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Factors Affecting the Probability and Timing of Parity Progression in Egypt

by

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Introduction

In this paper we use data from the Egyptian Fertility Syrvey (EFS) carried out in 1980 as part of the World Fertility Survey . A nationally representative probability sample of households was drawn from a multi-stage stratified master sample design. The number of questionnaires successfully completed by ever married women under 50 years of agewho were identified as eligible for the individual interview was 8788. (International Statistical Institute, 1983).

The results show that there has been a significant decline in period fertility since the early 1960's. Total fertility fell from 7.1 births per woman in 1960-65 to 5.3 in the period 1975-80, represnting a 26 per cent reduction. The primary analysis of the results show that the decline in total fertility was initially caused by rising age at marriage and that this was followed by a period in which the two dimensions of total fertility, namely the proportion married among women of childbearing ages and the rates of marital fertility, have worked in such a way as to reinforce each other. (International Statistical Institute ,1983).

The observed decline in the level of fertility may be regarded as a result of the interaction of intermediate variables which lead to variations in the chances of concpetion and live birth. The major determinants of fertility were identified by Davis and Blake (Davis & Blake, 1956). The most important of these variables were identified to be contraception and fetal mortality together with breast-feeding which determines the length of the post partum infertile period (Bogaarts, 1978). The relative effect of these variables on the probability of transition to the next parity varies from one birth interval to another. For example we may find that contraceptive use is a powerful determinant of the length of the fifth interval , while it is very weak in determining the length of the first interval. On the other hand we may find that breast- feeding is an important determinant of the first interval and so on.

It is also clear that this relative importance of the intermediate variables takes place within a given birth interval as time goes on. At the very begining of a birth interval i.e immediately following the bith of the child initiating the interval , the important variable controling conception may be breast- feeding. As time goes on, the woman may realise that this behaviour is insufficient to prevent ,or delay, conception and may decide to use a more powerful tool e.g contraception.

When adopting the above view it becomes necessary to look at the fertility history as a seris of events , in this case live births . The probability of occurence of each of these events and the timing of its occurence are determined by different sets of variables (Namboodiri, 1974; Bumpass et al., 1982; Rindfuss et al., 1984).

Methodology

The births that occured 5 - 20 years before the survey were first classified according to order. The first birth interval was excluded as it is different than the other intervals since it does not include a period of infertility at its start. We therefore have births of the order 2 to 6 and we aim at creating a life table for each of these intervals. Similar to the ordinary life table it starts with a cohort of women subject to a risk, which is in this case the occurence of a life birth which terminates this specific interval.
Therefore the duration of a birth interval is categorized into a number of segments and we follow a parity cohort of women through these segments and construct an abridged life table for each interval. The date of enterence to a life table of specific order is the date of birth of the live birth of that order which marks the beginning of exposure of the woman to the risk of the evnt of interest , i.e the birth of the next birth. At the beginning of each segment the universe consists of the women exposed to the risk, given that the event did not take place in a previous segment. Dividing the number of women who exprienced the event during a specific segment by the number who were exposed to the risk at the beginning gives a set of 'observed' probabilities q(x), by which a life table is defined.

At the begining of each segment we consider a binary dependent variable: whether the event did or did not occur, given that it did not occur in a previous segment . A regression model can be used for the assessment of the effect of categorical explanatory variables on the dichotomous response variable, and each segment can be analysed separately , permitting the isolation of effects in the segments where they are expected and no assumptins are needed to describe the relative effects (Bumpass, Ridfuss & Palmore, 1986). It then becomes possible to calculate the probability of transition to the next parity for women of a certain category when all other variables are held constant i.e we can calculate a set of 'adjusted' probabilities. The calculation of the 'adjusted' q(x)'s is carried out through the application of a regression analysis using the method of Multiple Classification Ananlysis , MCA (Bumpass,Rindfuss & Palmore, 1986).

According to this method each birth interval was divided into five segments : 9 -18, 19 - 24, 25 - 30, 31 - 45 and 46 -60 months. Each segment was analysed separately with a dependent variable: whether or not the interval was closed during that segment. The independent variables were all categorical. The three intermediate variables were: age of the woman at the start of the interval (A), length of her previous birth interval (L), and the survival of the child initiating the interval for a year following its birth (S). The four socioeconomic variables were: place of residence(R), wife's education(W), husband's education (H), and time when the interval was started (P).

Results

Overall birth probabilities

The birth probabilities q(x) and their cumulative probabilities B(x) are shown in table 1. These probabilities are unadjusted for the socio economic and the intermediate variables. They are presented for the birth intervals 2-6. There are some differences across parities in the percentage of women who move to the next parity and in their speed of transition. Within five years after the previous birth the percentage of women exposed who experience a second birth, B(60) is 96%. This percentage is reduced to about 94% for the third - fifth intervals and reaches a minimum of 92% for the sixth birth interval. This result shows that the probability of having a next birth within five years of the first is inversely related to parity.

Comparing the values of B(18) and B(24) across intervals show that having a sixth birth occurs at a slower rate than having the second. While 54% of the exposed women have their second birth within two years, only 44% have their sixth birth within the same period of time. We may also add that this difference in speed takes place such that the second birth occurs at a higher speed than any other birth. It seems that the second birth occurs with a higher probability and speed than other births. In the following sections we investigate the effect of each of the dependent variables on the two aspects of fertility quantity measured by B(60) and tempo measured by B(18) and B(24) when all other variables are held constant and also by the average time of transition to the next parity in months measured by the trimean.

(1) Age of the mother at start of the interval (A)

In table 2 we present the birth probabilities by age group of the mother. According to the mother's age at the start of the interval, women are classified into three groups (young, medium and old). The dividing ages differ for each birth interval and are presented at the bottom of table 2. These ages are chosen so as to divide the number of exposed women into three groups approximately equal.

We find that the values of B(60) are less for the 'old' group in all intervals. This means that the 'old' women are less likely to close a birth interval than other women, within five years. By examining B(18) and B(24), we find the same difference (to a higher degree), suggesting that the 'young' women who move to the next parity, do so at

Table 1. Birth probability, q(x), and cumulative birth probabilityB(x), by birth interval and segment (months)

	Interval				
Segment	2	3	4	5	6
q(x)					
9-18	33	28	25	25	25
19-24	31	26	26	26	25
25-30	35	34	33	32	30
31-44	66	65	61	60	60
46-60	59	55	56	54	51
B(x)					
18	33	28	25	25	25
24	54	47	45	45	44
30	70	65	63	62	61
45	90	88	85	85	84
60	96	94	94	93	92
No. of cases					
9-18	3912	3469	2983	2551	2041
19-24	2635	2498	2228	1907	1533
25-30	1805	1848	1656	1415	1147
31-45	1166	1228	1109	958	806
46-60	398	427	429	384	322

Table 2. Birth probabilities q(x)'s and cumulative birth probabilities B(x)'s by interval, duration segment and age at start of the interval(A)

Segment & Category	q(x) Intervals 2	3	4	5	6	B(x) Intervals 2	3	4	5	6
9-18										
young	34	31	31	32	33	34	31	31	32	33
medium	32	27	23	22	21	32	27	23	22	21
old	33	26	22	22	22	33	26	22	22	22
19-24										
young	30	30	27	28	27	54	52	50	51	51
medium	32	26	28	26	25	54	46	45	42	41
old	32	22	22	24	23	54	42	39	41	40
25-30										
young	34	38	35	34	31	70	70	67	68	66
medium	37	35	33	35	31	71	65	63	62	59
old	34	28	32	27	27	70	58	59	57	56
31-45										
young	67	67	64	60	58	90	90	88	87	86
medium	68	68	62	61	64	91	89	86	85	85
old	62	60	58	59	56	89	83	83	82	81
46-60										
young	61	55	55	63	47	96	96	95	95	92
mediu	58	58	57	50	52	96	95	94	93	93
old	57	51	57	52	53	95	92	93	91	91
Trimean										
young						23	23	24	23	23
medium						23	25	26	26	27
old						23	26	27	27	27

*Categories of age at start of interval(A) are as follows:
Interval 2:young (less than 17) medium (17-20) old (21+)
Interval 3:young (less than 19) medium (19-22) old (23+)
Interval 4:young (less than 21) medium (21-24) old (25+)
Interval 5:young (less than 23) medium (23-26) old (27+)
Interval 6:young (less than 25) medium (25-28) old (29+)

a greater speed than the older women . An exception is the second birth interval , in which no age differential is observed neither in quantity or speed of transition.

In general we conclude that women who start a birth interval (except the second interval) at a relatively late age are less likely to move to a higher parity, and in those who do so this progression is much slower than in the younger women. An explanation often used for such an association between maternal age and the speed of transition is that younger women wean the child at an earlier age than the older women and are therefore more likely to conceive earlier. However, this explanation is not enough to account for the observed differences. It has been reported that "while there are differences in the breast feeding of infants according to their mother's age and parity, this accounts for only about an additional two months of non-susceptibility to conception"(Central Agency for Public Mobilisation and Statistics,1980). Therefore, it appears that older women use contraception for spacing after the birth of the second (and subsequent births). This is confirmed by observing a large age differential for B(24) after the second birth.

(2)Length of the previous interval (L)

Table 3 shows probabilities by length of previous birth interval in months. The cumulative birth probabilities B(60) show little differences as women with previous long intervals (30 or more months) and those with shorter previous intervals have -almost- the same probability to proceed to the next parity. However, B(18) and B(24) show that women with long previous intervals are slower in proceeding to the next parity i.e have long intervals. Thus, we can say that -other factors being held constant- the length of the previous birth interval is not associated with differences in the probability of transition to the following parity, but it is directly related to the speed of transition. This differential suggests that couple specific fertility behaviour is almost constant across parities. This behaviour includes voluntary actions e.g prevalence of contraceptives use and breast feeding and involuntary factors e.g fecundability.

(3) Infant Mortality

This variable affects the pace of fertility, first, through early termination of breast feeding and so its effect will be concentrated in the first segment i.e 9-18 months (Rindfuss et al 1984). Secondly, infant mortality may affect the replacement behaviour of couples, in that when a child dies the couple may try to replace it quickly. In doing so they may avoid the use of contraception, an action which will be reflected in increased birth probabilities at later segments.

Table 3 Birth probabilities q(x)'s and cumulative probabilities B(x)'s by birth interval, duration segment and length of previous interval(L)

Segment & Category*	q(x) Intervals 2	3	4	5	6	B(x) Intervals 2	3	4	5	6
9-18										
short	35	38	34	35	36	35	38	34	35	36
medium	32	20	22	21	19	32	20	22	21	19
long	27	22	19	19	19	27	22	19	19	19
19-24										
short	32	29	28	29	25	56	56	52	54	52
medium	34	28	29	28	28	55	42	45	43	42
long	28	20	20	21	23	47	38	35	36	38
25-30										
short	35	34	32	31	29	71	71	68	68	66
medium	39	37	39	35	32	73	64	66	63	60
long	34	29	28	31	28	65	56	53	56	55
31-45										
short	66	64	56	58	58	90	90	86	87	86
medium	68	70	68	64	60	91	89	89	87	84
long	64	61	61	58	61	88	83	82	81	82
46-60										
short	61	54	55	50	50	96	95	94	93	93
medium	46	53	59	51	44	95	95	96	93	91
long	60	56	56	59	59	95	92	92	92	93
Trimean										
short						22	22	23	22	23
medium						22	26	26	26	26
long						25	27	28	28	28

*Categories for (L) are as follows (in months):
short (less than 20), medium (21 - 30), long (31 +).

Table 4 Birth probabilities q(x)'s and cumulative birth probabilities by birth interval, duration segment and infant mortality status of the birth initiating the interval(I).

Segment & Category	q(x) Intervals 2	3	4	5	6	B(x) Intervals 2	3	4	5	6
9-18										
lived	29	23	20	20	19	29	23	20	20	19
died	47	47	43	43	44	47	47	43	43	44
19-24										
lived	30	25	24	24	24	50	42	39	39	38
died	38	32	32	34	33	67	64	61	62	62
25-30										
lived	35	33	33	32	29	68	61	59	59	56
died	36	38	34	34	34	79	78	74	75	75
Trimean										
lived						24	26	27	27	27
died						19	19	21	20	20

The data presented in table 4 show differences in the birth probabilities in the first segment across all intervals. The probability of proceeding to the next birth after the death of a child is almost double that of proceeding to the next birth when that child is alive . The differential continues (to a lesser degree) until 24 months, confirming the effect of early and abrupt termination of breast feeding. Table 4 also shows a remarkable consistency of pattern across birth intervals 4-6. This suggests that the effect of infant mortality on the speed of fertility is not related to parity.

Thus, we may conclude that the intermediate variables act in the expected direction. Women who start the interval at a relatively old age, those who had a relatively long previous interval and those whose infant initiating the interval had survived infancy, are less likely to progress to the next pregnancy, if they do so, they are slower than the others. The results across segments indicate that breast feeding effects may be the same for women of all ages, that they may be associated with the length of the previous interval and that they mediate between infant mortality and the length of the birth interval.

Socio economic and Trend Differentials

Tables 5-8 show the birth probabilities and the cumulative birth probabilities for the four variables of interest unadjusted for the intermediate variables.

The urban rural differential is shown by the data in table 5. We find no difference either in quantity or speed for the second birth interval. On the other hand , an urban rural differential is confirmed for all other intervals, both in quantity and tempo. The proportion of women who proceed to the next parity within five years is higher among rural women. The speed of transition is shown to be higher among rural women(in those intervals) by the higher values of q(x)'s, especially in the last three duration segments i.e after two years of the start of the interval. This indicates that the slower rate of progression among urban women is not associated with breast feeding but it is of a voluntary nature. These data indicate that urban women use contraceptives starting from the third birth interval. On the other hand, we find that rural women follow a pattern that is almost constant over all birth intervals. By 18 months, about 25% of the exposed rural women have a birth and by 24 months about half of them do. In contrast the urban women's behaviour is parity related with faster progression in their second interval than in subsequent stages.

The effect of wife's education is shown in table 6. Again we find a strong educational differential in both quantity and speed. This differential occurs in all birth intervals. In the second birth interval the differential is not strong in quantity but it is

clear that women with no education proceed to the second birth at a higher speed than those with some education.

For both groups of women (those with no education and those with some education), the probability of progression to the next parity q(x) is parity related. Proceeding to higher parities is less probable and occurs at a lower speed. At the end of five years about 95% of the women move to the second birth (96% for women with no education and 94% for women with some education) but only 93% of those with no education and 81% of those with some education progress to the sixth birth.

The difference in tempo is shown by using B(18) and B(24) for comparing the two groups of women across parities. Such a comparison shows that -for all cases- the progression is slower among women with some education. This pattern of differentials suggests the use of contraceptives among women with 'some' education after the birth of the second child.

The data classified by husband's education shown in table 7 suggest great differentials in the quantity and speed of reproduction. Women married to husbands with 'some' education are less probable to move to higher parities and are slower. The values of q(x)s for women ,married to none educated husbands are consistently lower than those for women married to husbands with some' education especially in the last three segments indicating the effect of voluntary behaviour such as the use of contraceptives especially at higher parities.

The period effect on the progression process is apparent from table 8. B(60), which is the measure of the quantity of transition shows a recent reduction only in the sixth interval. However, comparing the values of B(18) and B(24) across periods shows that the transition is recently becoming slower in all intervals. It seems that the recent use of contraception is effective as far as spacing is concerned in comparison to the use for prevention

Table 5 Birth probabilities q(x) and cumulative birth probabilities B(x) by interval, duration segment and type of place place of residence (R)

Segment & Category	q(x)					B(x)				
	Intervals					Intervals				
	2	3	4	5	6	2	3	4	5	6
9-18										
urban	35	29	24	22	25	35	29	24	22	25
rural	31	28	26	27	25	31	28	26	27	25
19-24										
urban	32	23	26	23	27	56	45	44	40	45
rural	31	28	26	27	24	52	48	45	47	43
25-30										
urban	33	30	30	32	28	70	62	61	59	61
rural	37	36	35	32	31	70	67	64	64	61
31-45										
urban	63	60	57	51	55	89	85	83	80	82
rural	68	69	64	66	63	90	90	87	88	85
46-60										
urban	54	50	42	52	45	95	92	90	90	90
rural	62	60	67	56	55	96	96	96	95	93
Trimean										
urban						22	25	25	26	25
rural						23	25	25	25	26

Table 6 Birth probabilities q(x) and cumulative birth probabilities B(x) by interval, duration segment and wife's education (W).

Segment	q(x)					B(x)				
Category	Intervals					Intervals				
	2	3	4	5	6	2	3	4	5	6
9-18										
some	33	28	26	26	25	33	28	26	26	25
none	33	27	21	18	20	33	27	21	18	20
19-24										
none	32	27	26	26	25	54	47	45	45	44
some	26	21	18	20	22	50	42	35	34	38
25-29										
none	37	35	34	33	30	71	66	64	63	61
some	28	20	25	24	19	64	54	51	50	50
30-44										
none	67	67	62	61	61	91	89	86	86	85
some	59	50	53	48	43	85	77	77	74	71
45-59										
none	59	58	57	55	52	96	95	94	94	93
some	57	39	54	50	35	94	86	89	87	81
Trimean										
none						23	25	25	25	26
some						24	26	28	29	27

Table 7 Birth probabilities q(x) and cumulative birth probabilities B(x) by interval, duration segment and husband's education (H)

Segment & Category	q(x)					B(x)				
	Interval					Interval				
	2	3	4	5	6	2	3	4	5	6
9-18										
none	32	28	25	26	25	32	28	25	26	25
some	34	28	25	22	25	34	28	25	22	25
19-24										
none	32	27	26	26	25	54	47	45	45	44
some	29	24	25	24	26	53	45	44	41	45
25-29										
none	37	36	34	33	30	71	66	63	63	61
some	30	25	29	26	25	67	60	60	56	58
30-44										
none	67	69	63	61	63	90	90	86	86	85
some	62	55	52	53	41	88	82	81	79	75
45-59										
none	58	61	60	55	53	96	96	95	94	93
some	59	41	44	49	43	95	89	89	89	86
Trimean										
none						23	25	26	25	26
some						22	25	25	26	25

Table 8 Birth probabilities q(x) and cumulative birth probabilities B(x) by interval, duration segment and period interval started (P)

Segments & Category	q(x)					B(x)				
	Interval					Interval				
	2	3	4	5	6	2	3	4	5	6
9-18										
1969-74	31	24	23	24	21	31	24	23	24	21
1964-69	33	27	25	24	24	33	27	25	24	24
1959-64	34	34	28	28	31	34	34	28	28	31
19-24										
1969-74	32	24	23	25	24	53	42	41	43	40
1964-69	30	27	25	25	24	53	47	44	43	42
1959-64	32	28	30	28	27	55	52	50	48	50
25-29										
1969-74	35	31	30	30	28	70	60	58	60	57
1964-69	34	33	31	32	28	69	64	61	61	58
1959-64	38	37	38	35	34	72	70	69	66	67
30-44										
1969-74	68	68	60	60	59	90	87	83	84	82
1964-69	65	61	60	55	54	89	86	84	83	81
1959-64	64	67	65	66	71	90	90	89	89	90
45-59										
1969-74	67	60	62	64	57	97	95	94	94	92
1964-69	57	51	53	42	46	95	93	93	90	90
1959-64	51	54	53	59	50	95	95	95	95	95
Trimean										
1969-74						23	27	27	26	27
1964-69						23	25	26	25	26
1959-64						22	23	24	24	24

Discussion

In order to fully determine the effect of the socio economic variables on the quantity and speed of progression to the next parity, we applied a multiple classification analysis to control the itermediate variables and to arrive at the 'adjusted' probabilities. By comparing the 'observed' and the 'adjusted' values we may be able to understand the mechanism by which the intermediate variables affect the socio economic differentials. The results of the analysis are shown in table 9. The ratios of the birth probilities are used to represent the socio economic and trend differentials as 'observed' and as 'adjusted'. Theoretically, if our three intermediate vaiables were fully responsible for the differences in the birth probabilities, the observed ratio (if different from 100) would become equal to 100 when adjusted.

We shall, therefore, consider the adjustements in table 9. Out of 125 adjustments, the model was able to affect 45 in which socio economic differentials were reduced by five or more points. The effect is mainly concentrated in the variables (W) and (H) and to a lesser degree in (R) but not in (P). This shows that the period effect cannot be attributed to our three intermediate variables. The mild recent changes observed for the high parities are mainly caused by contraceptive use, the variable which is not explicitly used in our analysis,as it was not made available by WFS for all women of the sample.

On the other hand, fertility differentials associated with the wife's education or the husband's education were successfully controlled by our model. This indicates that the age of the mother, the previous behaviour and fecundity are determinants of the educational differences. The absence of this influence for the second birth interval suggest that birth control is involved and that it acts through the intermediate variable (L). Women who use contraceptives to delay the third birth, are more likely to continue to use birth control to delay or prevent further births.

Conclusion

The probability and timing of parity progression for each birth interval has improved our understanding of the fertility differentials in Egypt. The data show no differentials in progression to the third birth. However, the differences are in quantity and speed starting from the third birth interval and associated with the type of residence , the wife's education and the husband's education. Using the available intermediate variables we were able to control for several variations. This result indicates that the differences are associated with the voluntary use of contraception by older , urban, educated women and those married to educated husbands. The use of contraceptives continues from the third interval onwards.

Table 9. Ratios of q(x) as observed (O) and adjusted(A) by MCA by birth interval, segment duration (months) and socio aeconomic variables

Segment &	Interval 2		3		4		5		6	
Category*	O	A	O	A	O	A	O	A	O	A
9-18										
(R) u/r	113	117	104	100	92	100	81	88	100	100
(W) s/n	100	103	104	104	124	113	114	118	125	114
(H) s/n	94	94	100	97	100	93	118	104	100	96
(P) 1/3	91	91	71	73	82	92	86	89	68	73
(P) 2/3	97	97	79	82	89	96	86	93	77	80
19-24										
(R) u/r	103	110	82	82	100	96	85	85	113	113
(W) s/n	123	123	129	113	144	139	130	113	134	119
(H) s/n	110	103	113	100	104	96	108	100	96	93
(P) 1/3	100	103	86	86	77	80	89	89	89	93
(P) 2/3	94	97	96	96	83	83	89	89	89	89
25-30										
(R) u/r	89	94	83	91	86	91	100	103	90	90
(W) s/n	132	119	175	135	136	114	138	118	158	143
(H) s/n	123	113	144	121	117	107	127	127	120	107
(P) 1/3	92	92	84	84	79	82	86	86	82	85
(P) 2/3	89	89	89	86	82	82	91	91	82	82
31-45										
(R) u/r	93	94	87	93	89	92	77	77	55	53
(W) s/n	114	112	134	116	117	100	127	107	142	113
(H) s/n	103	126	115	121	115	115	115	103	154	138
(R) u/r	87	87	83	96	63	63	93	100	82	89
(P) 1/3	106	108	102	105	92	97	91	89	83	83
(P) 2/3	102	102	91	92	92	95	83	85	76	75
46-60										
(W) s/n	104	105	149	114	106	80	108	100	149	137
(H) s/n	98	95	149	146	136	126	112	110	123	115
(P) 1/3	131	131	111	119	117	129	108	108	114	110
(P) 2/3	112	112	94	92	100	112	71	71	92	87

u=urban, r=rural, s=some, n=none, 1=1969-74, 2=1964-69, 3=1959-64.

*Categories (P) Period: 1, 1969-74; 2,1964-69; 3,1959-64.

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