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**FERTILITY IN ITALY AND SPAIN:  
WHAT IS THE ROLE PLAYED BY FOREIGNERS?  
A DECOMPOSITION MODEL RESULTS \***

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## **1. Introduction**

Growing attention is being placed on the demographic behaviour of immigrants in southern European countries which, having become major receiving areas in the past few decades, have recently recorded a fast growth of their foreign populations and, at the same time, a remarkable increase in related demographic events (Coleman, 2006; Cordón, Maldonado, 2006; Sardon, 2006; Bonifazi, 2007; Sobotka, 2008). In particular, an analysis of the immigrants' reproductive behaviour appears to be of special interest in two countries, namely Italy and Spain, which have recorded the lowest levels of the pe-

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riod total fertility rate (TFR) among the countries with a certain demographic size (Livi Bacci, Deldado Perez, 1992; Golini, 1999; Kohler et al., 2002; Billari e Kohler, 2004; Roig Vila M., Castro M., 2007).

In these two countries foreigners have become a major reality both in absolute terms and in terms of demographic weight. At the beginning of 2007 the foreigners registered at the *Padrón Municipal* in Spain are almost 4.5 million; in Italy, residents alone are very close to 3 million and, considering also non-residents, both regular and irregular, the figure reaches almost 4 million (Blangiardo, 2008). In Spain foreigners account for almost 10% of total residents, in Italy slightly less than 7% if non-resident foreigners are also considered. Simultaneously with the foreign population growth, both countries have also recorded a slight increase in total fertility: in the 1995-2006 period the TFR grew from less than 1.2 to more than 1.35 children per woman in both Spain and Italy (Ine, 2008; Istat, 2008). The values of period TFR recorded by foreign women were remarkably higher, even though quickly decreasing over time in the case of Spain, while those of mean age at childbearing were definitely lower than those of national women. Although the synthetic values of period fertility for migrants must be considered with great caution (see Toulemon, 2004; 2006)<sup>1</sup>, they indicate a contribution of these populations to the period total fertility. This raises a few questions.

To what extent has the contribution of foreign women affected the recent evolution of fertility in Italy and Spain? How much was late fertility limited by the immigrants with more intense reproductive behaviours in younger age groups? Is it possible to identify any differences between the two countries in the contribution to period fertility by immigrant women? And to what extent do situations vary across the regions of either country? Decomposition methods of TFR variations and late fertility proportion in the 2001-2006 period will be used to try to answer these questions in order to quantify the contribution of the foreign component.

## **2. Decomposition models of fertility variation**

### *2.1. Contribution of foreign women to TFR variation*

In order to assess to what extent the period TFR variation in the last few years has been caused by the contribution of foreign women a decomposition model has been proposed which makes it possible to measure the absolute and relative contribution of national (N) and foreign (F) women to total fertility (Strozza *et al.*, 2007). The absolute variation of the TFR in a given period ( $\Delta$ TFR) depends on three effects: the TFR varia-

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<sup>1</sup> The measurements of fertility used in this paper assume a hypothesis of homogeneity. The available data (notably for Italy) do not allow to apply the solutions proposed by Toulemon (2004 and 2006), based on women's ages at the time of migration and on their prior fertility.

tion of national women; the TFR variation of foreign women; the variation of foreign women's incidence in the reproductive age group. In a formula:

$$\begin{aligned} \Delta TFR = & \sum \Delta f_x^F \cdot \left( {}_0\bar{d}_x^F + \frac{1}{2} \Delta \bar{d}_x^F \right) + \sum \Delta f_x^N \cdot \left( {}_0\bar{d}_x^N + \frac{1}{2} \Delta \bar{d}_x^N \right) + \\ & \sum \Delta \bar{d}_x^F \left[ ({}_0f_x^F + \frac{1}{2} \Delta f_x^F) - ({}_0f_x^N + \frac{1}{2} \Delta f_x^N) \right] \end{aligned} \quad [1]$$

where  $\Delta$  stands for the variation in the time interval 0-1,  $f_x^N$  and  $f_x^F$  for the fertility rate at age  $x$  of autochthonous and foreign women respectively, whereas  $\bar{d}_x^N$  and  $\bar{d}_x^F$  indicate the proportion between autochthonous and foreign women aged  $x$  (subscript at the front is reference to the year).

Following a classical approach, the contribution of each of the three factors was assessed by distinguishing the simple effects from those due to the conjoint variation of two or all the three factors and to the interaction effect. Because the fertility variation of foreign women and that of autochthonous women are considered to be independent of each other, the interaction takes on a nil value. Therefore the threefold interaction between the three factors considered is also nil. As a consequence, the components of the evolution may be summarised as follows:

$$\begin{aligned} \Delta TFR = & \Delta(TFR^F) + \Delta(TFR^N) + \Delta(\bar{d}^F) + I(TFR^F, \bar{d}^F) + I(TFR^N, \bar{d}^F) = \\ = & \Delta_2(TFR^F) + \Delta_2(TFR^N) + \Delta_2(\bar{d}^F) \end{aligned} \quad [2]$$

where the *simple effects* due to the variation of one of the three factors considered, assuming the values of the remaining two factors as stable in time, are equal to:

$$\begin{aligned} \Delta(TFR^F) &= \sum_{x=15}^{49} \Delta f_x^F \cdot {}_0\bar{d}_x^F, \\ \Delta(TFR^N) &= \sum_{x=15}^{49} \Delta f_x^N \cdot {}_0\bar{d}_x^N = \sum_{x=15}^{49} \Delta f_x^N \cdot (1 - {}_0\bar{d}_x^F), \\ \Delta(\bar{d}^F) &= \sum_{x=15}^{49} ({}_0f_x^F - {}_0f_x^N) \cdot \Delta \bar{d}_x^F, \end{aligned}$$

while the *double interactions*, obtaining by subtracting the simple effects from the double effects, are equal to:

$$I(TFR^F, \bar{d}^F) = \Delta(TFR^F, \bar{d}^F) - \Delta(TFR^F) - \Delta(\bar{d}^F) = \sum_{x=15}^{49} \Delta f_x^F \cdot \Delta \bar{d}_x^F$$

$$I(TFR^N, \bar{d}^F) = \Delta(TFR^N, \bar{d}^F) - \Delta(TFR^N) - \Delta(\bar{d}^F) = \sum_{x=15}^{49} \Delta f_x^N \cdot \Delta \bar{d}_x^N.$$

In synthesis, the decomposition model of the TFR variation contains five additional elements, three of which are the single effects and two the interaction effects. If we attribute the double interactions equally to the single effects involved, we go back to the three factors of formula [1], to which we will be referring in the paper. Each of these three components is nothing but the sum total of the single effects, due to the variation of that component alone over time, and of part of the effects of the double interactions of that component with each of the other two.

## 2.2. Contribution of foreign women to fertility variation at age 30 and over

The proportion of late fertility, that is fertility realised at age 30+ (%TFR<sub>30+</sub>), only provides a period view of the degree of total fertility ageing, always considering implicitly the underlying changes in the calendars of the cohorts (Giorgi, Mamolo, 2007). Thus the increase in the fertility proportion at age 30+ in a period perspective does not necessarily correspond to an increase in fertility at age 30+ for the different components by nationality considered. For example, a positive variation may be due to the dynamics of fertility in young ages (Giorgi, 1995), just like changes in the structure by birth order, even in the absence of changes to the calendar in the single orders, may bring about changes in the total fertility calendar.

In order to assess the contribution of foreign women to the %TFR<sub>30+</sub> variation we are going to adopt the decomposition model used by Giorgi and Mamolo (2007). The dimension related to the birth order is replaced by the dimension related to the mother's nationality. Despite the limitations of the indicator used, the aim is to quantify the effects on the variation of the %TFR<sub>30+</sub> of fertility in women who are citizens of the country under study compared to the fertility of foreign women. This paper attempts to explain fertility proportion dynamics at age 30+ dividing the effects of fertility changes into two broad age groups (15-29 and 30 and over) and by nationality, distinguishing national women (N) from foreign (F) ones. Unlike for intensity (section 2.1), this part of the paper uses a measurement of fertility based on the total population.

Following the general model described in Giorgi and Mamolo (2007) drawing on the classical models of additional decomposition with a structure with single, conjoint, interaction and total effects (Kitagawa, 1955; Das Gupta, 1978), the variation of the period fertility rate at age 30+

$$\Delta \frac{TFR_{30+}}{TFR} = \left( \frac{{}^*TFR_{30+}}{{}^*TFR} - \frac{TFR_{30+}}{TFR} \right) = \frac{TFR \cdot {}^*TFR_{30+} - {}^*TFR \cdot TFR_{30+}}{{}^*TFR \cdot TFR} \quad [3]$$

is decomposed using a four-parameter model:

$$\Delta \frac{TFR_{30+}}{TFR} = \Delta_{tot}(TFR_{15-29}^N) + \Delta_{tot}(TFR_{30+}^N) + \Delta_{tot}(TFR_{15-29}^F) + \Delta_{tot}(TFR_{30+}^F) \quad [4]$$

The four parameters considered are the period fertility of autochthonous ( $TFR_{15-29}^N$ ) and foreign ( $TFR_{15-29}^F$ ) women at ages 15-29, the period fertility of autochthonous ( $TFR_{30+}^N$ ) and foreign ( $TFR_{30+}^F$ ) women at age 30+. The total single element, for example  $\Delta_{tot}(TFR_{15-29}^N)$ , results from the sum total of the simple, double, triple effects and of their respective interaction effects (Giorgi, Mamolo, 2007).

For example, one would obtain the simple effect:

$$\Delta(TFR_{15-29}^N) = \frac{-\Delta TFR_{15-29}^N \cdot TFR_{30+}}{TFR \cdot (TFR + \Delta TFR_{15-29}^N)}$$

the double simple effect:

$$\Delta(TFR_{15-29}^N, TFR_{15-29}^F) = \frac{-TFR_{30+} \cdot (\Delta TFR_{15-29}^N + \Delta TFR_{15-29}^F)}{TFR \cdot (TFR + \Delta TFR_{15-29}^N + \Delta TFR_{15-29}^F)}$$

the double interaction effect:

$$I(TFR_{15-29}^N, TFR_{15-29}^F) = \Delta(TFR_{15-29}^N, TFR_{15-29}^F) - \Delta(TFR_{15-29}^N) - \Delta(TFR_{15-29}^F)$$

the double effect:

$$\Delta_2(TFR_{15-29}^N) = \Delta(TFR_{15-29}^N) + \frac{1}{2}(I(TFR_{15-29}^N, TFR_{15-29}^F) + I(TFR_{15-29}^N, TFR_{30+}^N) + I(TFR_{15-29}^N, TFR_{30+}^F))$$

and, continuing this way and deriving the various simple and interaction effects, one would reach the total effects of formula [4].

### 3. Results

The analysis was carried out for Italy and Spain between 2001 and 2006. Alongside the national level, the analysis was also performed at the territorial level of provinces, even though an analysis of fertility by nationality with such a geographical detail may raise some issues about the qualitative level of the values ob-

tained. The data used for the births and the populations have been drawn from the online databases available at ISTAT and INE.

### 3.1. The contribution of foreign women to period fertility

The period TFR estimates for Italy and Spain show a slight increase in fertility levels in the two countries between 2001 and 2006, a level which today is equal to 1.36 children per woman in both countries (Table 1). The absolute increase is greater in Spain than in Italy (138 and 91 children per 1000 women, respectively), but it resulted from common determinants, that is the greater incidence of foreign women and the increase in period fertility among autochthonous women. While in Italy these components seem to have acted to the same extent (48 and 43 children per 1000 women respectively), in Spain the effect due to increased fertility among Spanish women is predominant (50 as compared to 106 children per 1000 women). Finally, it is interesting to remark that the effect due to the intensity of the phenomenon among foreigners has always been irrelevant with reference to the recovery of total fertility: nil in the case of Italy and even negative in the case of Spain.

**Table 1** – *Period TFR variation between 2001 and 2006 and effects due to the variation of foreign women's incidence, of the TFR of foreign and autochthonous women in Italy and Spain.*

Country	TFR (per 1000 women)		TFR absolute variation 2001-2006	Effects due to the variation of:			Total effect due to foreigners
	2001	2006		Incidence of foreigners	TFR foreigners	TFR nationals	
Italy	1265	1356	91	48	0	43	48
Spain	1219	1357	138	50	-19	106	31

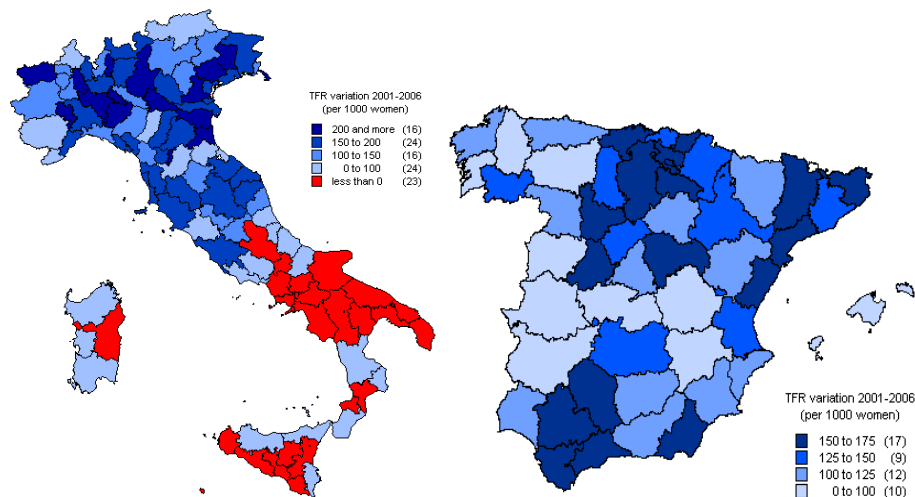
Going down from the national level to the detail of different areas across the country, the results of the decomposition model highlight a few remarkable features.

Italy is characterised by two different trends, i.e. a remarkable increase in fertility in northern provinces and its decline in southern provinces, which means that the north-south gap that used to be expressed also by the reproductive behaviour (Santini, 1995; 2006; Caltabiano, 2006) is becoming smaller. Conversely, in Spain a widespread recovery of fertility appears across the country, despite some clear differences at the territorial level (Figure 1).

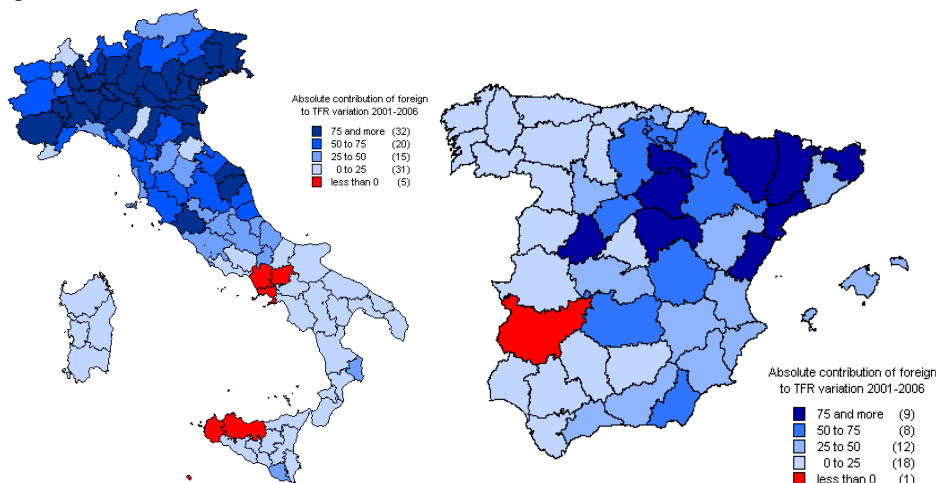
The overall contribution of foreign women to the recovery of fertility in Italy is remarkable in the north of the country, especially in Piedmont, Lombardy, Veneto and Friuli, and only minor in the south, which records a negative contribution in some provinces of Campania and Sicily (Figure 2). In Spain there seems to be a

territorial gradient along the east-west axis: the contribution of non-autochthonous women to total fertility is very small in the provinces of Galicia, Andalusia and Extremadura (negative in the province of Badajoz) and greater in the provinces of Aragon, Cataluña and Castile-La Mancha. The fundamental hypothesis is that these differences mirror both the different weight of the immigrant population in the various areas of the two national territories (Strozza *et al.*, 2007) and the different migration models and compositions by area of origin of the communities living in them (Cordón, 2006; Sobotka 2008). The effect of the immigrant population incidence corresponds to the geography of foreigners' settlements in the two countries, pointing to a greater variation in the provinces with stronger, more dynamic economies in the centre and north of Italy and in the east of Spain.

**Figure 1** – Variation of total period fertility in Italy and Spain 2001-2006.



**Figure 2** – Contribution of foreign women to the variation of period total fertility in Italy and Spain 2001-2006.



In the two countries under study numerous provinces recorded a decline in TFR among immigrant women in 2001-2006. Interestingly, the areas where such reduction was stronger are those in which, paradoxically, the total contribution of foreign women to local fertility was greater and totally attributable to the increase in immigrant population on the territory alone.

### 3.2. The contribution of foreign women to late fertility dynamics

In 2001 and 2006 the proportion of fertility after the age of 30 (%TFR<sub>30+</sub>) is equal to 54.11% and 57.96% respectively in Italy and 59.22 and 60.11% in Spain (Table 2). In both countries the proportion of late fertility increased in 2001-2006, which, notwithstanding the interpretation limits of the measurement, suggests an ageing of fertility.

The contribution of autochthonous women in their respective countries, both over and under the age of 30, favours an increase in the proportion of fertility at age 30+: fertility decreases at young ages and increases at older ages.

In Italy the contribution of Italian women to the relative variation of the late fertility proportion is equal to +6.1% under the age of 30 and +4.1% over. In Spain, the contribution of Spanish women to the relative variation of the fertility proportion after the age of 30 is equal to +3.5% before 30 and +2.5% after 30. The role of autochthonous women thus appears to be always positive in their respective countries and to contribute to increasing the proportion of late fertility.



**Table 2** – Fertility proportion at age 30+, variations of the fertility proportion at age 30+, relative single effects and aggregated effects.

	Italy		Spain	
	2001	2006	2001	2006
	2001-06		2001-06	
$\%TFR_{30+} / TFR$	54.10	57.96	59.22	60.11
$\% \Delta(TFR_{30+} / TFR)$	7.1251		1.4987	
<i>Single effects</i>				
$\Delta_{tot}(TFR_{15-29}^N)$	6.0864		3.4728	
$\Delta_{tot}(TFR_{30+}^N)$	4.1234		2.4808	
$\Delta_{tot}(TFR_{15-29}^F)$	-5.2177		-6.8938	
$\Delta_{tot}(TFR_{30+}^F)$	2.1330		2.4388	
<i>Aggregated effects</i>				
$\Delta_{tot}(TFR^N)$	10.2098		5.9536	
$\Delta_{tot}(TFR^F)$	-3.0848		-4.4549	
$\Delta_{tot}(TFR_{15-29})$	0.8687		-3.4209	
$\Delta_{tot}(TFR_{30+})$	6.2564		4.9196	

In both countries the greater role played by national women can be attributed to the reduction of fertility in the age group under 30 (+6.1% and +3.5%), which means the ageing of fertility is mainly due to its reduction in the younger age groups. Foreign women aged 15-29 always bring down the proportion of fertility at age 30+, which means they seem to contribute to bringing down the age of fertility or at least to slowing down its ageing imposed by local women: in Italy, Italian women contribute with +10.2%, slowed down by -3.1% of foreigners; in Spain, instead, Spanish women contribute 5.95%, slowed down by -4.45% of foreigners. Thus autochthonous women, in their respective countries, always bring  $\%TFR_{30+}$  up, causing an ageing of fertility, whereas foreign women always play the opposite role.

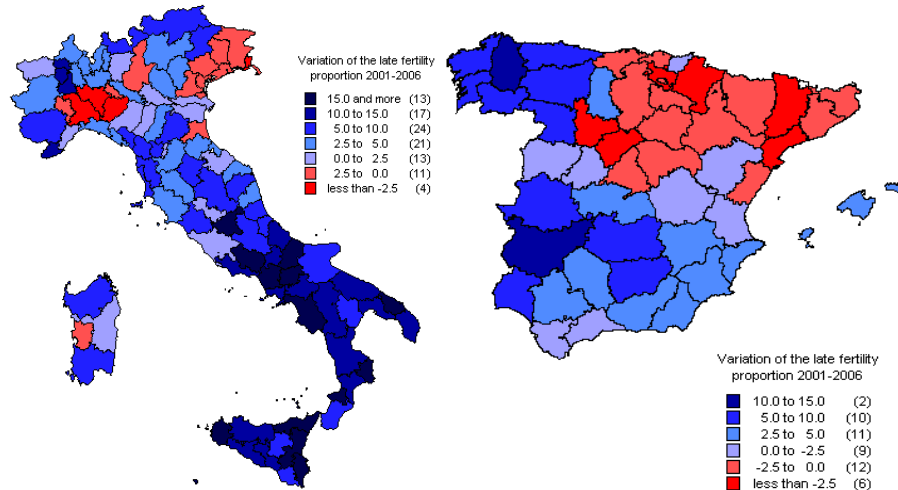
At the level of provinces, the model's parameters highlight some rather interesting aspects. In both countries there is a territorial gradient in the proportion of fertility at age 30+. In Italy this gradient ranges from the lowest values in the south to the highest in the north, whereas in Spain the south-north gradient seems to be complemented by the east-west one. There is also a gradient in the variation of  $\%TFR_{30+}$ .

Fertility tends to rejuvenate in the regions which have reached the highest levels in late fertility, mostly in northern Italy and the north-west of Spain, while the southern areas of both countries keep recording an increasing proportion of  $\%TFR_{30+}$  (Figure 3). In the provinces of southern Italy the decline in fertility in the younger age groups plays the main role, whereas in the north this adds up to the

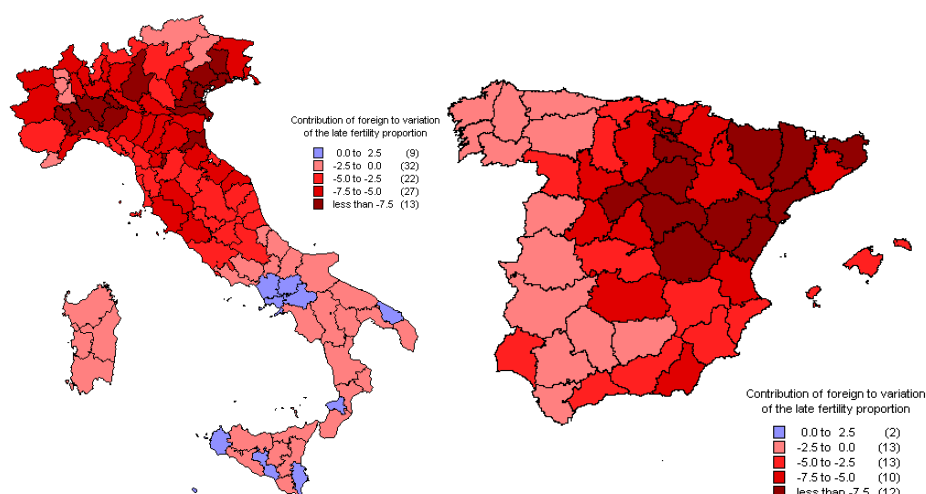
role of actual fertility at age 30+. In northern Italy and in most of Spain fertility under the age of 30 slows down the %TFR<sub>30+</sub> increase thanks to the contribution of foreign women's fertility, which manages to contrast the decline of fertility among autochthonous women. In southern Italy the predominant element is the negative effect of autochthonous women's fertility under the age of 30. In Spain fertility at age 30+ is increasing, although with a less clear-cut and evident territorial gradient. Foreigners always have a role in slowing down the %TFR<sub>30+</sub> increase, even though there are some exceptions in southern Italy. The positive effect of foreign women's fertility is most evident in some provinces in northern Italy and the north-west of Spain (Figure 4). The contribution of foreign women aged less than 30 reduces the ageing of fertility, while the contribution of foreign women aged more than 30, however positive, remains modest. The very evident territorial gradient highlights the growing slowing down from north to south in Italy and from south-west to north-west in Spain, and shows that in the northern regions of both countries the brake effect of young foreign women is stronger. In Italy this may be linked directly to the incidence of foreign women themselves.

Thus, the role of the foreign component in late fertility dynamics both in Italy and Spain becomes clear: foreign fertility slows down the increase of the proportion of fertility at age 30+. The effect is visible particularly under age 30 and in areas where late fertility is more pronounced, i.e. in northern Italy and north-eastern Spain where we noticed a decrease in %TFR<sub>30+</sub>.

**Figure 3 – Variation of late fertility in Italy and Spain 2001-2006.**



**Figure 4** – *Contribution of foreign women to the variation of late fertility in Italy and Spain 2001-2006.*



#### 4. In brief ... and to continue

The variation of total fertility in 2001-2006 appeared to be clearly due to two main factors, namely an increased foreign presence on the territory and a slight increase in fertility among autochthonous women. However, on the national scale, while these factors seem to have had a similar effect in Italy, in Spain the effect due to increased fertility among Spanish women seems to have been predominant.

In the period considered the proportion of late fertility increased in both countries, with foreign women – namely younger ones – always playing a role in slowing down the ageing of fertility.

At this stage, a few aspects seem to deserve further analysis. As far as decomposition models are concerned, it seems necessary, wherever possible, to go beyond the clear-cut distinction between the two solutions adopted in order to obtain a single model able to control the various dimensions taken into account simultaneously. In terms of approach, it seems important to assess whether and how it is possible to include the dimension of generations in the analyses: this aspect, how-

ever, raises problems about methods and, above all, the availability of longitudinal data concerning the foreign component. As for the assessment of results, it would certainly be useful to become able to link the results to the various structures by foreigners' area of origin and family type in order to assess whether some territorial gradients are linked to these aspects.

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