



Economic determinants of child marriage: Evidence from the Iranian provinces

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ABSTRACT

This study investigates the economic determinants of early marriage among girls under 19, using panel data from thirty Iranian provinces between 2007 and 2015. The panel fixed effects and generalized method of moments (GMM) estimations, which control for province fixed effects such as local cultural norms or geographical conditions, show that the level of income per capita (with a negative effect), inflation, and income inequality (both with a positive effect) are significant determinants of early marriage.

1. Introduction

Children are one of the most vulnerable groups in society, and the danger of having different people in the family or community threaten their rights is always at stake.¹ Child marriage is one of the issues that deprive children, especially girls, of their rights (Raj, 2010). The United Nations Population Fund (UNFPA) defines *early child marriage* as “any marriage carried out below the age of 18 years before the girl is physically and psychologically ready to handle the responsibilities of marriage and childbearing” (International Planned Parenthood Federation, 2006).

Since obtaining official and accurate data is typically difficult in developing countries, few studies have examined the root causes and drivers of early marriage. However, several studies have focused on its negative consequences and provided evidence of the harm caused by child marriage (Jensen & Thornton, 2003; Asadullah & Wahhaj, 2019), particularly for girls.

Recently, early marriage has become a topic of debate among

policymakers and non-profit organizations in Iranian society. Iran is one of the few developing countries with official annual data on marriages at different ages, including marriages below the legal age of 18. However, little research, apart from Ahmady’s descriptive study (see Ahmady, 2017), has been conducted to investigate why, despite the harmful effects of early marriage, some Iranian families in certain provinces continue to practice it more than others. Moreover, there is no consensus on the socio-economic determinants of early marriage or the drivers of regional differences in early marriage in Iran.²

In this paper, we use time-series data on early marriage (girls) across Iranian provinces for the first time to identify the impact of social and economic factors on this phenomenon. Our panel regression method allows us to control for province-specific factors (such as local norms, traditions, and differences in climate) by including fixed effects, reducing the risk of omitted variable bias. Using data from 30 provinces of Iran from 2007 to 2015, we demonstrate that lower levels of income per capita, and higher inflation and income inequality are the primary drivers of early marriage. Religiosity, measured by the proportion of

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¹ According to the *Convention of Rights of the Child*, we consider a child below the age of 18, though the age may differ depending on countries’ specific laws. (see <https://www.ohchr.org/documents/professionalinterest/crc.pdf>).

² Farzanegan & Alaedini, 2016; Farzanegan & Gholipour, 2016, 2018 and Gholipour and Farzanegan (2015) examined the economic determinants of total marriage and divorce rates in Iran.

household spending on religious products and services in total spending, is not significantly related to the early marriage rate.

The remainder of the paper is structured as follows: Section 2 provides a background on early marriage and relevant laws in Iran. Section 3 discusses the relevant literature on the determinants of early marriage in Iran and other developing countries, upon which we base our empirical analysis. Section 4 presents the empirical methodology and data. We present our findings in Section 5 and discuss them in Section 6. Finally, Section 7 concludes.

2. A background on early marriage in Iran

In line with target 5.3 of the Sustainable Development Goals, Iran has committed to eliminating early and forced marriage by 2030.³ Moreover, during its 2014 Universal Periodic Review, Iran agreed to consider suggestions to cancel laws promoting the marriage of girls as young as nine years old and to amend the Civil Code to increase the minimum legal age for marriage to 18 years old. Nevertheless, Iran is one of the few countries that has not signed or ratified the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), which prohibits child marriage.⁴

The increasing median age of the Iranian population from 18 in 1980 to 31 in 2018 (Euromonitor International, 2019), along with decreasing marriage and increasing divorce rates (Farzanegan & Gholipour, 2016; Gholipour & Farzanegan, 2015), is among the serious concerns for policymakers in Iran. In response to the declining fertility rate and future demographic concerns, all population control policies in Iran have been abolished by the order of Iran's Supreme Leader Ayatollah Khamenei. This order encourages more marriages and higher fertility rates as a new agenda objective for all cultural and social institutions in the country.⁵ Accordingly, there is a fear that imposing further restrictions on marriage may lead to a further reduction in the country's birth rate.

In addition to this general concern on the part of the government, the religious sensitivity of some Islamic scholars to changes in religious law has also had a significant impact on limiting early marriages in Iran. For religious conservatives in Iran, withdrawing from traditions such as early marriage is seen as a step toward recognizing different lifestyles, which is not in line with the desired patterns of the Islamic government in Iran.⁶

The Iranian religious structure considers menarche the pivotal transitional point that signals the end of girls' childhood. Reaching this threshold translates into eligibility and readiness for marriage, irrespective of biological age (UNFPA, 2012). The tradition of early marriage is more about control and power, which the patriarchal structure and masculine culture have imposed on this vulnerable segment of society. It implies an overemphasis on women's pre-marriage virginity and chastity and control of their sexual desire, which is deeply tied to family pride and the honor of the tribe (Ahmady, 2023).

Early marriage avoids the possibility of a girl reaching an age where she is no longer desirable as a wife by a man or his family. In most villages and small towns of Iran, families tend to assume that if their daughters do not marry at an early age, their marriage will become much more difficult later. The practice of blood marriages involves a girl

³ <https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-5-gender-equality/targets.html>.

⁴ <https://www.ohchr.org/documents/professionalinterest/cedaw.pdf>.

⁵ <https://en.radiofarda.com/a/iran-leader-urges-people-to-have-more-babies-amid-economic-crisis/30093451.html>.

⁶ An example of such opinions is documented in Tahrir Al-Wasilah (a book by the founder of the Iran revolution, Ayatollah Khomeini, as a commentary on a traditional theological text and as a guide for Shia Muslims): "Anyone who has a wife less than nine years of age is not allowed to engage in sexual intercourse, whether she is his permanent or temporary wife. However, other forms of sexual pleasures are permitted..." (Justice for Iran 2013, p. 2).

Table 1

Percentage of marriages between 15 and 19 for men and 10 to 14 for women by literacy (Source: Population and Housing Census results of the Statistical Centre of Iran).

Year	Literate		Illiterate	
	Man	Woman	Man	Woman
1996	2.2	1.1	10.5	3.6
2006	1.9	1.4	8.1	4.3
2016	2.13	1.26	9.15	4.51

being married off to resolve a dispute between two tribes. Navel-string marriages involve a newborn girl being pledged by families, through a symbolic cutting of the umbilical cord, to marry a cousin or distant relative when she is born. Most married children had almost no say in deciding whether or whom to marry (Jensen & Thornton, 2003) and have been encouraged or generally forced by their families (Ahmady, 2023) without having the opportunity to talk with their suitor before marriage (Safavi & Minaei, 2015).

Iranian Sharia-based law has also empowered a culture in which early marriage is considered somewhat socially acceptable. The strength of these social norms over early marriage laws has led to a continuation of this custom in Iran that is not limited to villages and small towns but is widespread throughout the country. However, the situation is more critical in the northwest and east of the country, such as Zanjan and Sistan & Baluchistan. Moreover, marrying a girl below 14 is mainly concentrated in rural, nomadic, and suburban areas (Kalhor & Khazaei, 2018).

According to the latest statistics from the Iranian Census Bureau, the proportion of women who married under 15 in 2016 was about 5.5%. However, based on other reports, 17% of girls in Iran are married before the age of 18, and 3% are married before the age of 15 (Human Rights Council, 2017).⁷

Education is often seen as the key to preventing early marriage worldwide.⁸ One of the factors affecting early marriage in Iran seems to be literacy. This is substantiated by the fact that illiterate people are much more likely to have an early marriage. According to the 2016 Census of Population and Housing, more than 9% of married men aged 15 to 19 were illiterate, which is more than four times higher than literate married men at these ages, at 2.13%. Additionally, about 4.5% of married women between the ages of 10 and 14 were illiterate, which is three times higher than the rate of literate married women in these ages, at 1.26%. For more details, see Table 1.

Since there are restrictions on the education of married girls in regular schools in Iran, early marriage can inevitably deprive school-age girls of continuing their education, leading to lower self-esteem and personal isolation. Statistics show that on average, urban women are more educated than rural women.

3. A review of literature on determinants of early marriage

The consequences of early marriage are devastating, yet the roots of this phenomenon are poorly understood. This section presents a review of studies that have examined this issue in Iran and other developing countries.

⁷ The United Nations Report of the Special Rapporteur on the situation of human rights in the Islamic Republic of Iran (Human Rights Council 2017, p.15) illustrates the situation in Iran: "Child marriage remains legally possible for girls aged 13 years and boys aged 15 years... In June 2016, a spokesperson for the Tehran-based Association to Protect the Rights of Children stated that child marriages had reached alarming levels and stressed that approximately 17 percent of all marriages in the country involved girls married to old men."

⁸ UNICEF, 'Girls' Education: Introduction', <https://www.unicef.org/girl-education/index.htm>.

Table 2
Previous studies on determinants of child marriage in other countries.

Authors	Topic	Sample	Method	Main determinants
Rumble et al. (2018)	Determinants of female child marriage	Indonesia	Multivariate regression with survey data	Education (-), having more siblings (-), wealth (-), media exposure (-), rural residence (+)
Marshan, Rakhmadi, and Rizky (2013)	Prevalence of child marriage and its determinants among young women	Indonesia	Multivariate regression with survey data	Income per capita (-), exposure to the media through the internet (-), floor per capita (-), education of household head (-), number of children in a family who are in high school and higher education (-), source of a family to cooking (-), and access to the free healthcare (-), the use of internet through cellular phone (+), age of household head (+), number of children in a family who are in elementary school (+) Conservative Islamic perspective (+)
Grijns and Horii (2018)	Child Marriage	Indonesia	Survey and descriptive statistics	Conservative Islamic perspective (+)
Hossain, Mahumud, and Saw (2016)	Prevalence of child marriage among Bangladeshi women and trend of change over time	Bangladesh	Multivariate regression with a survey data	Education (-), women with uneducated husbands (+), Muslims (+), poor economic backgrounds (+), rural areas (+)
Islam, Haque, and Hossain (2016)	Regional variations in child marriage in Bangladesh	Bangladesh	Multivariate regression with a survey data	Education (-), employment status (-), husband's education (-) and wealth index (-)
Kamal, Hassan, Alam, & Ying, 2015	Trends and determinants of Child marriage	Bangladesh	Cross-tabulation and multivariate regression with a survey data	Education (-), unemployment (+), Islamic religiosity (+), Rural area (+)
Seth et al. (2018)	Social determinants of child marriage	India	Qualitative case study	Patriarchy (+), coercion (+), social customs (+), and norms (+)
Raj et al. (2015)	Age at menarche, education, and child marriage	India	Multinomial regressions with survey data	Younger age at menarche (+), education (-)
Paul (2019)	Education and poverty and the prevalence of girl child marriage	India	Multivariate regression with a national survey data	Girls' secondary and higher level of educational attainment (-), household poverty (+), socio-religious practices related to marriage (+), women autonomy (-), urbanization (-)
Stark (2018)	Early marriage and cultural constructions of Adulthood	Tanzania	Interviews	Islamic religiosity (+), poverty (+), gendered economic inequality (+), high costs of education (+), high unemployment (+)
Bajracharya and Amin (2012)	Poverty, Marriage Timing, and Transitions to Adulthood	Nepal	Multinomial logit regressions	Household poverty during early childhood (+)
Workneh, Kibretb, & Degu, 2015	Determinants of Early Marriage among Female Children	Ethiopia	Multivariate regression with a survey data	Rural residents (+), income (-), parents who perceive ideal marital age as less than 18 (+), knowing the legal marital age (-), parents who know individuals who were accused of early marriage crimes (-)
Pankhurst, Tiemelisan, & Chuta, 2016	Determinants of child marriage	Ethiopia	National survey and interview	Rural residence (+), family poverty (+), parental education (-), girls' age (-), girls' education (-), death or absence of parents (+)
Sabbe et al. (2013)	Determinants of child and forced marriage	Morocco	Semi-structured interviews, reviewing existing studies and thematic qualitative analysis	Education (-), economic opportunities (-), weak legal framework (+)
Mpilambo et al. (2017)	Determinants of Early Marriage among Young Women	Congo	Descriptive analyses and multivariate regression with national survey	Age at first sexual intercourse (+), education (-)
Sabbah-Karkaby and Stier (2017)	Links between education and age at marriage among Palestinian women in Israel	Israel	Discrete-time logistic regression models	Girls' education (-)
Bhan et al. (2019)	Effects of parent-child relationships on child marriage of girls	India, Ethiopia, Vietnam, Peru	Multinomial regression with longitudinal data	Good parent-child communication (-), high parent-child relationship quality at age 12 years (-), dropping out of school (+), early menarche (+), rural residence (+)
Gastón, Misunas, and Cappa (2019)	Child marriage among boys	Global	Descriptive statistics for 82 countries	Highest in countries in Latin America, the Caribbean, and East Asia and the Pacific
Kalamar, Lee-Rife, and Hindin (2016)	Interventions to prevent child marriage	Multi-countries	Literature review on intervention program	Cash transfers or programs to decrease school-associated costs (-)

3.1. The drivers of early marriage in Iran

Using data from the Statistical Centre of Iran in 2001, Ghasemi Ardehaee (2007) showed that education affects women's marriage age and can explain the significant difference between women's average marriage age in urban and rural regions. Ebrahimi and Fakhrayi (2014) found that early marriage in Iran is positively associated with families' traditionality, women's security in the community, and the general perception of their trustworthiness. Eftekharzadeh (2015) considered poverty, family, and ethnic traditions, particularly the concern for disgrace and disrepute, as the most critical factors in early marriage.

The qualitative research of Ahmady (2017) in seven provinces with the highest rate of child marriages in Iran, i.e., Khorasan Razavi, East Azerbaijan, Khuzestan, Sistan and Baluchistan, West Azerbaijan,

Hormozgan, and Isfahan, concluded that the propagation of this phenomenon is a result of traditional views and social norms, especially those focused on controlling girls' sexual relations, legal and religious support, and poverty.

Religion is a prominent contributory factor to early marriage. Religious recommendations, e.g., encouraging girls' marriage early, even before adolescence, have a profound effect on the decision of religious people. Some Islamic scholars also give arguments based on the Quran, religious narrations, history, and moral grounds to support the allowance of temporary marriages, known as *Sigheh* or literally pleasure marriages.

Ahmady (2023) revealed that temporary marriages legalize illicit relationships and facilitate the narrative of early child marriage in Iran, especially since they are mostly not registered. This is probably why the

families living in Khorasan Razavi province, which is known to be more religious than other provinces, have the highest number of child marriages among all the provinces of Iran (Ahmady, 2018). Moreover, the results of Ahmady (2017) survey of sexual orientation in this province showed that more than one-third of people believe that a girl or boy cannot choose their spouse. More than one-quarter believe that even the time of marriage should not be left to a girl or boy and that pre-marital virginity is vital for most people.

Finally, poverty is another important contributing factor to child marriage and is linked to its prevalence in Iran (Ahmady, 2018). In difficult financial circumstances and economic downturns, some low-income families might consider marrying their daughters to reduce their household expenses.

3.2. The drivers of early marriage in other developing countries

Several studies have investigated the determinants of early marriage, particularly in developing countries, over the past decade. For example, using survey data, Grijns and Horii (2018), and Marshan, Rakhmadi, and Rizky (2013) showed that a wide range of socio-demographic factors (e.g., education, family income, age of household head, number of children in a family, access to media, religiosity) are statistically correlated with female child marriage in Indonesia.

Hossain, Mahumud, and Saw (2016), Islam, Haque, and Hossain (2016), and Kamal, Hassan, Alam, & Ying, 2015 utilized Bangladeshi survey data and explained the trend and determinants of child marriage in Bangladesh in recent years. They also found that socio-demographic variables such as religion, husband's education, wealth, and unemployment are major explanatory variables for child marriage in Bangladesh. Using a case study and regression analyses, Seth et al. (2018), Raj et al. (2015), and Paul (2019) showed that factors such as age at menarche, education, social customs and norms, poverty, and female autonomy could explain child marriage in India.

For Tanzania, Stark (2018), by conducting interviews, found that Islamic religiosity, poverty, gendered economic inequality, high costs of education, and high unemployment are essential determinants of child marriage. Using a survey dataset from rural Tanzania, Corno & Voena (2016) showed that when households have no access to credit markets, they severely count on bride price payments to smooth their consumption. Therefore, adverse rainfall shocks increase the probability of early marriages and early fertility among women. Moreover, ensuring access to credit markets makes legal barriers to child marriage more likely to be enforced.

For Ethiopia, Workineh, Kibretb, & Degu (2015) and Pankhurst, Tiemelissan, & Chuta (2016) used information gathered from surveys and interviews to show that residency in a rural area, customs, marriage regulation, parental education, poverty, and death or absence of parents can increase the probability of child marriage. Sabbe et al. (2013), applying semi-structured interviews, reviewed existing studies and thematic qualitative analysis and found that education, economic opportunities, and weak legal framework positively impact child and forced marriage in Morocco. For Congo, Mpilambo et al. (2017) showed that age at first sexual intercourse positively and education negatively impacts early marriage among young women. Human Rights Commission of Afghanistan (2018) suggests that erroneous traditions, patriarchal social structures, poverty, legal deficiencies in determining the legal marriage age, social insecurity, weakness of the government, and the rule of law are factors in child marriage in Afghanistan.

Finally, Bhan et al. (2019) and Kalamar et al. (2016) explored the critical determinants of child marriage among girls across countries. Bhan et al. (2019) provided evidence that good parent-child communication, as well as high parent-child relationship quality at the age of 12, decrease the rate of child marriage. However, other factors such as dropping out of school, early menarche, and rural residence increase child marriages.

Table 2 provides a summary of existing studies in other countries. As

can be seen, while previous researchers in South Asia, South East Asia, North Africa, and Central Africa have provided valuable insights on the determinants of child marriage, to the best of our knowledge, very few empirical studies have investigated the determinants of child marriage using longitudinal data from provinces of Iran.

4. Data and methodology

We use time-series data on registered early marriages (girls) across Iranian provinces from the Annual Statistics of the National Organization for Civil Registration of Iran.⁹ As the official data is not reported by age but in different age intervals, we consider all marriages below 19 years old as early marriages for girls.

We use panel data from 30 provinces of Iran from 2007 to 2015 to investigate the socio-economic factors contributing to the variation of early marriage across Iran. Our fixed-effects panel regression analysis enables us to infer the within-province effects of such factors on changes in early marriage within provinces. An essential advantage of panel data models is the possibility of eliminating unobserved heterogeneity between provinces by including province-fixed effects. Such fixed effects control for province-specific characteristics such as norms and local cultural attitudes toward early marriage.

Our main analysis uses the share of marriages of girls below the age of 19 in the total marriages of the province. However, we also use different variables to measure early marriage across and within the Iranian provinces. Our findings remain robust when we use the share of marriages of girls between 15 and 19 years old in total marriages. Additionally, we find similar significant determinants of early marriage when we use the share of marriages of boys below the age of 19 or between 15 and 19 years old in total marriages.¹⁰

Among the various drivers of early marriage, we examine the economic development of provinces by using the logarithm of Gross Domestic Product (GDP) per capita. We expect that deprived provinces with lower average income levels show a higher level of early marriage since low-income families in these areas could reduce their expenses by marrying off their daughters.

We also include increasing living costs, proxied by the consumer price index (CPI) inflation rate, in our estimations, and we expect a positive association with early marriage. Decreasing households' purchasing power may, *ceteris paribus*, provide more incentives for endorsing the early marriage of children and thus lower household costs. Additionally, we examine the role of the unemployment rate in provinces and expect to find a similar positive association with early marriage. As illustrated by the Gini index, provinces with higher income inequality may indicate the financial leverage of wealthier households over other social layers and thus the less reliable economic position of lower-income families to support their children's future. In other words, in a more unequal society, low-income families are more likely to find a rich and possibly older man to marry their young daughters.

Finally, we have controlled for the degree of religious activity in provinces by using the share of household spending on religious goods and services as a percentage of their total spending. Higher levels of this ratio may indicate a higher priority of religious activities and consumption among households, and we expect a positive association between this indicator of religion-related activities and early marriage rates.

We have also collected data on the share of spending of households on educational-related categories in their total household spending. We expect that provinces with a higher share of educational spending may have higher levels of respect for gender equality and place increased social importance on the quality of life of children, thus leading to lower

⁹ <https://www.sabteahval.ir/avej/tab-1499.aspx>.

¹⁰ In this study, we only report the results for girls' marriage as a dependent variable. Other results are available upon request.

Table 3
Summary Statistics.

Variables	Obs.	Mean	Std. dev.	Min	Max
Marriage of girls below the age of 19 (as a share of total registered marriages)	270	0.38	0.07	0.21	0.59
Marriage of girls between 15 and 19 (as a share of total registered marriages)	270	0.33	0.05	0.19	0.45
Marriage of boys below the age of 19 (as a share of total registered marriages)	270	0.05	0.03	0.02	0.21
Marriage of boys between 15 and 19 (as a share of total registered marriages)	270	0.05	0.03	0.01	0.19
Log of Gross Domestic Product per capita	270	4.22	0.74	2.44	6.54
Inflation rate (divided by 100)	270	0.20	0.09	0.07	0.39
Gini index	270	0.36	0.07	0.22	0.50
Spending on religion by households (as a share of total spending)	270	0.01	0.00	0.00	0.03
Spending on education by households (as a share of total spending)	270	0.02	0.01	0.01	0.04
Unemployment rate	270	11.40	2.89	5.77	20.54

levels of early marriage.¹¹ Table 3 reports summary statistics of variables. Data description and sources are presented in Table A1 of Appendix.

To measure the effects of socio-economic conditions on early marriage rates, we estimate the following panel regression for 30 provinces of Iran between 2007 and 2015:

$$EMR_{i,t} = \beta_1.GDP_{i,t} + \beta_2.INFLATION_{i,t} + \beta_3.GINI_{i,t} + \beta_4.UNEMPLOYMENT_{i,t} + \beta_5.RELIGION_{i,t} + \beta_6.EDUCATION_{i,t} + \alpha_i + \epsilon_{i,t} \quad (1)$$

where EMR in Eq. (1) is the dependent variable and refers to the girl's early marriage rate indicator, GDP is the logarithm of GDP per capita, and GINI measures income inequality (higher values indicate higher inequality). UNEMPLOYMENT indicates the unemployment rate. RELIGION and EDUCATION refer to household spending on religion and education-related goods and services. Province fixed effects (α_i) regressions eliminate unobserved heterogeneity between provinces such as cultural attitudes and ethnic factors (Baltagi, 2008).

5. Results

Table 4 presents the estimation results. The measure of EMR in Table 4 is the share of married girls below the age of 19 to the total number of marriages in the province. We begin by displaying the estimated average relationship between EMR and its determinants in the pooled sample across 30 provinces in Model 4.1. In the pooled estimation, we find that provinces with higher levels of the log of income per capita are linked to lower levels of EMR. This effect is statistically significant at a 1 % level. Another statistically significant variable in the pooled OLS model is the inflation rate, which is positively correlated with EMR.

¹¹ We also estimated the model using an alternative measure for education (i.e., literacy ratio). There is no official literacy index released at the provincial level in Iran. The only proxy available is from a nationwide survey conducted every five years. Therefore, we constructed a literacy index as the ratio of literates in the household expenditure data at the Iran Statistical Center's provincial level. Note that the sample size in this data is representative at the province level. Similar to our main analysis, an insignificant association is found between the literacy ratio and child marriage. The estimation results are available upon request.

Table 4

Panel regressions: Determinants of early marriage rate across Iran. Dependent variable: share of married girls below the age of 19 to total marriage in province

	(4.1)	(4.2)	(4.3)	(4.4)
	Pooled OLS	Fixed effect	Random effect	Random effect
Log of GDP per capita	-0.051*** (-3.23)	-0.025*** (-3.79)	-0.027*** (-4.33)	-0.026*** (-3.81)
Inflation rate	0.045** (2.55)	0.051*** (5.07)	0.050*** (5.08)	0.051*** (4.79)
Gini index	-0.079 (-0.58)	0.119** (2.34)	0.107** (2.16)	0.115** (1.99)
Spending on religious products	1.878 (0.97)	-0.731 (-1.32)	-0.634 (-1.20)	-0.796 (-1.43)
Spending on educational products				0.305 (0.57)
Unemployment rate				0.025 (0.31)
Observations	270	270	270	270
R ²	0.29	0.48	0.47	0.48

Notes: t-statistics are in parentheses and are based on robust standard errors clustered at the province level. ** and *** indicate significance at the 5% and 1% levels, respectively.

In Model 4.2 of Table 4, we account for time-invariant unobserved heterogeneity by introducing province fixed-effects. According to the fixed-effects regression results in Model 4.2, higher inflation and income inequality increase the early marriage rates of girls below 19. Their positive effect is statistically significant at 1 % and 5 %, respectively. As in Model 4.1, we also consider the negative impact of economic development, captured by the log of income per capita, on children's early marriage. In fixed-effects regression, the effect of religion, proxied by households' spending on religious items, is statistically insignificant. The included explanatory variables explain 48% of the within-province variation in girls' marriage rate below the age of 19.

In Model 4.3, instead of estimating fixed effects, we use the potentially more efficient random effects. The random-effects estimations align with the fixed-effects results. We employed the Hausman (1978) test to compare the fixed and random effects estimates of coefficients. The null hypothesis of "no systematic difference between the two estimators" is not rejected based on the Hausman test (p-value of 0.19). In Model 4.4, we include two additional control variables: the relative share of household spending on educational goods and services in their total spending and the unemployment rate. Neither of these additional controls is statistically significant, and our earlier findings remain unchanged after their inclusion.

In short, our fixed and random effects estimations indicate that a higher income level reduces early marriage among girls, while inflation and inequality increase it. We could not observe a significant effect of religiosity on early marriage across provinces of Iran.

We re-examined our initial specification by controlling for the lag of the dependent variable (early marriage rate). The current practice of early marriage is likely to exhibit some path dependency.

$$EMR_{i,t} = \beta_0.EMR_{i,t-1} + \beta_1.GDP_{i,t} + \beta_2.INFLATION_{i,t} + \beta_3.GINI_{i,t} + \beta_4.RELIGION_{i,t} + \alpha_i + \epsilon_{i,t} \quad (2)$$

We estimate a dynamic specification (Eq. 2) using both fixed effects and the Arellano-Bond general method of moments (GMM) estimator (Arellano & Bond, 1991). The results of the dynamic model are presented in Table 5.

Model 5.1 in Table 5 begins with estimating the dynamic model using fixed effects. It reveals a significant and positive correlation between the lag of the child marriage rate (girls below 19) and the current period rate (coefficient of 0.55 with statistical significance at a 1 % level). Significant predictors include the negative impact of the

Table 5

Dynamic panel regressions. Dependent variable: share of married girls 19 to total marriage in province.

	(5.1)	(5.2)	(5.3)
	Dynamic model using fixed effects	One-step difference GMM	Two-step difference GMM
Log of GDP per capita	-0.015**	-0.021***	-0.021**
	(-2.63)	(-3.22)	(-2.67)
Inflation rate	0.033**	0.051***	0.053***
	(2.59)	(3.35)	(3.16)
Gini index	0.041	0.089**	0.084**
	(1.16)	(2.61)	(2.22)
Spending on religious products	-0.312	-1.385	-1.318
	(-1.03)	(-1.38)	(-1.45)
Lag 1 dependent variable	0.552***	0.336*	0.345*
	(3.24)	(1.88)	(1.73)
Number of observations	240	210	210
Hansen test, p-value	n.a.	0.429	0.429
AR(1), p-value	n.a.	0.036	0.027
AR(2), p-value	n.a.	0.680	0.656

Notes: t- statistics are in parenthesis and are based on robust standard errors. The AR test is the [Arellano and Bond \(1991\)](#) autocorrelation test of orders 1 and 2 in the case of GMM. *, **, and *** indicate significance at a 10%, 5%, and 1% level, respectively.

logarithm of GDP per capita and the positive impact of the inflation rate. It is argued that by including the lag of the dependent variable in the set of explanatory variables and under fixed effects, we may encounter the Nickell bias ([Nickell, 1981](#)).

To ensure that our estimates of the effect of early marriage rate drivers are not affected by Nickell biases, we re-estimate the reduced model using the Arellano-Bond GMM estimator ([Arellano and Bond, 1991](#)). We employ both one-step and two-step estimators. The estimation results are presented in Models 5.2 and 5.3, respectively. The one-step difference GMM in Model 5.2 indicates a significant negative impact of income per capita and positive and significant impacts of inflation and income inequality on the early marriage rate in Iran. The results of the two-step difference GMM in Model 5.3 reconfirm the earlier findings in Model 5.2.

We use three to five lags of potentially endogenous variables as instruments, such as the lag of the dependent variable and the Gini index. The Hansen test indicates the adequacy of the instruments, and we do not reject the null hypothesis of the instruments' validity, indicating that the specification is correct. Additionally, we reject the absence of first-order serial correlation and do not reject the absence of second-order serial correlation. We expect to reject the presence of second-order serial correlation if the instruments are properly uncorrelated with the errors. The dynamic GMM addresses country-specific effects or any time-invariant country-specific variable by using the first difference of variables, eliminating any endogeneity due to the correlation of these province-specific effects and the explanatory variables. It also addresses the potential non-stationarity of explanatory variables ([Farzanegan & Hayo, 2019](#)).

6. Discussion

It is widely recognized that poverty is a major factor contributing to early child marriage. However, a closer examination of the results reveals that macroeconomic variables, including inflation and especially inequality, play an even greater role in fueling this practice. Our study demonstrates the significant impact of income, inflation, and inequality on child marriage, which is consistent with the findings of several researchers. For example, [Eftekharzadeh, 2015](#); [Stark, 2018](#); [Workineh, Kibretb, & Degu, 2015](#), and [Marshan, Rakhmadi, and Rizky \(2013\)](#) have

all highlighted the link between income/poverty and child marriage, while [Ahmady \(2018\)](#) has provided evidence of the association between the cost of living and child marriage. [Stark \(2018\)](#) has also shown that inequality has a positive effect on early marriage.

Our findings call for the improvement of income equality to reduce the rate of early marriages. In other words, more equal income levels make it less likely for parents to marry off their child to a wealthy person. [Zolfaghari, Kabiri, and Saadatmanesh \(2020\)](#) have shown that investment in education, healthcare, communication technology, energy, and water infrastructure significantly reduces income inequality. Therefore, policymakers should consider allocating resources to these areas to combat early child marriage. The reduction of income inequality requires large-scale political and economic reforms. In the case of modern history in Iran, this occurred after the collapse of the monarchy system in 1979 and the establishment of a new Islamic republic government, which resulted in significant capital outflow, emigration of capital owners, and high-skilled labor force ([Farzanegan, 2022](#); [Farzanegan & Alaedini, 2016](#); [Farzanegan, Alaedini, Azizimehr, & Habibpour, 2021](#); [Farzanegan & Kadivar, 2023](#)). The second period of declining income inequality was observed during large-scale subsidy reforms and direct cash payments to all households during the *Ahmadinejad* administration. [Farzanegan & Habibpour \(2017\)](#) also showed that universal rent distributions with new taxation are effective in reducing inequality in Iran, while targeted rent distributional policies are effective in dealing with poverty.

Our results challenge the prevailing narrative on who is responsible for early child marriage and what actions should be taken to reduce it. While it is widely assumed that poverty is the primary cause of early child marriage, other contributing factors, such as income inequality, have not received the attention they deserve in efforts to combat it. However, once we acknowledge that macroeconomic variables have an even greater impact on early child marriage, it becomes clear that the government has a significant role in addressing this issue. This can be achieved by stabilizing key macroeconomic indicators and improving tax and subsidy policies to address inequality more effectively ([Farzanegan, Gholipour, and Nguyen 2016](#); [Alaedini & Ashrafzadeh, 2016](#); [Chamlou, 2016](#); [Khabbazan & Farzanegan, 2016](#); [Raghfar & Babapour, 2016](#)).

Furthermore, we have challenged the prevailing belief that religion is one of the main driving forces behind early child marriage. Indeed, capturing the religiosity of households is difficult, especially in Iran, where people tend to falsify their preferences and reveal socially accepted attitudes. Nonetheless, this study attempted to find a proxy that reflects the relative religiousness of households in different Iranian provinces based on their average expenditures on religious items. Moreover, our estimation approach (fixed-effects regressions) also controlled for province time-invariant factors such as norms, traditions, or beliefs. Our results indicate that our proxy for religiosity (household spending on religious categories) is not significantly associated with early child marriage. This finding is robust to different model specifications and estimation methods. In fact, tradition overlaps with religion, as many so-called religious rituals are more based on traditional beliefs than religious ones. Therefore, for future work, one could attempt to capture how tradition plays a role in this issue.

7. Conclusion

Our study analyzed the economic determinants of early marriage using panel data from 30 provinces of Iran between 2007 and 2015. By employing fixed and random effects as well as GMM estimation methods, our results, which are robust to different specifications, show that the main drivers of early marriage in Iran are income per capita (negative), inflation, and income inequality (both positive). We did not find a significant effect of religiosity on early marriage when controlling for economic factors and fixed effects (e.g., local norms, traditions, or geographical location). Due to data availability, we only used the

Table A1
Data description.

Variable	Definition & transformation	Data sources
Marriage	Share of early marriage in total registered marriages	Annual Statistics published by National Organization for Civil Registration of Iran https://b2n.ir/e50158
Unemployment rate		Statistical Centre of Iran https://b2n.ir/b65387
Gross Domestic Product per capita (in 10,000,000 IRR)	Logarithmic transformation is used.	Statistical Centre of Iran https://b2n.ir/y27712
Gini index		Statistical Centre of Iran https://b2n.ir/b89537
Inflation rate	It is divided by 100	Statistical Centre of Iran https://b2n.ir/w98451
Households' educational spending	Share of the average spending of a household on education in its average total expenditure	Statistical Centre of Iran https://b2n.ir/f01508
Households' religious spending	Share of the average religious spending of a household in its average total expenditure	Statistical Centre of Iran https://b2n.ir/y33028

province-level sample in this study. Future research could replicate our study across Iranian cities (urban vs. rural) if data become available over time and across cities. Micro-level data would provide more detailed insights into the determinants of child marriage in Iran. The other limitation of our study is that the available official child marriage data are reported at the age intervals and not the exact age of married child. If we had the exact child's marriage age, we could provide more reliable estimations to check the robustness of our results at different possible cut-off points for early child marriage.

CRedit authorship contribution statement

Mozhgan Asnaashary: Data collection, Literature Review. **Mohammad Reza Farzanegan:** Formal analysis, Methodology, Project administration, Software, Validation, Writing – review & editing. **Mehdi Feizi:** Conceptualization, Project administration, Methodology, Validation, Writing – original draft, Writing – review & editing. **Hassan F. Gholipour:** Project administration, Methodology, Validation, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix

See [Table A1](#).

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