Female Labor Supply and Fertility in Iran: A Comparison Between Developed, Semi Developed and Less Developed Regions

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Abstract

Background: Female labor supply has been changed dramatically in the recent yr. In this study, we examined the effects of development on the relationship between fertility and female labor supply.

Methods: We used data of population and housing census of Iran and estimated three separate models. To do this we employed Logistic Regressions (BLR).

Results: The estimation results of our study showed that there was a negative relationship between fertility rate and female labor supply and there are some differences for this relationship in three models.

Conclusion: When fertility rate increases, FLS would decreases. In addition, for higher fertility rates, the woman might be forced to work more because of the economic conditions of her family; and negative coefficients of the fertility rate effects on FLS would increase with a diminishing rate.

Keywords: Female labor supply, Fertility, Iran

Introduction

Changing the gender composition in labor supply is one of the most fundamental changes in the work in the last century. The empirical literature on determinants of female labor force participation rate is well-documented (1). United States and western European countries had more rates of female labor supply rather than less developed countries, but some developing countries had rapid growth in female labor supply. For example, female labor supply has increased from 21.8% in 1991 to 31.9% in 2009 in Iran. It increased from 56.7% in 1991 to 58.4% in the 2009 United States. Despite these changes, in some countries the rate of female labor participation remains very low.

For example, in Iraq this rate was only 14% in 2012(2).

Female workers are known as substitutes for male workers in the labor market. Increasing in male labor supply will decrease female labor supply (3). Categorizing the factors which affects female labor supply has been shown that three major features affects female labor supply: Cultural factors, socioeconomic factors and health factors. These features may have opposite or negative effects. For example, urbanization as a determinant of female labor supply is influenced by economic, social and cultural effects (4). Cultural effects cause that urbanization raises female labor supply,

but an economic factor like agricultural effect has a negative effect (5, 6). Education is another variable, which affects female labor supply. In agricultural sector, education may decrease female labor supply, but in services sectors, it increases female labor supply. In economic viewpoint, in one hand, education may increase income and hinder sending women to work and it may lead to increase female labor supply because of increasing in the skilled women(1, 5). Some variables like fertility and aging are categorized as health variables. Having more children reduces the ability of working women. This is because the women must stay at home and take care of their children so they have not enough time for working (7). Aging is another factor, which affects female labor supply. The ability of women to work will decrease at higher age groups. Retirement is another reason to decrease the female labor supply at higher ages. Living alone also increases the probability of working too. This is a social variable (8). A divorced woman may fall in some bad conditions. She must live with her parents or children or alone. A widowed woman has such conditions; however, she can use her husband's retirement salary. If these women face with improper socioeconomic conditions, they have work to get money, so the female labor supply will increase (9, 10). Wage is another variable, which affects female labor supply. Increasing wages will stimulate unemployed and householder women to find jobs and work. Migration also affects female labor supply (5).

The numerous studies have examined the determinants of female labor supply. Because of cultural, socioeconomic and health factors, the effects of the variables on female labor supply vary among different regions. In this study, we compare the effects of the effective variables in less-developed and developed provinces of Iran.

Methods

Based on descriptive and analytical study in 2012, we divided the provinces of Iran into 3 regions: less-developed, semi-developed and developed provinces. For less-developed provinces including Sistan and Baluchestan, Chaharmahal and Bakh-

tiari, Kordestan, Bushehr, Hormozgan, Lorestan, Ilam, Kohkilooye and Boirahmad, and South Khorasan, we used 78743 data. For developed provinces including Tehran and Alborz, we used 115492. These 2 provinces account for near 15% of Iran's population, so we did not add other industrialized provinces in this region. Finally, the semi-developed provinces include Fars, Mazandaran, Gilan, Azerbaijan-Qarbi, Khouzestan, Kerman and Khorasan-Razavi. The total observations for these provinces were 199163. The categorization criterion used for the provinces was Maleki and Sheykhi study (2010). They used several development indicators to sort the provinces from developed to less-developed regions. Data was derived from the population and housing census of Iran in 2011. These data have been gathered by the Statistical Center of Iran (SCI) between 24 October and 13 November 2011.

Model

Here, a logistic regression is used to estimate the relationship between explanatory variables and female labor supply as dependent variable. The general model for 3 regions is as follows:

$FLP_i = f(\ TFR_i,\ URB_i,\ AGE_i\ ,\ MIG_i\ ,\ INT_i\ ,\ EDU_i,\ ATD_i\ ,\ REL_i\ ,\ MAR_i\ ,\ GIRL_i\ ) + u_i$ (1I)

In a logistic regression, we need to categorize each variable based on dummy or categorical variables. Therefore, we rewrite the regression model in explicit form in which dependent variable is defined in odds ratio, i.e., chance of being worked to chance of being not worked:

$\ln\left(\frac{p(prog = work)}{p(prog = not\ worked)}\right) = \beta_0 + \beta_1(TFR = 1) +$
$\beta_2(TFR = 2) + \beta_3(TFR = 3) + \beta_4(TFR = 4) +$
$\beta_5(TFR = 5) + \beta_6(URB = 1) + \beta_7(AGE = 1) +$
$\beta_8(AGE = 2) + \beta_9(AGE = 3) + \beta_{10}(MIG = 1) +$
$\beta_{11}(INT = 1) + \beta_{12}(EDU = 1) + \beta_{13}(EDU = 2) +$
$\beta_{14}(EDU = 3) + \beta_{14}(EDU = 4) + \beta_{15}(EDU = 5) +$
$\beta_{16}(ATD = 1) + \beta_{17}(REL = 1) + \beta_{18}(MAR = 1) +$
$\beta_{18}(MAR = 2) + \beta_{19}(GIRL = 1) + u_i$ (II)

β_0 is the intercept of regression and $\beta_i s$ (i=1, 2, …19) show the coefficients of explanatory variables. To prevent multicolinearity, we select a base value for each variable and omit them from the model. The variables are described in the following:

FLP: Labor participation of female aged 15 and more. Under 15 yr old female labor supply is considered as child labor supply. The base category for FLP is female group, which does not work.

TFR: Total fertility rate, the number of children born by a woman. It is categorized into 5 groups: 1. having not children. 2. Low fertility rate, with 1-2 children, 3. Middle fertility rate, with 3 - 4 children, 4. High fertility rate, with 5-7 children; and 5. Very high fertility rate, with 7^+ children. In this study, all children are regarded alive or dead. The category 1 is given as base group.

URB: Living in urban regions. An urban region is administrated by municipality. Living in rural regions is selected as the base category and omitted from the model.

AGE: Age structure in 4 female groups: 15 -30 yr old, 30 -45 yr old, 45 - 60 yr old and 60^+ yr old. The 15 -30 yr old female group is selected as the base.

MIG: Migration variable. Migration occurs when the family moves from one region to another in a 5-yr span. Otherwise, no migration occurs. No migration is selected as base variable and was omitted.

INT: an indicator for using the internet at home at home at least one time in past 12 months. Not using internet is the base variable.

EDU: the latest education degree of the women. The education level is categorized into 7 groups: 1. Illiterate women; 2. Low literate women; 3. Primary school level; 4. Secondary school level; 5. high school level; 6. University degree such as B.A; and 7. Higher education degree such as M.A, M.S and Ph.D. Illiterate women are given as the base variable.

ATD: Attendance to school or university in the present time. If a woman is going to school or university, ATD takes value of 1 and otherwise its value will be 0. Not attending to school is selected as the base.

REL: The relationship of a woman with her family. In some families, the absent or sick father cannot earn money, so the mother or the daughters have to work and finance the family. Not being the head of household is the base group of this variable.

MAR: Marital status. We classified this variable into 3 groups: 1. a woman living with her husband; 2. a divorced or widowed woman; and 3. a single or alone woman. Group 1 is selected having as base category and is removed from the model.

GIRL: The girl living with parents. If a woman lives with her parents, this variable takes value 1; otherwise its value is 0. The female living without parents is the base group and is omitted from the model.

Results

In Table 1, female labor participation rate for the three regions is shown. As shown, the female labor participation rate for developed provinces is higher than for less-developed and semi-developed ones. The female labor force participation rate contains people who work and others who are seeking for work. Our results are different from the results of World Bank, which calculated female labor participation rate in Iran near 30%. This is because the World Bank standards and definitions are different from our groupings, in a way that World Bank considers householders as workers (11). The results of statistical center of Iran (SCI) are similar to our results which has calculated female labor force participation rate about 11%(12).

Table 1: The results of female labor force participation rate in 3 studied regions

Province	Participation rate
Less developed	0.086966
Developed	0.109423
Semi Developed	0.093526

Model

Table 2 shows the estimation results of model two in which columns two, four and six give coefficients of factors affecting female labor participation rate in developed, semi-developed and developed provinces of Iran, respectively. The corresponding *P*-values are given in columns three, five and seven.

Table 2: The results of binary logistic regression in three studied regions

Variables	Developed coefficient	*P*-value	Semi developed coefficient	*P*-value	Less Developed Coefficient	*P*-value
Urbanization (base living in rural regions)	0.2008	0.000	-0.5343	0.000	-0.3871	0.000
Age (base 15-30 yr old)						
30-45	1.1900	0.000	1/3125	0.000	0.8971	0.000
45-60	0.5133	0.000	1.0120	0.000	0.1656	0.002
More than 60	-1.3304	0.000	0.4857	0.000	-0.2962	0.000
Relation (base: mother is not the head of house)	0.9563	0.000	1.5623	0.000	0.8238	0.000
Education (base illiterate)						
Primary school	-0.1878	0.001	0.1292	0.000	-0.1967	0.000
Secondary school	-0.3072	0.000	0.2360	0.000	-0.3104	0.000
Up to secondary school	0.0838	0.081	0.7503	0.000	0.1167	0.000
University degree	1.1801	0.000	2.3523	0.000	1.7278	0.000
High university degree	1.9965	0.000	2.6615	0.000	2.3153	0.000
Self-educated and others	0.4404	0.000	0.9180	0.000	0.5504	0.000
Total fertility rate (base: tfr=0)		-				
Tfr= 1, 2	-0.7959	0.077	-0.2915	0.000	0.1720	0.000
Tfr=3,4	-1.5455	0.851	-0.7040	0.000	-0.2398	0.000
Tfr=5,6,7	-2.0555	0.000	-0.7774	0.000	-0.2272	0.000
More than 7 children	-1.8201	0.000	-0.5801	0.000	-0.0160	0.773
Migration (base: not migrated in 5 years)	-0.1261	0.001	-0.0274	0.425	0.0836	0.139
Using internet (base: not using internet at home)	0.4380	0.000	0.3282	0.000	0.7505	0.000
Marriage (base: woman has husband)	-		-			
Divorces or widow woman	0.7061	0.000	0.2416	0.000	0.9325	0.000
No marriage yet	-0.0260	0.420	-0.0314	0.273	0.4387	0.000
Constant	-2.8263	0.000	-3.4504	0.000	-3.1851	0.000

For developed provinces, urbanization positively effects female labor supply (FLS). But it negatively affects FLS in both semi- and less-developed provinces. The *P*-values indicate statistical significance in the three models. Aging is the other variable influencing FLS. For developed provinces, similar to the less-developed ones, the women under 60 yr old supply more labor, but the labor supply of women more than 60 yr is low. In semi-developed provinces, all coefficients were positive and significant. The proportion of retirement in

semi-developed provinces is less than other regions. As shown, for older ages, the coefficient is smaller too. These effects for semi-developed provinces are not so big and the results for 60^+ women remain positive. In developed and under developed provinces, the retirement effects are such big that relevant variable has a big negative coefficient.

Education also is correlated with FLS. Similar to aging, when the level of education increases, the coefficients become bigger. Except one, other ag-

ing variables are significantly pertinent to FLS. Migration has a significant negative relationship with FLS, only in developed provinces model. The internet use positively affects FLS in all models. We include the internet use as a micro-welfare indicator. Therefore, when internet use increases, the proportion of working female will increase too. Marital status is another variable, which affects the proportion of female labor. Being divorced or widowed has a positive relationship with FLS in all models, but it is not significant for not married female.

Results for total fertility rate

For developed provinces, low and middle fertility rate have no significant relationships with the proportion of FLS. In this model, the relationship for high and very high fertility rate is significantly negative. For semi-developed provinces, the relationship is significantly negative too. In under-developed provinces, the relationship between low fertility rate and FLS is positive, however middle and high fertility affects negatively FLS and finally very high fertility rate has no significant effect on FLS. In all 3 models, as the fertility rate increases, the coefficients become smaller; however this is not the case in very high fertility rate. It is important to note that, for each variable, the negative effects are higher in developed provinces than semi-developed and under-developed provinces ones.

Discussion

Urbanization has a positive effect on FLS in developed provinces, but this effect is negative for semi- and underdeveloped regions. These differences could be justified by agricultural effects (13, 14). In less-developed regions of Iran, work force activities on farms and handicrafts are more in comparison with activities in services and modern industries. Also the places of agriculture and handicraft works are villages (15, 16). Therefore, in developed regions, by increase in the proportion of living people in urban regions, the likelihood of working in the sectors of industries and services will increase, so FLS will increase too. In semi-

and less-developed regions, due to agricultural effects, as working in rural regions is increased, the probability of working in farms and handicraft sectors will increase and FLS will increase too(17). Kalsit examined the effects of living in urban regions on FLS. Using a Probit logistic regression, he divided this variable to living in metropolitan regions and the center of the city or not living in the center of the city. He found that, living in the center of the city has a positive relationship with FLS and not living in the center of the city has a negative relationship (18). In another study a negative relationship was found between urbanization and FLS (19).

Concerning age groups, our results showed that the coefficients of the female more than 60 years old are negative in two models. It means that retirement has a big effect on FLS. In addition, the corresponding coefficients for the less-developed regions are smaller than developed ones. It means that in less-developed regions of Iran, female employment does not depend on the ages of them as much as developed regions. In addition, along with increasing in age, the coefficients of age groups in 3 models have been decreased. It confirms that FLS will increase with increasing the age of women, but with a diminishing rate. Similar to our study, Cebula and Coombs found that there is a positive, but diminishing relationship between age and female labor participation rate in the United States (20). Similar results were found by Contreras in Chile and Gong and Van Soest in Mexico City (21, 22). In a study it was found that for higher ages this relationship was negative and for lower ones, it was positive (23). In another one there were negative relationships between age and FLS in both rural and urban regions (24).

Education also affects FLS. Higher education has a positive and a stronger effect on the proportion of FLS. Similar to our study, Bloom et al. found that this relationship is positive too (19). In constant of our study, Contreras et al. divided education into some sub-categories: Primary, secondary, tertiary education. They found that primary education does not have a significant relationship with FLS, but there is a significant positive relationship between FLS and secondary and tertiary education

(21). In addition, Maurer et al. found that there is a negative relationship between education and FLS in low education levels, but this relationship for higher levels is positive and strong(23). Similar results were found by some other studies (18, 25).

In current study if the woman is head of the family, her attending at work will increase. This is because, when the woman is the head of the family, she must work and earn money for her family. Contreras et al. used this variable in the female labor model and found similar results (21). Similar results were found by others (26, 27).

Migration from rural to urban areas has a negative effect on FLS in developed provinces (28, 29). In a study, "being non-native" affects negatively female labor participation rate in United states (20, 30). Marriage is a central variable for estimating the FLS. A divorced woman, does not like to live with her parents, so she must work for her subsistence. Thus the proportion of female supply will increase in divorced women. In our study, the positive and bidirectional relationship between being divorced and women, participation in labor market is confirmed. The literature confirms this effect in Ireland, Singapore, China, and France (9, 14, 31, 32).

We employed "internet use "to indicate the welfare of the family (33). When the welfare of the family increases, because of social effects, women have more time to go out and work, so the likelihood of FLS will increase (4, 6, 34). The results indicate positive effect of internet use on FLS.

Fertility and FLS

When the number of children born by a mother increases, she will have not enough time to go to work. Therefore, she decides to stay at home and take cares her children. In the less-developed provinces, the effect of total fertility rate on FLS is lower. It seems that the fertility rate is not a serious barrier for female labor supply in these regions. In addition, having a big family size forces the woman of less-developed regions to work in farms and handicrafts.

The nature of FLS in developed regions is to work at services, offices, light industrial works covered by social security and labor law. For example, in

pregnancy period, mothers are free to stay at home with no concern on cutting their salary or wage, so FLS will decrease. In farming or handcrafting and other home works, the women are not covered by such benefits. Their income depends on their work and if they do not work, they could not earn money. When fertility rate increases in less-developed regions, the mothers continue to work out of home. The positive relationship is confirmed between low fertility and FLS in less-developed provinces.

As the fertility rate increases, the negative effect of fertility on FLS is bigger too. But this increase is stopped when the number of children exceeds 7. This occurs due to economic factors. When the number of children in a family increases, the head of household cannot earn enough money for his/her family so other members of the family have to work.

Bloom et al. divided the women into age groups and found a significant and negative relationship between fertility rate and female labor supply (19). Cebula and Coombs found a negative relationship between the numbers of children under 6 yr old and FLS; and concluded that mother is not responsible for all childcare and her spouse helps her in this regard. Since the number of potential male earning money is greater than female attending in the formal labor market, the willingness of the women to stay at home is more than men, so the relationship between the fertility rate and FLS remains negative (20). In another study children were categorized by the age groups. Authors found that the relationship between the number of children and labor participation rate is negative for children between 6 to 15 yr old. In addition, negative relationship were found between these two variables in Japan and Latin America, respectively (7, 35). Similarly in a study using time series data in the United States, authors found that there is a causal effect between these two variables (36). In addition, Mishra and Smyth found similar results using panel co-integration and Granger causality test (37). Furthermore if a child benefit policy is implemented in a country, fertility rates and female labor participation rate would increase (38). The study had some limitations. First, we used

only two provinces for developed provinces of Iran because the high population of them, second living in a developed region is not the reason for having a developed family and we extended the level of development of provinces to families.

Conclusion

The main aim of this study was to compare the relationship between FLS (female labor supply) and fertility rates in different regions of Iran. We found that, this relationship was not stable in different economic regions and may be negative or positive. The results of this study showed that when fertility rate increases, FLS would decrease. In addition, we found that for higher fertility rates, the woman might be forced to work more because of the economic conditions of her family; and negative coefficients of the fertility rate effects on FLS would increase with a diminishing rate.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgement

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