



The Effect of Child Spacing on Mothers' Labor Force Participation in Urban Households of Iran

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Abstract

Background: Short and long birth spacings have negative effects on the health of mothers and children and consequently on the level of mothers' employment.

Objectives: This study aimed to investigate the effect of first and second children spacing on mothers' labor force participation in Iranian urban households.

Methods: This descriptive-analytical cross-sectional study was performed using econometric methods as a probit and probit model with an instrumental variable in Stata version 16 in 2021. The sample size included 8920 urban households in all provinces of Iran, and the data were extracted from the cost and income questionnaire of urban households.

Results: The birth spacing of the first and second child had a positive effect equal to 0.16 on the probability of employment of mothers in households with 2 children, which was equal to 0.22 for households with 2 or more children. The coefficients of maternal age, having a private home, father's education, and father's age on mothers' employment were -0.02, -0.09, -0.06, and 0.02 in households with 2 children, respectively.

Conclusions: Increasing the birth spacing, especially for the first and second child, led to an increase in the probability of the mother's employment in the labor market. Therefore, optimal birth spacing is recommended, which improves both the health of the mother and the child and does not reduce job opportunities. In this regard, policies to promote optimal birth spacing through raising awareness, the use of contraceptive methods, and the importance of breastfeeding are also proposed.

Keywords: Birth Spacing, Employment, Education, Child, Mothers, Family Characteristics

1. Background

"Birth spacing" or "birth interval" is defined as the time gap between 2 consecutive births, which is also known as the inter-pregnancy interval (1). The World Health Organization (WHO) recommends an interval between the last live birth and the next pregnancy of at least 24 months (2), a birth spacing of 33 months (3). Short birth spacing, also regarded as rapid repeat pregnancy, increases the risk of adverse outcomes in mothers and infants (4), including adverse childbirth consequences, preterm birth, infant mortality, and low birth weight (5, 6). In addition, the infants will usually experience sustained health complications such as growth problems, asthma, hearing impairment, and low vision (7). Short birth spacing is not only a problem in developing countries as it is also seen in developed nations (1). It should be noted that a very long birth spacing also has negative effects on the infant's health (4,

8, 9). Apart from health outcomes, very short birth spacing increases the population growth rate and weakens the stages of development. As a result, it prevents women from becoming productive members of society and limits their contribution to economic development (10). Since short and long birth spacings have negative impacts on maternal and child health (4-6, 8, 9), proper birth spacing is an important issue for their health promotion, which can play an important role in the women's decision to conceive and labor market participation (11). Therefore, it is important to evaluate birth spacing, its determinants, and its effects on women's employment.

Several cultural, economic, and social factors have been reported as determinants of women's employment (12, 13), including the women's education level and income, household income, sex ratio, growth domestic production per capita, unemployment rate, fertility rate, and cyberspace (14-18). In this regard, birth spacing, with

its marked effects on fertility and maternal and neonatal health, is an important determinant of female labor market participation. Several studies have evaluated the determinants of female labor market participation (14-18); however, a few studies have investigated the effect of birth spacing on female labor market participation (11, 19-21). In China, Pan et al. (11) found that long birth spacing had a positive effect on female labor market participation, and delaying the second birth by 1 year markedly increased the probability of participation in the labor market for married women in urban areas. Karimi (20) found that a long birth spacing increased female participation and income in the labor market for a long time after the second birth in Swedish families. Troske and Voicu (21) reported that delaying the second birth increased the probability of female labor involvement and reduced the negative effects of the second child on their labor force participation. Gough (19) showed that a birth spacing between 2 and 6 years had the least effect on female participation, while a longer interval before the second birth reduced participation in midlife. In Ethiopia, Ayane et al. (1) found that the education level, age at first marriage, having a female child, short duration of breastfeeding, and not using contraceptives were the most important determinants of short birth spacing. Pimentel et al. (3) reported that a shorter duration of breastfeeding and the sex of the previous child were the only 2 factors constantly associated with short birth spacing.

Short and long birth spacings may have negative impacts on maternal and child health and play an important role in the fertility decision of women and their labor involvement. On the other hand, evaluation of the effect of birth spacing on female labor market participation may provide practical solutions for determining the number of children and postponing it. Furthermore, such studies are very important to formulate governmental policies to increase the female labor market participation or fertility rate. Therefore, the present study was conducted to evaluate the effect of birth spacing on the employment of married women in urban households in Iran. To achieve this objective, birth spacing was theoretically considered an endogenous variable and a function of other determinants.

2. Objectives

The present study aimed to determine the effect of birth spacing between the first and second child on the employment of married women in urban households in Iran.

3. Methods

This cross-sectional descriptive-analytical study was conducted in 2021. The accessible population, including 18825 urban households from all provinces of Iran with live parents (father and mother), was selected by the Statistical Center of Iran using a 3-stage sampling method (selection of city, block, and household) with random sampling. In the first stage, 75 sample cities were selected from all the provinces. In the second stage, some blocks were selected among the listed blocks in the sample cities according to the systematic sampling method. In the third stage, sample households were selected. From this accessible population, according to the purpose of the study to determine the birth spacing between the first and second child, only 8920 households with 2 or more children were selected as the sample. The sample data were also collected by the Statistical Center of Iran using the "Urban Household Income Expenditure Survey" and publicly available data. The data required for this study were extracted from the mentioned survey for 2019. To define the model, the methods used by Pan et al. (11), Troske and Voicu (21), and Karimi (20) were applied, evaluating the effect of birth spacing as an endogenous variable on the probability of female employment. The female labor equation is as follows:

Equation 1:

$$FL = \alpha_1 + \alpha_2 BS + \alpha_3 X + \epsilon$$

where FL is female labor. It is a binomial dependent variable that takes a value of 1 if the household mother is employed and a value of 0 if not. BS is birth spacing; X is other effective variables such as economic, social, and cultural factors; α_1 , α_2 , and α_3 are the model coefficients, and ϵ is the error term. Other variables affecting female employment were selected according to the studies conducted by Pan et al. (11), Karimi (20), Kazemi et al. (16), Voigtländer and Voth (22), Azimi (14), and Keshavarz and Borhani (23). Table 1 presents the characteristics and values of the study variables.

Accordingly, birth spacing was considered an endogenous variable and a function of other factors according to studies conducted by Pan et al. (11) and Karimi (20). Previous studies evaluated the effects of many variables as independent variables on birth spacing, including age, occupation, education level, and place of residence (4). Ayane et al. (1) found that the female education level, having a female child, and age at first marriage were the most important determinants of a short birth spacing; also, Pimentel et al. (3) reported that a shorter duration of breastfeeding and the sex of the previous child were the most important determinants of a short birth spacing. Since Iranian households have a preference for sons (16), the first child being a

Table 1. Study Variables and Their Values^a

Variables	Values and Considerations
Female employment	Employed: 1, otherwise: 0
Number of children	Person
Birth spacing	Year
Father's wage	Per hour (Rial)
Household income per capita	Per month (Rial)
Father's age	Year at sampling time
Mother's age	Year at sampling time
Father's education level	Illiterate: 0, primary school: 1, secondary school: 2, high school (unfinished): 3, high school diploma and college: 4, associate degree: 5, bachelor's degree: 6, master's degree and general practitioner: 7, PhD and higher: 8
House ownership	Owning a house: 1, otherwise: 0
Having a child under 2 years old	Households with children under 2 years old: 1, otherwise: 0
Living with an elderly person above 60	Households with members above 60 years old: 1, otherwise: 0
Father's governmental job	Governmental job: 1, otherwise: 0
Mother's wage	Per hour (Rial)
Same sex of the first 2 children	Same sex of the first 2 children: 1, otherwise: 0
Girl	The first child being a girl: 1, otherwise: 0
Mother's education	See father's education

^a Reference: Research findings

girl may increase the desire for a second child; also, many studies consider mothers' education an important factor in birth spacing (1, 11, 20). Therefore, to address the endogeneity of birth spacing, the variables of the mother's education level and the first child being a girl were used as instrumental variables according to Ayane et al. (1) and Pimentel et al. (3) to formulate Equation 2.

Equation 2:

$$BS = \beta_1 + \beta_2 \text{girl} + \beta_3 \text{medu} + \epsilon$$

where BS is the birth spacing as the difference between the first 2 children's ages, girl is the first child being a girl, medu is the mother's education level, and β_1 , β_2 , and β_3 are model coefficients. Since the dependent variable of Equation 1 is a binomial variable and considering the endogeneity of birth spacing according to Equation 2, the instrumental variable probit (IV-probit) model (11, 14, 17, 20, 24, 25) was applied to estimate Equations 1 and 2 (models 1 and 2 in Table 2). For robustness results, a probit model (models 3 and 4 in Table 3) was used to estimate Equation 1 without the assumption of endogeneity. Model estimations and other statistics were carried out using Stata version 16 (StataCorp LP). In this study, the Wald test with chi-square statistic is used to evaluate the presence of endogeneity. The null hypothesis is the exogeneity of the independent variable. Moreover, the marginal effects were applied to evaluate the effect of independent variables on the

dependent variable (26).

4. Results

Descriptive statistics showed that the mean birth spacing between the first and second birth for households with 2 or more children was 5.35 years (5.54 years for employed women and 5.33 years for unemployed women). Table 4 presents the relationship between birth spacing and the employment percentage of mothers in urban households. The results of Table 4 for households with 2 children showed that with an increase in birth spacing, the employment percentage of mothers increased from 2% to 13% for a birth spacing of 5 years; however, the employment percentage decreased with a further increase in birth spacing. This relationship was also true for households with 2 or more children.

To evaluate the effect of birth spacing between the first and second child on the probability of female employment, as discussed in the methods section, models 1 and 2 were estimated using the instrumental variable probit model, and the results are presented in Table 2. The sample included in model 1 was only a household with 2 children. However, since selecting households with 2 children could have biased sample selection, model 2 was estimated for all households with 2 or more children to address this

Table 2. Effect of Birth Spacing Between First and Second Child on Labor Market Participation of Mothers ^a

Variables	Model 1		Model 2	
	Coefficient	Probability	Coefficient	Probability
Birth spacing	0.1608	0.014	0.2216	0.027
Number of children	-	-	0.3322	< 0.001
Father's wage	-1.03×10^{-8}	0.725	-1.58×10^{-7}	0.473
Household income per capita	-4.02×10^{-8}	0.007	-3.02×10^{-8}	0.052
Father's age	0.0271	< 0.001	0.0271	< 0.001
Mother's age	-0.0225	0.037	-0.211	0.05
Father's education level	-0.0620	0.039	-0.0466	0.014
House ownership	0.0953	0.275	0.0618	0.440
Having a child under 2 years	0.1988	0.525	0.2727	0.350
Living with an elderly person above 60	0.1285	0.574	0.1106	0.586
Father's governmental job	2.4461	0.001	1.9817	0.033
Constant	-3.0263	< 0.001	-3.5710	< 0.001
Endogeneity test	41.1	0.021	77.1	0.018
Endogeneity variable	Birth spacing		Birth spacing	
Instrumental variable	Girl		Girl	
Instrumental variable	Mother's education		Mother's education	
Sample	5748 households with 2 children		8920 households with 2 or more children	

^a Reference: Research findings**Table 3.** Effect of Birth Spacing Between the First and Second Child on Labor Market Participation of Mothers Without Endogeneity ^a

Variables	Model 3		Model 4	
	Marginal Effect	Probability	Marginal Effect	Probability
Birth spacing	0.001202	0.0145	0.000747	0.0276
Number of children	-	-	-0.012179	< 0.001
Father's wage	-2.74E-09	0.932	-2.40E-09	< 0.921
Household income per capita	-4.97E-09	< 0.001	-4.27E-09	< 0.001
Father's age	0.00189	0.003	0.0015	0.002
Mother's age	-0.003018	< 0.001	-0.002937	< 0.001
Father's education	-0.00818	< 0.001	-0.00755	< 0.001
House ownership	-0.01508	0.012	-0.013684	0.003
Having a child under 2 years	-0.00498	0.841	-0.00958	0.644
Living with an elderly person above 60	-0.01174	0.246	-0.01816	0.008
Father's governmental job	0.838962	0.001	0.814432	0.001
Mother's education	0.028472	< 0.001	0.028117	< 0.001
Girl	0.001606	0.781	0.007119	0.112
Sample	5748 households with 2 children		8920 households with 2 or more children	

^a Reference: Research findings

Table 4. Distribution of Birth Spacing Between First and Second Child Regarding Employment Percentage of Mothers in Urban Households^{a, b}

Birth Spacing of First and Second Child (y) ^c	Households with 2 Children	Households with 2 or More Children
0	114 (0.02)	177 (0.02)
1	222 (0.04)	465 (0.05)
2	567 (0.10)	1184 (0.13)
3	624 (0.11)	1193 (0.13)
4	696 (0.12)	1170 (0.13)
5	741 (0.13)	1129 (0.13)
6	601 (0.10)	882 (0.10)
7	568 (0.10)	759 (0.09)
8	432 (0.08)	560 (0.06)
9	327 (0.06)	407 (0.05)
10	250 (0.04)	300 (0.03)
11	180 (0.03)	206 (0.02)
12	118 (0.02)	136 (0.02)
13	91 (0.02)	101 (0.01)
14	68 (0.01)	77 (0.01)
15	57 (0.01)	66 (0.01)

^a Values are expressed as No. (%).^b Reference: Research findings^c The birth spacing of more than 15 years was not reported.

problem. The results are presented in Table 2. The results of endogeneity testing in model 1 showed that the value of chi-square was equal to 41.1; therefore, the assumption of exogeneity was rejected with a probability of 0.02, and the birth spacing between the first and second child was considered an endogenous variable. The birth spacing between the first and second child had a positive effect of 0.16 on the maternal employment probability. Moreover, an increase in the household income, mother's age, and father's education level had a negative effect, and the father's age and father's governmental job had a positive effect on the probability of maternal employment. Owning a house, having an under 2-year-old child, or living with an elderly member aged above 60 years did not have any statistically significant effects in the model.

The results of endogeneity testing in model 2 showed that the value of chi-square was equal to 77.1; therefore, the assumption of exogeneity was rejected with a probability of 0.018, and the birth spacing was considered an endogenous variable. In model 2, the birth spacing between the first and second child had a positive effect of 0.22 on the maternal employment probability. Moreover, an increase in the number of children, household income, mother's age, and father's education level had a negative effect, and

the father's age and father's governmental job had a positive effect on the probability of maternal employment.

The birth spacing between the first and second birth was considered endogenous in models 1 and 2. However, if the hypothesis of the birth spacing endogeneity is disregarded (assuming that the mother's education level and the first child being a girl directly affect female employment), models 3 and 4 can be estimated using the probit model (Table 3). Table 3 shows that the birth spacing in both models has a positive effect on the probability of female employment. The first child being a girl had no effect on the employment probability, while the mother's education level had a positive effect in both models. The number of children, household income, owning a house, and father's education level had negative effects on the probability of female employment.

5. Discussion

Birth spacing is a determinant of female labor market participation (3, 11); therefore, the aim of the present study was to evaluate the effect of birth spacing on the employment of married women in Iranian urban households. The results showed that in all instrumental variable probit models, birth spacing had a positive effect on the probability of maternal employment. Moreover, regardless of the endogeneity of birth spacing, the results of probit models still show that the birth spacing between the first and second birth has a positive effect on the probability of female employment. Therefore, in addition to the fact that birth spacing, whether endogenous or exogenous, is a key factor in female labor market participation, increasing the birth spacing to the standard time may increase the probability of maternal employment. This finding is in line with the results of studies by Pan et al. (11), Karimi (20), and Troske and Voicu (21). Karimi (20) argued that delaying the second birth by about 1 year increased the probability of returning to work between births. Pan et al. (11) found that delaying the second birth by 1 year on average increased the probability of labor market participation by 11.51% in married women in urban areas.

A longer interval between births may allow women to re-enter the labor market during the childbearing period, thus preventing long work interruptions and reducing the negative effects on subsequent children (20). Proper birth spacing, which is defined as an interval of 3 - 5 years between births (2, 3, 27), is an important part of human rights and a component of sustainable development (4). Inadequate birth spacing is associated with adverse outcomes such as stillbirth, low birth weight, and malnutrition for mothers, as well as low birth weight and reduced physical and intellectual growth for infants (4). However, many

people still do not practice proper birth spacing for religious reasons (28). Although an increase in birth spacing increases the probability of female employment, its length is also very important. Gough (19) found that a long interval before the second birth reduced participation in midlife; in other words, although increasing the birth spacing leads to an increase in the female employment rate, it is associated with an increase in the maternal age, which in turn reduces employment.

Considering the results of the present study, practice proper birth spacing should be practiced to promote maternal and child health and prevent a reduction in maternal labor opportunities with an increase in maternal age. Family planning macro policies should be formulated to promote proper birth spacing, increase awareness of the use of contraceptives, underline the importance of breastfeeding as a proper birth spacing mechanism, and implement protective policies for working women, especially for childbearing. One of these protective policies for women to promote childbearing and maintain their employment status is maternity leave, which is implemented at different levels in the majority of countries. In all Organisation for Economic Co-operation and Development (OECD) countries (except the US), maternity leave is funded by the government budget (20); however, an increase in the duration of maternity leave has different effects on female employment (29, 30).

Female education is an important factor in female labor force supply (25, 31, 32). The results of the present study showed that an increase in the maternal education level had a positive effect on the maternal employment rate, which is consistent with the results of studies conducted by Shittu and Abdullah (32), He and Zhu (25), and Pan et al. (11). It was also in line with descriptive statistics; 0.26% and 0.51% of the women with a bachelor's or master's degree and 0.12% and 0.04% of the women with an associate degree and high school diploma were employed, respectively. An increase in the education level of women improves their expertise and increases the value of their time in the labor market, which promotes their motivation to participate in the labor market (33). An increase in the education level of women also increases their job opportunities and improves their decision-making ability in the household (34). Moreover, women with a university education practice have longer birth spacing compared with women with lower education levels (19).

The results showed an inverse relationship between the number of children and female employment; in other words, the probability of the employment of mothers decreased with an increase in the number of their children, which is in line with previous studies. The birth of a child usually affects women's education, participation in the la-

bor market, and personal and occupational desires (35). In the UK, Ukil (18) showed that the birth of the third child reduced the probability of the mother's participation in the labor market. Moreover, having 2 sons or 2 daughters had a positive effect on the probability of having a third child. In China, He and Zhu (25) reported that the second child significantly reduced the mothers' work participation.

In different models, an increase in the father's age was associated with an increase in the probability of the mother's employment. In other words, the father's age had a positive effect on the probability of the mother's employment. It seems that with an increase in the father's age, the family members, especially the father, are more likely to consent to the mother's employment. The father's income and wage were other important determinants of the mother's participation in the labor market. An increase in the household income or father's wage had a negative effect on the probability of the mother's participation in the labor market. This finding was consistent with the results of studies conducted by Kazemi et al. (16), Keshavarz and Borhani (23), and Harandi and Jamshidi (36). This relationship indicates that in households with a high father's wage or a high household income (sum of work and non-work income), the mother reduces her labor force supply due to access to more financial resources (23).

5.1. Limitations

This study has some limitations. First, the age of the children was evaluated in years in the Urban Household Income Expenditure Survey, from which the data of the present study were extracted. Therefore, the birth spacing was expressed in years, not months. Also, the number of abortions and time intervals with the next birth is unclear; thus, "birth spacing" in this study concluded the time intervals between the 2 living children. Second, some of the variables affecting the women's participation in the labor market, such as their wage, living with an elderly person, and under 2-year-old child, were not significant in the models, and some other variables were not evaluated due to a lack of data such as abortion and divorce rate. Finally, in this study, the effect of birth spacing between the first and second child on women's employment was examined in households with 2 or more children as a sample, and caution should be taken to generalize these results.

5.2. Conclusions

The results showed that an increase in birth spacing, especially between the first and second child, increased the probability of the participation of mothers in the labor market. Therefore, proper birth spacing does not reduce the probability of female employment. Hence, it is

recommended that proper birth spacing should be practiced to promote maternal and child health, as well as to prevent a reduction in the mothers' job opportunities with an increase in age. Family planning macro policies should be formulated to promote proper birth spacing, increase awareness of the use of contraceptives, underline the importance of breastfeeding as a proper birth spacing mechanism, and implement protective policies for working women, especially for childbearing. The maternal education level had a positive effect on their employment rate. The number of children, household income, maternal age, owning a house, and father's education level had a negative effect on the probability of the mothers' employment.

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Footnotes

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Data Reproducibility: The data presented in this study are openly available at www.amar.org.ir/english#10291052-national-statistics.

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