Journal of Money and Economy
Vol. 12, No. 2, Spring 2017
pp. 107-122

The Effect of Divorce on Urban Housing Costs in Iran: A Spatial Autocorrelation Model

Esmaiel Abounoori* **Hossein Abdoh Tabrizi†**
Nooshin Mahmoodi‡

Received: 25 May 2018 Approved: 29 Oct 2018

In addition to traditional factors, demographic changes also depend on factors such as marriage and divorce. Yet only few researchers investigated the impact of divorce on housing costs. The aim of this paper is to estimate the effect of divorce on housing costs in Iran. Doing so, we have applied a fixed Panel Spatial Autocorrelation model using the data from a set of Iranian provinces over the period of 2006-2014. The results indicate that a one-percent point rise in divorce increases housing rental index by about 1.05% point directly and indirectly. The outcomes also show that household size has a negative and significant effect, but the per capita gross domestic product and the population have positive and significant effects on the housing rental index. On average, a one-percent point increase in the housing rental index of any provinces will increase the housing rental index in a province by about 0.34 percentage points.

Keywords: Housing, Divorce, Spatial Econometrics, Iran
JEL Classification*:* C21, J10, O18

1 Introduction

With the growth of cities, the need for shelter and housing has become the main concern of the inhabitants, and this challenge grows every year with increasing housing price and rental rate. Over the past years, housing prices and rentals have been rising in Iran. When there is a market for a good, the supply and demand status used for investigation and planning is accessible. Since housing is a nonmarket good whose information is not directly available, the investigation into factors affecting the demand for housing is a way to make accurate predictions and planning (Walks and August 2008). For

* Department of Economics, Semnan University, Iran; esmaiel.abounoori@semnan.ac.ir
† Tehran, Iran; abdoh@abdoh.net
‡ Department of Economics, Semnan University, Iran; n.mahmoodi@semnan.ac.ir
(Corresponding Author)

This paper is extracted from Ph.D. dissertation of Nooshin Mahmoodi entitled "Estimating the Impact of Demographic Structure Change on House Price Index using Fuzzy Spatial Econometrics Approach".

example, population structure is a highly important factor, which affects the demand for housing in Iran.

Studies conducted by the Ministry of Roads and Urban Development for need assessment and classification of housing applicants show that the annual population growth rate in Iran increased approximately 4% in the first half of the 1980s, to approximately 2% in the first half of the 1990s, and to approximately 1% in the first half of the 2000s. In contrast, the number of household growth rate has increased. So that, the annual number of household growth rate increased from 2.51% from 1985-1995 to 2.89% by the end of 2010. The inverse relationship between the rates of population growth and the number of household growth was developed three decades ago.

Although the rate of population growth reduced during 2010-2016 from 1.29% to 1.24%, total households increased by 14% in the same period. A thorough investigation into Iran's population shows that in recent years, 'lifestyle change' has exacerbated this inverse relationship. Lifestyle change along with such factors as 'divorce' that reduced 'household size' practically neutralizes the effect of reduced rate of population growth. Typically, urban planners estimate the demand for housing based on the rates of population growth and marriage. Meanwhile, changes in the population structure of Iran is highly significant and affects the housing demand not only in terms of the number of housing units but also their type and features.

Divorce is among the most important factors, which are less addressed in urban housing planning. Therefore, this study investigate the effect of divorce on the rental rate. Since the increase in divorce rate has become more prominent in recent years, its effect on housing demand between 2006 -2014 is used in 30 provinces.

It is worth noting that due to the spatial nature of housing, two issues often arise: (i) spatial dependence between observations, and (ii) spatial heterogeneity in relationships that are modeled. As a result, the use of a spatial econometric model is needed (LeSage, 1999). In this paper, the first issue is considered and the spatial econometrics employing panel data is used.

2 Literature Review

Typically, the effect of changes in population growth on demand for housing has been addressed based on the range and mean age of the populations. Mankiw and Weil (1989) use census data in the USA to show that the age range dramatically affects the demand for housing. Based on their work, many other studies investigate the effect of age range on the demand for housing;

however, the majority of them focus on young adults aged 20-49, as they accounted for the majority of newly formed households.

A study by Essafi and Simon (2015) investigate the effect of changes in population structure on the real estate market in France between 2000-2013. Results suggest that the prices in this market are significantly and positively affected by population and GPD. It is worth noting that population changes have a greater impact than GDP changes on the housing price. Moreover, real estate prices have an inverse relationship with aging- ratio of people over 60 years to active population. Among these studies, there is one that is conducted in Chongqing between 2003 and 2012. It shows that the rate of population brought-up and sex ratio, in particular, have a negative impact on the housing price. In general, it is concluded that the population structure affects the housing price (Gao & He, 2014).

According to the reports by Ohlsson-Wijk et al. (2017), in addition to traditional factors, changes in population structure also depended on such factors as marriage and divorce in the last decade. Hlaváček and Komárek (2011) have expressed that higher divorce rate causes property price to rise because divorce changes one household into two, as a result the demand for the property will be higher. But few research has been directly addressing the effect of divorce on demand for housing and rental rate or housing cost.

A study has been published by Denmark National Bank shows that in many OECD countries, increasing home ownership, urban extension and demographic changes such as a higher divorce rate motivate housing market (Dam and Rasmussen 2014)

Mikolai and Kulu (2018) study the effect of marital and non-marital separation on individuals' residential and housing trajectories. The results show that many moving are due to separation. Remarkable, separated women and men chose different types of houses. Women are presumably moving to terraced houses, whiles separated men equally prefer to move to flats (apartments) and terraced (row) houses.

This study is important because it estimate the effect of divorce on housing directly. As mentioned, few researches have been investigated the effect of divorce on demand for housing directly. A lot of disassociate researches such as (Phillips & Vanderhoff, 1991; Rezazadeh & Outadi, 2008; Hasanzadeh & Kianvand, 2012; Farzanegan & Gholipour, 2016; Fischer, 2015; Jia, Wang & Fan, 2018; Mikolai & Kulu, 2018;) are about both of these issues (housing and divorce) that show their vital role in the economy or study the inverse direction that means the effects of housing on the divorce rate.

Housing has always played an important role in the economy because it contributes to GDP in two basic ways, the first one is buying a house as investments and the second one is buying a house as consumption (Kapinos, Gurley-Calvez & Kapinos 2016). In the same manner, systematic changes in the demographic structure of the country are part of economic development (Kelley, 1969). Conventionally, the impact of divorce rate fluctuations on demographic changes are clear. Consequently, this paper investigate the direct effect of divorce on demand for housing. As we know, studying any of these issues required spatial econometrics due to dependency between observations, and it comes from the nature of houses. In addition, the rate of divorce significantly growing in Iran which has a notable impact on population structure and therefore on housing.

3 Methodology

Two issues often arise when working with spatial data: (i) spatial dependence between observations, and (ii) spatial heterogeneity in modeled equations (Anselin, 1988). It means that the model equations or parameters, along with sample data changes with moving on the coordinate plane. The conventional econometric models ignore these two possibilities (spatial dependence and heterogeneity). This model runs counter to the conventional econometrics' hypotheses (Gauss–Markov theorem), that the desirable features are ordinary least squares estimators.

Following tests are used to test the significance hypothesis of spatial dependence between error terms in the model: (i) Moran's I, (ii) likelihood ratio test, (iii) Lagrange coefficient test, and (iv) Wald test (Elhorst, 2014).

3.1 Spatial Models

According to Anselin (1988), there are three basic models concerning spatial econometrics, namely the First Order Spatial Lag Model or the First Order Spatial Autoregressive Model (FSAR) or (SAR), Spatial Error Model (SEM), Spatial Durbin Error Model (SDEM) (Anselin, 1988). However, these Spatial Model can be extended which some of the most commonly used in the literature are presented in table 1 (Cook, Hays, and Franzese, 2015). In the SAR, the spatial effects are distributed only through the dependent variable. In the SEM, the main path of spatial distribution is through the error term. In the SDM, the spatial distribution is through both the dependent and independent variables.

Table 1
Spatial Econometric Models (taken from Cook, Hays, and Franzese, 2015)

Name	Structure	Restrictions
General Nesting Spatial Model (GESM)	$y = \rho Wy + X\beta + WX\theta + u$ $u = \lambda Wu + \varepsilon$	none
Spatial Durbin Error Model (SDEM)	$y = X\beta + WX\theta + u$ $u = \lambda Wu + \varepsilon$	$\rho = 0$
Spatial Autocorrelation Model (SAC)	$y = \rho Wy + X\beta + u$ $u = \lambda Wu + \varepsilon$	$\theta = 0$
Spatial Durbin Model (SDM)	$y = \rho Wy + X\beta + WX\theta + u$	$\lambda = 0$
Spatial Autoregressive (SAR)	$y = \rho Wy + X\beta + u$	$\lambda = \theta = 0$
Spatially Lagged X's (SLX)	$y = X\beta + WX\theta + u$	$\rho = \lambda = 0$
Spatial Error Model (SEM)	$y = X\beta + u$ $u = \lambda Wu + \varepsilon$	$\rho = \theta = 0$ $\lambda = -\rho\beta$

Source: Research Findings.

For panel data, a complete model with all types of spatial effects can be written as:

$$y_{it} = \rho \sum_{j=1}^{n} w_{ij} y_{jt} + \beta_0 + X_{it}\beta + \theta \sum_{j=1}^{n} w_{ij} X_{jt} + u_{it} \quad (1)$$
$$u_{it} = \lambda \sum_{j=1}^{n} w_{ij} u_{ij} + \varepsilon_{it}$$

Here i indexes are cross-section of economic units and t indexes are time periods. y_{it} is the output, whereasX_{it} is the input vector. β is parameter vector to be estimated, and u_{it} is an $i.i.d.$ disturbance. w_{ij} is a known non-negative element of the spatial weights matrix. The Wald tests are applied to select the optimal model (Elhorst, 2014).

3.2 Data

In this section, we applied annual dataset from 30 provinces of Iran for the period of 2006-2014. As a measure of housing costs, the Housing Rental Index in urban areas (HRI) (2011=100) is used, which are collected from the Central Bank of Iran. In addition to HRI, the Household Size (HS), the Natural Increase of Population (NIP), the Population (POP), the Real Gross Regional Product per Capita (PCGRP) and the Investment in House Building (IHB) are selected as control variables. The Percentage of Ratio of Divorce to Population (PRDP) in a year is applied as independent variables. The percentage of the ratio of divorce to population, birth, and death are collected from the National Organization for Civil Registration of Iran. The gross regional product per capita, the population and the number of the household of each province are gathered from Statistical Center of Iran. Fig 1 and Fig. 2 show the spatial distribution of the percentage divorce ratio to population corresponding to different years in each province.

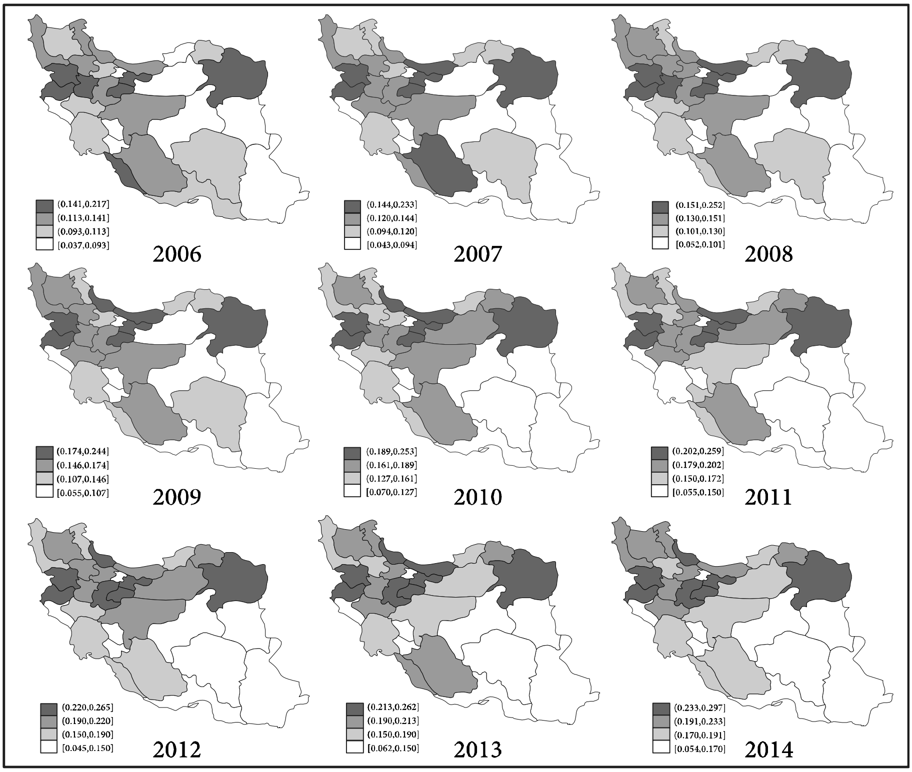

Figure 1. The spatial distribution of the Percentage of Ratio of Divorce to Population. It is drawn by the STATA 15. *Source*: Research Findings

Because of the difference in scaling variable, the logarithmic regression form is helpful in analyzing and measuring the effects of variables. So the natural logarithms of the Housing Rental Index in urban areas (LHRI), The Percentage of Ratio of Divorce to Population (LPRDP), the Household Size in year (LHS), the Natural Increase of Population (LNIP), the Population

(LPOP), the real Gross Domestic Product per Capita (LPCGRP) and the investment in housing building (LIHB) are applied in this research. Table 2 summarizes the descriptive statistic of the variables.

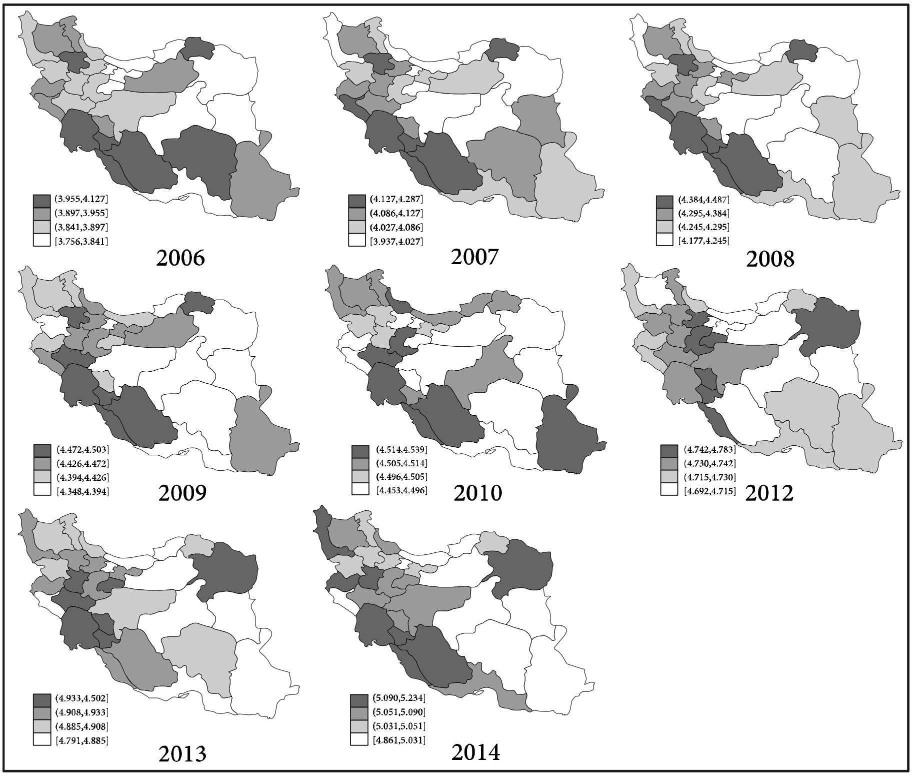

Figure 2. The spatial distribution of the natural logarithm of Housing Rent Index. It is drawn by the STATA 15. *Source*: Research Findings.

In this paper, the inverse of the distance between the provinces is applied for the computation of the weight matrix. The summarized spatial weights matrix is available in Table 3. Spectral clustering means the weighting matrix is normalized in the way that its largest Eigenvalue is 1.

The spatial econometrics is suitable for our data, the spatial dependence between error terms in the basic panel least square model is tested (Elhorst 2014). The result show that spatial autocorrelation is confirmed (see Table 4). As you see, positive spatial autocorrelation exists that means high HRI correlate with high HRI of neighbors or low HRI correlates with low HRI of neighbors.

Table 2
Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
HRI	96.0033	33.1736	42.80	187.75
PRDP(percentage)	0.1566	0.0534	0.0370	0.2971
IHB (Million Rials)	11833189	24526225	374465	187015615
POP(person)	2394509	2265972	545787	1.26e+07
HS (person)	3.762698	0.4214942	2.952103	5.1186
NIP(person)	32044.85	29345.39	2207	146626
PCGRP(Million Rials)	71.9839	58.1114	9.61472	405.6375

Calculated using STATA 15. *Source:* Research Findings.

Table 3
Weighting Matrix

Type	The inverse of the distance
Normalization	spectral
Dimension	30 × 30
Elements	
Minimum	0
Minimum > 0	0.008185
Mean	0.030765
Max	0.152365

Calculated using STATA 15. *Source:* Research Findings.

3.3 Model Selection

For the first step before Wald test, the General Nesting Spatial Model (GNSM) as equation (2) is estimated. And Table 5 shows the results of both estimations.

$$LHRI_{it} = \rho \sum_{j=1}^{N} w_{ij} LHRI_{jt} + \beta_0 + PRDP_{it}\,\beta_1 + LHS_{it}\beta_2 + LNIP_{it}\beta_3 + LCPGRP_{it}\beta_4 + LPOP_{it}\beta_5 + LIHB_{it}\beta_6 + \theta_0 \sum_{j=1}^{N} w_{ij}\, LHS_{it} + \theta_1 \sum_{j=1}^{N} w_{ij} LCPGRP_{it} + \theta_2 \sum_{j=1}^{N} w_{ij} LIHB_{it} + \varepsilon_{it} \qquad (2)$$

$$\varepsilon_{it} = \lambda \sum_{j=1}^{N} w_{ij}\, \varepsilon_{it} + u_{it}$$

Table 4
Testing Spatial Autocorrelation

Ho: Error has No Spatial Autocorrelation		
H1: Error has Spatial Autocorrelation		
GLOBAL Moran's I	= 0.2957	P-Value > Z(16.655) 0.0000
GLOBAL Geary GC	= 0.6821	P-Value > Z(-15.659) 0.0000
GLOBAL Getis-Ords GO	= -0.2957	P-Value > Z(-16.655) 0.0000

Calculated using STATA 15. *Source*: Research Findings.

Table 5
The General Nesting Spatial Model- Fixed Effects

Dependent variable: LHRI		
	Coef.	P-value
PRDP	0.7270	0.002 **
LHS	-1.2347	0.000***
LNIP	0.0367	0.021*
LPCGRP	0.1714	0.000***
LIHB	0.0224	0.000***
LPOP	1.1461	0.000***
WD*LHRI	0.5467	0.069*
WD*e.LHRI	0.6866	0.000***
WD*LHS	1.6298	0.151
WD*LPCGRP	0.0769	0.699
WD* LIHB	0.0674	0.154
Variance of ε	0.05	
Wald test of spatial terms:	chi2(4) = 173.26	Prob > chi2 = 0.00

Note: The asterisks *, **, and *** denote significance at the 10, 5, and 1 % levels, respectively. Calculated using STATA 15. *Source*: Research Findings.

Table 6
Model Selection

H_0	**chi^2**	**Degree of freedom**	**Prob**
The model is SDEM.(ρ=0)	3.32	1	0.0685
The model is SAC.(θ=0)	4.45	3	0.2169
The model is SDM.(λ=0)	35.49	1	0.0001
The model is SAR ($\lambda = \theta = 0$)	116.16	4	0.000
The model is SLX($\rho = \lambda = 0$)	128.15	2	0.000
The model is SEM($\rho = \theta = 0 ,\lambda = -\rho\beta$)	960.94	10	0.000

Calculated using STATA 15. *Source*: Research Findings.

As described in the previous section, the Wald tests are applied to select the optimal model. The result shows that all the models that are described in

Table 1, except Spatial Durbin Error Model (SDEM) and Spatial Autocorrelation Model (SAC), are rejected. The results of Wald test for different models are presented in Table 6.

4 Estimation

Based on the previous discussion, the empirical model that must be applied is Spatial Durbin Error Model (SDEM) or Spatial Autocorrelation Model (SAC). In this section, both model estimations are presented.

4.1 SDEM Model

The SDEM (3) is estimated by Maximum Likelihood approach using Stata 15. The result of fixed effects and random effects are reported in Table 7.

$$LHRI_{it} = \beta_0 + PRDP_{it}\,\beta_1 + LHS_{it}\beta_2 + LNIP_{it}\beta_3 + LCPGRP_{it}\beta_4 + LPOP_{it}\beta_5 + LIHB_{it}\beta_6 + \theta_0 \sum_{j=1}^{N} w_{ij}\, LHS_{it} + \theta_1 \sum_{j=1}^{N} w_{ij} LCPGRP_{it} + \theta_2 \sum_{j=1}^{N} w_{ij} LIHB_{it} + \varepsilon_{it} \quad (3)$$

$$\varepsilon_{it} = \lambda \sum_{j=1}^{N} w_{ij}\, \varepsilon_{it} + u_{it}$$

Table 7

The Spatial Durbin Error Model

Dependent Variable: LHRI		
Variable	fixed-effects	random- effects
PRDP	0.7156**	0.5001*
LHS	-1.1948***	-0.7920***
LNIP	0.0354*	0.0726***
LPCGRP	0.1736***	0.2310***
LIHB	0.0243***	0.0235***
LPOP	1.0848***	-0.1115**
Cons		5.2392***
WD*LHS	1.2194	-1.1209***
WD*LPCGRP	0.2958	0.2066
LIHB	0.1011*	0.0273
WD*e.LHRI	.8464***	0.8692***
Statistics		
AIC	-722.135	-652.89
BIC	-682.55	-606.11
Wald test of spatial terms	chi2(4) = 388.17***	chi2(4) = 375.36***

Note: The asterisks *, **, and *** denote significance at the 10, 5, and 1 % levels, respectively. Calculated using STATA 15. *Source:* Research Findings.

In this paper, the Hausman test (Table 8) is applied based on the difference between the fixed and random effects specification of the model. According to the Hausman test, the fixed effects model better describes the relation between the variables.

Table 8

Hausman Test

H_0: Difference in coefficients not systematic
chi2(10) = 29.82
Prob>chi2 = 0.0009

Calculated using STATA 15. Source: Research Findings.

4.2 SAC Model

The estimation result from applying the Spatial Autocorrelation Model (equation 4) and the Hausman test are shown in Tables 9 and 10. Using Hausman test, the results reveal that the random effects is inconsistent and fixed effects is more suitable for the data.

$$LHRI_{it} = \rho \sum_{j=1}^{N} w_{ij} LHRI_{jt} + \beta_0 + PRDP_{it}\,\beta_1 + LHS_{it}\beta_2 + LNIP_{it}\beta_3 + LCPGRP_{it}\beta_4 + LPOP_{it}\beta_5 + LIHB_{it}\beta_6 + \varepsilon_{it} \quad (4)$$
$$\varepsilon_{it} = \lambda \sum_{j=1}^{N} w_{ij}\,\varepsilon_{it} + u_{it}$$

Table 9

The Spatial Autocorrelation Model

Dependent variable: LHRI		
Variable	fixed-effect	random- effect
PRDP	.7158**	.63714*
LHS	-1.1952***	-1.0098***
LNIP	.03730*	.073915***
LPCGRP	.17280***	.268316***
LIHB	.02020***	.022983***
LPOP	1.1681***	-.110337**
Cons		5.26960***
WD*LHRI	.34169***	-.025645
WD*e.LHRI	.74674***	.925073***
Statistics		
AIC	-724.1878	-618.2127
BIC	-691.8020	-578.6301
Wald test of spatial terms	chi2(2) = 166.91***	chi2(2)= 2147.38***

Note: The asterisks *, **, and *** denote significance at the 10, 5, and 1 % levels, respectively. Calculated using STATA 15. *Source:* Research Findings.

Table 10
Hausman Test

H_0: difference in coefficients is not systematic
chi2(8) = 83.11
Prob>chi2 = 0.00

Calculated using STATA 15. *Source:* Research Findings.

4.3 Comparing SDEM and SAC Model

Comparison helps to determine which model is the best to rely on. The Hausman test indicate that the fixed effects for SDE model and the SAC model must be chosen. The Akaike information criterion (AIC) and the Bayesian information criterion (BIC) are reported in Table 11. Comparing these estimators show that the SAC model is more reliable. Therefore, all tests and interpretation are based on the SAC fixed effects model. In addition, there are some constant features such as area, geographical location and neighbors of each province that would not change by the time so it is better to choose the fixed effects.

Table 11
Comparing SDEM and SAC Model

Model	df	AIC	BIC
The SDEM random effect	11	-722.135	-682.55
The SAC fixed effect	9	-724.187	-691.80

Calculated using STATA 15. *Source:* Research Findings.

4.4 Results

The results show that a significant and positive association exists between housing rental index and the percentage of the ratio of divorce to the population in Iran provinces (see column 1 of Table 9). The positive impact of divorce on housing rentals can be explained by increases in demand for housing, that means by each divorce one household usually becomes two households. Interestingly, the coefficient of LPRDP shows that a 1% increase in this variable increases HRI about 1.057% in the provinces. The coefficient WD*LHRI (ρ in equation 4) shows that the housing rental index in a province depends on the housing rental index in the other provinces. On average, a one-percent point increase in the housing rental index of any provinces will increase the housing rental index in each province by about 0.34 percentage points. The coefficient of WD*e.LHRI (λ in equation 4) show that there is dependence in the disturbance process. It means that some unrecognized variables influence the housing rental index and they are dependent to each other because of their location.

Table 12
Direct, Indirect and Total effects

	Direct	p-value
PRDP	0.7210	0.002
LHS	-1.2039	0.000
LNIP	0.0375	0.020
LPCGRP	0.1740	0.000
LIHB	0.0203	0.001
LPOP	1.1766	0.000
	Indirect	
PRDP	0.3359	0.003
LHS	-0.5608	0.000
LNIP	0.0175	0.050
LPCGRP	0.0810	0.000
LIHB	0.0094	0.004
LPOP	0.5481	0.000
	Total	
PRDP	1.0570	0.002
LHS	-1.7647	0.000
LNIP	0.0550	0.025
LPCGRP	0.2551	0.000
LIHB	0.0298	0.001
LPOP	1.7248	0.000

Calculated using STATA 15. *Source:* Research Findings.

Table 12 summarizes the direct and indirect effects of independent variables on the dependent variable. As it is said the own-province direct effect of a 1-percentage increase in the percentage of the ratio of divorce to population is to rise housing rental index by 1.05 percentage points in total. The across-province spillover effect of a 1-percentage increase in the percentage of the ratio of divorce to population is an increase in housing rental index by 0.33 percentage points on average. In total, it shows that if there is a 1-percentage increase in the percentage of the ratio of divorce to population, the housing rental index increases by 0.72 percentage. The own-province direct effect of a 1-percentage expansion in the household size is the reduction of housing rental index by 1.2 percentage and the across-province spillover effect of a 1-percentage increase in it decreases housing rental index by 0.56 percentage points on average. In total, it shows that if there is a 1-percentage increase in the household size, the housing rental index decreases by 1.7 percentage. The good explanation is the housing rental in Iran is more dependent to the area of the house not to the number of people that living in the house and on the other hand, in Iran, there is no limitation like other countries for the per capita area for each person.

The own-province direct effect of a 1-percentage increase in the natural growth of population in a province is to increase housing rental index by 0.037 percentage. The across-province spillover effect of a 1-percentage increase in the natural growth of population is to increase housing rental index by 0.017 percentage points on average. And in total, it shows that if there is a 1-percentage increase in it, the housing rental index increases by 0.055 percentage. The impact of the natural growth of population is very small so it can be ignored.

The own-province direct effect of a 1-percentage increase in the average per capita income is to increase housing rental index by 0.175 percentage. The across-province spillover effect of a 1-percentage increase in the average per capita income is to increase housing rental index by 0.081 percentage points on average. And in total, it shows that if there is a 1-percentage increase in the average per capita income, the housing rental index increases by 0.25 percentage points. House is a capital asset in Iran so by increase in the average per capita income, the demand for buying house rises and it will cause housing price increases therefore housing rental increases as well.

In fact, the supply of housing must increase by more investment in the housing construction so then the prices decrease. But the impact of investment in housing construction in the model becomes so insignificant that can be ignored. A good explanation is that an increase in investment in housing construction and an increase in the exchange rate of Iranian Rial to U.S. Dollar occurred at the same time. The last variable is the population, and the direct and indirect and total impact of it on the housing rental index is equal to 1.17, 0.54 and 1.72 respectively. It means if there is a 1-percentage point increase in the population the housing rental index increases by 1.72 percentage points.

5 Conclusion

There are some studies investigating the effect of housing costs on divorce. However, the reverse effect has not been studied. Divorce rate is growing in the developed countries and making changes in population structure that is one of the important factor on the housing demand. We have applied a fixed Panel Spatial Autocorrelation model using Iranian provinces data over the period of 2006-2014. The results suggest that a 1% increase in the ration of divorce to population increases the housing rental index about 0.72 % directly and 0.34 indirectly.

The findings also indicate that household size has a negative and significant effect on housing rental index in Iran; as one percentage increase in the household size reduces the housing rental index by 1.76 percentage. Moreover, a one percentage increase in the population, and the natural growth in population will increase the housing rental index by 1.72 and 0.05 percentage, respectively.

In general, the result indicates that there has been socio-cultural changes that causes the demographic changes in Iran. The belief that a divorced woman has to live with her family, is changing. This could be due to increasing women's financial independence. According to the World Bank data, female labor force participation rate has increased from 9.83 percent in 1990 to 16.84 percent in 2017. Bisagni and Eckenrode, (1995) show that employment has an important role after divorce for adjustment and psychological well-being. So, divorce increases the number of households and the demand for housing. As a result, the housing rental index increases.

References

Anselin, L. (2013). *Spatial Econometrics: Methods and Models* (Vol. 4). Springer Science & Business Media.

Bisagni, G. M., & Eckenrode, J. (1995). The Role of Work Identity in Women's Adjustment to Divorce. *American Journal of Orthopsychiatry*, 65(4), 574-583.

Cook, S.J., Hays, J. C., & Franzese, R. J. (2015). *Model Specification and Spatial Interdependence*. Working paper.

Dam, N. A., & Rasmussen, H. (2014). *A Multi-Speed Housing Market*. Danmarks National bank, 43–64.

Elhorst, J. P. (2014). *Spatial Econometrics: From Cross-Sectional Data to Spatial Panels* (Vol. 479, p. 480). Heidelberg: Springer.

Essafi, Y., & Simon, A. (2015). *Housing Market and Demography, Evidence from French Panel Data*. European Real Estate Society 22nd Annual Conference, 107–33.

Farzanegan, M. R. & Fereidouni Gholipour, H. (2016). Divorce and the Cost of Housing: Evidence from Iran. *Review of Economics of the Household,* 14(4), 1029–54.

Gao, B., & He, X. (2014). The Influence of Demographic Structure on Housing Price: An Empirical Analysis of Chongqing. *Modern Economy*, 05(05), 609–613.

Hasanzadeh, A. & Kianvand, M. (2012). The Impact of Macroeconomic Variables on Stock Prices: The Case of Tehran Stock Exchange. *Money and Economy*, 6(2), 171–90.

Hlaváček, M., & Komárek, L. (2011). Regional Analysis of Housing Price Bubbles and Their Determinants in the Czech Republic. Finance an Uver – Czech. *Journal of Economics and Finance*, 61(1), 67–91.

Jia, S., Wang, Y. & Fan, G. Z. (2018). Home-Purchase Limits and Housing Prices: Evidence from China. *The Journal of Real Estate Finance and Economics*, 56(3), 386–409.

Kapinos, P., Gurley-Calvez, T., & Kapinos, K. (2016). (Un)Expected Housing Price Changes: Identifying the Drivers of Small Business Finance. *Journal of Economics and Business*, 84, 79–94.

Kelley, A. C. (1969). Demand Patterns, Demographic Change and Economic Growth. *The Quarterly Journal of Economics*, 83(1), 110-126.

LeSage, J. P. (1999). The Theory and Practice of Spatial Econometrics. *International Journal of Forecasting*, 2(2), 245–46. Retrieved (http://www.spatial-econometrics.com/html/sbook.pdf).

Mankiw, N. G., & Weil, D. N. (1989). The Baby Boom, the Baby Bust, and the Housing Market. *Regional Science and urban Economics*, 19, 235–58.

Mikolai, J., & Kulu, H. (2018). Divorce, Separation, and Housing Changes: A Multiprocess Analysis of Longitudinal Data from England and Wales. Demography, 55(1), 83-106.

Ohlsson-Wijk, S., Turunen, J., & Andersson, G. (2017). *Family Forerunners? An Overview of Family Demographic Change in Sweden*. The International Handbook on the Demography of Marriage and the Family. Springer.

Phillips, R. A., & Vanderhoff, J. H. (1991). Two-Earner Households and Housing Demand: The Effect of the Wife's Occupational Choice. *The Journal of Real Estate Finance and Economics*, 4(1), 83–91.

Rezazadeh, R., & Outadi, T. (2008). A Review of Housing Demand Considering the Changes in Population Structure In The Case Of Tehran. *International Journal of Engineering Science* (English), 19(10), 139–50.

Walks, A. & August, M. (2008). The Factors Inhibiting Gentrification in Areas with Little Non-Market Housing: Policy Lessons from the Toronto Experience. *Urban Studies*, 45(12), 2594–2625.