Seasonality of Births in Europe and the USA: A Comparative Approach

Byron Kotzamanis[1], *Anastasia Kostaki*[2]

1. Inroduction

The analysis of the distribution of births per day in all developed countries in the world suggests a radical change in the post-war years. Until the end of the first post-war decade, births were more or less uniformly distributed across the week days. Thereafter, the daily life born deliveries in the developed countries suggest a systematic gradual decline in the last two days of the week, i.e. Saturdays and Sundays.This phenomenon is related to practices of the medical profession who, for obvious reasons, plan their working hours, especially regarding deliveries by caesarean sections. The intensity and the starting time of this phenomenon, significantly differ between countries, while in some of them, the appearance of reactions, as well as awareness of the medical body,

In this work a comparative analysis of the daily fluctuations of births in the European countries and the USA is attempted, considering among the European countries those countries that are representative of the various patterns and intensities, (Austria, France, Switzerland, Sweden, the Netherlands, Spain, Greece, USA).

2. Daily coefficient of births

As a measure for the appearance of heaping in the birth counts we use the following index,

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$$ {}^{t}I_i = \frac{{}^{t}B_i / k}{{}^{t}B / n} $$

where:

${}^{t}B_i$ is the total count of births taken place the ith day of the week at year t, i=Monday, Tuesday,… Sunday,

k is the number of days ***i*** at year ***t,*** and ***n*** is the count of days in year ***t,***

An index of 110 (or 90, respectively) indicates a day where there were 10% more (or fewer, respectively) births compared with an average day (base of 100).

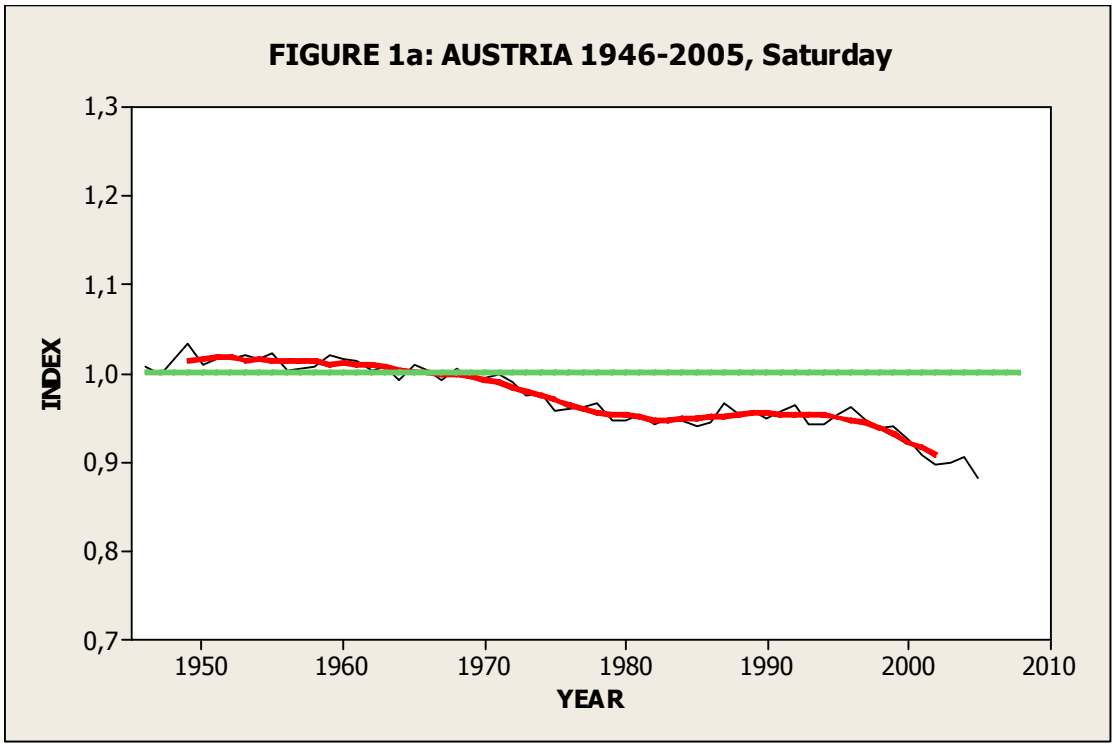
3. Results

Historical data provide an evidence that until the middle 60's, there was no tendency towards a growing differentiation of the number of births between the various week days, e.g. Swiss data for the years 1926 and 1927, Austrian and French data for the years 1946 and 1968 (see table below).

	Switzerland		**Austria**		**France**	
Weekday	**1926**	**1927**	**1946**	**1970**	**1946**	**1968**
Monday	1,016	1,015	0,978	1,007	1,02	1,012
Tuesday	0,976	0,971	0,995	1,007	0,98	1,017
Wednesday	0,981	0,983	0,978	1,01	0,989	1,011
Thursday	0,998	0,996	1,01	0,998	0,993	1,003
Friday	0,98	0,997	0,996	1,002	0,998	1,007
Saturday	0,984	1,013	1,007	1,004	1,006	1,007
Sunday	1,066	1,024	1,036	0,971	1,015	0,943

However, the daily distribution of births begins to dramatically change from the late 60's. The number of births becomes continuously diminished on Sundays and, to a lesser extent, on Saturdays too. This systematic behaviour might be attributed to the increasingly medical management of deliveries especially mainly the induced vaginal deliveries and the Caesarean ones. Nevertheless, the lower frequency of births at Saturdays and Sundays is observed across Europe, with varying degrees of intensity and times of initiation through countries.

In Figures 1a-8b the values of the daily coefficient and their trends using seven terms moving averages, for the countries and the years examined are illustrated.



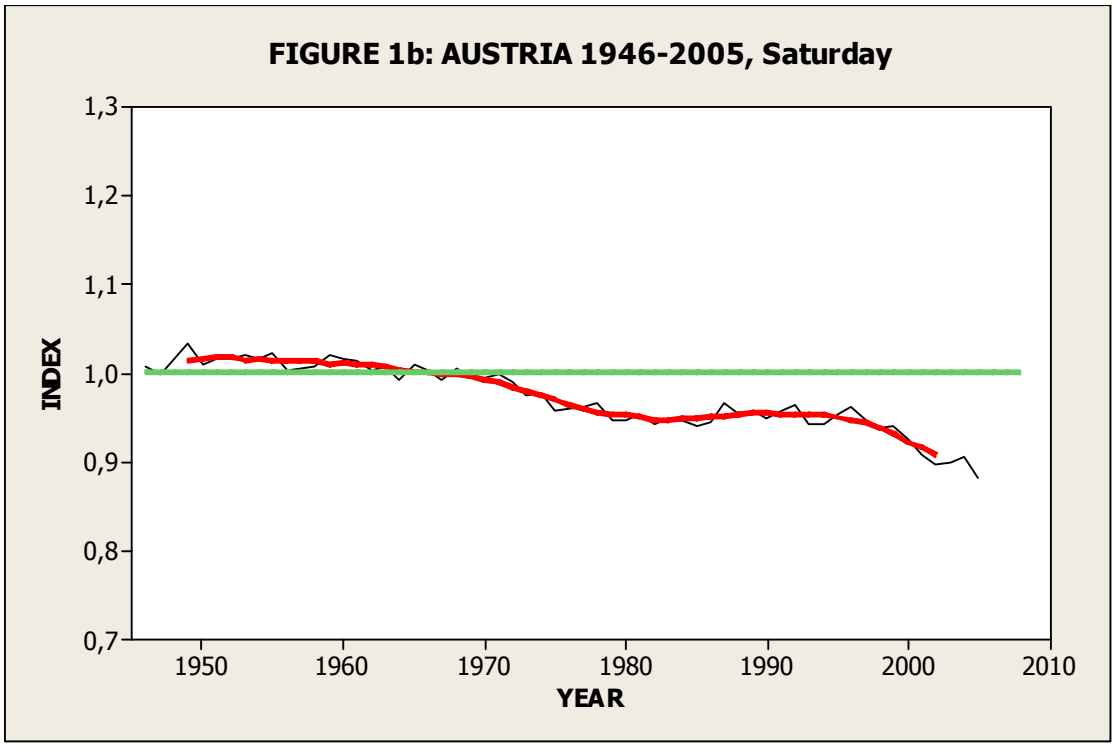


FIGURE 1b: AUSTRIA 1946-2005, Saturday
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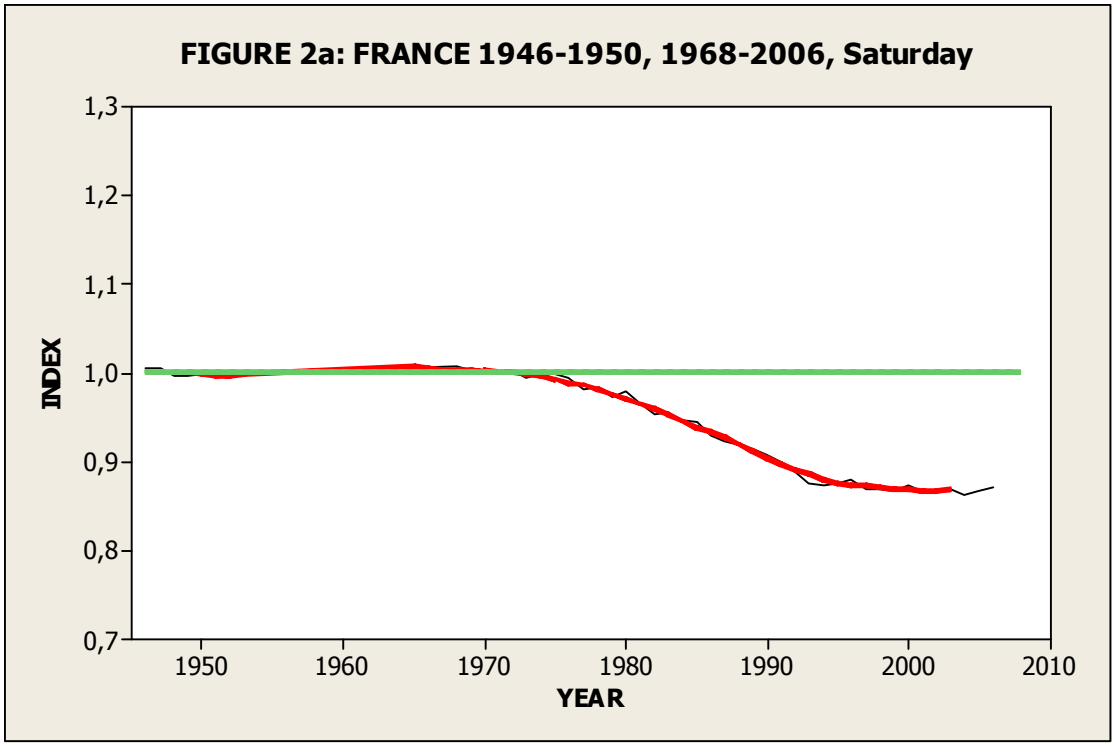
FIGURE 2a: FRANCE 1946-1950, 1968-2006, Saturday
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FIGURE 2b: FRANCE 1946-1950, 1968-2006, Sunday

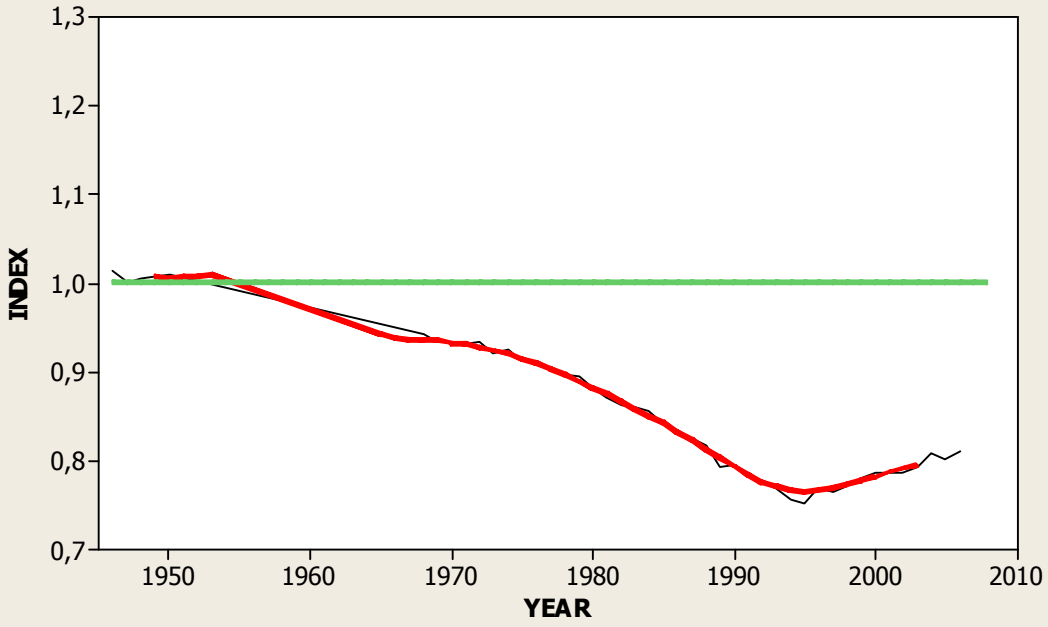
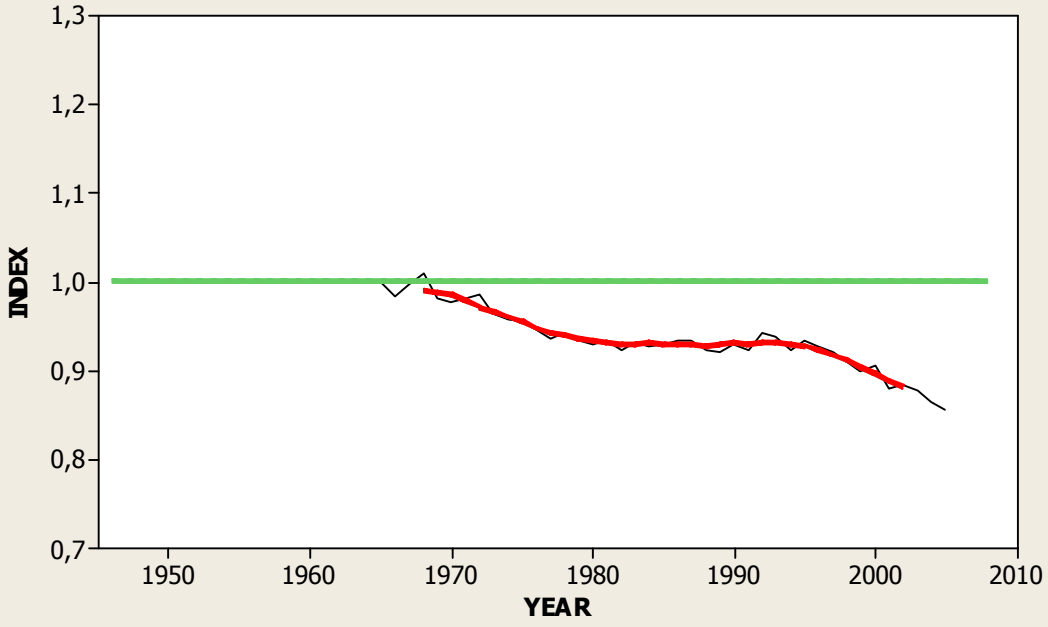


FIGURE 3a: SWITZERLAND 1965-2005, Saturday



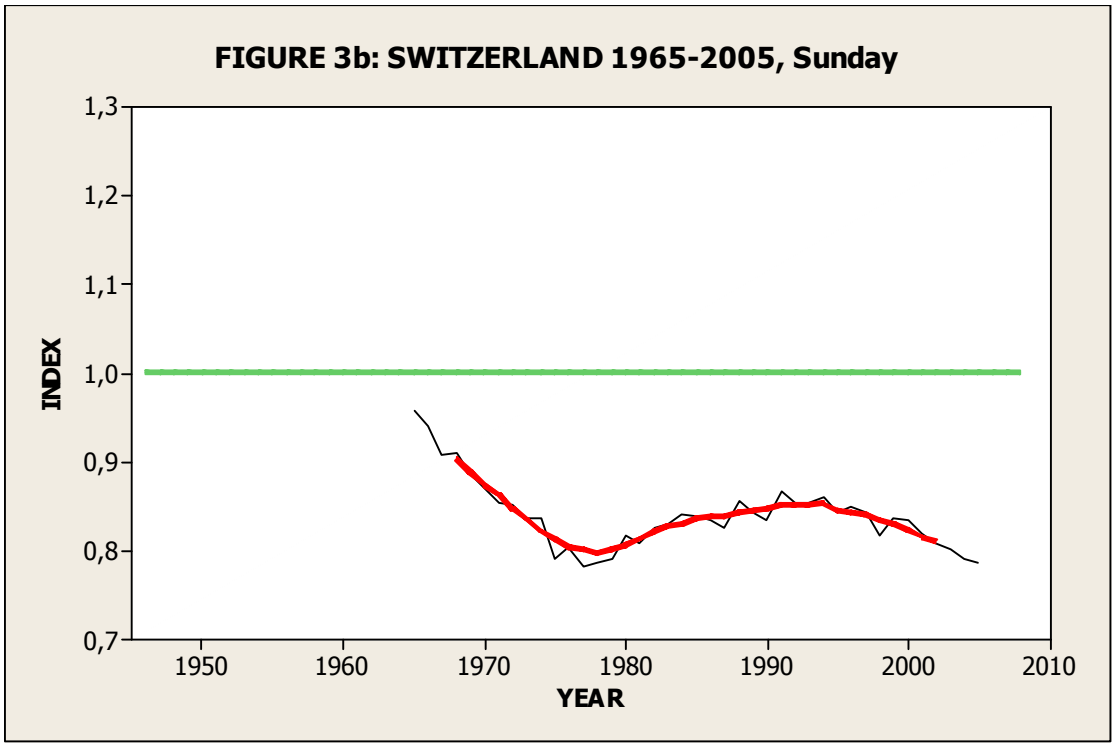


FIGURE 3b: SWITZERLAND 1965-2005, Sunday
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FIGURE 4a: SWEDEN 1968-1996, 1999-2005, 2007, Saturday

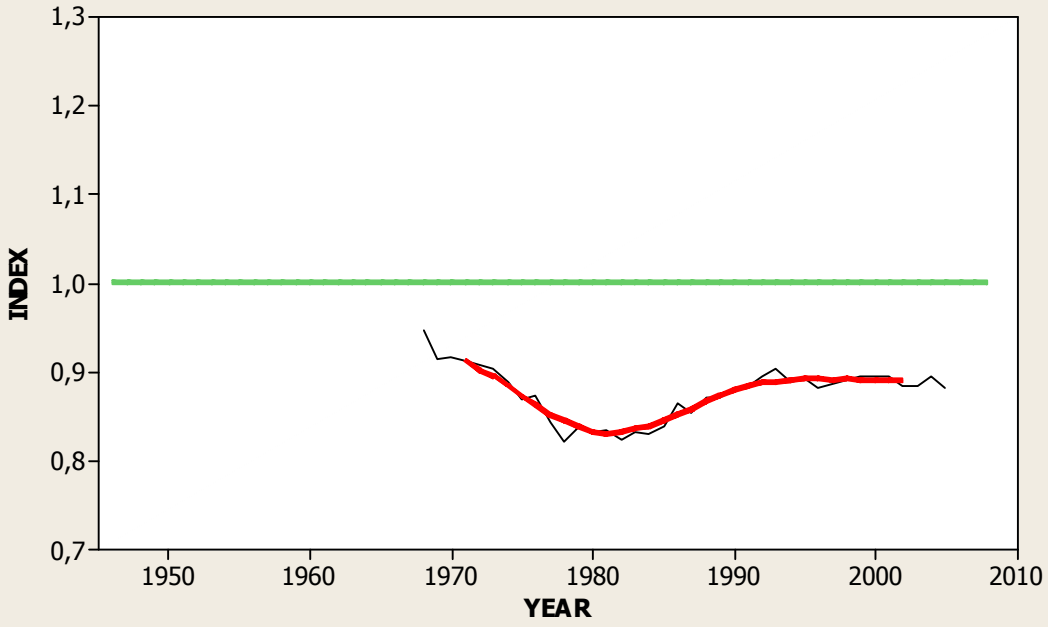


FIGURE 4b: SWEDEN 1968-1996, 1999-2005, 2007, Sunday

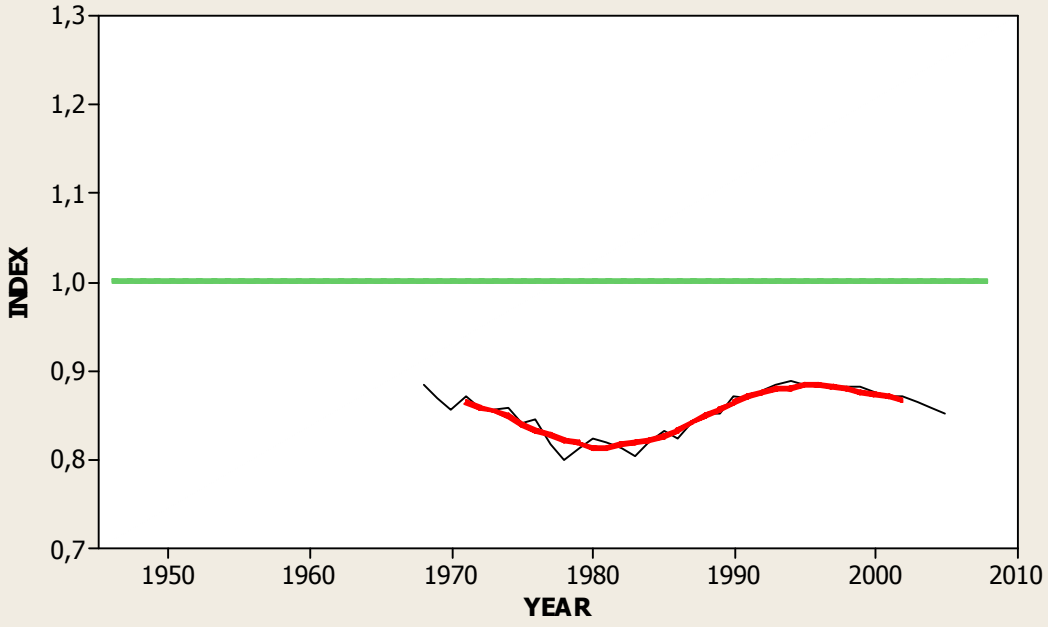


FIGURE 5a: THE NETHERLANDS 1989-1996, 1999-2005, Saturday

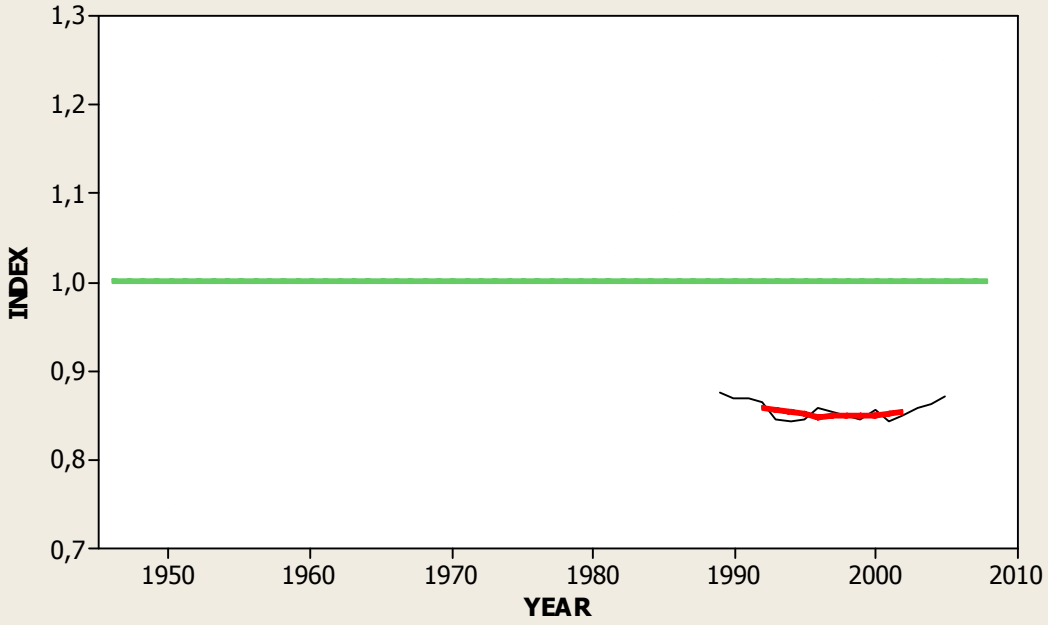
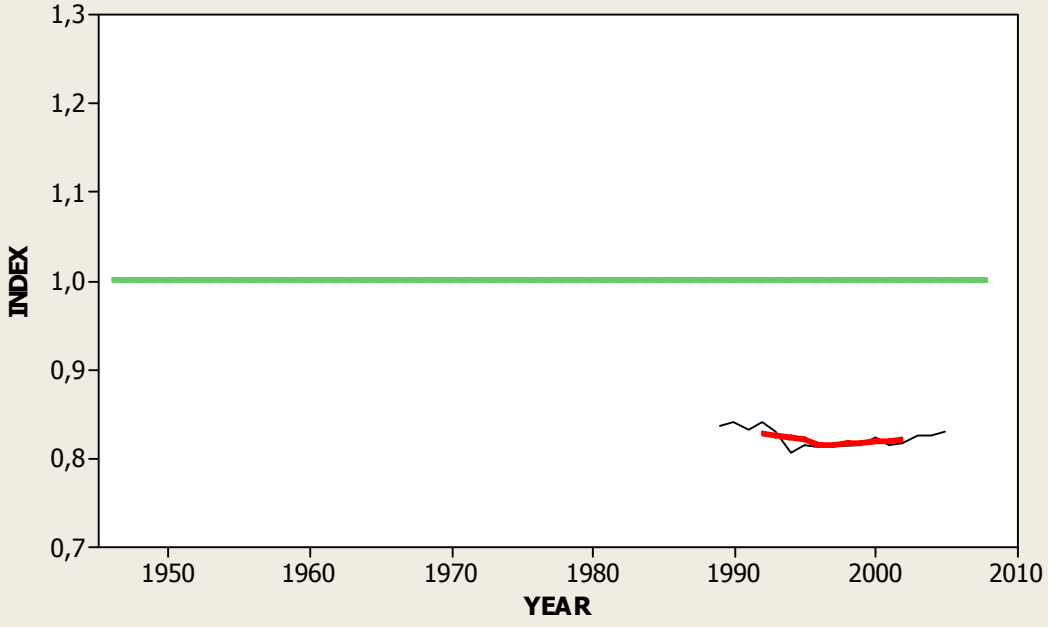


FIGURE 5b:THE NETHERLANDS 1989-1996, 1999-2005, Sunday



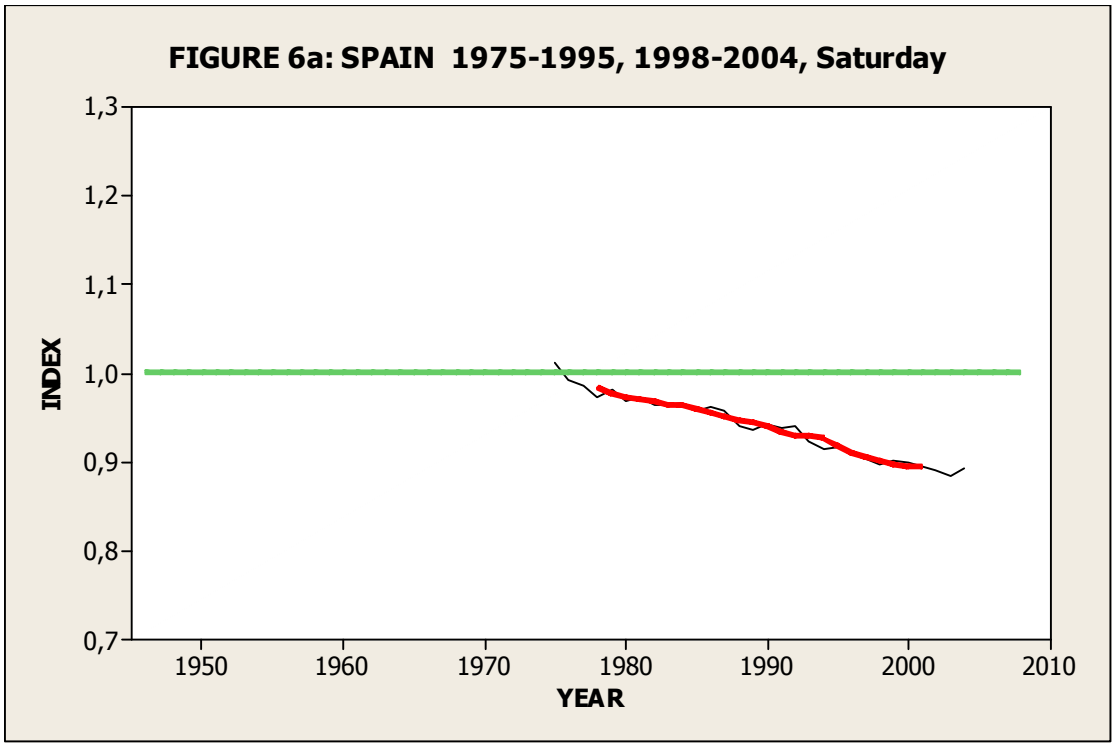


FIGURE 6a: SPAIN 1975-1995, 1998-2004, Saturday
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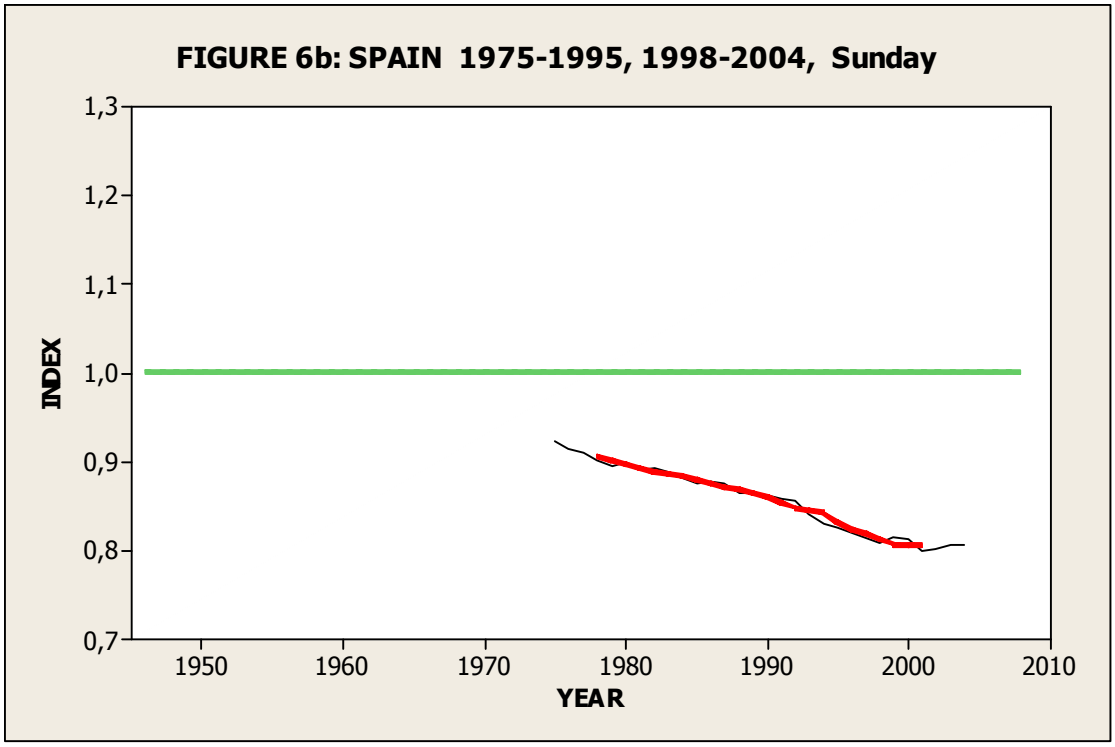
FIGURE 6b: SPAIN 1975-1995, 1998-2004, Sunday
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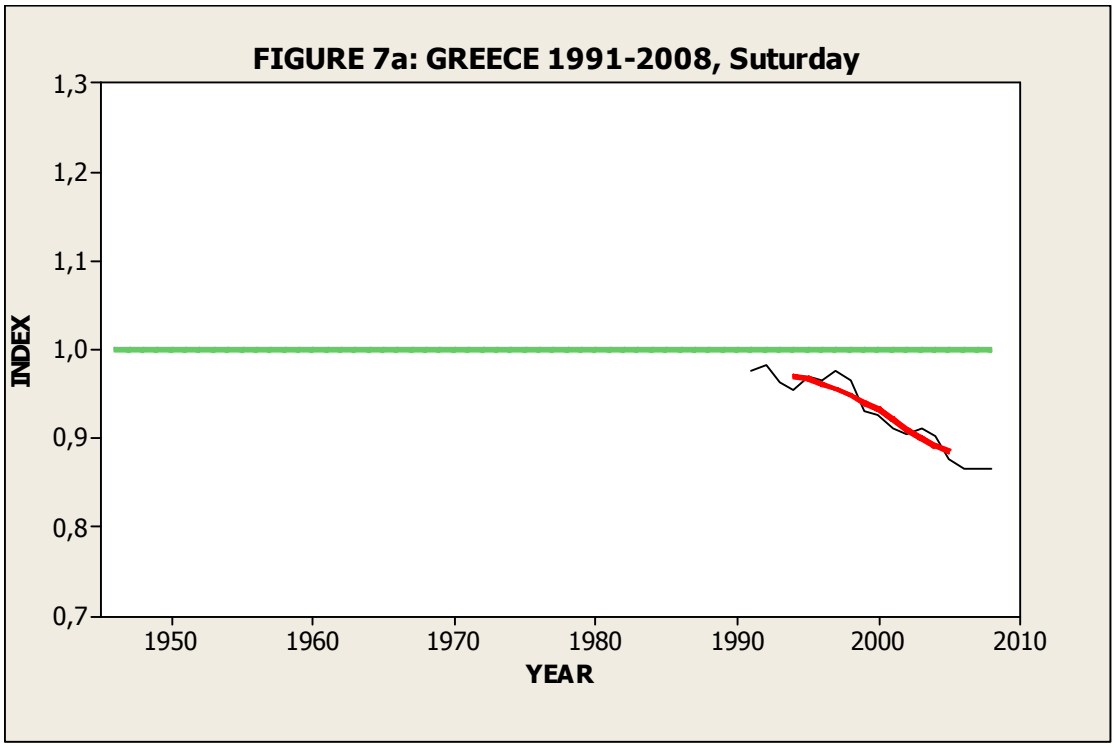
FIGURE 7a: GREECE 1991-2008, Suturday
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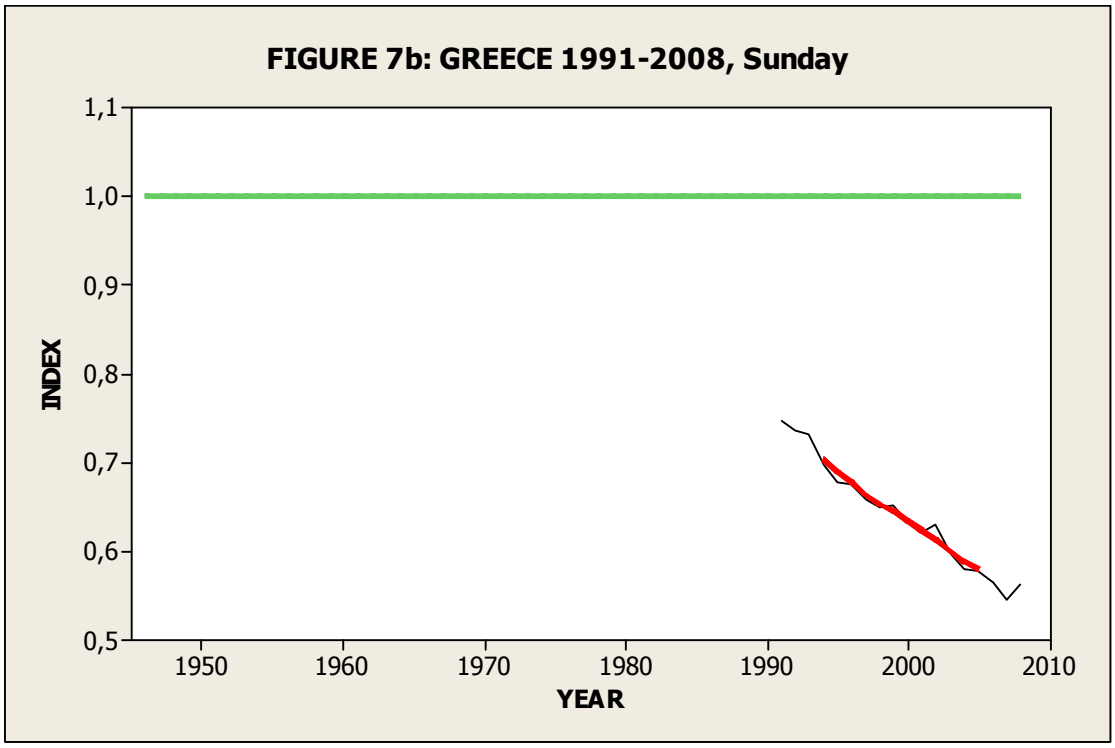
FIGURE 7b: GREECE 1991-2008, Sunday
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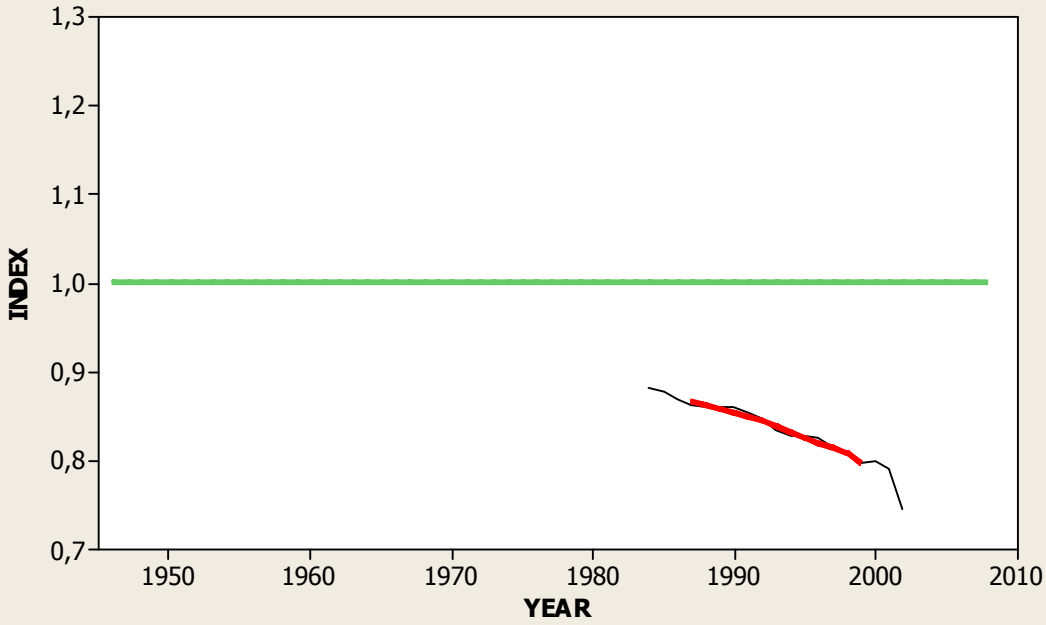
FIGURE 8a: USA 1993-2001, Saturday



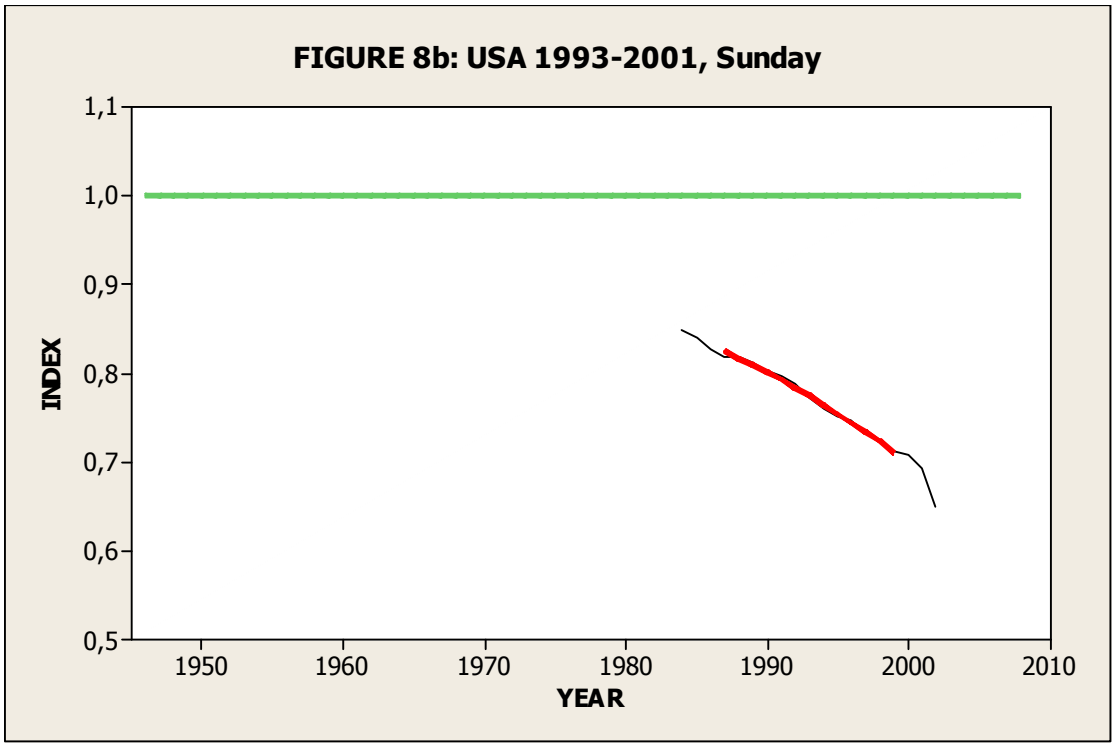


FIGURE 8b: USA 1993-2001, Sunday
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Historical data available for Austria, France, and Switzerland, highlight the unequal distribution of deliveries throughout the week days, a trend originated in the late 60's in most countries of central and Western Europe. The emerging practices of the medical profession in these countries, led to a gradual decline of deliveries on Sundays and then, about ten years later, on Saturdays too. The drop of deliveries in the two last week days has obviously resulted to a rapid rise of deliveries in the other week days, especially Tuesdays. Apparently, the awareness of both the medical and paramedical professions, as well as the public health services in Austria and Switzerland in the mid 80's, and a decade later in France too, resulted to a moderate braking of this trend in these countries. This reversal process continued for roughly two decades in Austria but it did not lead to a permanent reversal of the trends, since in the early 2000 the downward trend returned, resulting to a dramatic drop of the daily coefficient of births for Saturdays and Sundays, reaching in 2005 its post-war minimum (882 and 864 for Saturdays and Sundays respectively in Austria and 856 and 786 in Switzerland). Roughly the same trends characterized the Nordic countries and the Netherlands. In these countries the decline in births at the end of the week was interrupted in the early 80's. Thereafter, in the Netherlands the values of the daily coefficient of births were stabilized, while Sweden exhibited the same behaviour as Austria since the downward trend became restarted.

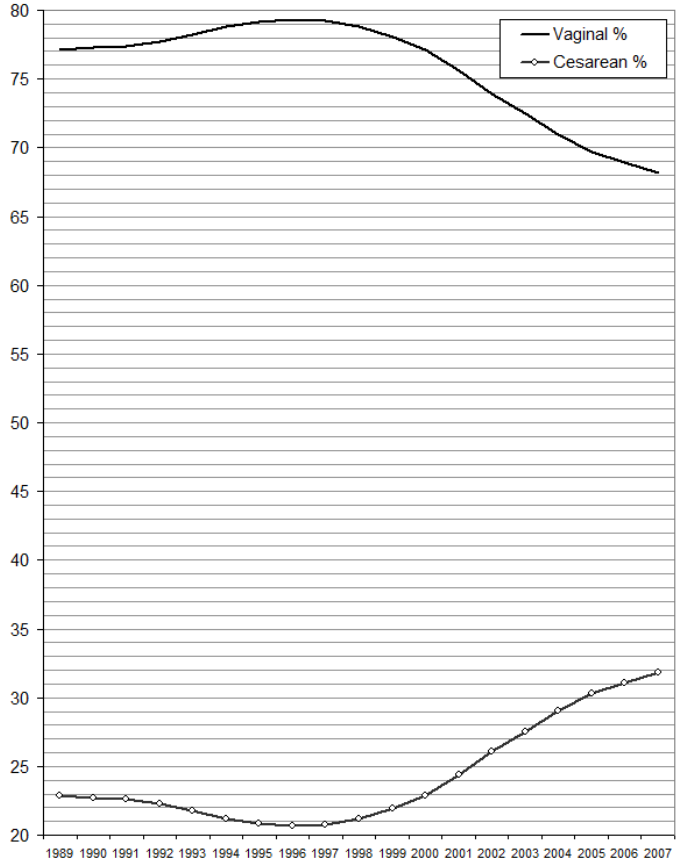
The Southern European countries exhibit a different picture than the countries of Western, Central and Northern Europe. The unequal distribution of births started much later (in the early 70's in Spain and a decade later in Greece), while the downward trends are much more rapid and have not shown any reverse trend yet. The daily coefficients of births for Sundays, take extremely low values for these two countries (0.562 to Greece in 2008, and 807 for Spain in 2004).

The time lag of the appearance of the unequal distribution of deliveries during week days in the Southern European countries might be attributed to the facts that the percentage of induced vaginal deliveries and caesareans as well as the percentage of out hospital deliveries in the first post war decades, in these countries were much lower in the Northern and Central European countries.

Finally, the trends of the United States only slightly differ from those of the Southern European countries, exhibiting a rapid decline in the values of the daily coefficient of births in recent years, without showing any reverse trend yet. In this

country, the rapid decline of the daily coefficient of births for Saturdays and Sundays, especially after 1987, is highly related to the increase of caesarean deliveries (while until the middle of the 1980 was ¼ of the total number of births, in 2007 obtained the 1/3 of the total, as illustrated in Figure 9).

Figure 9: Live births by method of delivery, United States, 1989-2007



Caesareans and, in a lesser degree, induced vaginal deliveries are both easily scheduled and therefore they highly contribute to the uneven distribution of deliveries throughout the week days. Available data of the USA for the year 1997 confirm their impact. Obviously the rapid increase of the percentage of caesareans between 1987 and 2007 and most probably of induced vaginal deliveries too, justifies the significant decrease of the coefficient values for Sundays and Saturdays, passing from 81,9 for Sundays and 86,2 for Saturdays in 1987 to 46,5 and 56,4 respectively in 2007.

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