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Females' intra-household Bargaining Power and Fertility in Iran

GholamReza K. Haddad[1]
Mahboobeh Kabiri-Renani[2]

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Abstract
This research investigates demand for child among Iranian urban households in an intra-household bargaining decision process. Using Household's Expenditures Survey of Iran(2008), a count regression technique which takes into account the over-dispersion and under-dispersion characteristic of Poisson regression is specified as a function of intra-household bargaining factors, extra-household environmental factors, and family's characteristics. Findings confirm the significance of extra-household environmental factorsand household's characteristics in demand for child. Mothers with higher opportunity cost of child caring, more particularly college educated women, tend to have less children and they substitute quality of children for their quantity. As the Mothers' bargaining power goes up, their propensity to bring more children decreases, however fathers with higher non-labor earning prefer to have more children. Diagnostic checking confirms accuracy and appropriateness of the Generalized Poisson against its alternatives. To examine the exogeneity of the explanatory variables we re-estimated the proposed specification with Generalized Method of Moments (GMM), where the hypothesis of exogeneity is confirmed. Further robustness checking by Negative Binomial distribution of dependent variable and specifying the models by mothers' age disaggregation show that the sign and significance of estimated coefficients are similar to those of the Generalized Poisson and GMM; however modest changes have been experienced in the magnitude of estimated coefficients.

Keywords: Fertility Decisions, Collective Bargaining, Poisson and Generalized Poisson Regression
JEL Classification: J13, J22, D13, C25

1.Associate Professor, Sharif University of Technology, Graduate School of Management and Economics, G.K.Haddad@sharif.edu
2.PhD Candidate Faculty of Economics, Tehran University, m.kabiri@alum.sharif.edu

1. Introduction

Fertility rates in developed and developing societies were decreasing over the recent decades. Total fertility rate in Switzerlandover 1900 and the middle of 1930's declined from 4 children per woman to 2, and it experienced further decrease to 1.5 children per woman in 1999. This demographic change in Indonesia was observed from 5.7 in 1960 to 3.3 in 1990. The same pattern has been experienced in Mexico and Germany. Population structure and demographic changes in Iran were not an exception to these patterns and a similar trend has been observed in Iran. Figure (1) declares over 1987-2009 the rate declined from 5.8 to 1.8 per woman.

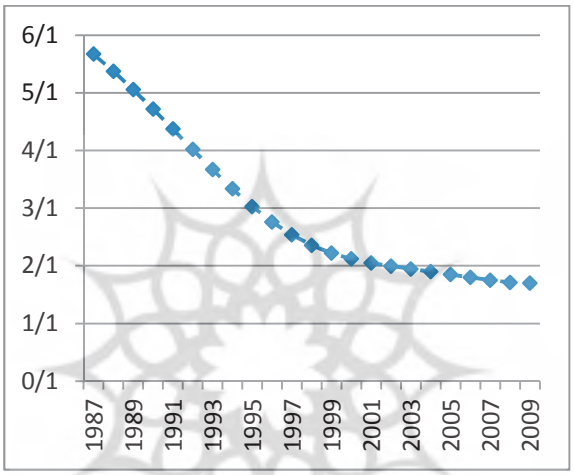
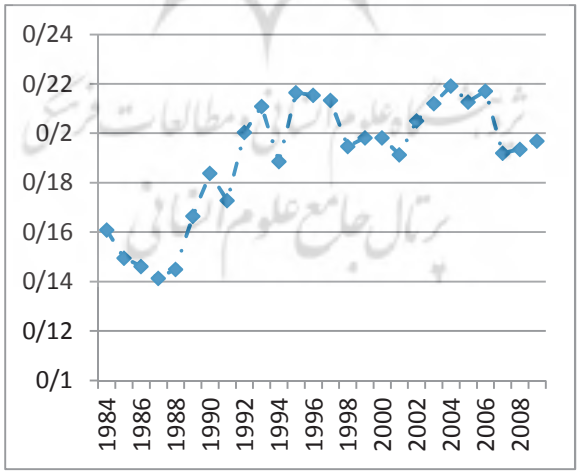


Figure (1): Total fertility rate in Iran



Figure(2): Females' participation rate, aged 18-30

Source: Handbooks of yearly statistics, Statistical Center of Iran (1984-2009)

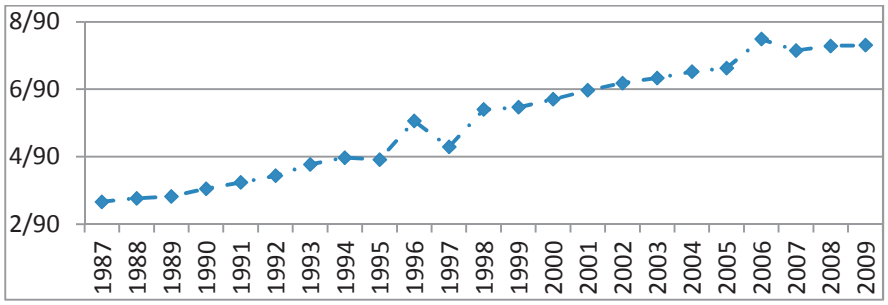


Figure (3): average of females' educational attainment

Source: Households' expenditure survey, Statistical Center of Iran (1987-2009)

Demographic and socio economic factors can drive the decision for fertility among the families. Figure (2) demonstrates females' participation rate over 1984-2009 is moderately increasing for young females with the aged 18-30, from 15 percent to about 20 percent. However; females' (aged 10-60) participation rate over the last decade never exceeded 17 percent and it was even slightly decreasing over the last five years by 2009. Also females' educational attainments in terms of schooling years is of an increasing trend over 1984-2009 and changed from 3.8 in 1984 to 8.2 years in 2009, figure (3). Furthermore, figure (4) demonstrates an upwarding trend in the average monthly real wage. The rising trend partly stems from labor participation of college educated women, whose share out of employed females has reached to 53 percent[1]. These two factors reflect females' opportunity costs of child bearing are increasing, therefore it is not far from expectation that females' education and labor participation are among the main determinants of less demand for children in urban Iran. At the same time, higher education attainment of women cause shorter period of child bearing opportunity for females. One possible consequence of involving in the higher levels of education is the increase in marriage age. As figure (5) shows average age of never married women, aged older than 17, have risen from 22 to 24 years old over 1989-2009. Considering this social indicators and labor market prospects, one can tentatively infer that all of the factors which may play as disincentives for child bearing, have changed in a way that affect the decision toward bearing fewer children. In this paper, along with the demographic and socioeconomic determinants, our main interest is to investigate the role of females' bargaining power in the families' fertility decision in the urban areas of Iran. Particularly we address the following questions: Do the females' intra-household bargaining power drive family's fertility? Do the mothers' opportunity cost, employment status, and their

1.Households' expenditure survey, Statistical Center of Iran 2009

educational attainment affect their fertility? What is the role of father's wage and non-wage earnings in the family's fertility?

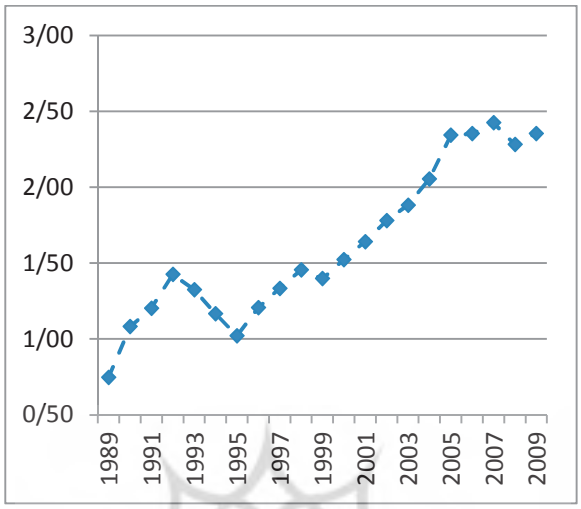
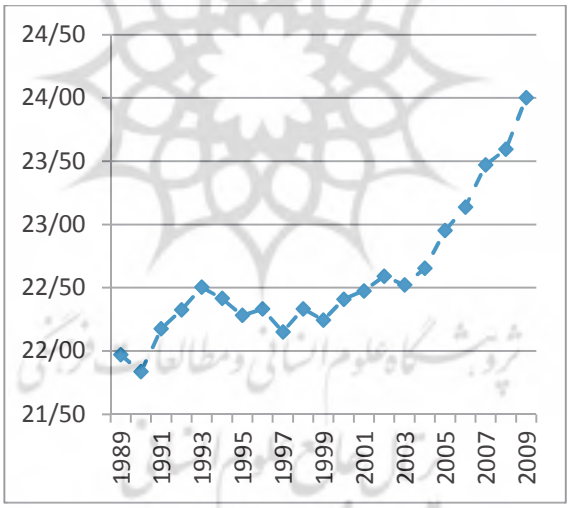


Figure (4): Average of females' monthly real wage (Million Rials)



Figure(5): Average age of never married females aged older than 17
Source: Households' expenditure survey, Statistical Center of Iran (1989-2009)

We base our theoretical framework on a household decision theory in which special attention is given to the collective household decision for child demand and extra-household factors in Iran. To this end, we use data both from Households' Expenditure Survey and individualized data of Annual Statistical Yearbooks of Iran in provinces level. Number of children in a

family is a count variable, therefore we apply count regression techniques of *Generalized Possion*, simple *Possion*, *Negative Binomial*. We also employ *Generalized Method of Moments* (GMM) estimators to control for the endogeneity of some explanatory variables.

Our findings based on an extensive survey data and some individualized province level variables, support very strongly appropriateness of collective barraging framework against unitary household decision model. The evidence shows that women with higher bargaining power have fewer children and also children are normal goods in the family's preferences, although families with higher earnings spend more on the education and recreation of their children and prefer higher quality against their quantity. Therefore, quality of children is of importance for richer families. In addition, parents with higher schooling prefer to have fewer children in comparison with the less educated parents. Therefore parental opportunity cost is a key determinant of demand for child in Iran. Theses finding are robust to the alternative estimation methods and age disaggregation of mothers. Log likelihood of *Generalized Possion* is larger than that of simple *Possion* and the dispersion parameter of variance is negative and significantly different from zero. GMM is used to control for the endogeneity of mother's education level, her wage and daily work hours. The results reveal that over identification moments conditions are not rejected and those characteristic are not endogenous.

Contribution of this paper is to provide robust estimated parameters of child demand count regression equation for a unique society in which social status of women have experienced remarkable changes through increasing rate the higher educational attainment and increasing labor participation. We also individualized two provinces level variables of females bargaining factors: divorce rate and gender ratio for households, and examined their role in the household's demand for child. Furthermore, we tested effect of family's attitudes toward quality of children and found that they prefer to have fewer children with higher quality. Finally our paper is the first attempt in Iran, in this area of research.

This paper is organized as follows. We present the theoretical and empirical literature review in the next section. Section 3 discusses the analytical framework for model specification and parameters estimation. Data is described in section 4 and estimations are reported in section 5. Finally, we conclude in section 6.

2. Litrature Review

This section is devoted to review the theoretical and empirical contributions. The first subsection reviews the most important households' behavior models of demand for child, in which we present two branches of classical

and game theoretic analytical frameworks. Where, the latter includes cooperative, non-cooperative bargaining and the collective decision models. The second subsection surveys application of the mentioned theories in empirical studies, which is started by Beckrian based researches and extended to the application of Chiappori's collective models of household's decisions.

2.1. Theoretical Background

Becker (1960,1973) in his seminal works provided a theoretical framework for household fertility studies. He assumes unit preference for all of household members, and considers a family as a basic decision-making unit. Although this setting seems to be very convenient from a technical point of view, its practice in the household's resource allocation has been strongly criticized by several authors (Manser and Brown(1980), Apps and Rees(1988), Chiappori(1992), Bourguignon and Chiappori(1992), Browning and Chiappori(1998)). Since the unitary model considers a unique preference relation for a family as a whole, it does not have any implications for intra-household resource allocation and family formation and dissolution. Furthermore, it violates the individualism principle, according to which definition of a consistent social welfare function is impossible. To overcome these disadvantages, several models of intra-household bargaining have been appeared in 1970's. Household's cooperative Nash bargaining theory is among the first attempts which is proposed (Manser and Brown(1980), McElroy and Horney(1981)) to consider that household's behavior is the result of an interaction process among family members. This approach assumes different preferences for spouses, and they behave as they intend to maximize the following Nash product subject to total household's income:

$$\max N_x = [U^M(x) - V^M(P^M, Y^M; \alpha^M)].[U^F(x) - V^F(P^F, Y^F; \alpha^F)]; \quad i \in \{M, F\} \qquad (1)$$

Where V^i is threat point of individual $i \in \{F, M\}$ and indicates the best gain which the individual can get if she/he dissolves her/his marriage. Indirect utility of V^i, in addition to the commodity prices vector P^i, is a function of Extra-household environmental parameters. Where these parameters may constitute factors from marriage market, for instance gender ratio, socio-economic situation and social norms which reflects the individual's post divorce welfare status. Since this model considers a similar sharing mechanism of non-labor earning between spouses for all households, furthermore divorce is a long run threat in almost all societies; this model has been criticized by economists. Instead, they proposed a non-cooperative bargaining model, in which α^i is replaced by δ^i (individual non-cooperative situation) in the cooperative models, household behavior is

assumed to be the outcome of a cooperative game among the family's decision making members. Under symmetric information, the result of these games is Pareto efficient; therefore they have more applicability in empirical studies of intra-households resources allocation.

Cooperative structural model is divided in to two streams, the first category of these models have been provided by (Manser and Brown(1980), McElroy and Horney(1981)) that assume a bargaining model in which individuals, subject to their relative bargaining power (BP) in the family, have to reach a Pareto efficient intra-household allocation from gains of living together. On the other hand, Chiappori(1992) in his seminal paper developed an alternative approach, the so called collective bargaining model. According to the collective setting, family is assumed as a group of individuals with their own individual preference who may have cooperation and conflict in the household's decision makings; however the outcome of this collective decision is Pareto efficient. This approach argues that unitary preference assumption and the systematicaggregation assumption are not realistic. Empirical evidence consistently reject the unitary assumption, for instance, Thomas (1990), Schultz (1990), Johnson & Rogers (1993), Quisumbing and Otsuka(2001), Attanasio and Lechene(2002) and Haddad(2010). Haddad et al. (1997) argue that using unitary model as a policy guide may result in failures in policy making, because public transfers, given the characteristics of receivers, may have different welfare effects. Also, there are several evidence in the developing countries that, men and women have different preferences toward the family size (Bankole and Sing 1998).

A difficulty that one encounters in empirical modeling of household behavior is finding factors which proxies the BP of spouses. Data availability, plausibility and endogeneity of proposed variable are the most challenging issues that appeared in the underlying literature. For example, wife's relative earning(Haddinott and Haddad 1994), current assets share accumulated through marriage(Beegle et al. 2001), mother's schooling (Thomas 1994, Handa 1996), exogenous welfare receipts (Lundberg et al. 1997), gender ratio and divorce rate (Chiappori(1992)), social acceptance of violence against women (Doss 1996), are factors which have been used as BP proxies in the underlying literature. Alongside of data unavailability, endogeneity is a potential difficulty that many of the above listed variables may encounter with. For instance, Thomas(1990) observed that mother's non-labor earnings in Brazil have negative and significant effect on the number of children. Dissimilarly, Schultz(1990) documented a positive association between mother's non-labor earns in Thiland. Accordingly the endogeneity problem of these factors should be checked and taken into account by estimation techniques.

Several empirical studies on the demand for child have applied the frameworks of unitary and collective decision theories. The pioneer studies on the household fertility have developed by Becker(1960), Becker and Mincer(1960 and 1965), Leibenstein(1963) and Becker and Lewis(1973). Becker argues that children are durable goods, and demand for child, given the household's income and prices level, depends on the costs and benefits that household member may receive from having them, in a time horizon. Therefore demand for child is considered as a function of spouses' wages, employment status and schooling years of wife, where these two variables are considered to capture mother's opportunity costs. Becker(1960) asserts that the demand is an increasing function of household's income, although this hypothesis is rejected by cross sectional data[1]. He argues increase in the earnings would improve both children's quantity and quality, however the marginal effects is larger for quality. Therefore the spirit of Becker's theory of demand for child can be summarized as: any increases in the households' earning would give rise to higher welfare and quality of their children, and also increases in the family earning may increase number children. Wang and Famoye (1997) tested Becker's hypothesis by PSID, in a count regression framework, and shows mother's age, her education, employment status and race are of considerable and significant effects on the household's decision for fertility. They confirm Beckerian neoclassical analysis, namely, they the disincentive role of mother's opportunity cost in the childbearing (Becker 1981 and Becker and Lewis1973). In an empirical study on the Greece economy, Hondroyiannis(2004) investigates households' fertility by a count regression of cross section data, in which number of available rooms for a household's accommodation, total property and non-property earnings, women's work hours, her education level, health status and age, are explanatory variables. His conclusions show that upper social class families prefer children with higher quality2. He discovers a negative estimated coefficient for the social status and number of children in household level. Therefore, substitution effect (higher quality) is greater than income effect for child demand. Mother's work hours and education are of negative impact on the dependent variable, suggesting that mother's opportunity cost reduces number of children in a family. These evidence support Becker's idea and is consistent with Wang and Famoye(1997). Fernandez and Fogli(2005) document the role families' experience and culture in the fertility formation of U.S. They apply lagged values of fertility rate in the mother's home land as proxy of culture and number of siblings as a proxy for mother's family experiences, to decompose effects of two determinants. This study takes the

1.However these cross section data do not control the use contraceptives among families.
2.Differences in the households' cultural and social status are measured by their property (non-labor) earnings.

effects of markets and institutes as given, and finds positive and significant coefficient for culture, indicating a woman from a country with higher fertility rate, tends to have more children and a similar effect is reported for wife's family experience, predicting populated families have a tendency to have bigger family size. Furthermore, significance of education level reveals the role of opportunity cost in the fertility. Nguyen-Dinh(1997) used a limited dependent *Ordered Logit*, *Possion* and *Linear Probability* estimation methods, to formulate the fertility rate in Vietnam. He reports higher fertility rate for agricultural sector employed, while the rate is higher for nonparticipating women in labor market. Residing in rural area has positive effect on the fertility, but that of parents' education are negative and significant, however mother's education level is of greater marginal effect. This finding is robust in all estimated models. Making use of a *Possion* scheme Tadesse and Asefa(1998) and a random sample at Ethiopia, models mother's current age, her age at marriage and parents' education, mother's participation in labor market, her religion and ethnicity as candidate determinants of household's fertility. They find that mothers participation in formal labor market, utilization of pregnancy preventive procedures and age of mother at marriage have negative association with the dependent variable, on the other hand being Muslim, parent's preferences toward having boy infants, and infants mortality impact household's fertility positively, although mother's employment is not identified as a statistically significant variable. The intra-household collective decision process permits parents to have different preferences and each of them may incline to maximize her/his own private gain. This approach asserts number of children as a function of spouses' preference, and bargaining weight of spouses. The theory is based on an assumption that, pregnancy and child caring role is taken by her mother and increases in the mother's BP would result in a lower fertility. Bankole and Singh(1998) found evidence for this claim in thirteen African countries. In Seebens(2005), the hypothesis of fertility reduction due to BP of women is supported for rural areas in Ethiopia, however the effect of father's BP was positive and significant. In addition, spouses' age difference has negative influence on the childbearing, implying that spouses' with higher age difference tend to have fewer children. Seebens's(2005) study did not find any significant relationship between household's education and number of children in any conventional level, although a negative effect is observed.

To test collective bargaining model, Herner(2010), uses German's socioeconomic panel and pays particular attention on the spouse's preference for having additional child. The key variable of interest in the model is the preference toward additional child by spouses, and their descriptive statistic shows average of the variable is smaller for women, than that of men. They

assume parents' preference for child is invariant over the time horizon; therefore it is reasonable to distinguish preference conflict between spouses[1]. The second key determinant of BP is the parents' relative income. They documented a strong association between wife's relative income and number of children for spouses with higher conflict in their preference toward child, in comparison with agreeing spouses. The interaction term of conflict and relative income ($Conflict \times Y^R$), shows relative income has different impact on the probability of additional child bearing, namely the effect for women with higher propensity of additional child is positive and is negative but insignificant for women with lower propensity (absence of conflict). This nonlinear effect indicates that, in an intra-household decision making, a wife with higher BP can easily persuade her husband to have more children. Equivalently, husbands with higher preference toward additional childbearing cannot convince their wife, it may arise from the fact that, wife is the final controller of household's fertility. Hener's findings indicate that bargaining theory can explain the household fertility better than that of unitary and relative income can play a key role in the decision process as a measurement of BP.

3. Analytical Framework

Up to about three decades ago to some extent, father was the head of the family, and had authority over family members in Iranian society. But in the recent decades, females literacy rate has increased by 85% and their college enrolment has experience a remarkably increasing rate, consequently it seems the traditional setting has been changed and intra-household balance of power is changing in favor of wives. Therefore, we intend to specify a collective bargaining model of demand for child to conduct our empirical analysis.

Let assume the household is formed of a wife and husband, whose utility function is $u^i = u^j(\mathbf{x}_j, N, \mathbf{X}_j, \cos t, room)$ where $j \in \{1,2\}$ and 1 stands for wife and 2 for husband. N shows number of children, which is a public good for the spouses. Vector $\mathbf{x}_j$ indicates private consumptions of the parents (Becker 1960, Samuelson 1956, Manser and Brown 1980, McElroy and Horney 1981, Murat and Randall 2002, Chiappori1992,1997) and $\mathbf{X}_j$ contains individual's characteristics, including, age, age square, leisure time, and her education(Becker1960, Murat and Randoll 2002, Wang and Famoye 1997, Tadesse and Asefa1998). The demand cost stands for the cultural and recreational expenditures of households and proxies the quality of child.

1.The binary variable of conflict takes 1 if preference of mother for additional child is greater than that of man, and takes 0 otherwise.

Households' Expenditures Survey of Iran includes expenditures on: photographing equipments, personal data processing machines and recreational facilities, pets, cultural services, newspaper, books and stationeries, however Murat and Randoll (2002) uses the children's human capital as a proxy for child quality. Since school age children in a family may have less years of schooling because of her age, namely she is still a student in the week of proceeding to survey, while their parents may invest larger amount of money on their education and training in future, therefore the measure can not identify child's quality approporiately.

A quadratic relationship between mother's age and number of children at home is expected. Women's education and employment is considered to reflect her child caring opportunity cost (Becker 1960,1981, Becker and Lewis 1973, Rasoul 2008, among others) also it can be argued that employed and educated females usually postpone their marriage, consequently this decision increases the age of first marriage,(Li et al. (1998), Moor(1998) and Shi(1992)) and improve their intra-household bargaining position (Yadava, K. N. S., and S. S. Yadava(1999)), thus decrease the number of children. On the other side, if we assume a positive association between schooling years and wages rate, the former may have positive impacts on the child demand, through income effects. A study on the 30 developing country identified a negative effect, while it is positive for developed countries, (United Nation 1987).

The maximization program of intra-household collection bargaining is equivalent to the optimization of following weighted spouses' utility function subject to home production function.

$$\begin{aligned} &Max \quad \mu u^1(x_1, N, X_1, \text{cost}) + (1-\mu)(u^2(x_2, N, X_2, \text{cost}) \\ &t_1, t_2, g_1, g_2, N \qquad\qquad (2) \\ &PN = h_1 t_1 + h_2 t_2 + g_1 + g_2 \end{aligned}$$

Where t_j is the time which parents spent for child caring and her growing up, h_j is the effective allocated time of parents' for children (can be measure by market wages), g_j is parents' financial assistance to child's expenditures which includes household's training and cultural expenditures, p is defined as the child price, and $\mathbf{x}_j = w_j(T - l_j - t_j)$ is the private consumption of individual j. We define $T - l_j - t_j$ as the spouses' daily work hours, with per hour wages of w_1, w_2 for wife and husband respectively. The sharing rule is reflected by $\mu(.)$ and shows wife's bargaining power, which is a function of relative wages and extra-household environmental parameters, gender ratio,

divorce and marriage policy and social norms (Manser and Brown 1980 and McElroy and Horney 1981). Chiappori 1992, 1997 consider the sharing rule as a function of commodity prices level, relative income, relative assets, gender equality in the society and divorce legislation. Given the availability of data on social norms in Iran we define the $\mu(.)$ as a function of relative wages, non-wage earnings, local gender ratio, local divorce rate, spouses' education level and being college educated. A higher wife's relative wage reflects higher cost of child caring, consequently it reduces her inclination toward bearing an additional child. According to Iranian civil procedures, men have divorce right, therefore a higher divorce rate implies the greater BP of wife against her husband. On the contrary, a larger local gender ratio implies that marriage market situation is in favor of men, therefore women have less BP in the intra-household bargaining, suggesting household may have more children.

Optimal value function of $N = N(y_F, P, X_j, cost, (w_1/h_1), (w_2/h_2), \mu)$ is derived as a solution for the household utility optimization problem, where $y_f = w_1(T - l_1 - t_1) + w_2(T - l_2 - t_2)$ is households' total labor and earnings. It is expected that total earning to have income effect (according which number of children would increase) and substitution effect (which may result in increases in children's quality) on the fertility of family. If the latter is greater than the former, parents would prefer quality of children to their quantity(Wang and Famoye(1997), Becker(1960,1981), Becker and Lewis(1973), Hondroyiannis(2004), Bedassa Tadesse and Sisay Asefa(1998), Khan & Raesde(1997), Murthi(2002), Schultz & Zeng(1999), Walker(1995), Zhang(1999)), which supports the argument that considers children as durable goods. Rise in the children's quality implies an increase in the share of children's developments and education costs in the household's budget, which in turn it would result in a lower fertility of family. In this cooperative model, any increases in the mother's wage level may have three consequences: (1) Income effect, w_1 would increase y_f, consequently, upon to the preference of spouses toward quantity or quality of children, it may increase or decrease N. (2) Substitution effect, a positive change in the w_1 would increase child caring opportunity cost, thus it may decrease N. (3) Increases in w_1 would give rise to positive change of the relative wage, namely $w_1/(w_1 + w_2)$, which improves the bargaining power $\mu(.)$, therefore given $\partial N/\partial \mu < 0$, it may decrease the fertility.

3.1. Econometric Consideration and Estimation Method

A common feature of the developed estimation procedure in household's fertility studies is using count regression. Barmby and Cigno(1990) uses a *Sequential Probability* model, and Sobel and Arminger(1992) applies a nonlinear simultaneous *Probit* model. In the recent years, decision making toward having additional child was modeled by Poisson scheme. King(1989), and Winkelmann and Zimmermann(1991) applied a *Generalized Event Count* technique which includes *Poisson* and *Negative Binominal* probability distributions. Although *Poisson* regression is used more frequently in this context, it suffers from equality of the mean and variance restriction. If this restriction is not true, its estimators would be inefficient, although it remains consistent. Thus statistical inference about the estimated parameter of regression is no longer valid. In this situation, *Binominal* distribution regression is more flexible than that of the standard *Poisson*, and it is often used for data which is of over dispersion (Manton et al.(1981), Cameron andTrivedi(1986), Goodwin and Sauer(1995), Englin and Shonkwiler(1995), Winkelmann and Zimmermann(1991)).

Furthermore, *Poisson* regression has been generalized to overcome the equality restriction by considering over and under dispersions, which is known as the *GeneralizedPoisson* regression. We define the dependent variable in regression of interest by y_i, which is a count random variable. Then, the probability distribution of y_i is:

$$f_i(y_i;\mu_i,\alpha) = (\mu_i/1+\alpha\mu_i)^{y_i}[(1+\alpha y_i)^{y_i-1}/y_i!]\exp(-\mu_i(1+\alpha y_i)/1+\alpha\mu_i)$$

$$y_i = 0,1,2,3.....$$

$$\mu_i = \mu_i(\mathbf{X}_i) = \exp(\mathbf{X}_i\beta)$$

Where $\mathbf{X}_i$, is the vector of $K-1$ explanatory variables, including spouses' characteristics, bargaining factors, and β is a vector of unknown parameters. Accordingly its mean and variance are derived as follow:

$$E(Y_i \mid X_i) = \mu_i$$

$$V(Y_i \mid X_i) = \mu_i(1+\alpha\mu_i)^2$$

Where $\alpha \in R$, and is known as dispersion parameter which is estimated together with other parameters of the regression model. This probability scheme reduces to the simple *Poisson* if $\alpha = 0$. $\alpha > 0$ implies $V(Y_i \mid X_i) > E(Y_i \mid X_i)$ and the GPR is of over dispersion, and otherwise $V(Y_i \mid X_i) < E(Y_i \mid X_i)$ and GPR has under dispersion. Corresponding log of likelihood function for α and β is:

$$lnL(\alpha,\beta;y_i)=\sum_{i=1}^{n}\{y_i\log(\mu_i/1+\alpha\mu_i)+(y_i-1)\log(1+\alpha y_i)-\frac{\mu_i(1+\alpha y_i)}{1+\alpha\mu_i}-\log(y_i!)\}$$

First order conditions of the log likelihood function optimization are nonlinear, so α and β are estimated by numerical calculation algorithms, in which an appropriate initial value for α is zero.

4. Data Description

Our data-set are sourced from Household's Expenditures and Income Survey (HEIS) for individuals' data and statistical yearbook of Iran for aggregate data that are individualized for households to capture the role of extra-household factors in childbearing decision making. The survey is conducted annually for both urban and rural areas in all provinces of Iran. The number of surveyed household in each province is determined based on its population, and variability of households' total expenditures. This research is using urban section of the data-set in 2008 with total sample size of 19442, but in the estimated model the size varies because of missing observation in some variables. We restrict our working samples to the households with two partents, and the mother's age is between 15 and 48. Local divorce rate and gender ratio are used as two extra-household factors that may influence spouses' BP, which are defined as the total number of local female over male population aged between 20 and 60, in the same provinces and the near age group of urban area, and number of recorded divorces on marriages in the urban areas of provinces, respectively.

Table(1): descriptive statistics (Sample size=19442)

Variable	Standard Deviation	Mean
Dependent variable		
1- Number of Children	1.48	1.96
Independent variables		
2- Woman's age	7.6	34.27
3- Man's age	14.1	46
4- The number of rooms available for household	1.17	3.5
5- wife's daily working hour	2.4	6.41
6- Husband's 's daily working hour	2.44	9
7- Gender ratio of Female's population per male	0.26	1.04
8- Years of male's schooling	5.61	6.9
9- Years of women 's schooling	5.15	6

10-Divorce rate (recorded divorces on marriages by province)	0.042	0.105
11-Industrial development index	0.238	0.236
12-Percentage of college educated women	0.29	0.09
13-Percentage of college educated men	0.35	0.143
14-Total monthly household's earnings	4.05	2.97
15-Per capita costs of cultural, educational and recreational items	43.81	12.22
Endogenous variables		
16-The number years of schooling of women		
17-Number of available rooms for household	5.15	6

Table (1) reports the descriptive statistics which includes mean and standard deviation of each variable in our data set. Average of married female's age is 34.27 and average of daily working hours for employed males and females are 9 and 6.41 hours respectively. Average number of children at home is 1.96 which is consistent with the fertility rate in Iran. Total divorce rate in urban area is 0.105 and that of gender ratio amounts to 1.04 implying that potentially marriage market is in favor of males. Schooling years of married males and females are respectively 6.9 and 6, and daily work hour for males is sizably greater than that of females.

5. Estimation

For the first step we estimate a *GeneralizedPoisson* regression with an exponential specification for the regression equation. We begin with a more inclusive model containing main individual's characteristics, intra-household bargaining factors and extra-household environmental variables to find a final model. Table (2) presents the results from Count Regressions of Demand for child.

Table (2): Count Regressions of Demand for child

Variable	GP	PM	NB	GMM
Gender ratio of female to male total	0.089 (0.0)	0.07 (0.001)	0.07 (0.001)	0.05 (0.23)
Woman's age	0.128 (0.0)	0.107 (0.00)	0.11 (0.0)	0.16 (0.00)

Woman's age square	-0.002 (0.0)	-0.001 (0.00)	-0.001 (0.0)	-0.002 (0.00)
Man's age	0.134 (0.0)	0.125 (0.00)	0.12 (0.0)	0.196 (0.00)
Man's age square	-0.001 (0.0)	-0.001 (0.00)	-0.001 (0.0)	-0.002 (0.00)
Number of years of female education	-0.037 (0.0)	-0.035 (0.00)	-0.034 (0.0)	-0.047 (0.00)
Number of years of man education	-0.007 (0.0)	-0.007 (0.00)	-0.007 (0.0)	-0.036 (0.00)
Number of daily working hours of women	-0.001 (0.625)	-0.002 (0.507)	-0.002 (0.507)	-0.012 (0.056)
Number of daily working hours of men	-0.004 (0.008)	-0.004 (0.015)	-0.004 (0.015)	-0.011 (0.00)
Number of available rooms	0.051 (0.0)	0.052 (0.0)	0.052 (0.0)	0.115 (0.0)
Non-labor earnings of woman (million Rials)	-4085.88 (0.012)	83.056 (0.924)	83.05 (0.924)	-10036.6 (0.00)
log of relative wages	-0.003 (0.009)	-0.003 (0.008)	-0.003 (0.008)	-0.0098 (0.00)
Divorce rate	-1.47 (0.0)	-1.31 (0.00)	-1.31 (0.0)	-3.21 (0.00)
Household's total earnings(one thousand million Rials)	2.105 (0.141)	2.180 (0.123)	2.18 (0.123)	3.26 (0.128)
per capita costs of cultural, educational and recreational	-0.34 (0.071)	-0.247 (0.111)	-0.25 (0.111)	-0.64 (0.0)
Dispersion parameter	-0.077 (0.0)	-	-	-
J-Statistic	-	-	-	0.00094 (0.978)
AIC	2.86	3.08	-	-
Log Likelihood	-17315.1	-22825.9	-	-

a. GP: Generalized poisson, PM: Poisson model, NB: Negative Binomial, GMM: Generalized method of moments
b. p-values are in parentheses
c. AIC: Akaike information criterion

The estimated dispersion parameter $\hat{\alpha}$, is statistically different from zero and negative, suggesting that simple *Poisson* is not a true specification and demand for child process in Iran is of under-dispersion. Furthermore Table (2) compares the log likelihood and AIC of generalized *Poisson* models and

corresponding simple *Poisson* models, in which the log-likelihood is greater for generalized *Poisson* models. Also the same comparison can be made in terms of *Akaike* information criterion, that AIC of GP is less than that of PM. Thus, one can confidentially concludes that the *generalizedPoisson* specification fits more accurately the data.

Estimated value of daily work hours for spouses is consistent with a-priori expectations and is negative. The same pattern is observed for parent's education, suggesting that parents with higher opportunity cost of child caring tend to have fewer children. These finding support Becker(1981), Becker and Lewis(1973) and is consistent with, Wang and Famoye(1997), and Fernández and Fogli(2005). The estimated coefficients for parental daily work hours shows that father's work hours affects the demand for child more severe than that of mother's, in other words more busier fathers have fewer children, holding other factors fixed. Parental educational level has negative impact on the demand for child; however that of mother is larger in magnitude. These finding suggests that provinces with higher educational attainment for women, fertility rate will experience more decreases. Comparison of fertility rate between capital cities in provinces with small towns in the same province confirms this finding. The effect of being a college educated is dissimilar for men and women; however it is not statistically significant. The negative sign of the dummy variable of being college educated for mothers may indicate that opportunity cost of this group of females is greater than that of non-college educated. Thus they tend to spend less time for child caring; additionally this can be attributed to the higher bargaining power of a college educated woman. Mother's non-labor earning has negative and significant influence on the families' childbearing decision, indicating that with a higher bargaining power she would convince her husband to have fewer children. This result is similar to that of Tiefenthaler(2001) and Imran Rasul(2006), but it is different from the result of Schultz(1990), absolute value of the estimated coefficient is larger for women, which implies a negative income effect. Number of available rooms for household can be used as a proxy for family wealth. In the specified model, it is identified as a significant determinant of demand for child with positive effect, which is consistent with finding in Hondroyiannis(2004). Among the mother's personal characteristics, her age is of quadratic effects on the number of children. This is consistent with our prior expectations and the facts that matured children usually leave parents' home for mandatory military services, study at university far from her family or they get married and form an independent family[1]. Number of child at home is maximized at the mother's age of 32 years. This quadratic estimated form of age is similar to Hondroyiannis (2004), and Rasoul (2006).

1.HEIS does not consider out of home children as household's members

Log of relative wag is of negative effects on the number child at home. We have used this variable as an intra-household bargaining factor. This negative estimated coefficient reflects the woman's bargaining power to bearing less children, and is similar to that of Varanasi(2009). The positive and significant coefficient for household's total earning indicates that income effect of demand for children is greater than its substitution effect. In other words increases in the household income would give rise to higher quality of their children. An opposite conclusion is made by, Hondroyiannis (2004 among others, although our result empirically supports Becker(1960).

Yearly per capita expenditures of households on recreational and cultural items, which is used as a proxy for children's quality, significantly and negatively explains number of children at home. This suggests that parents prefer to have more children but with higher quality. Local divorce rate, which indicates wife's BP against her husband, is of negative effect on the demand for child, implying women's power overcomes to their husband while they are bargaining for childbearing. In the same direction gender ratio (scarcity of females against per male) has positive influence on the household fertility. It is important to notice that female's bargaining factors are absent in the Becker's unitary theory of household, therefore significance of these variables imply that collective decision framework is an appropriate base for household behavior analysis of demand for child in Iran.

Index of industrial development is not identified as a significant determinant, however, its negative estimated coefficient can be interpreted as the inclination of industrialized province residences to fewer number but higher quality of children, therefore that more industrialized societies have a propensity to invest on the children's human capital. This finding is close to the results that were provided by Westerberg Thomas (2006).

5.1. Checking for Robustness and the Problem of Endogeneity

To check robustness of the results we re-estimate the model by Negative Binomial and GMM estimation techniques. The sign of estimated parameters are consistent across all of estimation procedures, although magnitudes of the estimated parameters have experienced modest changes, Table (2). Underlying literature argues mother's years of schooling, her wage and work hours are suspected to suffer from endogeneity. Employed mothers tend to have fewer numbers of children and the number of children may control her employment and time allocation decisions. Also, females with higher education incline to have lower number of children and the reverse direction might be hold for females with less children. To take into account these features in the model specification and parameters estimation, we re-estimate the model by GMM as an additional robustness checking assessment. Instrumental variables which are used to capture the endogeneity problem

are: local gender ratio, non-labor earrings of each spouse, divorce rate, mother's age, mother's age square, father's age, father's age square, number of available room, mother's gross earnings, father's gross earning, father's schooling, father's daily work hours, household's total earnings, per capita cultural, educational and recreational costs, log of relative wages, dummy variable of mother's employment status, dummy variable of father's employment, dummy variables of being college educated (men and women). The estimation outcome is given in Table (2). It is important to note that Sargan statistic does not reject the over identifying restrictions at conventional critical levels, which confirms the validity of the instruments and consistency of the parameter estimates, with J-statistic equal to 0.00094. Table (2) shows that the sign of estimated GMM estimation outcome is the same as GPM and other estimations, although they differ in terms of calculated parameters. Also the findings remained quietly unchanged to the mothers' age disaggregation. The positive relation of households' demand for children does not change with the age of mother, but the magnitude of estimated coefficient is decreasing by the age groups of mother, which ranges from 0.49 to 0.0038, table (3). The similar patterns are observed for number of available rooms and households' earnings. Furthermore, the negative impacts of parental years of schooling, children's quality, log of parental relative wages are of the same sign across the mothers' age disaggregation. The disaggregated models are re-estimated by the PM (table 4), NP (table 5) and GMM (table 6) methods. There was no change in the direction of the explanatory variables' impacts on the dependent variables.

6. Summery and Concluding Remarks

This study, estimates households demand for children in the urban area of Iran, using four estimation techniques of GPM, simple Poisson, Negative Binomial and GMM. It was shown dispersion parameter is negative and significant. GMM and Negative Binomial estimators are found consistent with GPM. Intra-household bargaining factors are identified as determinants of child at home. Therefore validity of this framework is confirmed. Parental educationand wage rates affect the dependent variablenegatively, suggesting that increases in parent's opportunity costs of child bering whichinturn will significantly decrease household size infuture. Thus,it is in general acceptable that Iranian economy will encounterwith reduction in the growth of demand for educational services andhousing in long run. Furthermore, importance of mothers' bargaining power in demand for children was accepted. One of the main driving forces of the BP is females' education and spouse's relative wages, which by stimulating female's labor participation, it will decrease the household fertility in turn. We found parents care about the quality of children and prefer to have fewer children with higher quality. Similar findings are observed for the age disaggregated model of GPM.

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Table (3): GPM regressions of demand for child by females' age

Variables	15-25	26-30	31-35	36-40	>41
Gender ratio of female to male total	0.49 (0.05)	0.40 (0.05)	0.26 (0.29)	0.147 (0.001)	0.0038 (0.89)
Woman' age	0.73 (0.06)	-1.58 (0.0)	0.14 (0.86)	0.48 (0.34)	0.067 (0.009)
Woman' age square	-0.01 (0.097)	0.03 (0.0)	-0.002 (0.86)	-0.006 (0.34)	-0.0009 (0.0006)
Man' age	0.17 (0.006)	0.106 (0.0)	0.012 (0.69)	0.12 (0.0)	0.083 (0.0)
Man' age square	-0.002 (0.03)	-0.001 (0.0)	0.0001 (0.73)	-0.001 (0.0)	-0.0008 (0.0)
Number of years of female education	-0.056 (0.0)	-0.05 (0.0)	-0.03 (0.0)	-0.031 (0.0)	-0.028 (0.0)
Number of years of man education	-0.03 (0.009)	-0.023 (0.011)	-0.01 (0.085)	-0.004 (0.11)	-0.006 (0.006)
number of daily working hours of women	-0.03 (0.46)	-0.018 (0.306)	-0.003 (0.77)	-0.003 (0.67)	0.002 (0.59)
number of daily working hours of men	-0.01 (0.2)	-0.003 (0.72)	-0.005 (0.39)	-0.005 (0.16)	-0.002 (0.33)
Number of available rooms	0.049 (0.11)	0.052 (0.08)	0.033 (0.04)	0.052 (0.0)	0.06 (0.0)
Non-labor earnings of woman (million Rials)	-11459.1 (0.86)	-30441.1 (0.56)	-12586.2 (0.39)	-6427.2 (0.21)	-114.04 (0.9)
log of relative wages	-0.02 (0.04)	-0.008 (0.243)	-0.007 (0.17)	-0.001 (0.58)	-0.004 (0.042)
Divorce rate	-1.37 (0.41)	-0.191 (0.87)	-2.7 (0.0)	-1.15 (0.0)	-1.06 (0.0)
Household's total earnings (one thousand million Rials)	15.64 (0.37)	8.11 (0.24)	7.53 (0.29)	1.59 (0.48)	-0.04 (0.98)
Per capita costs of cultural, educational and recreational	-0.56 (0.72)	0.405 (0.698)	-0.39 (0.64)	-0.78 (0.195)	0.106 (0.62)
Dispersion parameter	-0.23 (0.0)	-0.191 (0.0)	-0.114 (0.0)	-0.078 (0.0)	-0.038 (0.0)

Table (4): Poisson regressions of demand for child by females' age

Variables	15-25	26-30	31-35	36-40	>41
Gender ratio of female to male total	0.058 (0.7)	0.03 (0.776)	0.123 (0.079)	0.121 (0.034)	0.004 (0.9)
Woman's age	0.71 (0.018)	-1.26 (0.238)	0.41 (0.69)	0.32 (0.76)	0.07 (0.01)
Woman's age square	-0.015 (0.036)	0.024 (0.222)	-0.006 (0.69)	-0.004 (0.77)	-0.0009 (0.001)
Man's age	0.08 (0.021)	0.11 (0.001)	0.102 (0.002)	0.158 (0.0)	0.84 (0.0)
Man's age square	-0.0005 (0.26)	-0.001 (0.011)	-0.0009 (0.017)	-0.001 (0.0)	-0.0008 (0.0)
Number of years of female education	-0.08 (0.0)	-0.053 (0.0)	-0.036 (0.0)	-0.033 (0.0)	-0.028 (0.0)
Number of years of man education	-0.022 (0.016)	-0.02 (0.001)	-0.01 (0.024)	-0.004 (0.207)	-0.006 (0.01)
number of daily working hours of women	-0.062 (0.018)	-0.022 (0.07)	-0.007 (0.365)	-0.005 (0.497)	0.002 (0.651)
number of daily working hours of men	0.002 (0.84)	-0.008 (0.24)	-0.003 (0.6)	-0.007 (0.146)	-0.001 (0.39)
Number of available rooms	0.064 (0.012)	0.054 (0.004)	0.038 (0.014)	0.054 (0.0)	0.062 (0.0)
Non-labor earnings of woman (million Rilas)	5.94 (0.89)	-60.82 (0.085)	-0.53 (0.97)	-9.3 (0.123)	-0.099 (0.916)
log of relative wages	-0.003 (0.64)	-0.004 (0.292)	-0.005 (0.155)	-0.003 (0.267)	-0.004 (0.052)
Divorce rate	-2.99 (0.0)	-1.86 (0.0)	-1.27 (0.004)	-1.172 (0.002)	-1.04 (0.0)
Household's total earnings one thousand million Rials	5.95 (0.89)	0.008 (0.184)	0.007 (0.147)	0.004 (0.245)	-0.00007 (0.972)
Per capita costs of cultural, educational and recreational	1.78 (0.108)	-0.403 (0.56)	-0.56 (0.322)	-0.82 (0.07)	0.106 (0.61)

Table (5): Negative Binomial regressions of demand for child by females' age

Variables	15-25	26-30	31-35	36-40	>41
Gender ratio of female to male total	0.07 (0.655)	0.06 (0.607)	0.089 (0.251)	0.14 (0.03)	0.002 (0.94)
Woman's age	0.58 (0.08)	-3.244 (0.2)	-0.37 (0.88)	1.55 (0.56)	0.067 (0.025)
Woman's age square	-0.012 (0.132)	0.059 (0.192)	0.006 (0.88)	-0.02 (0.56)	-0.0009 (0.003)

Man's age	0.08	0.11	0.11	0.174	0.083
	(0.02)	(0.004)	(0.005)	(0.0)	(0.0)
Man's age square	-0.0005	-0.001	-0.001	-0.002	-0.0008
	(0.225)	(0.26)	(0.019)	(0.001)	(0.0)
Number of years of female education	-0.08	-0.06	-0.038	-0.031	-0.028
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Number of years of man education	-0.022	-0.02	-0.008	-0.007	-0.005
	(0.01)	(0.003)	(0.122)	(0.144)	(0.018)
number of daily working hours of women	-0.064	-0.02	-0.006	-0.004	0.003
	(0.016)	(0.15)	(0.5)	(0.65)	(0.555)
number of daily working hours of men	0.003	-0.01	-0.001	-0.006	-0.002
	(0.8)	(0.207)	(0.8)	(0.25)	(0.362)
Number of available rooms	0.065	0.06	0.038	0.052	0.061
	(0.012)	(0.004)	(0.024)	(0.001)	(0.0)
Non-labor earnings of woman (million Rilas)	5.77	-53.05	-5.92	-7.29	-0.187
	(0.89)	(0.159)	(0.73)	(0.203)	(0.845)
log of relative wages	-0.003	-0.004	-0.006	-0.004	-0.003
	(0.6)	(0.387)	(0.161)	(0.197)	(0.082)
Divorce rate	-2.96	-1.74	-1.34	-1.13	-1.03
	(0.0)	(0.003)	(0.006)	(0.009)	(0.0)
Household's total earnings one thousand million Rials	0.007	0.006	0.007	0.006	-0.0002
	(0.56)	(0.38)	(0.18)	(0.082)	(0.91)
Per capita costs of cultural, educational and recreational	1.82	-0.3	-0.83	-0.78	0.099
	(0.101)	(0.75)	(0.223)	(0.096)	(0.64)

Table (6): GMM regressions of demand for child by females' age

Variables	15-25	26-30	31-35	36-40	>41
Gender ratio of female to male total	0.010	-0.034	0.28	0.33	-0.016
	(0.9)	(0.71)	(0.0)	(0.0)	(0.83)
Woman's age	0.47	-2.32	0.95	0.69	0.06
	(0.002)	(0.021)	(049)	(0.72)	(0.122)
Woman's age square	-0.009	0.043	-0.014	-0.009	-0.001
	(0.01)	(0.018)	(0.503)	(0.73)	(0.002)
Man's age	-0.094	0.114	0.164	0.38	0.224
	(0.14)	(0.048)	(0.01)	(0.0)	(0.0)
Man's age square	0.002	-0.0009	-0.001	-0.004	-0.002
	(0.03)	(0.27)	(0.103)	(0.0)	(0.0)
Number of years of female education	-0.102	-0.097	-0.008	-0.04	-0.088
	(0.0)	(0.002)	(0.803)	(0.037)	(0.0)
Number of years of man education	-0.009	-0.021	-0.057	-0.03	-0.006
	(0.465)	(0.24)	(0.005)	(0.017)	(0.63)
number of daily working hours of women	-0.056	-0.013	-0.03	-0.026	0.014
	(0.0)	(0.179)	(0.027)	(0.069)	(0.321)
number of daily working hours of men	0.002	-0.013	-0.0096	-0.02	-0.006
	(0.78)	(0.056)	(0.152)	(0.02)	(0.26)

Number of available rooms	0.069 (0.0)	0.088 (0.0)	0.086 (0.0)	0.14 (0.0)	0.168 (0.0)
Non-labor earnings of woman million Rials	10563.30 (0.372)	-34528.6 (0.0)	-1014.6 (0.922)	-16618.9 (0.0)	2050.05 (0.28)
log of relative wages	-0.003 (0.42)	-0.005 (0.33)	-0.015 (0.007)	-0.008 (0.158)	-0.009 (0.045)
Divorce rate	-2.57 (0.0)	-2.52 (0.0)	-2.63 (0.0)	-3.17 (0.0)	-2.38 (0.0)
Household's total earnings one thousand million Rials	5.59 (0.254)	14.7 (0.006)	8.94 (0.09)	2.305 (0.67)	0.93 (0.83)
per capita costs of cultural, educational and recreational	-0.009 (0.01)	0.043 (0.018)	-0.014 (0.503)	-0.009 (0.73)	-0.001 (0.002)
J-statistic	0.005	0.004	0.006	0.004	0.0006