Fertility decline and timing of births in Malta

Maja Miljanić Brinkworth*

* Ministry for Social Policy, Malta

Introduction

Malta is one of the European countries which is currently witnessing strong impacts of tempo and quantum effects of fertility, with the TFR level falling below 1.5.

This paper attempts to determine the trends associated with the timing of the first child in terms of age of mother at the time of the first birth. The aim is to quantify the impact of timing of the first birth on the timing and realisation of children of subsequent parities. Logistic regression models, which relate a categorical response variable to a number of explanatory variables (predictors), are used to derive odds and predicted probabilities. One of the tasks in this study is, to quantify the probability of having a second child before the age of 28, by categorising this variable to have two possible outcomes. On the basis of 1999-2006 time series, spacing of births will be analysed using the time interval between the first and subsequent births.

In view of the above, the paper is structured in the following way: the first section deals with major factors impacting fertility decline in Malta in the past decade or so. The second section describes the database used for modelling purposes and some basic rules applied regarding data selection. The outcomes of the modelling application are presented in the third section; fourth section deals with child care[1] and family policies and offers few policy recommendations derived from the outcomes of this research, which are summarised in the last section.

I Fertility decline: the background

Malta is a typical example of a Mediterranean country where low fertility rates are coupled with low female employment rates. In 2006, the employment rate of women in Malta stood at 34.9% and similarly, low levels were also registered in Greece 47.4% and Italy 46.3%[2]. However, in terms of fertility rates, the last decade records somewhat opposite trends in Malta, when compared to the other Southern European countries. While the TFR in Italy and Greece started moving upwards from its lowest levels, the Maltese TFR, took a cliff dive from a comfortable replacement levels in the mid-90s. In 1992

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[1] Child care is taken in a broad sense, including care for children before school, after school and holiday care.
[2] Eurostat data.

the TFR stood at 2.1 level, only to fall to 1.37 in 2005 and 1.41 in 2006[3]. However, the TFR of the Maltese segment of the population reached its lowest levels of 1.34 in 2005 and 1.33 in 2006, verging thus on very low fertility levels. It is pertinent to note that the TFR in Malta reached its below replacement level at a much later stage then was the case in other EU member states. Today, Malta is among EU member states with low fertility levels and with poor prospects of achieving replacement levels by year 2050 TFR at 1.6 (Commission, 2007). In view of the recent demographic challenges, further research is needed specifically on the changes in timing of first births and spacing of births of the Maltese mothers.

Marked decline has been registered in the ASFR of 20-24 years old Maltese mothers, from 87.51 per thousand in 1985 to 40.23 per thousand in 2006. The ASFR of the 25-29 years old decreased from 138.36 per thousand to 92.62 per thousand[4] in the same period. Taking age of 30 as a threshold to late fertility, the shares of TFR to mothers 30 years of age and over in the total TFR, the Maltese fertility does not exhibit the same sharp increase as was the case in Italy (Giorgi and Mamolo, 2007:67). The respective shares for Malta were more stable and generally lower (figures for Italy in brackets): in 1990 they stood at 37.46% (40.1%), in 1995 39.67% (48.0%) and in 2000 40.03% (53.7%). The increase in TFR30+ in total period TFR after year 2000 is evident. However, these figures are of a static nature, and should be taken as such, as they do not explain the structural changes resulting from the interplay of tempo and quantum effects of fertility.

Figure 1.
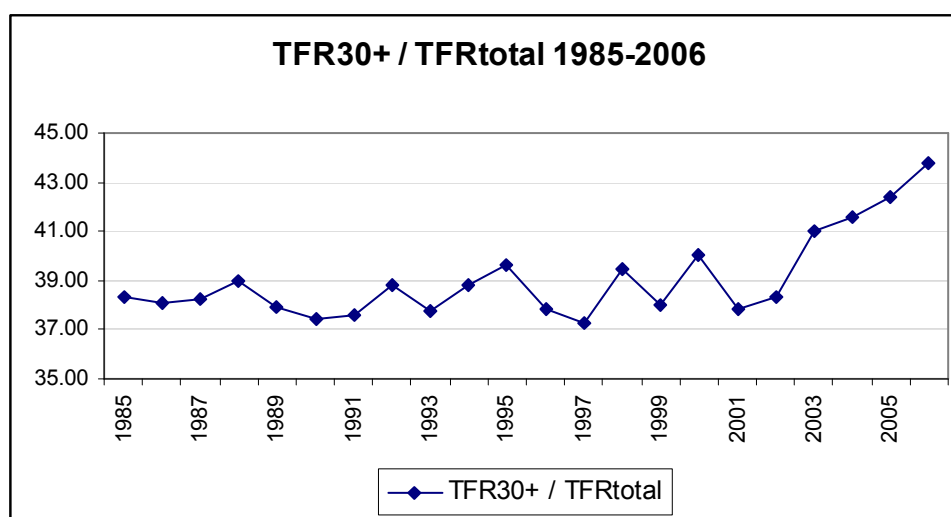
The aspirations regarding ideal number of children of Maltese younger generations are much lower then what was the case in the past. The subjective demand for children expressed by family size ideals among young Maltese women under 35 years of age, indicates not only lower values (1.85)

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[3] As from year 2005, annual population estimates are available for total population as well.
[4] Calculations by the author, based on the Demographic Review figures on vital statistics and population estimates.

than their male counterparts (2.19), but also the lowest family size ideals of young women in Europe (Fahey and Speder, 2004:27-28). This can be partly explained by the double burden of the younger cohorts of Maltese women, in a still largely patriarchal family set up. An opposite situation was evident in the case of Maltese women aged 55 years of age and over, who considered 2.58 as an ideal number of children, much higher than their male counterparts at 2.47 and reasonably high in comparison with their cohort counterparts in other European countries (Ibid.). It also shows that the family ideal of parents with two children does not seem to appeal as much to the young Maltese women any more. Higher participation in activities outside home, enrolment in tertiary education at par with male students, coupled with other societal changes: general increase in the standard of living, individualisation and social and physical mobility not experienced by older generations (Vassallo et al., 2002). Women have recently experienced greater empowerment, similar to those in other European countries (Aarsen, 2005) and these time-competing activities are gradually becoming main-stream in women's lives in Malta.

Apart from the cultural factors and elements of tradition, socio-economic circumstances are strongly coupled with the reproductive considerations of the Maltese family. The major factors contributing to postponement of marriage, birth of first child, and ultimately to a low realised number of children per couple, can be found in:

a) excessive housing costs borne by the first-time buyers in Malta and thus increased financial vulnerability of young families,
b) prolonged education of female students, as more and more girls opt for tertiary education, and
c) a relatively high unemployment rate of young workers, and financial insecurity associated with it.

There are signs of looking for furthering economic security of the Maltese couples through women's employment outside home, which in view of higher indebtedness is seen as a must. As the amount of personal loans taken increases, the realised number of children decreases. There were 32.4 children born to every 1 million Maltese Liri[5] (Lm) spent on personal loans in 1994, while there were 7.7 babies born to the equal amount of personal loans taken in 2002[6]. The trend can be observed focusing on earnings, whereby to each Lm 1 earned there were 6.6 children born in 1994 and only 3.6 children in 2002. It is evident that higher personal spending is coupled with fewer children. Home-loans represent a significant chunk in the overall indebtedness of an average Maltese family. In 2007, the all property price index stood at 172.8[7] (2001=100) a rapid increase in the span of just 6 years. The price index of terraced houses, the traditionally most popular type of dwellings in Malta went up to 213.37 in the same period.

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[5] From the 1st of January 2008 Malta has adopted Euro and the national currency Maltese Lira ceases to exist. 1Maltese Lira (ML)=Euro2.3294
[6] NSO (2004)
[7] Data NSO (2007).

Increasingly competing demands for time between motherhood and education are observed, as more and more girls opt for a university degree. The share of female students in the total number of tertiary students has increased from 51.5% in 1999 to 56.3% in 2005. The average age at first birth of mothers with secondary school was 25.8 years (median 26), while in case of mothers with university degree it was 27.9 years (median 28)[8]. It is evident that priorities have been placed on furthering one's education and job prospects.

The unemployment rate of young workers is high relative to the total population. As it is closely timed with the onset of procreation, unemployment of young workers could be another possible factor delaying the birth of the first child due to financial insecurity that it brings along. Although the level of unemployment rate of young workers has been declining from 18.8%[9] in 2000 to 12.6% in 2007, it is still much higher than the unemployment rate of the total population (6.7% and 6.3% respectively).

Economic prosperity achieved in the last decade or so, also portends a shift towards low fertility (1.3 children) born to families rating their standard of living as 'very good'[10]. When compared by standard of living, the highest number of children per woman aged 18 years and over, was recorded in families whose self-rated standard of living was "bad" and "very bad", 2.4 and 2.2 children, respectively. This important aspect is not to be overlooked if policies are aimed at fertility revival in Malta, as here there is a clear dichotomy of working mothers and 'home-centred', non-working mothers (Hakim, 2003), who would be most prone to achieve their family ideals.

Secularisation also manifests itself in another evident trend of mistimed and unplanned pregnancies occurring to teenage mothers[11], emanating from more frequent pre-marital sexual activity and subsequent birth. Particularly worrying are the unplanned pregnancies of teen-age and adolescent girls. The age specific fertility rate (ASFR) of mothers under 20 years[12] of age, increased from 12.76 in year 1985 to 16.34 per thousand in 2006[13].

A cursory look at the data on births outside marriage, the event which used to measure below one hundred cases, now rises sharply into several hundreds (799 in 2006). As a result of the changing social attitudes in the Maltese society, the share of births out of wedlock rose from 2.2% of all births in 1992 to 22.53% in 2006[14]. It is worrying that the births out of wedlock to mothers aged 20 years or less have been continuously increasing. Further to this, in 2006, 26% of all births outside marriage are of mothers below age of 20, which is 92% of all births to this age group. The age of a father was reported as unknown in 44.56% of all births out of wedlock in 2006, which can serve as a proxy of unplanned pregnancies.

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[8] Data NOIS 1999-2006.
[9] Data Eurostat.
[10] Data NSO, 2004. This survey dealt with mothers aged 18 years and over.
[11] Sexual activities involving minors are considered illegal.
[12] ASFR for below 20 years of age calculated against 15-19 age group.
[13] Data on Maltese births only.
[14] See the footnote above.

Due to the above mentioned trends, the marriage event is gradually being postponed. In the last twenty years, the average age[15] of the Maltese brides (first time brides i.e. previous marital status single) has increased from 24.02 years in 1985, to 24.43 years in 1995 and to 26.83 years of age in 2006.[16]

In view of the constellation of causes mentioned above, the postponement of first marriage and birth of the first child, coupled with lower desired number of children have been leading to a reduced number of children per woman in Malta.

II Data sources: strengths and limitations

Malta's demographic trends are recorded by means of vital statistics, decenial population census[17] and through ad-hoc population surveys. Malta does not have an established system of population registers. Therefore, there is not one single data source that combines demographic and socio-economic characteristics of the mother, her family and her previous reproductive history. For the purpose of this research, the 1999-2006 National Obstetric Information System (NOIS) database on births has been used. This data-base was developed in the context of the pan-European Obstetrical Quality Indicators and Data Collection (OBSQID) Project. The national NOIS data-base was launched in 1999 at case-based (individual level), and since 1999 it built on the existing hospital based system and started covering all deliveries taking place in Malta i.e. including all government and private hospitals. This is a medical register of births which apart from medical information also includes demographic variables such as age, marital status and nationality of the mother, data on education, and availability of support to mother at home after birth.

Anonymised, case based data for all mothers delivering between 1999-2006 were obtained from the national NOIS register. All mothers with an unknown ID card numbers were excluded, as well as those mothers with missing or unknown date of birth. Mothers with multiple pregnancies (twins, triplets etc.) have been also deselected, as it is possible that the considerations about future births could differ between mother with first single pregnancy and mother with first pregnancy being multiple. Multiple pregnancies would have a small impact on the calculated spacing of births, as shown in other research (Breton and Prioux, 2005). Maltese mothers have been the focus of this research, therefore selection on the basis of nationality has been done as well. Mothers aged 18 years and over at the time of the first birth were selected. The NOIS 1999-2006 database records the number of all previous pregnancies and deliveries of the mother delivering in this period, but does not

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[15] Given the purpose of this research, the average age of bride (previous marital status being single) has been calculated taking into consideration only brides in the reproductive age contingent. It excludes thus women of single previous marital status aged 50 years and over whose number was anyhow very low.

[16] Data NSO Demographic Review 1985-2006.

[17] The last census of population took place in 2005.

record the dates of these previous confinements. This is a real drawback in the analysis of completed fertility of older cohorts. The time series 1999-2006 based on de-selection procedure described above, contains records of 13,774 unique mothers with first and subsequent birth orders (up to four) occurring in this period. The highest number, as expected, were mothers giving birth to one child only (9,540 such mothers, 69.3%), followed up by mothers of two children (3,818, 27.7%), three children (387, 2.8%) there were only 29 mothers who gave birth to four children between 1999 and 2006 (0.2%). Bearing in mind short time series, and general preference for smaller families of young Maltese mothers, the progression to third and particularly to fourth child was a rare event.

Another limitation regarding data is that timing of marriage, undoubtedly one of the most relevant factors influencing completed fertility, and changes in longitudinal fertility, was not available in the NOIS data-base[18]. Father's age, educational attainment or occupation, were not available either, limiting therefore the gender aspect of analysis on timing and number of births.

A major limitation is the high percentage of non-response to question on education (72.1% data unknown). However, in cases where education details were available, almost 98% were mothers with secondary and tertiary education.

Variable 'support at home' could have been of great significance to this research, however, 97.8% of all mothers reported that they have support at home. This makes it the least productive variable, *vis-à-vis* specific analysis on coping with motherhood. The question on 'support at home after birth' is to be interpreted as 'support at home to raise the infant' and it contains no reference to engaging in work outside home and support related to it, hence the high share of affirmative answers. It is considered however, that both variables education and 'support' are significant in the decision process leading towards second and third birth in the Maltese context, and therefore ought to be explored thoroughly by aiming at highest possible response rate.

In view of the analysis by birth order, such as the mean age at childbearing by birth order (MAC) the data are not fully available from the NOIS database, as stated before. Although a question on previous births was asked, it was not linked to the date of birth of infant/s, so as to enable the calculation of age-specific fertility rates by birth order. This was a prerequisite for the calculation of the adjusted TFR of Maltese mothers as shown in other research on the subject (Sobotka, 2004, Population Europe, 2006)

The envisaged difficulty in this research is a very short time series, as national based NOIS data collection commenced only in year 1999 (prior to this a more limited medical database of government hospital delivery data only was available). The time series of only eight years 1999-2006, gives too short a time span to elaborate upon longitudinal fertility as date of previous live births could not have been obtained from this database.

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[18] NOIS database has its own precisely defined aims and therefore was not initially geared to contain all demographic data needed for this type of research. However, this may change in the future.

The availability and affordability of child-care is closely connected to the achieved levels of completed fertility. The national standards regulating child-care centres, including those for children 0-3 years of age, have been issued only in 2006. It is not surprising that as much as 69% of the interviewees did not know of them a year later (Sciortino, 2007), which means that their impact has yet to be factored in as an influencing factor on the tempo of fertility and its quantum in Malta.

III Research findings on timing of births of Maltese mothers

The mean age at childbearing in Malta has been increasing continuously from 1999 when it stood at 25.24 years, to 2006 when it reached 27.31 years. These averages include also mothers giving birth before age of 18. The analysis below focuses only on mothers 18+ years.

3.1 The trends in timing of the first child

The average age at time of first birth in Malta is continuously increasing, leaving thus fewer years, and less reproductive quality years available for any subsequent births, the latter due to the natural decline in fecundity, leading to lower levels of completed fertility. The tempo effect indicating timing of fertility has been a salient factor (Table 1) impacting the level of Maltese TFR in the last decade, coupled with the decline in the quantum component.

The average age at first birth has increased from 25.6 years in 1999 to 26.7 years in 2006 (all mothers 18 years of age and older at time of first birth) contributing to an increase in the period mean length of generation. Similarly the average age at time of first birth of mothers who gave birth to at least two children has also increased from 25.2 years in 1999 to 26.3 years in 2004[19].

Table 1

Year	Mothers 18 + years of age		
	Average age at first birth	Average age at second birth	Spacing of births
	all mothers	mothers 2+chld	
1999^	25.609	25.120	-0.489
2000	25.826	26.690	0.864
2001	25.798	27.670	1.872
2002	25.988	28.210	2.222
2003	26.131	28.690	2.559
2004	26.361	28.940	2.579
2005	26.537	29.120	2.583
2006	26.737	30.090	3.353

Source: NOIS 1999-2006
Note: ^only 33 cases with two births occurring in two calendar years.

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[19] There were no mothers of two children who gave birth to their first child in 2006 (two deliveries in one calendar year) and there were only 68 such mothers in year 2005 (two deliveries in two calendar years).

Late fertility does not necessarily mean low fertility, as long as there is a desire to have more than one child and the spacing between two births is realistic - the Netherlands, the UK and Luxembourg being cases in point (Nimwegen et al. 2002, Rychtarikova, 2008).

3.2 Spacing of births

3.2.1 Cross-sectional analysis

While the median age at first birth increased from 26 years in 1999[20] to 27 years in 2006, the postponement of birth of second child was evident, with median age moving from 27 years in 2000 to 30 years in 2006. Evidently, with time, the postponement factor is impacting the progression towards second child by additional two years.

Spacing of births (first[21] to second) increased from 1.9 years in 2001 to 3.3 years in 2006. Median age at time of first birth by parity[22] indicates: 26 years for mothers of only one child and mothers of two children, 24 years in case of mothers of three children, and 23 years in case of mothers of four children.

Table 2

Mothers of:	Spacing between:		
	first and second birth	second and third birth	third and fourth birth
one child	-	-	-
two children	3.09	-	-
three children	2.14	2.32	-
four children	1.82	1.52	2.14
Total average	2.58	0.10	-0.04^

Source: derived from the NOIS 1999-2006 data, detailed table in the Annex
Note: ^ negative value due to an early average age at birth of fourth child.

The widest spread is between first and second child in case of Maltese mothers with two children only (3.1 years), followed by mothers of three children (2.1 years between first and second child). Standard deviation of age at time of first birth of these mothers stood at 3.9 years, while standard deviation of age at time of second birth stood at 4.1 years. When mothers who had first child between age of 18 and 28 only were taken into consideration (as required for the logistic regression analysis presented in the next section),

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[20] There were only 33 mothers who also had their second child in the same calendar year.
[21] All selected Maltese mothers.
[22] Calculated on the basis of individual ages of mothers. In this work only mothers who did not have any previous births were included, in order to obtain the parity for each calendar year.

standard deviation declines significantly to 2.6 and 3.0 years for age at first and second births respectively.

The gap between the second and the third child (2.3) is considerably longer in case of mothers of three children then in case of mothers with four children (1.5 years[23]). Evidently, mothers who opt for two children only, have their reproductive considerations linked to a low desired number of children. They reckon that there will be enough quality reproductive years ahead for realisation of one more child (spacing is longest), while mothers who opt for higher parities, reduce this gap between first and second child considerably, only to take longer for realisation of the third child. In fact, the age and spacing between first and second child have significant impact on progression towards third child (Breton and Prioux, 2005). Hence, median age for second child 29 years (mothers of two children), 27 years (mothers of three children) and 25 years (mothers of four children). In 2006, only 13.3% mothers give birth to their second child before age of 26, a staggering decline from 39.9% in 2000. While in 2000 60.6% mothers gave birth to their second child before age of 28, in 2006 this stood at mere 25.4%. This shows not only that fewer mothers opt for more than one child, but at a later age too, reducing thus even further the possibility of childbearing in the remaining quality-less fertility years.

On the basis of the adapted Bongaarts-Feeney (BF) formula and the proof that the intercept of the regression line is not statistically significant, when applied to Malta the slope coefficient obtained for the Southern European countries k = 1.5, resulted in the adjusted TFR of 1.64 in 2004, which is 0.16 increase from the observed value, reported at 1.48 (European Demographic Data Sheet, 2006 and Population Europe, 2006).
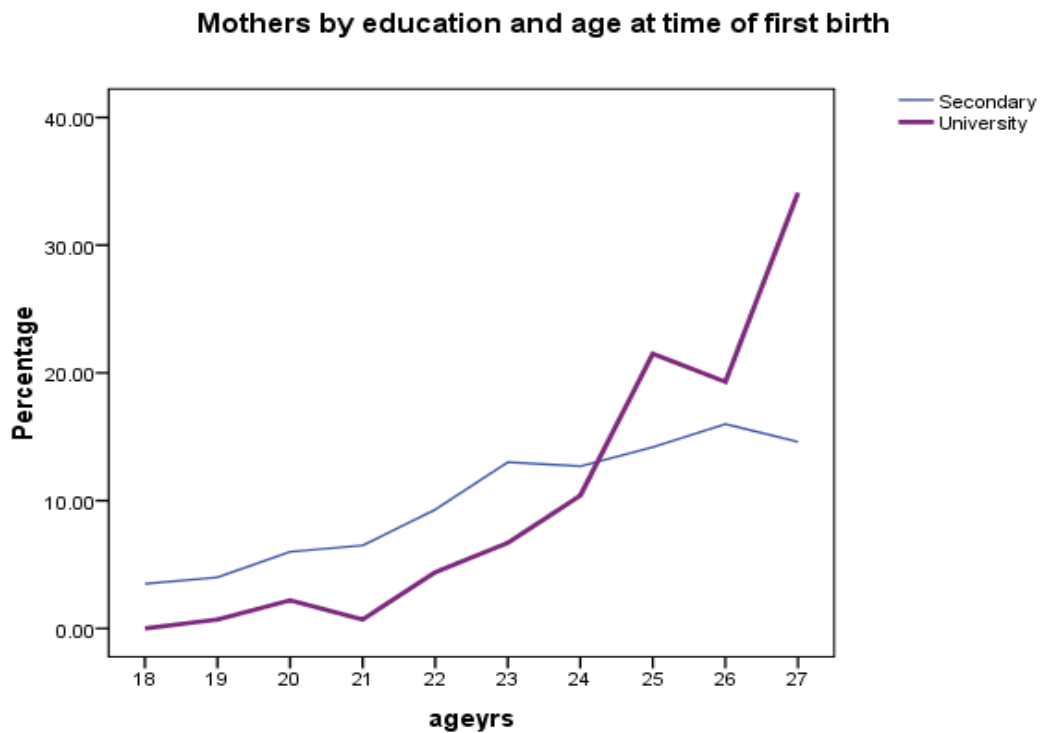
3.2.2 Education

The analysis of age at first birth by educational level indicates that mothers with secondary school education give birth to their first children on average at the age of 25.8 years (median 26 years), while mothers with university degree were on average 27.9 years of age old (median 28 years) at the time of the first birth. There was a very low percentage of reported cases with primary school only. However, very high percentage of unknown data (72.1%) made this analysis limited.

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[23] Only 29 such mothers.

Figure 2

Mothers by education and age at time of first birth

The graph above indicates first sudden jump in the share of mothers with university degree between ages 24 and 25 at the time of first birth. In fact, there is no such rapid increase in the case of mothers with secondary school education. While after the age of 26 the share of mothers with secondary level education decreases, the increase in the share of university-qualified mothers gets even steeper. Tertiary level education commitments have a significant impact on the share of university graduate mothers, expressed by age at first birth.

3.2.3 Marital status

The majority of all selected mothers were either married or single mothers (79.7% and 19.2% respectively). The difference in timing and spacing of births between single and married mothers is striking. Single mothers are on average four years younger at the time of first birth than married mothers (22.1 years against 26.2 years). Similarly, the mean age of single mothers at second birth stands at 25.0 years, while in case of married mothers it is 29.2 years. Such a difference was observed also in the case of mothers with three children, where on average single mothers (25.3 years) were four years younger than the married mothers (29.3 years). It is evident that the delay linked to higher education and housing reasons in case of young married couples, are the major contributing factors to this time lag.

On average single mothers were 24.8 years of age at the time of second birth, while married mothers were 27.4 years of age. 62% of single mothers gave birth to a second child before age of 26, while only 23% of married mothers did so.

It has been mentioned already that the births out of wedlock (single and separated mothers) have been on the increase in the last decade or so, as they were not so common in the Maltese society in the past. Based on the NOIS 1999-2006 data, the increase in the single mothers was evident, from 13.3% in 1999 to 25.8% in 2006.

3.3 The impacting of the timing of the first child on the timing and realisation of children of subsequent orders

3.3.1 Age

This section aims to quantify the odds of event of having only one or more children in relation to age at time of first birth by means of logistic regression.

The timing of the birth of the first child has been analysed taking only mothers who were at least 18 years of age at the time of the first birth[24]. During the 1999-2006, this group of mothers gave births to one up to four children (the latter only in 29 cases). The age of mother at the time of first birth is a significant predictor of the outcome, number of births (p value < 0.05). However, taken as a sole predictor, age of mother at time of birth of first child, explains only 1% of the variations in the response variable number of births (Nagelkerke Pseudo R-squared value 0.01). This indicates that there are other important factors impacting the outcome variable. Earlier works confirm that indeed the age factor on its own is not the key factor causing low competed fertility, as long as there is a desire for having more than one child (Nimwegen et al. 2002).

The age of the mother is recorded at two instances - at first birth and at second birth:
a) the variable 'age at time of first birth' is assumed to be a covariate and will be used as a predictor in the subsequent logistic regression models.
b) the variable 'age at time of second birth' is categorised to have two possible outcomes - second birth before the age of 28 years and second birth at the age of 28 years and after. This cut-off point was established on the basis of analysis presented in section 3.2. This categorical variable will be used as a response variable in the subsequent logistic regression models.

Table 3 shows the parameter estimates, odds ratios and 95% confidence intervals (CI) of odds ratios for the logistic regression model having 'number of children' as the response variable and 'age of mother at first birth' as a sole predictor.

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[24] Births occurring to mothers younger than 18 were excluded from this analysis as they are a consequence of sexual activities involving minors, which are considered illegal.

<p style="text-align: center; color: blue;">Table 3</p>

Parameter estimates[25]		B	Standard error	Sig.	Exp (B)	95% Confidence Interval for Exp(B)	
Number of children [a]		B	Standard error	Sig.	Exp (B)	Lower Bound	Upper Bound
Two	Intercept	-.294	.116	.011			
	AGEYRS[b]	-.024	.004	.000	.976	.968	.985
Three	Intercept	-.645	.319	.043			
	AGEYRS	-.101	.013	.000	.904	.882	.927
Four	Intercept	-1.322	1.170	.258			
	AGEYRS	-.181	.050	.000	.834	.757	.920

a. The reference category is: 1 child.
b. AGEYRS indicates variable Age of mother at time of first birth.

<p style="color: blue;">The modelling result shows that the estimated odds that mother gives birth to two children rather than to one child, decreases by 2.4% for every one year increase in the age of the mother at the time of first birth. The 95% CI for the odds ratio is between 1.5% and 3.2%. In the case of the three children scenario, the estimated odds that a mother gives birth to three children decreases even faster, by 9.6% for every one year increase in the age of mother at first birth. The range, at 95% degree of confidence is between 7.3% and 11.8%. In the unlikely scenario of a mother giving birth to four children instead of one, the estimated odds decrease by 16.6% for every one year increase in the age of mother at the time of first birth. The percentage decrease ranges between 8.0% and 24.3%, at 95% degree of confidence.</p>

<p style="color: blue;">The graph displays the predicted probabilities that a mother gives birth to one, two, three or four children against the age of mother at first birth, expressed as single years. For every one year increment in the age of the mother at first birth, the probability of having solely one child increases. In case of outcome of higher parities, two to four in this case, the probability of a mother giving birth to more than one child decreases as her age at time of first birth increases.</p>

Figure 3
Probabilities of having one or more children by age of mother at first birth
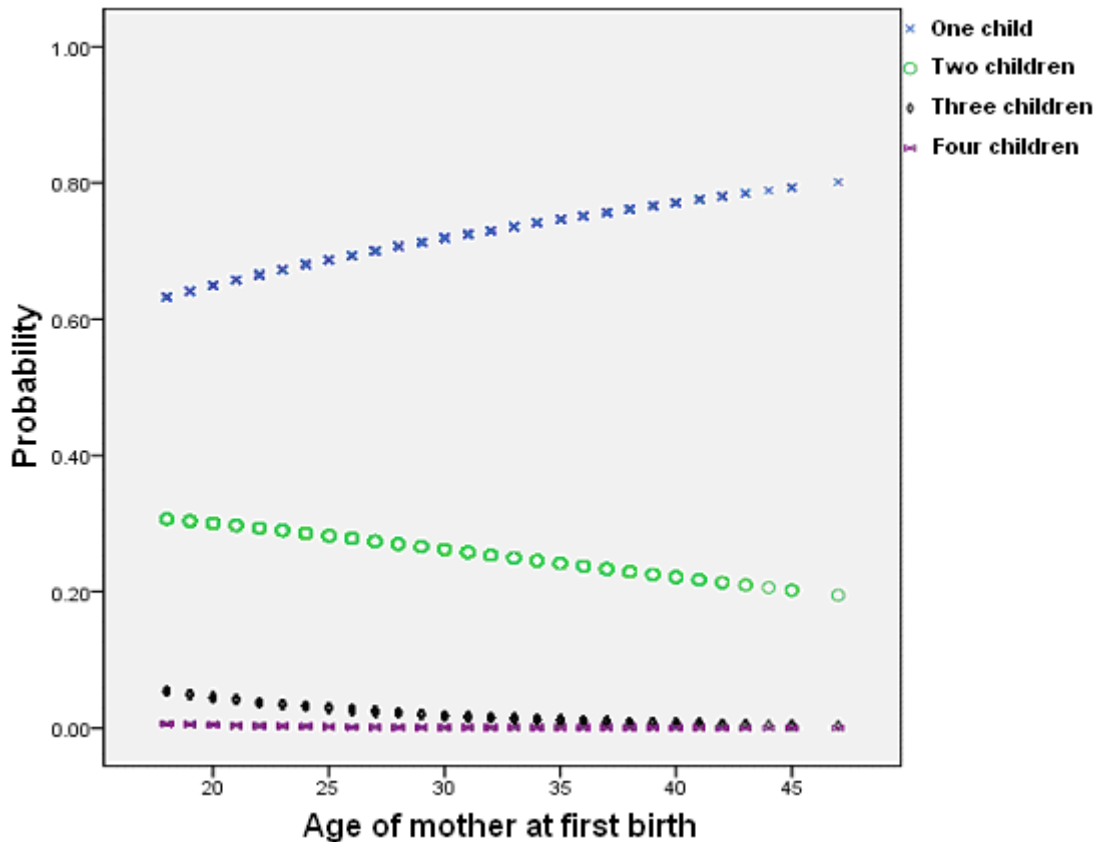
A further task is to relate the age of mother at second birth to a number of explanatory variables (predictors) using logistic regression models. These predictors include mother's education, marital status and her age at first birth. The categorised variable representing mother's age at second birth is the response variable and several combinations of the predictors are included as main effects in the model fit. There were 2,945 such mothers[26]. Table 4 shows the parameters estimates, odds ratios and 95% CI of odds ratios for the logistic regression model having 'age of mother at second birth' as the response variable and 'age of mother at first birth' as a sole predictor.

Again, the age of mother at the time of first birth is a significant predictor of the outcome of the time of second birth (p-value <0.05). Predictor 'age at time of first birth' explains more than 50% (Negelkerke Pseudo R-squared value 0.673) of the variations in the response variable: 'age of mother at second birth'. The estimated odds that mother gives birth to a second child at/after age of 28, increases by 237.4% for every 1 year the increase in the age of mother at the time of first birth. At 95% degree of confidence this percentage increase ranges between 209.3% and 268.0%, i.e. more than two-fold increase is expected.

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[26] Mothers of second children, as some of these mothers also progressed to parity three and four.

Table 4

Parameter estimates		B	Standard error	Sig.	Exp (B)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Second birth before age 28 yes=1 no=0[a]							
0	Intercept	-29.716	1.090	.000			
	AGEYRS[b]	1.216	.044	.000	3.374	3.093	3.680

a.   The reference category is: 1.
b.   AGEYRS indicates variable Age of mother at time of first birth.

The following illustration exhibits the relevance of the predicted probabilities of the binary response variable. In case of a mother who gives first birth at the age of 24 years, the probability that she gives a second birth before the age of 28 years is 0.63 and this is 1.7 times higher than the probability that she gives second birth at the age of 28 years or after. However, with the postponement of the first birth to 26 years of age, the probability that a mother gives birth to a second child before age of 28 years, declines to 0.13. Ages between 24 and 26 appear to be crucial years on the life-cycle, when competing demands for time converge - education, motherhood, work and entry into home-ownership contracts.

Figure 4
Probability of having a second child before or at/after age of 28 years, by age of mother at the time of first birth
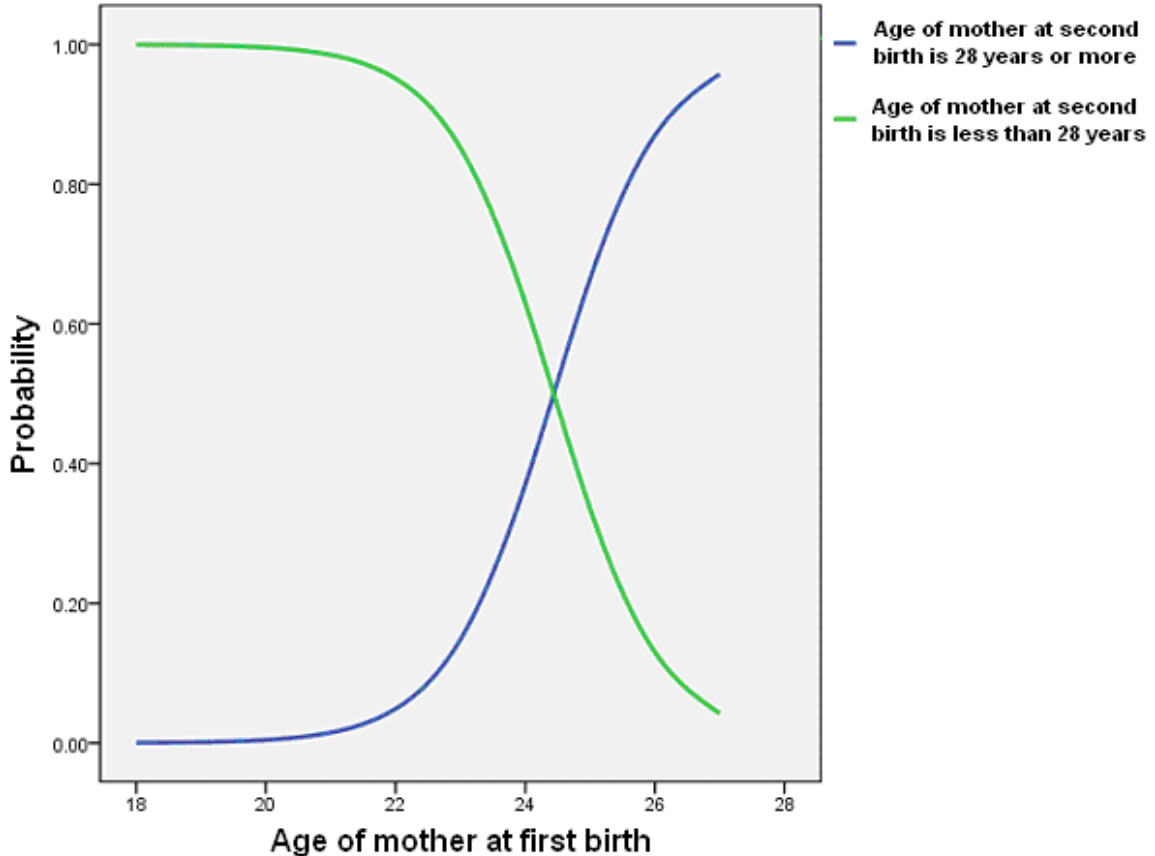
As expected, the probability of having a second child at the age of 28 or after, increases with age of mother at time of first birth. A sharp decline in the probability of having a second child before age of 28 is visible if the first child was born at age 26 rather than at age 24.

3.3.2 Education

Education has been listed together with housing and employment as one of the factors influencing postponement of the first child. However, it is also significant regarding overall reproductive considerations which may or may not result in progressing towards higher parities. Mothers with university degree have lower fertility than mothers with secondary education only. This also ties well with the previously published research (Nimwegen et al. 2002, Rychtarikova, 2008).

The next logistic regression model relates the response categorical variable 'age of mother at second birth' to the predictor 'mother's education'. Although this predictor contributes significantly to the model fit, it only explains 2.6% in the variability of the responses.

<div align="center">Table 5</div>

Parameter estimates						95% Confidence Interval for Exp(B)	
Second birth before age 28 yes=1 no=0[a]		B	Standard error	Sig.	Exp (B)	Lower Bound	Upper Bound
0	Intercept	-.124	.064	.054			
	EDUCATION=University	.885	.196	.000	2.423	1.651	3.555
	EDUCATION=Sec.School	0[b]	.	.	.	.	.

a. The reference category is: 1.
b. This parameter is set to zero because it is redundant.

Based on this data set, the estimated odds that a mother with tertiary education gives birth to a second child at/after age of 28 years is 142.3% greater than the odds that a mother in the same age group, with secondary education gives birth to a second child. At the 95% degree of confidence, the confidence limits are between 65.1% and 255.5%. However, the probability that a mother has a second child before the age of 28 years if she has university level education is 31.84%. In other words, the probability that the mother with university degree would have a second child at/after age of 28 rather than before this age, is 2.14 times higher. Education as such is a significant predictor, however it explains less than 3% of variability in the outcome variable.

3.3.3 Marital status

Late or later marriage and increase in the number of births out of marriage generally results in a very low fertility (TFR of 1.3 and below). Single motherhood in Malta is on the increase, although not quite widespread as in some other European countries.

Table 6

Parameter Estimates					95% Confidence Interval for Exp(B)	
Second birth before age 28 yes=1 no=0[a]	B	Standard error	Sig.	Exp (B)	Lower Bound	Upper Bound
0 Intercept	0.015	0.040	0.704			
MARITAL STATUS=Single	-1.764	0.141	0.000	0.171	0.130	0.226
MARITAL STATUS=Married	.	.	.	.	.	.

a.   The reference category is: 1
b.   This parameter is set to zero because it is redundant.

The probability that a single mother will have a second child before age of 28 is high, 85.18%. However, the probability that a married mother will have a second child before age of 28 is only 49.63%. Marital status, taken as a sole predictor indicates high probabilities of single mothers linked to early progression towards second child.

Further analysis focuses only on single and married mothers with university and secondary school education. When both factor predictors were taken into consideration, both were significant. However, they explain very little in term of variability of the outcome (Nagelkerke Pseudo R-squared value 0.076).

Table 7

Parameter estimates					95% Confidence Interval for Exp(B)	
Second birth before age 28 yes=1 no=0[a]	B	Standard error	Sig.	Exp (B)	Lower Bound	Upper Bound
0 Intercept	0.011	0.068	0.877			
MARITAL STATUS=Single	-1.429	0.243	0.000	0.239	0.149	0.386
MARITAL STATUS=Married	0[b]	.	.	.	.	.
EDUCATION=University	0.809	0.198	0.000	2.246	1.523	3.310
EDUCATION=Sec.School	0[b]	.	.	.	.	.

a. The reference category is: 1.
b. This parameter is set to zero because it is redundant.

Considering mothers with at least two children, the probability that a single mother with secondary level education gives birth to the second child before the age of 28 is 80.5%. Conversely, the probability that a married mother with tertiary level education gives second birth before the age of 28 is 30.6%.

The probability that a single mother who is e.g. 26 and with a university degree, would have a second child at/after age of 28 is 35.2%. In case of a

married mother this probability goes up to 69.42% (2.27[27] higher than having a second child before age of 28). However, in the case of a single mother with secondary school education, the probability of having a second child before age of 28 is 80.5%, which indicates that single motherhood coupled with moderate education, produces high probabilities of early progression towards second child. The probability of having a second child before age of 28 is only 49.7% for married mothers' with secondary education.

It is known that a lone predictor could be rendered a very important contributor in a model, but would be rendered unimportant in the presence of other predictors. In other words, the appropriateness of an explanatory variable often depends on what other explanatory variables are included with it in the model. Working with three predictors (one covariate, age at time of first birth and two factors, as before) renders the latter two insignificant. Indeed, 'age at birth of first child' is a much more efficient explanatory variable of the outcome 'second birth before age of 28', then education or marital status (Nagelkerke Pseudo R-squared value 0.677).

Table 8

Parameter estimates						95% Confidence Interval for Exp(B)	
Second birth before age 28 yes=1 no=0[a]		B	Standard error	Sig.	Exp (B)	Lower Bound	Upper Bound
0	Intercept	-30.391	1.832	0.000			
AGEYRS		1.251	0.075	0.000	3.495	3.018	4.047
MARITAL STATUS=Single		0.318	0.377	0.398	1.375	0.657	2.876
MARITAL STATUS=Married		0[b]	.	.	.	.	.
EDUCATION=University		-0.264	0.275	0.337	0.768	0.448	1.316
EDUCATION=Sec.School		0[b]	.	.	.	.	.

a. The reference category is: 1.
b. This parameter is set to zero because it is redundant.

Variable 'age at first birth' is the dominant predictor of the response variable and it improves the Nagelkerke Pseudo R-square considerably. 'Age at first birth' overshadows the effects of education and marital status. In this research, due to the chosen data-base, the set of explanatory variables relevant to the purposes of this research topic, was rather limited.

IV Child Care and Family Policy in Malta

Malta's glide into 'fertility bust' has been swift, particularly in the last decade. The policy measures introduced so far, are mainly oriented towards gender equity, regulated child-care facilities (standards of 2006) and fiscal and social benefits arrangements (Budget 2008). Malta is experiencing a transitional phase from a traditional male bread-winner earning model, towards the two-earner concept which has developed from education and job opportunities for both spouses, emanating from the modern growing economy. However, it is

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[27] This compares well with the 2.14 ratio obtained in the case of all mothers irrespective of education and marital status.

also due to the financial insecurity driven by consumption pressures and home ownership at a high cost, affecting young couples in particular. In this context, the heterogeneity of women in Malta is evident: well educated women are set to look for work outside home, while less qualified women have a tendency to remain more 'home oriented'. With processes of secularisation and individualisation affecting family ties, the provision of informal child care, which was and still is to a certain extent, a key to child care provision in Malta, could become somewhat limited.

Therefore, in the near future two processes could be unfolding simultaneously: a) current drive towards higher female participation in the formal labour-market could create negative impacts on fertility, as provision of informal child care could become somewhat scarce, and b) standards-regulated child care could positively impact fertility, albeit these standards are still in the early stages, comparing with other EU member states. Currently, both private and public child care centres (latter ones being more recently opened) still do not fully satisfy the needs of the working mother, either in terms of opening and closing hours or in terms of quality and affordability.

Child caring facilities and services are recently being given a lot of importance policy-wise, in relieving mothers and not only employed mothers, from child rearing, releasing thus time either for work, training or further education. Even perceptions on the subject seem to be in transitional phase. An earlier research based on a survey on child care[28] (Borg, 2003) reveals that 59% of all participants did not consider child care facilities in view of their family's needs. A closer look into the situation of younger mothers with children below age of 14 years showed then, that 77.5% mothers expressed no need for such a service (Borg, 2003:8-10). It appeared that in 2002, there was reasonably enough 'free of charge' reliable child care within family circle. However, a quality child care research conducted four years later showed that 81% of respondents thought that one can have a better work-life balance through childcare (Sciortino, 2007), indicating the reversal in the attitude towards formal child care.

Given the above backdrop, it is not surprising that the current measures are mainly oriented towards building a family friendly climate, based on shared responsibilities[29] and duties between spouses, and on the increase of work-family balance. The issue of balancing family life with work commitments has been identified however, it still needs to get established firmly through the concrete measures such as provision of more child care centres, which satisfy the affordability and accessibility requirements. Flexibility of working arrangements has been also recognised mainly in the public sector where employees[30] are now more in a position to avail themselves of flexi-hours, tele-working, career breaks etc. Yet, the bulk of the female labour force

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[28] This was the first survey of its kind in Malta conducted in 2002.

[29] In 2003 the Employment and Training Corporation (ETC) has adopted its Gender Equality Plan, and the national work-family balance campaign was launched in 2004 (ETC), the focus was on the work-family balance and raising awareness that both parents are responsible for bringing up their off-spring. In practice however, only limited success has been achieved.

[30] Barring employees in decision making posts.

employed with the private sector (approximately two-thirds of all employed women) is still to benefit fully from the family friendly measures in real terms. The effective introduction of work and family balancing is still to be implemented in the private sector, which till 2003 has been left with the discretion of independently deciding on provision of family friendly measures for its employees (ETC, 2007: 26).

The 2008 Budget contains several measures addressed at the issues of fertility, namely: paid maternity leave was extended from 13 weeks to 14 weeks, children's allowance for second and any subsequent children was doubled as from 2008, so as to equal the children's allowance received for the first child. The minimum payable children's allowance has been increased from Euro 121 to Euro 250 for each child. Entitlement to children's allowance (flat rate) has been extended to all families with children 16 years of age and below, irrespective of household income. Until 2008 children's allowance in Malta was means tested, targeting low income and middle class households (with income cap of Euro 24,000). Fiscal measures are also being deployed in order to facilitate child rearing. A deduction from income tax in respect of a child who attends private kindergarten, up to a maximum of Euro 1,000 a year. Social security contribution credits for a parent up to 2 years per child / 4 years in case of child with severe disability, subject to their re-entering to labour market after the period of child rearing, were also introduced.

Getting to know the intended parity, proves to be as equally important for the national family policy to work well as examining the observed trends (Hagewen and Morgan, 2005). Children's allowance or other form of family support, could be seen as a vertical equity measure (McDonald, 2002), aimed at low-income families, who in Malta on average have more children and who perceive their living standards as 'bad' and 'very-bad'. However, research proves that it is also of utmost importance to facilitate work related obligations of both spouses, so as to ensure that the couples achieve their ideal family size without jeopardising their individual careers. Changing the rules of entitlements according to the long-term needs of family policy could be beneficial, however, changing them too often could bring uncertainty (Demeny, 2003). The 2008 Budget introduced children's allowances for families with children younger than 16 years as an across the board entitlement, a significant change from the previously means tested, household income capped children's allowance.

The onset of procreation might not be the only important factor in realisation of the desired number of children, and as long as there is a wish to have more than one child, a reasonable postponement is not an *a priori* negative factor. If the spacing between the first and the second child is realistic, since it is one of the key variables influencing the progression towards higher parities (Breton and Prioux, 2005) then it would be worthwhile looking at other determinants impacting the birth of the second and third child, e.g. child care, education, financial constraints. Affordable and quality child-care, relaxed conditions of education in terms of entry, duration and re-entry, flexibility at the work-place for both father and mother, fiscal and social benefits, and above all greater gender equality still need to be explored to a greater extent in Malta.

In addition, the current lack of family-friendly measures in the major part of the private sector in comparison to the public sector employees, needs to be addressed urgently (Abela, 2004).

However, should the future family policy[31] measures in Malta aim to encourage progression towards second and third child to women whose desired number of children is higher then their realisations, progressive approach to children's allowance (means tested segment) could be applied in these cases, as proved in other countries, namely Austria and Sweden (McDonald, 2002).

Given the fact that the current generations of Maltese parents have low fertility considerations, the likelihood that their offspring would adopt even lower norms is reasonably high (Goldstein et al., 2003, Lutz and Skirbekk, 2005). Future fertility policies in Malta should focus thus more on the tempo effects and above all, should aim at preventing further decline to very low fertility, primarily by stalling further postponements of births and facilitation progression to second births of those most prone to achieve it. The probabilities of having a second child before the age of 28 years, as presented in this research in respect to mother's age at first birth, education and marital status, could serve as an indicator of possible areas of application of tempo policy measures. These measures could comprise financial or fiscal incentives to mothers achieving their desired family ideal earlier in life, as shown in the case of Singapore, for example (McDonald, 2002 and Lutz and Skirbekk, 2005). However, change in completed fertility is not always achieved by policies aimed at timing of births, while vice versa, policies aiming at life-time achieved fertility, do imply the change in timing of births (Hantrais, 2005).

Campaigns and projects oriented towards facilitating parenthood and working life are still to show their effectiveness[32], as they would work in synergy with other societal changes currently unfolding in Malta in a similar fashion as in other European countries (Gauthier, 2002). Given the dramatic impact of tertiary education on the postponement of first births in Malta, it would be opportune to examine further the link between tertiary education and motherhood, as it is clearly working towards postponement of the first child. Policies in this regard have been successfully implemented elsewhere e.g. in France (Ekert-Jaffé et al. 2002, Baizan and Martin-Garcia, 2006) through provision of child care.

It is believed that the reversal of falling fertility rates could been achieved: a) by increasing completed fertility levels of working mothers, through provision of affordable and adequate child care centres and other measures aimed at gender equity and reconciling family and work activities in public and in private sector where the drop-out rate is higher mainly due to motherhood, as well as b) by facilitating further reproductive considerations of mothers who would ultimately have more children than average, such as non-active, 'home-

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[31] Currently, the family policy document is in a drafting stage.
[32] Several projects in Malta were supported by the European Social Fund, with participation of employment, training and gender equality organisations.

centred' mothers, through fiscal and social-benefit measures aiming at tempo and quantum aspects of fertility.

V Conclusions

This research, aimed at quantifying the effects of timing of first births on subsequent births, proved to be just a start in discerning the wider causal mix of factors, leading to a significant decline in Maltese fertility.

The national NOIS database proved to be useful in measuring the impact of age at first birth on spacing of births and likelihood of moving towards second or higher parities. Notwithstanding the efforts done by the medical staff to cater for non-medical variables, such as marital status, education and support at home, more efforts are needed to obtain the exact replies to these questions and thus reduce the element of ambiguity and non-response. Very high non-response rate to education should be closely look into. The strict definition of the variable 'support at home' limited to support for child rearing is only one segment of a wider concept of informal child care provision, hence high positive response and its limited use for the purposes of this research. The current drive to increase the female employment rate across the board, could affect the provision of informal care. Similarly, the impacts of standards-regulated child care on increase of use of formal child care, and subsequent potential increase in fertility still need to be observed and analysed. Variable marital status shows good level of detail and proofs very useful in a more specific analysis of 'single mother' category, which appears to reflect the recent societal changes in Malta. The fact that the time-series consisted of only eight calendar years and only three demographic variables such as age, marital status, and education could have been used, posed some serious limitations for a comprehensive causal analysis. One evidently missing detail was date of previous birth/s (i.e. births that occurred before the NOIS data-base was established, namely prior to 1999), as it was not possible to reconstruct fertility history of mothers giving births during 1999-2006 on the basis of the NOIS data-base only. In the future this could be remedied by merging the NOIS database with the Public Registry database.

The main conclusions related to fertility trends and timing of births in Malta during 1999-2006 period could be summarised as:

- The mean age of the Maltese mothers at first birth has increased from 25.6 years in 1999 to 26.7 years in 2006 (based on the selection applied to the NOIS database).
- In 2006, only 13.3% mothers gave birth to their second child before age of 26, a staggering decline from 39.9% in 2000. While in 2000 60.6% mothers gave birth to their second children before age of 28, in 2006 this stood at a mere 25.4%. Less and less Maltese mothers opt for more children and at a later age too.
- Single mothers are on average four years younger at the time of first and second birth than married mothers.

- In a span of mere 15 years the share of births out of wedlock increased from 2% in 1992 to 22% in 2006. Secularisation of the Maltese society is happening fast.
- In 2006 26% of all births outside marriage were of mothers below age of 20, which is 92% of all births to this age group. The age of father was reported as unknown in 44.56% of all births out of wedlock in 2006, which can be taken as a proxy of unplanned pregnancies.
- Mothers who opt for three children, reduce the gap between first and second child considerably, only to take longer for the birth of the third child. The age and spacing between first and second child have significant impact on progression towards third child.
- Mothers with tertiary education were on average 27.9 years of age at time of first birth, while mothers with secondary education were on average 25.8 years old during the period of observation. Higher education delays first birth by approximately two years.
- The age at time of first birth is significant predictor of the realised number of children. For each one year added to age at time of first birth, the estimated odds of having two children decreases by 2.4%.
- The estimated odds that a mother gives birth to a second child at/after age of 28, increases by 237.4% for every one year the increase in the age of mother at the time of first birth.
- The estimated odds that a mother gives birth to a second child at/after age of 28 years, increases by 142.3% if the mother has tertiary level education rather than secondary level education.
- Marital status, taken as a sole predictor variable indicates high probabilities of single mothers experiencing an early progression towards second child: the probability that a single mother will have a second child before age 28 is high, 85.18%; however the probability that a married mother would have a second child before age of 28 is only 49.63%.
- Single mothers with secondary education are the stratum of mothers that are most likely to give second birth before the age of 28. Conversely, married mothers with tertiary education are the least likely to give second birth before the age of 28.
- The critical ages appear to be between 24 and 26 years, as there is a sharp decline in probability of having a second child before age of 28 between these two ages: from 63% if the first child was born at the age of 24, to 13% if this occurs at the age of 26.

There is a scope for the application of tempo fertility policies in Malta. It is important to fully understand the causes of postponement of births in order to devise means of stalling it. Preventing further decline into a very low fertility is of the utmost importance at this moment in time, while the TFR is still holding above very low fertility levels.

Future research could take one stage earlier on the life-event cycle, and explore the impact of timing of marriage, undoubtedly one of the most relevant factors influencing completed fertility, by possibly combining the Public Registry data on nuptiality, with the NOIS data. Also, the age of the father could be an interesting detail to look into, as it would enable gender specific

analysis in timing and spacing of births, between spouses. Mother's and father's type of employment or occupation could have been also usefully deployed in order to discern the causality backdrop of fertility trends in Malta.

The impacts of economic and financial security attached to decisions of having a second and third child, need to be looked into further. Costs of parenthood, increasing opportunity costs of maternity through potential higher female wages as their education levels increase, financial burden of the family expressed in terms of indebtedness or savings ratio, should be analysed in more depth, as important factors in decision making regarding future offspring. Monitoring the trends of moving towards higher parities by socio-economic status, as well as the intentions of moving towards these parities, could prove useful from the policy design point of view. The fact that families who described their standard of living as 'very good', had only 1.3 children on average i.e. the lowest number of children, and families with standard of living described as 'bad' and 'very bad' had highest number of children on average 2.4 and 2.2, calls for further analysis of the effects that social benefits would make to completed fertility of these two social groups bearing distinctively different family ideal perceptions.

There is still scope to explore the fertility potential lying in earlier births of mothers who want a higher number of children than average, and particularly in earlier second births. The desired and intended family size should be matched as closely as possible, so as to compensate for the reduced subjective demand for children of the young Maltese women. The causes of this reduced subjective demand of young Maltese mothers require deeper causal analysis, as they may be linked to aspirations other than motherhood.

Maltese society will continue its passage through the transitional phase, shown markedly by a consequent rapid decline in fertility. To which extent will alternative family formations, births out of wedlock, together with the possible further postponement of first births contribute to the future fertility decline, remains still to be measured. However, it is hoped that the recent measures introduced in the area of standards-regulated child care provision, gender equity and balancing family and work duties would perhaps partly offset fertility decline and help to stabilise its levels. This would prove highly beneficial in view of Malta's population ageing and future pension sustainability requirement.

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Annex

Table A1: Spacing of births

Mothers of:	Average age at first birth	Average age at second birth	Average age at third birth	Average age at fourth birth	Median age at first birth	Median age at second birth	Median age at third birth	Median age at fourth birth	Spacing between:		
									first and second birth	second and third birth	third and fourth birth
1 child	26.30	-			26.00	-		-	-	-	-
2 children	25.85	28.94	-	-	26.00	29.00	-	-	3.09	-	-
3 children	24.50	26.64	28.96	-	24.00	27.00	29.00	-	2.14	2.32	-
4 children	23.28	25.10	26.62	28.76	23.00	25.00	26.00	28.00	1.82	1.52	2.14
Total average	26.12	28.70	28.80	28.76	26.00	29.00	29.00	28.00	2.58	0.10	-0.04

Source: author's calculations based on the NOIS 1999-2006 data.

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