the end of the week, there has been an increase in the frequency of births from other days, especially on Tuesday.

The French data, despite their unavailability for the period 1950-1967, describe a very similar trend, albeit more pronounced and probably more ancient practice.

Data for other countries are not going back beyond the late 1960s, so it is not possible to date precisely the beginning of this transformation of the daily rhythm of birth. But if we extrapolate the data available to the past, we can estimate that this change took place concurrently around 1960 in England and Wales, the Federal Republic of Germany, France and Switzerland. Sweden is a pioneer, since in this country, interventions in the process of delivery may have started in the 1950s.

The gradual depletion of the Sunday births appears to have spread all the continent, including the former Eastern Europe, although the levels vary widely from country to country; without these levels really depend on the age of onset of deliveries practices, as shown by the comparison of Austrian and French curves.

There is no doubt that these changes result from the development of these new medical practices that are drug triggers the process of childbirth and caesarean deliveries. In France, the percentage of trips that had changed little from 1972 to 1981[14] has doubled between 1981 and 1995 from 10.4 to 20.5%[15]. The proportion of caesarean before labour, which had doubled between 1972 and 1981 (from 3.0 to 6.0%), continued to grow although at a slower rate from 6.0 to 8.5%[16].

It should be noted that, as these practices have spread across Europe, they seem to have aroused, in the long run, oppositions, as suggested stopping the decline in daily coefficients of

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[13] In France, the frequency of deliveries is also higher on Monday, the Sunday rest may slightly favours the induction of delivery. This influence of the rest also seems to shine through the hourly breakdown of the early work for unprovoked deliveries, trips are, indeed, more frequent effect overnight

[14] 8,5 % in 1972, 10,1 % in 1976 and 10,4 % in 1981. Cf. C. Rumeau-Rouquette, Ch. du Mazaubrun, Y. Rabarison, *Naître en France, 10 ans d'évolution : 1972-1981*, INSERM, 1984.

[15] Cf. B. Blondel, Ch. du Mazaubrun, G. Breart, *Enquête nationale périnatale 1995. Rapport de fin d'étude*, février 1996.

[16] If we add caesarean before labour to tripping, we obtain 16.4% for 1981 and 29% for 1995. That is quite equal to the sum of the deviations values, from one, of daily coefficients of Saturday and Sunday for these years: 16 and 30%. The calculation of daily coefficients may well provide an estimate of non-spontaneous deliveries, even if for earlier periods, the adequacy of the measures, direct and indirect, is a little worse and leads to an underestimation of induced births 6.5 against 11.5% in 1972 and 9% against 14% in 1976.

birth Saturdays and Sundays which is observed almost everywhere, although at different times.

An increase from the late 1970s is even observed in countries where the value of daily coefficients weekend fell early under 0.8 (England and Wales, Switzerland and Germany in particular). This increase stops for a development that had settled in recent decades, probably reflects an awareness of the effects, possibly adverse, of too much control of the delivery process.

A reversal of similar trend is observed in the early 1980s in Austria, and in the middle of the 1990s in France, as in many other countries.

Few seem to be the countries that continue to be committed, such as Belgium and Greece, in the process of sharpening control deliveries.

In the Iberian Peninsula (Spain and Portugal), this practice undoubtedly relatively recent has not less reached levels close to those observed in Northern and Western Europe. In contrast, Greece and Italy, if we judge by the Sunday coefficient, are among the countries where the programming of deliveries, caesarean sections practice, seems most prevalent, with Belgium and Luxembourg. The latter two countries are those that have gone furthest in this domain. The coefficients observed in Belgium, on Saturday and Sunday, and in Greece on Sunday are undoubtedly, the lowest ever recorded in a European population.

5) Daily variations over the year

For some variations across the year, the availability of births classified by day of occurrence could hold to explain the reason of the variation. For example, in some countries a significant increase of the average daily of live births occurs during September, showing a secondary maximum of this average number centred arround September 24th.

That is the case for the increase of births occuring in September.

As we can see in seasonal variations of live births, in almost all countries a rise in births in September is observed, which corresponds to an increase of conceptions in December, whose presence dates back at least to the beginning of the century. To further analyze this phenomenon, it is necessary to have daily data.

The analysis of the evolution of the daily number of births[17] around September shows in all countries extra births relative to the trend that lasts 4-7 weeks and totalling equivalent of 1 to 5 days of birth. This September Spike appears almost everywhere centred on a period which runs from 20 September to 1 October and especially on September 25th, 26th and 27th (Figure 5)

It therefore appears that the secondary maximum in September would come from additional conceptions around the end of the year. Indeed, the modal duration of pregnancy is 266 days, additional conceptions on 1st January, for example, should increase the number of live births, 266 days later, around September 23. Due to the variability of the gestation period, one cannot observe a peak centred on that day, but an additional spread over a period of 40 to 50 days[18]. This is what we see in Figures 6a and 6b that replicate the daily number of births from August 15 to November 15, observed in England and Wales and France at different times.

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[17] Adjusted for variations due to the type of day within the week, and smoothed to reduce the residual random variations. Figure 4 shows the evolution of the daily number of live births in France throughout the year 1985.

[18] For a detailed analysis see Leridon, H. Les conceptions du 1er janvier (ou : les étrennes de septembre). *Population*, 1986(3): 599-602.

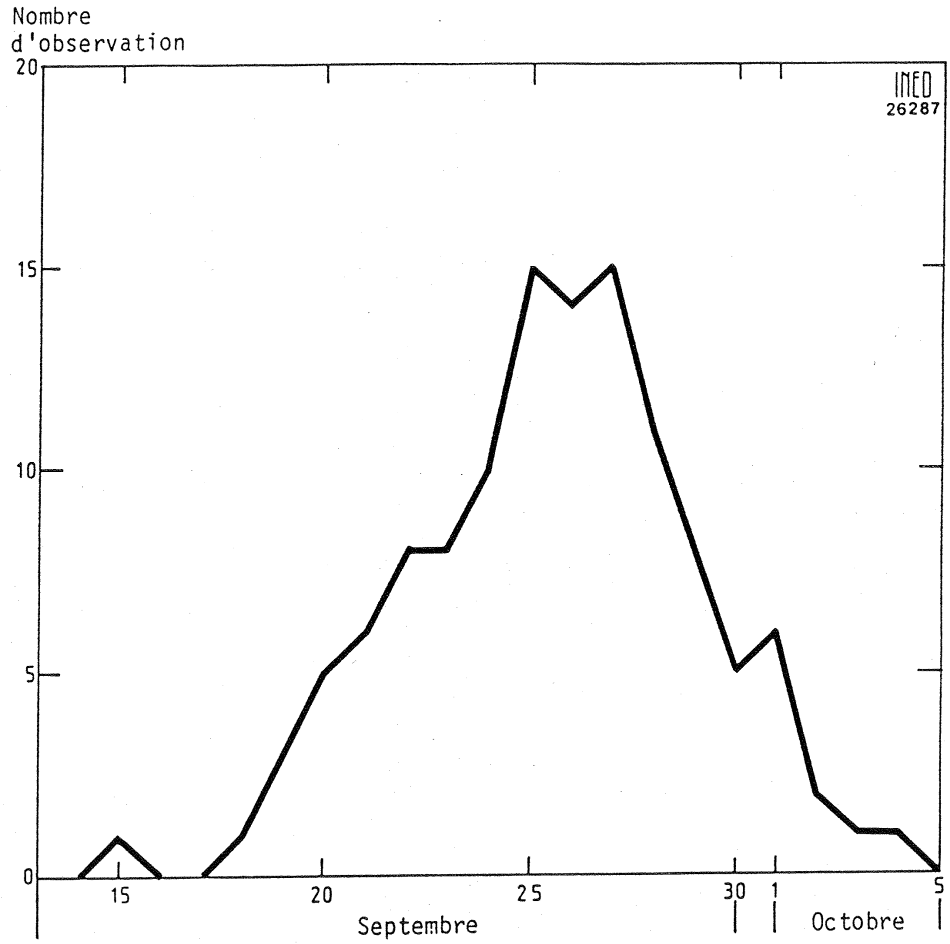

Figure 5. - **Répartition des dates moyennes de l'excédent des naissances de septembre**

Given the somewhat erratic developments of the equivalent number of days of births from one year to another, it is difficult to distinguish countries according to the magnitude of the phenomenon or discern an evolution of the fifteen last years. It appears however that this additional births is more marked in England and Wales, where it usually corresponds to 3-4 days of births, than in France where it accounts for only about two days of birth.

Anyway, it appears that this increase of births in September is due to an increase of conceptions around January 1st, and rather after January 1 than during the end of the year, as the mode of distribution is from 25 to 27 September and not on 23 September. It seems that we cannot consider additional conceptions at Christmas

Two complementary explanations can be given for this:

- A higher frequency of sexual intercourse without contraceptive coverage (for couples not using continuous method), which could be related to an increase in the frequency of sexual intercourse in the year-end holidays,
- An increase in the frequency of sex among couples looking to conceive.

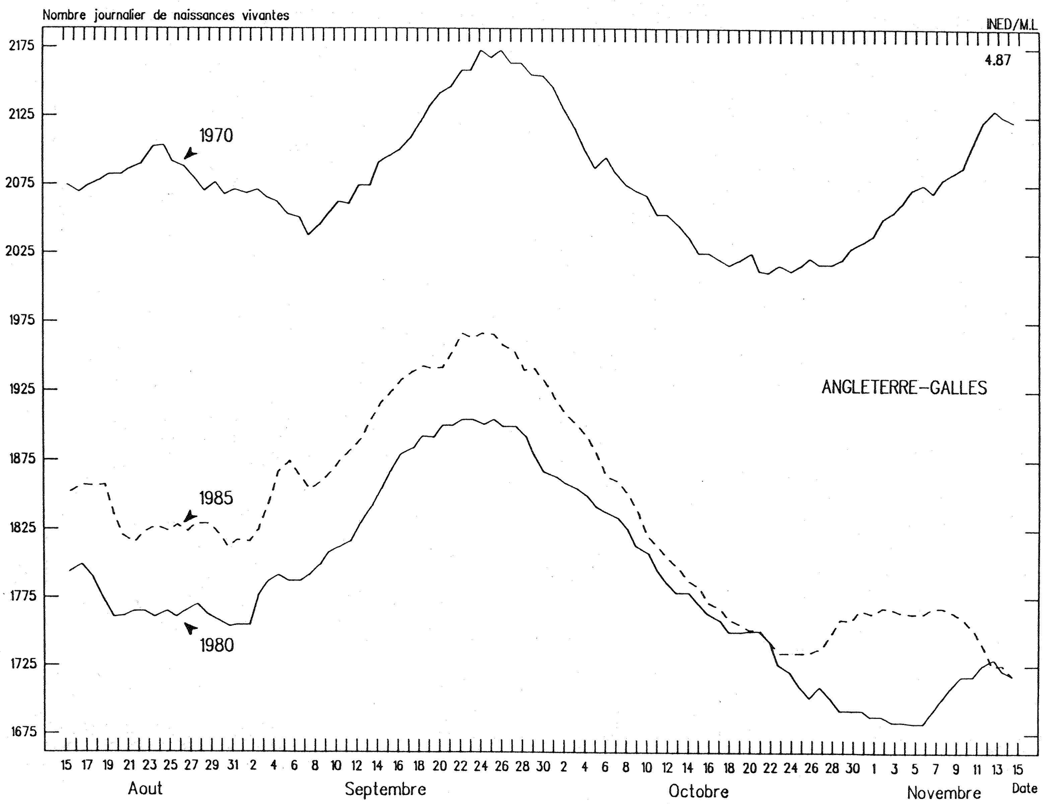

Figure 6a. – Angleterre-Galles. Pointe de septembre

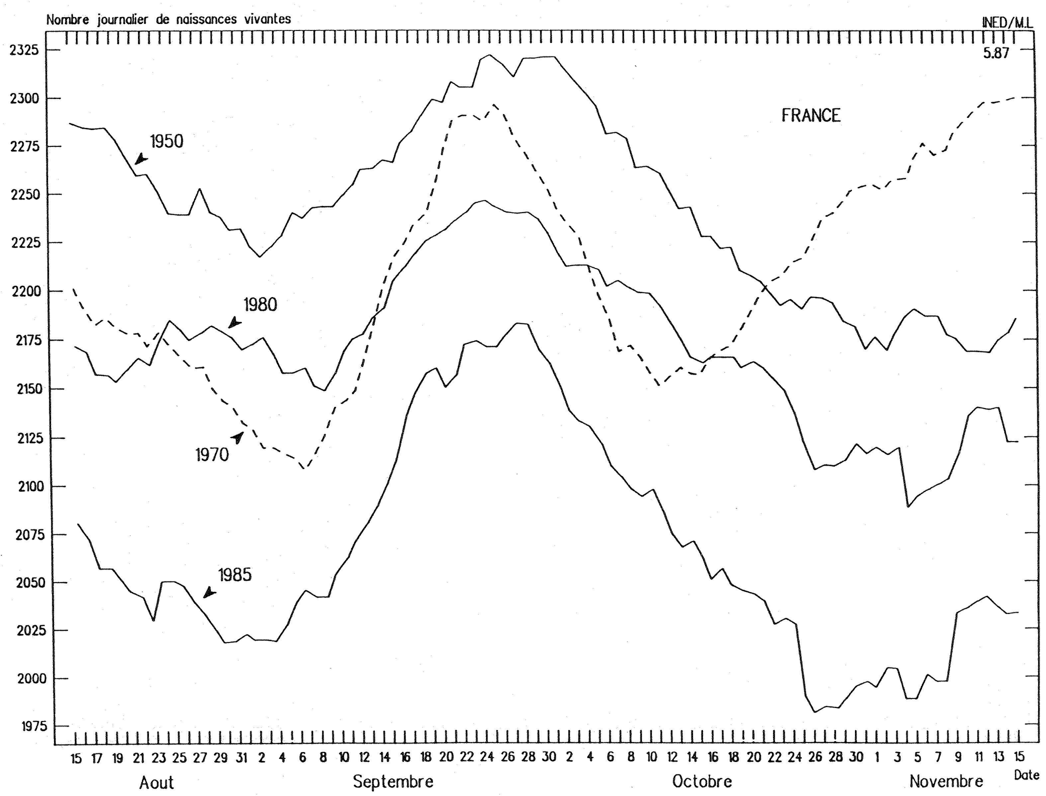

Figure 6b. – France. Pointe de septembre

Conclusion

The fertility analysis at the monthly level highlights the wealth of additional information provided by a cut below the year. Thus appear the manifestations of flu outbreaks that might seem anecdotal, at least in the context of a fertility analysis, if they did not involve breaks in the evolution of the annual fertility indicator as in 1971. Indeed, the ignorance of these events could lead to incorrect interpretations. Similarly, analysis of monthly indicators of various countries helps to better conduct comparisons between trends and to highlight more precisely parallelism and starting points for changes in behaviour.