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Short-term reproductive behaviour of foreign women who became mothers between 2002-2006 in Italy

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Abstract

The rapid increase in the number of foreigners in Italy has raised public interest in their demographic behaviour. In 2001-2007 the annual number of births to at least one foreign parent has more than doubled, from about 41,000 to more than 86,000. The main objective of this study is to give an overview of the demographic characteristics of foreign mothers in Italy. We investigate the risk of having another birth for women who became mothers between 2002 and 2006. The new approach in this study is the application of a deterministic record linkage to Italian administrative data on births, which allows a longitudinal analysis of birth histories. The results show that citizenship remains one of the most important factors in explaining the high heterogeneity in the reproductive behaviour among the mothers. The possibility of an 'assimilative behaviour' to fertility patterns of native Italians increases for mothers whose partner is Italian.

1 Introduction

The number of foreigners resident in Italy has increased from 1.5 to almost 3.5 million in 2001-2008 (ISTAT 2008). If we take into account also non-resident, legal or illegal foreigners then about 4.5 million foreigners were assumed to be living in Italy at the beginning of 2008 (ISMU 2009), representing almost 7.2% of the total population. The rapid increase in the number of foreigners and, concurrently, their increasing contribution to the number of births and other

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demographic events, has raised public interest in their demographic behaviour in Italy. The new demographic developments coincide with an ongoing settling-down process of the foreign population. The continuing increase in the number of family residence permits proves that more and more foreigners choose to stay in Italy and live there with their family and relatives.

It is generally known that Italian fertility is one of the lowest in the world (Livi Bacci and Delegado Perez 1992). The total fertility rate (TFR) of foreigners is higher than for Italians and the age of childbearing notably younger (ISTAT 2008a).Therefore it is important to consider the effect that births with at least one foreign parent have on the total number of births in the country. The number of births of this kind increased from about 41,000 in 2001 to more than 86,000 in 2007[1] and their share of the total number of births increased from 7.6% to 15.5% in the same period.

Fertility behaviour of foreign women is a complex subject that raises important demographic and political questions. Numerous studies have been carried out to investigate different aspects of fertility behaviour of international migrants. Several studies have compared migrants from different countries residing in the same destination (Ford 1990; Kahn 1994), underlining differences in levels of 'childbearing propensities' between women from different countries of origin (Andersson 2004). The literature in Italy has mainly focused on estimating the fertility of the foreigners in the country (Maffioli and Castiglioni 1995; Natale and Strozza 1997) and studying the impact of the fertility of foreigners on the structure and dynamics of the population, with particular attention being paid to the TFR (Strozza et al. 2007). Some other studies have described the socio-demographic characteristics of foreign mothers in Italy (Sonnino 2003). The determinants of fertility and of family dynamics in general were also analysed on the basis of survey data which focused on specific regions and local areas (Bonomi and Terzera 2003; Terzera 2006).

The main objective of this study is to give an overview of the demographic characteristics of foreign mothers in Italy in 2002-2006 using the *Survey on Live Birth* of the resident population in Italy[2]. Owing to our methods of linking the data records, we consider all mothers of non-Italian citizenship as of 2002, as foreigners, irrespective of whether they became Italian citizens afterwards. We investigate the risk of having a second birth for the women who became mothers in the period under consideration with paying particular attention to the impact of citizenship on the choice of having a second birth.

Owing to the lack of specific data it is often not easy to answer these questions. In Italy, official surveys on births and fertility are generally not representative for foreign women (Strozza and Cibella 2006), while sample surveys on the demographic behaviour of foreigners are rarely conducted and refer to specific geographical areas with a high presence of foreigners.

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1 Data are available at www.demo.istat.it

2 Description available at www.demo.istat.it/altridati/IscrittiNascita/index.html

To overcome these data limitations and to demonstrate the usefulness of vital statistics data from administrative sources, we have implemented a deterministic record linkage of the births recoded from Municipal Population Registers in 2002-2006. These linked records allow us to explore the intensity of the reproductive behaviour of foreign women in Italy and its development over time. With this procedure we can extrapolate all births by foreign mothers in that period and analyse differences by citizenship in the risk of having another birth when controlling for several demographic characteristics.[3] In this way we obtain a representative picture of fertility behaviour for all mothers living in Italy in the period considered, even if we do not follow them throughout their entire reproductive period. The use of a record linkage on Italian administrative data that permits reconstructing longitudinal birth histories of foreign mothers constitutes a main innovation in this study.

The article is divided into four sections. In the second section we give a general overview of the data and methods. Results and conclusions are presented in the third and the fourth section. The appendix provides details on the methods and results of the record linkage.

2 Data and Methods

The data used come from the *Survey on Live Birth* of the resident population in Italy. They are recorded in Municipal Population Registers and have been collected by the Italian National Institute of Statistics (Istat) since January 1999. The individual form used (P4) includes information on births (date and place of birth, citizenship), parents (date of birth, citizenship and marital status), and the head of the household.[4] These surveys allow us to obtain detailed demographic information on all births at the municipality level. We considered the period 2002-2006 because since 2002 the survey has become more reliable and well-established and the number of births to foreign mothers has been higher and more relevant.

In the first step of our analysis we identify births to the same mothers in 2002-2006 by using record linkage techniques. The aim of this procedure is to identify the same women over the period analysed and acquire information about them and their children. At the end of the procedure we had 283,700 births from 252,

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3 It is not possible to study the risk of having the first birth in this period because the datasets do not include childless women. When interpreting the results of the study we should keep in mind that they refer to women who had a child between 2002 and 2006 irrespective of whether the births occurred in Italy or not.

4 The previous survey (from 1926 to 1998) by contrast was on the births among the *present* population in Italy and it included administrative, socio-sanitary and socio-demographic information. Since law 127/97, enacted in 1997, the socio-sanitary and some of the socio-demographic information has been excluded from the population register.

330 foreigners and foreign-origin mothers.[5] By reconstructing the fertility history of foreign mothers we can use the results of the record linkage as panel data. The new information that we received from the record linkage allowed us to study the timing of one or several births. To sum up, the aim of the record linkage was to create a dataset of foreign mothers on the basis of events obtained from a dataset on births. In this way each mother is linked to all her births during the period 2002-2006 (see Appendix).

Since the change in the law in 1997[6] it has not been possible to register parity in official Italian data. Thus, there is clearly a serious problem in estimating fertility rates by parity as well as in studying fertility in general. For this reason we had to estimate a proxy for women's parity by using a variable called 'number of cohabiting minors',[7] introduced in the P4 form in 2003. Already in 2004 ISTAT had validated this proxy by using the Birth Sample Survey (conducted in 2003). The analysis found a high correspondence between the parity information present in the survey and this variable. Our study further contributes to this validation because ISTAT focused on Italian mothers, while we are studying foreign mothers. We found that the quality of the proxy variable has been increasing over time. Overall, for 3.7% of all women the parity information was missing at the time of their first birth; however, most of the missing cases (52.3%) were registered in 2003 and only 3.1% in 2006. Between any two subsequent events (births) we observed coherence of 93.3% (registered number of children at the first event is lower than at the second) and perfect correspondence for 86.6% of all cases (for every event the variable increases by one). If we consider just the transition between the first and second birth the values for coherence and perfect correspondence increased to 100% and 92.8%, respectively.

In the second step of the analysis the linked records are analysed further. First, we provide descriptive statistics and a non-parametric analysis: the transition to the next birth is studied using Kaplan-Meier survival curves. Second, we study the impact of socio-demographic variables on the risk of having a second birth by the time (in months) since the birth of the first, using a piecewise exponential model (Allison 1984; Blossfeld and Rohwer 2001). We assume that the baseline is a piecewise constant function. The 'process time' was divided into segments after 12, 18, 24, 30, 36, 42 and 48 months. The hazard rates are constant for these time segments, but they can vary across them. We consider only the women reaching parity one in the period 2003-2006. Due to lacking information on their parity, women who had a first child before 2003 are not considered in this analysis. When interpreting our results we have to keep in mind that several

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5 These mothers were foreigners at the time of the birth of their first recorded child, but it is possible that they became Italian citizens later on during the period under observation.

6 Law 127/97

7 To use and evaluate this variable we have to limit our observation period to the years 2003-2006. In total 220,618 of women are present in the year 2003-2006, and for 120,525 of them the first registered event is their first child (Parity 1).

conditions had to be fulfilled in order to be included in the sample. All women who are considered in the analysis had to be resident in Italy and they had to register their first child in Italy between 2003 and 2006. In our event history analysis we consider all individuals as right-censored at the end of 2006 if they did not give a second birth during our observation period. In addition, we cannot track women who died or left Italy before the end of 2006. We also cannot account for left truncation (Blossfeld and Rohwer 2007) because we have no information on the migration history and on the first birth event for first births that happened before 2003.

We consider the following control variables: the characteristics of the mother (age, country and region of citizenship, marital status), the geographical context (Italian geographic division and city size of the mother's residency), the citizenship of the father[8] (macro area of citizenship: Italy, more developed country,[9] or "high migration pressure country" [this category includes all other countries]), the characteristics of the birth (born in Italy or abroad, year of birth and if it was a twin birth) and the proxy for parity.

The variables that we include in the models refer to the time of the first birth in the period considered. European comparative studies have shown that fertility is heterogeneous and different citizenships imply a different propensity for childbearing (Andersson 2004; Sobotka 2008). We assume the same for all foreign communities in Italy. They have different migration histories, levels of integration and family patterns, and they also come from countries with different fertility patterns. All these factors have an impact on their choice to have children in the host country. We plan to test the impact of citizenship and we assume that its effect remains strong when we control for other demographic characteristics of the mothers.

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8 On the form we have information about the father of the child. In this article we consider the father of the child as the partner of the mother.

9 European Union, Switzerland, San Marino, Norway, Monaco, Andorra, Liechtenstein, Malta, Iceland, Vatican City, United States of America, Canada, Israel, Japan and Australia and New Zealand.

3 Results

3.1 Foreign mothers in the period 2002-2006: General characteristics

Our database includes 252,330 foreigners and foreign-origin[10] mothers with a total of 283,700 births. Almost 12 % of these women had more than one birth between 2002 and 2006. Table 1 shows the distribution of foreign mothers by number of births in the period and by the region of citizenship and by the ten main citizenships separately. The women who have only one birth during the period tend to come from central and eastern Europe.[11] On the other hand, the women that have three or more births tend to come from North Africa.

Moroccans represent the largest group of mothers with one, two and even three or more births during our observation period. The Chinese are the second largest group of women with three or more births, although they ranked only fourth in the total distribution. They show higher fertility in Italy than in their home country (Golini 2006). The third largest group with three births in 2002-2006 comes from Tunisia, even though they represent only 3.4% of the women that have at least one birth in the period. In contrast, we found that Romanians, who rank third among women with one birth, are only the fifth largest group with three and more births. This is an interesting result because the Romanian proportion of the total number of migrants as well as the number of their children increased during the period 2002-2006, but they usually have just one birth, suggesting that they have a low fertility pattern, just as in their home country (Golini 2006). Albanians on the other hand have a high percentage of women with two births in the period, but they rarely have three or more births. Women from the Philippines with at least one birth in 2002-2006 represent the seventh largest group for the first birth but rank only 17th in the group with two deliveries recorded. It is probable that the low likelihood for women from the Philippines to have a second delivery is due to their older age structure at the previous birth.

Figure 1 shows the age distributions of women at the time of their first recorded birth by area of citizenship and for the seven largest national groups. In general there are significant differences in the age distribution of mothers by area of citizenship. African mothers seem to be very young while the women from

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10 Women who are recorded also for the second and third time in the period can receive Italian citizenship in the meantime, but their share of the total number of second and third births is small. In total 1,557 women changed their citizenship between the first and second birth during our observation period and almost 80% of them obtained Italian citizenship. Generally, these women have an Italian partner.

11 We consider women from the following countries: Albania, Belarus, Bosnia-Herzegovina, Bulgaria, the Czech Republic, Cyprus, Croatia, Estonia, Hungary, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, the Russian Federation, Serbia-Montenegro, Slovakia, Slovenia, Turkey and Ukraine.

more developed countries are considerably older when they give birth to a child. Of the seven largest citizenships, the Filipinos have the oldest distribution, while Albanians have the lowest mode value (21 years). The total distribution is closer to a normal distribution with a mode at age 27.

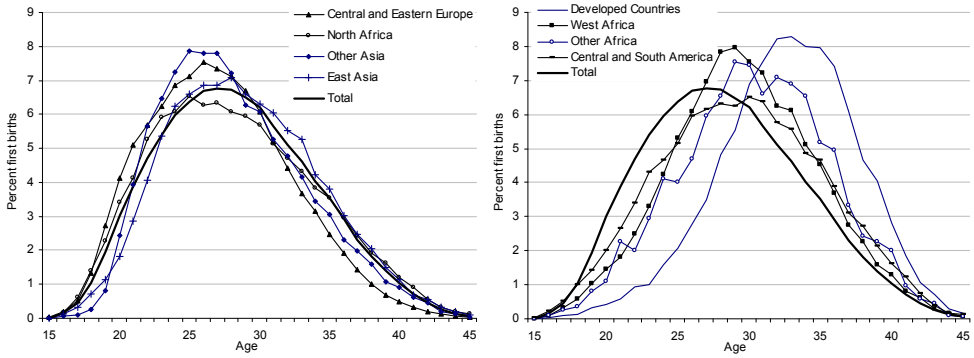
Table 1:
Percentage of foreign mothers by area of citizenship and for the main ten countries of citizenship distinguished by number of births in the period 2002-2006

Area of citizenship	Total		Only one birth		Two births		Three or more births	
	Rank	%	Rank	%	Rank	%	Rank	%
Central and eastern Europe	1	39.21	1	40.36	1	30.89	2	24.80
North Africa	2	19.84	2	18.48	2	29.69	1	35.15
Central and South America	3	9.47	3	10.07	7	5.22	7	1.94
East Asia	4	9.22	4	9.11	3	9.89	3	11.99
Other Asia	5	7.86	5	7.70	4	8.97	4	11.84
West Africa	6	6.02	6	5.73	5	8.06	5	10.57
More develeloped countries	7	5.27	7	5.22	6	5.67	6	2.45
Foreigner, unspecified	8	1.62	8	1.82	9	0.28	9	0.14
Other Africa	9	1.49	9	1.51	8	1.33	8	1.12
TOTAL		100.00		100.00		100.00		100.00
10 main countries of citizenship[(a)]								
Morocco	1	13.46	1	12.82	1	18.24	1	17.05
Albania	2	12.47	2	12.62	2	11.64	8	4.99
Romania	3	10.97	3	11.64	4	6.08	5	5.73
China	4	5.70	4	5.41	3	7.79	2	10.72
Tunisia	5	3.37	6	3.02	5	5.86	3	9.38
Poland	6	3.20	5	3.29	9	2.54	18	0.89
Philippines	7	2.75	7	2.91	17	1.57	17	1.04
Ukraine	8	2.22	8	2.36	20	1.19	25	0.45
Serbia and Montenegro	9	2.19	11	2.09	8	2.84	9	4.69
India	10	2.13	12	2.09	10	2.48	15	1.34
Others		41.54		41.75		39.77		43.72
TOTAL		100.00		100.00		100.00		100.00
Absolute values		252 330		222 335		28 652		1 343

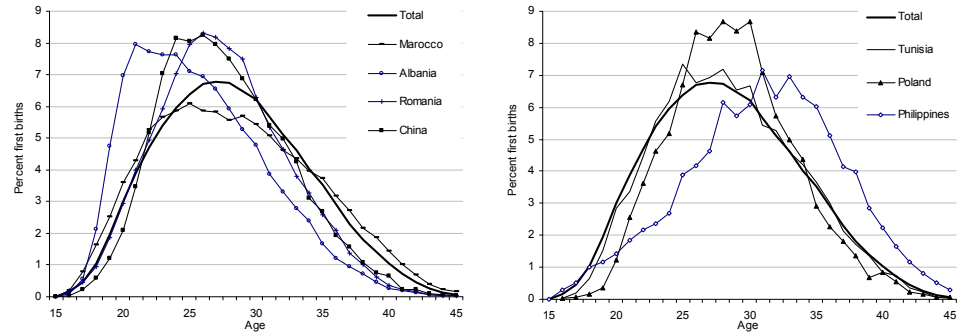
(a) We considered the first 10 citizenships as defined by the number of mothers with at least one child in the period.
Sources: Record Linkage between 2002-2006, authors' own elaboration.

Figure 1:
Age distribution at the first recorded birth in the period 2002-2006 for all women and for (a) the mother's region of citizenship and (b) for the seven main citizenships

(a) Mother's area of citizenship



(b) Mother's citizenship (top 7 countries)



Sources: Record Linkage between 2002-2006, authors' own elaboration

The distribution of foreign births is not homogeneous over the Italian territory. About 50% of all births took place in three regions (Lombardy, Veneto and Emilia Romagna). This is also the case for the first, second and even the third births in the period. These three regions comprised 31.6 % of the total Italian population and 45.8% of the foreign population at 1 January 2009. All are located in the north of Italy. It was also shown that a higher proportion of migrants settle in these regions as compared to other regions of Italy.

At the first recorded birth 74% of all women were married, while for the second and third event the percentage married was considerably higher (87%). In more than 24% of all cases the partner was Italian. This proportion is lower for women who have more than one birth in the period. The inclination to have an Italian partner varies by the mother's citizenship. While the likelihood of having an Italian partner is very low for women from Morocco, China and Tunisia, a

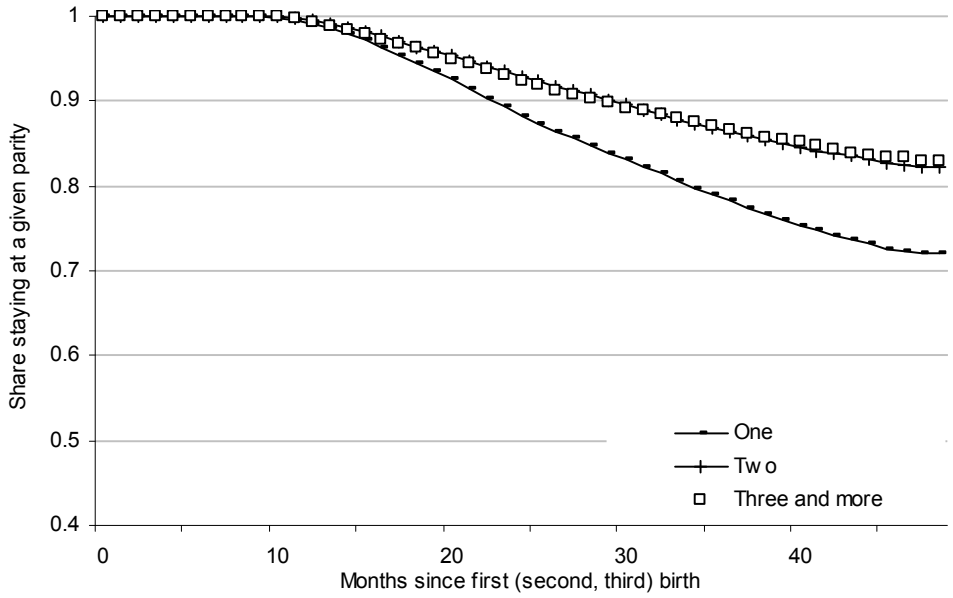
high proportion of women from European countries, especially Romanians and Poles, live as a mixed couple with an Italian partner.

3.2 Kaplan-Meier survival estimates

Considering these results we now investigate the influence of parity on the risk of having another birth (*n+1*) in the period, focusing on transition from the first to the second birth. We first estimate Kaplan-Meier survival functions without controlling for age at first birth, although Figure 1 indicates considerable differences between foreign groups with respect to their age distributions at childbearing.

To use proxy for parity we have to limit our observation period to the years 2003-2006. Figure 2 shows that the transition to another birth is higher for women at parity one[12] than for women of higher parities (Figure 2). There are no differences, however, between mothers of parity two, three and more.

Figure 2:
Transition to the next birth in the period 2003-2006 by parity



Sources: Record Linkage between 2003-2006, authors' own elaboration

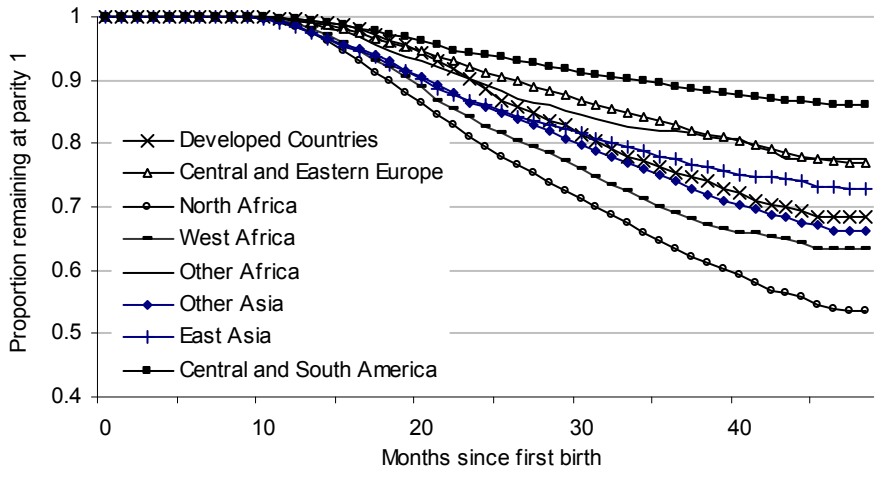
[12] They represent 55% of the population considered during the period 2003-2006.

We look in more detail at the transition to next birth for women who did not live with minors when the first birth in 2003-2006 was recorded (i.e., women who are assumed to have reached parity one in the period).

Figure 3 shows the transition from the first to the second birth by the citizenship of the parents (region and citizenship for the mother and broader geographical area for the partner). First results (Figure 3a) show that North African women have a higher risk of having a second birth: 46.4% had a second birth before 2006, which is significantly different from the other regions ($p < 0.001$). The lowest risk is observed for women who come from Central and South America; 86.1% remained at parity 1 in the period. The progression from first to second birth differs significantly between the seven main countries of citizenship (Figure 3b). Filipinos experience the lowest risk, which is probably due to the higher age structure of this group. The highest second birth risk is observed among Tunisian mothers: 52.3% had a second birth during our observation period. The transition from first to second birth is also affected by the area of citizenship of the partner (Figure 3c). The citizenship of the partner, especially if he is Italian, seems to have an impact on both the timing (Maffioli and Sonnino 1990) and the number of children. Women who have a partner from a high migration pressure country[13] experience about 10% higher risk of having a second birth than women with a partner from Italy or from another developed country. At the same time, the second birth also happens sooner for these women.

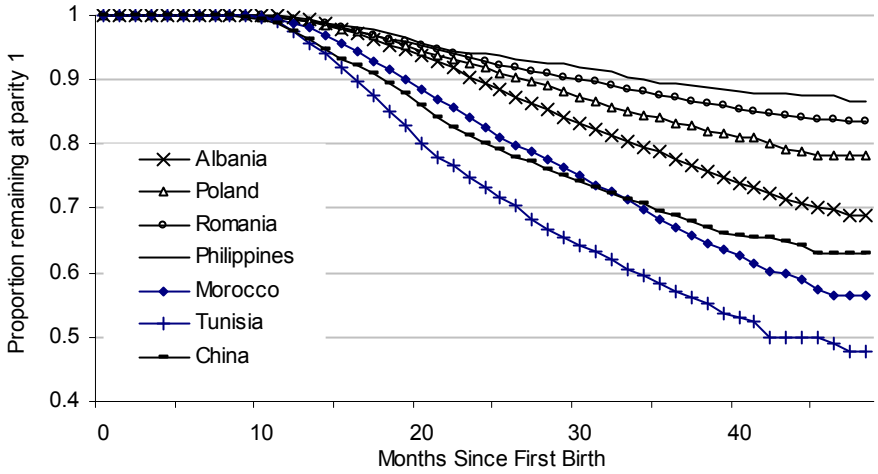
Figure 3:
Transition to the second birth in 2003-2006 by (a) mother's area of citizenship, b) by country of citizenship (main seven countries) and (c) by partner's macro area of citizenship

(a) Mother's area of citizenship

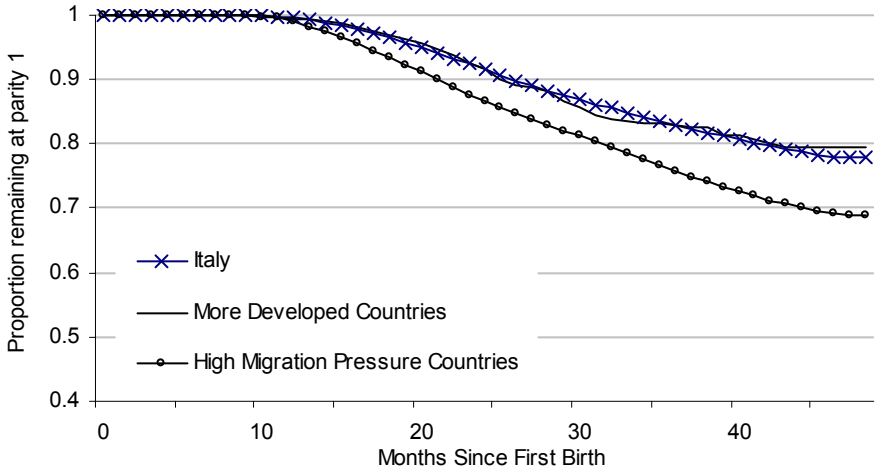


[13] As defined by Istat.

Figure 3 (continued)
(b) Mother's citizenship (top 7 countries)



(c) Partner's macro area of citizenship



Sources: Record Linkage between 2003-2006, authors' own elaboration

3.3 Risk of having a second child

The analysis showed that there are significant differences in the transition between the first and second child if we consider the characteristics of the mother and partner separately. In order to control for all the demographic characteristics simultaneously we decided to apply a multivariate analysis. We estimated the second birth intensities by using a piecewise constant exponential hazard model for women who had their first child in the period 2003-2006. This also allowed us to make our results more comparable across groups of mothers and partners.

As before, we are interested in the impact of citizenship on the risk of having a second birth, with or without controlling for other demographic characteristics of the mother, the partner and the birth. In a first basic model (Model 1) we consider only the duration since first birth and the area of citizenship of the mother. In the second model (Model 2) we include all other variables. The duration variable shows a U-shape with a peak between the 18th and 24th months after the first birth (Table 2). This result supports our choice to study fertility over a relatively short period of time. There is strong heterogeneity in the propensity to have a second birth by area of citizenship of the mother. This heterogeneity did not decrease when we included the other demographic factors in the model. The risk of having a second birth is significantly higher for foreign women from North and West Africa. We decided to consider central and eastern Europe as the reference category, because it is the most important group in the population of foreign mothers. We found that only women from Central and South America have a lower hazard ratio of having a second birth than women from central and eastern Europe. The year of the recording of the first birth is significant. The shorter the remaining observation period, the lower the risk of having a second birth. The results by age show that the youngest women have a higher risk of having a second birth and that this risk decreases with age. In addition, the hazard ratio significantly differs by the women's marital status. For married women the indicator shows a higher fertility risk than for the non-married, as has also been observed in previous studies (Milewski 2007; Mussino and Raalte 2008). Regarding the place of birth of the child[14] we found that delivering the first birth in the respective country of citizenship is negatively linked with the likelihood of having another birth in the period. When comparing the risk of single birth with twin delivery, the model showed that twin delivery does not significantly affect the risk of having a second birth (note that a twin delivery is counted as one birth in our analysis). We found that the area of citizenship of the partner has a strong impact on the decision to have a second birth.[15] The hazard ratio is significantly higher for women with a partner from high migration pressure countries.

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[14] Some resident migrant mothers decide to deliver abroad although they lived in Italy before and after the birth event.

[15] Women with an Italian partner are considered as the reference category because we assumed that having an Italian partner can be an indicator of adaptation.

The indicator for the social context of the town of residency shows that having a second birth is more likely in medium sized cities compared to large or small cities. According to previous research medium sized Italian cities often pay more attention to local needs than big cities, which might explain this finding (Allasino 2000). Living in the north also appears to be positively correlated with the likelihood of having a second birth, while living in the centre of Italy does not seem to significantly affect the propensity to have a second birth. This is probably due to the more advanced settling-down process among immigrants in the northern regions.

We also constructed an interaction model[16] between city size and Italian geographical division. The results of this model show that women living in a medium sized province in the north of Italy have a higher risk, as expected, while the lowest risk was found for the big cities of southern Italy and small cities in the centre.

The results showed great heterogeneity between the different areas of citizenship of the mother, so we decided to conduct a hazard regression for the three largest national groups: Romanians, Albanians and Moroccans.[17] The first two groups are both part of central and eastern Europe but, as the descriptive findings showed, they have two different fertility patterns. Romanians represent the one-child model, Albanians the two-child model and Moroccans represent the high-fertility model typical of North African women. The main difference between these three models and the general model is that these three national groups are not significantly affected by the geographical divisions of residence. We also found that the area of citizenship of the partner affects the three citizenships differently. The Romanian women do not seem to be affected because they also have a low fertility pattern in their home country, while Albanians and especially Moroccans have a significantly elevated risk of having a second birth if the partner comes from a high migration pressure country, and in these cases he is generally a compatriot.

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16 The interaction is not shown in the table, the single effects did not change and only the significant interactions are commented on in the text.

17 We do not show a table of these results, because they are very similar to the general model. Thus we decided to point out the few differences.

Table 2:
Models: Hazard ratio of having a second birth in the period 2003-2006[18]

Risk to have **second** birth 2003-2006		
	Model 1	Model 2
Duration since first birth (months): <12	0.05 ***	0.07 ***
12_18	0.71 ***	0.74 ***
18-24	*1*	*1*
24-30	0.92 **	0.90 ***
30-36	0.91 **	0.88 ***
36-42	0.83 ***	0.79 ***
42-48	0.57 ***	0.54 ***
Year of the first birth: 2003		*1*
2004		0.93 ***
2005		0.75 ***
2006		0.11 ***
Area of citizenship of the mother: Developed Countries	1.41 ***	2.05 ***
Central and eastern Europe	*1*	*1*
North Africa	2.43 ***	2.26 ***
West Africa	1.93 ***	1.96 ***
Other Africa	1.11	1.26 **
Other Asia	1.64 ***	1.55 ***
East Asia	1.46 ***	1.64 ***
Central and South America	0.63 ***	0.75 ***
Age at the first birth: < 20		1.06
20-25		*1*
25-30		0.88 ***
30-35		0.76 ***
35-40		0.56 ***
40+		0.18 ***
Marital Status: Other		0.83 ***
Married		*1*
Macro-area of partner's citizenship: Italy		*1*
Developed country		0.76 *
High migration pressure country		1.23 ***
Place of birth: Italy		1
Outside		0.81 ***
Delivery: Single		1
Twin		0.83
City: Big		0.93 *
Medium		*1*
Small		0.92 *
Italian geographical division: North West		*1*
North East		1.07 ***
Center		0.99
South and Island		1.03

Note: ***<=0.001, **<=0.005, *<=0.01.
Sources: Record Linkage between 2003 and 2006, authors' own elaboration.

[18] A twin birth is considered as one delivery.

4 Discussion and conclusion

The use of a longitudinal dataset of foreign mothers, reconstructed by using record linkage techniques allows us to study the reproductive behaviour of foreign mothers in the period 2002-2006. Our relatively short observation window does not include the whole fertile period of the women, but it permits making valid inferences about the fertility behaviour of foreign women in Italy and its main determinants. The dataset constructed through record linkage constitutes an important contribution of this paper, which allows us to test new variables, work with a longitudinal prospective and study the fertility differences by citizenship in detail. In this way we are able to study the fertility behaviour of foreigners, which was not previously possible with the use of single-year data only. The foreign population is generally characterised by a young age structure (concentrated in the most fertile period) and a higher fertility level (typical for some of their home countries); but also, as some studies show, by high birth rates in the period immediately after migration (Goldstein and Goldstein 1981; Toulemon and Mazuy 2004).

Foreign mothers have a different fertility profile by citizenship (e.g. Sobotka 2008). Some, like Tunisians and Moroccans, have a high risk of having a second birth, provided that they have at least one in the observation period. Others, such as the Romanians, maintain their low fertility in Italy also.

This study shows that North African mothers have a fertility rate that is about twice as high as the fertility rate of central and eastern European mothers. This difference persists even after we control for the other demographic characteristics. It was shown that citizenship is a distinguishing factor for the high heterogeneity between childbearing propensities of the groups (Andersson 2004). As many studies have already shown (Maffioli and Sonnino 1990; Saenz et al. 1994; Andersson and Scott 2007), we also found that a native partner can accelerate an "adaptation process" as measured by a convergence in fertility behaviour towards that of native Italian women. The citizenship of the partner substantially contributes to the choice of having a second birth. If the partner is Italian, which indicates a stronger link to the host country, the risk of having another child is lower. For Romanians, who experience a low fertility pattern, the nationality of the partner did not influence the decision to have another child, while it had a large impact for citizenship groups with high fertility. This shows that having an Italian partner brings the social behaviour of foreign women closer to that of native women and increases the possibility of "assimilative" fertility behaviour. Different risks by city size and region, which are in agreement with patterns observed for Italian mothers, seem to be an indicator of the different adaptation processes to the various Italian contexts (Blangiardo 2009). Where and when to have a family and become parents is differentiated by the place where the family decides to live (Terzera 2006). The heterogeneity found between Italian

geographical divisions suggests that a survey conducted only in one specific area cannot be considered representative for the whole country.

In this work we were only investigating the risk of having a second birth, given the limitations of the data that we discussed in the methodological section. In the near future we will try to overcome these limitations by creating a database of foreigners, using different administrative sources. The next step will be to link the reproductive information obtained in this study, with the register of residence permits for the period 2002-2006. In this way we will have all the information necessary for migration history and all the events that the women have experienced over time, and we will be able to test not only the impact of migration timing, but also the risk of having at least one birth in the observation period.

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Appendix 1: Deterministic record linkage

The aim of record linkage is to identify the same individual, object or event in different databases by using common characteristics and the information that we have in the single files (Fellegi and Sunter 1969). These techniques are particularly useful for migration studies because there is little available data and by using these techniques we can expand the existing data by improving and integrating administrative sources. Since we work with Italian register data, socio-economic aspects are not included. In this study we aim to obtain data for all foreign women who have at least one child in the period considered. We applied record linkage techniques to the Municipal Population Register in order to analyse individuals rather than aggregated populations, which were used in most of the similar studies in the past. We were able to work with a large database, so the first step was to organise and harmonise the single files.[19] For our analysis we considered all births that took place in the period 2002-2006[20] (Table A). A woman may have one or more children in the period, so we have to consider the combination for all those years. The following table shows the data before (Column 1) and after the harmonising procedure (Column 2). The third column shows, for each year, the number of deliveries by foreign or foreign-origin mothers, considered in the record linkage after harmonisation.[21]

Table A1:
Data at each single step of the record linkage procedure

Year	1. Official Data: births	2. Harmonised [(a)] Data: mothers	3. Output: considered foreign mothers or foreign-origin mothers
2002	43,011[(b)]	42,370	42,370
2003	531,274	523,412	47,312
2004	553,770	535,649	57,621
2005	544,030	536,289	65,363
2006	552,019	529,193	71,034
Total			283,700

[(a)] Without duplication and considering twins.
[(b)] In this year we only studied foreigners. For all other years we also included Italians because we considered the possibility that foreigners might change their citizenship during the period.

19 For all steps of the analysis, for example the identification of duplicates, twins and mothers that registered two children in the same year and also the merging procedure, we used the SAS package.

20 Here we also had to make several corrections, for example assigning the events to the right year. There is a tendency of long delays between the birth event and the registration of this event. Additional corrections are necessary after the merging process.

21 We already consider if they have more than one child in the same year or if they have twins during harmonisation.

For the record linkage we have to use unique identifiers and deal with their possible errors or to construct identifiers of our own (Winkler 1995). Here, different strategies of deterministic record linkage were tested. We used two different keys with the aim of correcting typing errors on the form. Although we harmonised the characters in the mother's first name and surname, the main problem was to transcribe and spell the name correctly, especially when it was written in a different alphabet. The first key, where we assumed that the name of the woman was correct, considered the combination of the first name, surname and the date of birth. This key did not link if some of the information in the key was missing. If all information used in the key was confirmed we considered the link as exact. If we had a missing value we considered it as a possible link. As there were not so many cases with a possible link, these were checked manually. The third group is the non-link group. For this group we applied a second key, where, considering the possibility of typing errors, we used the first letter of the name and surname, date of birth, citizenship and the province of residence. Initial results, regarding women with one child in 2002, show that passing from the strict key to the second key leads to an increase (mothers linked with a second key divided by mothers linked with both keys) in the number of exact links by approximately 10.8% for 2003, 11.5% for 2004, 11.7% for 2005 and 12.1% for 2006.[22] In the final dataset (Table A2), the number of women is lower than the sum of the foreigners in single years. The reason is that a mother is counted only once now and not every time that she is registered at the time of giving birth. If births rather than mothers are counted, the results are the same for both sets of files (283,700 deliveries).

Table A2:
Total number of mothers and births in the database considered for the period 2002-2006

Number Children in the period	Total births	Total mothers	Percentage of mothers
1	222,335	222,335	88.11
2	57,304	28,652	11.36
3	3,936	1,312	0.52
4	120	30	0.01
5	5	1	0
Total	283,700	252,330	100

[22] If we consider mothers linked with a second key divided by all mothers in 2002 the increase is approximately 0.5% for 2003, 1% for 2004, 1% for 2005 and 0.9% for 2006.

It is important to note that our database does not cover the whole reproductive period of the women studied. Since our observation period is quite short, many women are likely to have more children in the future. It is also possible that we did not observe the subsequent births for all women in our observation period because they left Italy before giving birth again. We also do not have information on women who died during our observation period. It is also possible that their legal status changed so they could no longer register a subsequent child at the population register. We have to consider the possibility that because of errors in the data we were not able to link all individuals, or we have false matching. We assume that the effects of these kind of errors are small and do not have a significant impact on our results.