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Factors delaying marriage in Korea: an analysis of the Korean population census data for 1990–2010

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ABSTRACT

The Korean total fertility rate is one of the lowest in the world. This study assesses a broad range of factors associated with delayed first marriages, an important determinant of low fertility, using the Korean Population Census 2 per cent sample from 1990, 1995, 2000, 2005 and 2010 and other data sources. Using a multivariate logistic regression, we examine the probability of ever being married for men and women aged 30–34 and 35–39 for different years. We find that women with higher education delay marriage compared to those with a high school degree. Highly educated men marry earlier than men with high school or less education, particularly those aged 35–39. The strongest gender effect occurs among those working in agriculture, a declining industry in Korea. Men working in agriculture are much less likely to marry by age 40, but women marry earlier. In 2005 and 2010, men working in stable, high-paying industries marry earlier, with similar effects for women aged 30–34. Finally, several regional characteristics are associated with delayed marriage including higher housing prices, higher income for women, lower unemployment rate for young women, and higher income inequality, lower income, and higher unemployment rate for men.

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Age at marriage; male income inequality; employment and marriage; Korean marriage market; marriage squeeze; house price

1. Introduction

The total fertility rate (TFR) in Korea is one of the lowest in the world (1.19 children in 2013).¹ Researchers predict that a continuation of TFRs below 1.3 along with moderate increases in longevity could cause the population to start declining in 2019. The Korean population would then decline by 15 per cent over the next 30 years, and the proportion of the population aged 65 and over would increase from 9 per cent in 2005 to 23 per cent in 2030, and to 36 per cent in 2050 (Choe & Retherford, 2009).²

Two mechanisms that drive declining birth rates are: (i) changes in the number of children that women have, and (ii) changes in the timing of births and proportions of those never marrying. In many low fertility countries, first marriages and/or first births tend to occur at a later age. Over the period of 1990–2005, the average age at first marriage for Korean women increased from 25.5 years to 28.7 years (Jones & Gubhaju, 2009).

Because the number of extramarital births in Korea is still negligible (only 1.5% of births in 2007) and cohabitation is not recognised as an alternative to marriage in Korean society, a large part of fertility decline can be attributed to the increase of age at first marriage, thereby reducing the number of childbearing years and increasing infertility (Eun, 2003; Lee, 2009).

Given the concerns of a continued low TFR in Korea, this paper explores the key factors that explain delayed marriage using data from the public use Korean Population Census 2 per cent samples from 1990, 1995, 2000, 2005, and 2010. This allows us to explore how the importance of different factors influencing age at marriage has changed over time. In addition to the traditional socioeconomic reasons for delayed marriage, we also explore the influence of industry and several regional factors.

We find that Korean women with college or higher education are less likely to have ever been married by age 40, compared to women with high school education or less (hereafter referred to as the 'success gap'). Furthermore, we find that young men with high school or less education appear to have more difficulty finding a spouse than college educated men. Both men and women who reside in Seoul (the capital city of Korea with 11 million people) and 6 metropolitan areas (with more than 1 million people) marry later. In addition, both men and women working in stable and high-paying industries, including communication, finance, insurance, public administration, education, and health services, seem to marry earlier in 2005 and 2010.

Men working in agriculture are much less likely to have married by age 40, but women working in agriculture tend to marry earlier. Finally, we find that various regional characteristics are associated with a decrease in the likelihood of marriage for men and women including higher housing prices, higher income for women, lower unemployment rate for young women, higher male income inequality, lower income for men, and higher unemployment rate for men.

2. Review of related literature

There are four prominent marriage theories that can be used to explain different reasons for the delay of marriage in Korea. Even though some of this research (such as Becker's) is based on Western marriage and data, it seems reasonable to assume that some aspects of these models would apply as well to the Korean population. According to Becker's (1973, 1974, 1981) theory of marriage, marriage offers gains from trade between spouses on the basis of the comparative advantage associated with traditional marriage roles. More productive and higher income men marry earlier given the high opportunity cost of home production for them. This model also suggests that men facing job insecurity or earning low wages delay marriage. For women, Becker's model predicts that having higher education and better employment opportunities delay marriage by increasing the opportunity cost of having children and home production.

Vella and Collins (1990) claim that individuals search for partners with complementary characteristics, such as older men trading their higher income for youth in their wives. Rose (2006) tests this model in the United States and finds a 'success gap' in the 1980s, when highly educated women had a difficult time in finding a partner. While this gap had disappeared in the U.S. by the 2000s, Jones and Gubhaju (2009) find what they call a 'marriage squeeze' in Japan, Korea, and Taiwan between 1990 and 2005, where highly

educated women find few acceptable single male partners in their age bracket. This is caused by the increase in the proportion of college educated women, the success that college educated men have in the marriage market, and the over-expectation of wage growth by college-educated women who delay their marriages. The proportion of college-educated women in Korea in the 30–34 age group increased from 10 per cent in 1990 to 70 per cent in 2010. As the population became increasingly educated, young college graduates were met with a scarcity of jobs requiring their education level, causing many to accept less than ideal positions (Choe & Retherford, 2009). This lack of opportunity contributed to later marriages and lower fertility rates. Our analysis of the success gap among highly educated women and the influence of industry type on age at marriage complement these studies. In addition, Choe and Retherford (2009) also found that changes in women's education could only account for 7 per cent of the decline in fertility from 1995 to 2005. In this light, this paper continues their work by exploring other causes as well.

A third marriage model argues that the persistence of traditional sex roles in childrearing and home production have led to the rising age at marriage and low TFRs (McDonald, 2008). Kim (2005) states that young Korean women understand that their career will be compromised once they get married and have babies. Therefore, many women have started considering marriage a 'compromissary' option rather than a 'mandatory' process in their lives. Kawaguchi and Lee (2017) suggest that the expectations of different generations may be a reason for the slow adjustments in gender equity within the family. For example, it is possible that a man may be willing to engage in home production activities, but his parents may not be receptive to their son performing duties done only by women in their own birth cohort. More recently, Lee (2019) analysed how attitudes toward marriage have changed for younger individuals, causing a disconnect between birth cohorts in South Korea. Yoon (2016) and Kim (2017) provide evidence to support the fertility depressing effect of gender inequality within the family using Korean data. Finally, Kim (2020) studies the influence of premarital co-residence with one's parents on the age at first marriage.

Korean men also tend to work very long hours³ and this disadvantages Korean wives in two ways. First, according to Goldin (2014), male workers' long work hours contribute to the gender pay gap, as women often cannot work very long hours or particular hours due to their household obligations. In addition, the long work hours mean that Korean husbands can devote little time to household work, which encourages the traditional division of labour within the family (Tsuya et al., 2000).

Finally, Eun (2003), Kim (2005) and McDonald (2008) suggest that competitive and unstable labour market conditions in Korea have encouraged young people to invest in their own human capital, rather than make long term commitments to marriage and children. In addition, Loughran (2002) and Gould and Paserman (2003) demonstrate that women search longer for spouses in cities with higher wage inequality for men. Korea has many latent unemployed young adults under 30, known as 'employment preparers,' who tend to be preparing for public examinations or attending vocational training courses (Whang, 2014). They make up 25 per cent of the economically inactive among the age group 25–29. Some studies, such as Kim (2014), examine the role of women's labour force participation on fertility. However, there are very few that look at which type of industries or occupations encourage early marriages and which industries

feature more family-friendly workplaces. We therefore add value to the literature by including an exploration of the relationship between age at marriage and the industries where men and women are employed.

Jones (2019) lists the following as the major factors for low fertility rates and the delay in age at marriage in East Asian countries including Japan, South Korea, Singapore, Taiwan and Hong Kong: labour market uncertainties, rising housing costs and shortages, high financial cost of having children, the educational 'arms race', difficulties for women in balancing work and household responsibilities, and workplaces that are unfriendly to families. Korean studies such as Lee and Lee (2014) recognise that high housing prices delay marriages in Korea. However, rigorous formal tests of this hypothesis have not been conducted, mainly due to the paucity of good quality house price data for detailed areas over time. The analysis here will attempt to fill this gap.

A number of these previous findings (e.g., concerning education and city size) are confirmed in this paper. The paper further contributes to the understanding of the age at marriage in Korea by exploring the role of several regional characteristics. Given the recent societal concerns about rising housing prices and rising income inequality, it is important for researchers to understand the impacts of regional factors on marriage formation. In order to calculate some of the regional characteristics, the Census data is supplemented with data from several other data sources including income data from the Korean Labor & Income Panel Study, apartment sales price data from the Korean Institute of Real Estate Appraisal, and the apartment sales price index from Kukmin Bank.

Understanding the causes of the rising age at marriage has several important policy implications. The Korean government has spent a large amount of money to raise TFRs by providing public subsidies for nursery and childcare, subsidies for women's pregnancy and parental leave for both spouses, and monetary incentives for higher fertility rates. However, this has not achieved any notable changes in TFRs and the policies have been criticised for not targeting specific groups. Thus, re-testing the causes of age at marriage using more detailed Korean Population Census data is an instructive endeavour.

3. Census data analysis

3.1. Data and time trends

Compared to previous studies which often use a single year of data from the Korean Population Census and mainly focus on differences in means, our analysis pools five years of the 2 per cent sample of the Korean Population Census data in 1990, 1995, 2000, 2005 and 2010 using a more robust logistic regression analysis. By using regression analysis, the results presented are more precisely estimated by controlling for all of the other variables included in the analysis. This is especially important for variables that may be correlated such as location of residence and the type of job a respondent has, as such correlations could make it difficult to disentangle the effects. The data contains a rich set of demographic information about men and women in Korea, including age, marital status, education, place of residence, industry information, etc. with about 500,000 men and women observed in each Census year.

Industries were classified based on the 2005 Korean Population Census 2 per cent sample codebook in the following categories:

- (1) Agriculture
- (2) Mining, Manufacturing, and Utilities
- (3) Sales and Services: Wholesale and Retail Sales, Lodging and Restaurants Services, and Transportation Services
- (4) Communication, Finance, and Insurance
- (5) Public Administration, Education Services, and Health and Social Welfare Services
- (6) Other Industries: Construction; Real Estate and other Business; Entertainment and other services
- (7) Not Working: unemployed or not in the labour force

The analysis focuses primarily on two age groups: 30–34 and 35–39. We use these groups since those who are 20–29 may be in school, and men may be enlisted in required military service. Jones and Gubhaju (2009) note that marriage before age 40 is critical for women because women’s fertility capacity starts to decline after age 35. Additionally, the vast majority of men and women are married by age 40.

Table 1 presents time trends for several of the main variables in the analysis for men and women in the 30–34 and 35–39 age groups. Supplementing this table is Figure 1, which presents a visualisation of the changes in these variables for the younger age group. There are a few important trends with implications for the increasing age at first marriage in Korea. First, the younger population in Korea is becoming increasingly well-educated. The proportion of men (women) in the 30–34 age group with some college or more education increased from about 30 per cent (13%) in 1990 to 72 per cent (68%) in 2010. The distribution of the population within different city sizes has been quite stable between 1990 and 2010. Around 40 per cent of the population live in Other Cities (Smaller Cities: 50,000+ people), 25 per cent live in one of the six large metropolitan areas, 25 per cent live in Seoul, and 10 per cent live in rural areas. The fraction in rural areas has been slightly declining over time as more people move to smaller cities.

Next, Table 1 shows the proportion of the sample in various industries (or Not Working) among men and women in the two age groups. The prominent industries for employment for men in 1990 was Manufacturing and Sales and Services. While employment in Sales and Services has remained relatively constant, employment in Manufacturing has fallen, particularly in the younger age group. Women in 1990 primarily worked in the Sales and Services industries. Women’s employment in this sector and in Manufacturing declined. Over time there has been rapid growth in women’s employment in the Public Administration sector (from 12.4% in 1990 to 35.2% in 2010 for the younger age group) and in Communication/Finance sector (from 4.9% in 1990 to 10% in 2010). Since 1990, we have also seen a decrease in employment in Agriculture and a rise in employment in Other Industries for both men and women.

In addition, we explore the role of regional factors on the age at marriage in Section 4. We calculate sex ratios and male and female unemployment rates for each of the 209 cities, counties, and wards by taking regional averages using the Census data. The sex ratio is calculated by dividing the region’s male population aged 20–40 by corresponding female population. This is used to capture demand and supply conditions in the local marriage market. Job instability

Table 1. Annual proportions (by %) for men and women Ages 30–34 and 35–39.

	Men					Women				
	1990	1995	2000	2005	2010	1990	1995	2000	2005	2010
Ages 30–34:										
Low education	23.0	11.7	5.0	2.7	1.8	41.3	20.9	6.7	2.3	1.4
High school	47.5	47.0	46.6	40.0	26.3	45.8	54.8	58.2	47.2	30.4
High education	29.4	41.3	48.4	57.3	71.9	12.8	24.4	35.1	50.5	68.2
Seoul	24.6	23.2	23.2	23.2	22.6	25.6	22.1	21.8	22.2	22.9
Metropolitan cities	25.0	25.4	25.1	23.7	24.3	25.0	26.0	26.1	24.7	24.5
Smaller cities	38.9	40.3	41.5	44.6	43.5	38.0	41.1	42.8	45.6	43.9
Rural areas	11.5	11.2	10.2	8.5	9.6	11.3	10.8	9.3	7.5	8.7
Agriculture	8.4	4.5	2.9	2.6	2.0	19.4	9.8	4.3	2.6	1.5
Manufacturing	35.7	33.2	29.1	26.7	27.0	22.1	18.8	17.3	13.4	11.0
Sales & Services	25.1	27.3	26.3	24.3	23.6	33.2	34.5	32.3	27.9	22.6
Comm./Finance	3.9	4.6	6.1	5.9	9.6	4.9	7.5	9.0	8.2	10.0
Public Admin.	9.7	10.2	10.7	11.0	12.5	12.4	18.4	24.6	30.6	35.2
Other industries	17.2	20.2	24.9	29.6	25.3	8.0	11.0	12.6	17.3	19.6
Not working	6.3	5.8	10.1	13.6	13.7	71.9	65.7	61.1	57.0	43.5
Ages 35–39:	1990	1995	2000	2005	2010	1990	1995	2000	2005	2010
Low education	31.9	20.5	11.1	4.7	2.8	55.6	38.0	19.5	6.5	2.8
High school	44.6	46.5	44.6	43.2	38.2	34.6	47.1	54.5	55.2	45.9
High education	23.5	33.0	44.3	52.1	59.0	9.8	14.9	25.9	38.3	51.3
Seoul	25.5	22.0	19.5	19.9	20.2	27.2	23.7	20.1	20.1	20.4
Metropolitan cities	25.0	26.0	26.0	24.4	23.9	25.3	26.5	27.4	25.2	24.5
Smaller cities	37.4	40.5	43.7	46.6	45.5	34.9	38.7	42.8	46.6	45.6
Rural areas	12.1	11.6	10.7	9.2	10.5	12.6	11.0	9.8	8.1	9.5
Agriculture	10.1	6.4	4.5	3.9	3.0	22.5	13.1	7.3	4.9	2.8
Manufacturing	29.2	28.7	28.6	25.3	23.7	23.4	21.4	19.7	16.5	12.9
Sales & Services	27.7	28.4	26.4	24.9	23.6	34.4	38.9	37.4	33.6	26.7
Comm./Finance	3.3	4.2	5.2	5.7	8.9	3.4	6.1	6.5	5.8	7.9
Public Admin.	10.7	10.3	11.3	11.7	12.7	8.0	9.8	17.7	24.8	31.4
Other industries	19.0	22.1	24.0	28.6	28.0	8.3	10.7	11.4	14.3	18.2
Not working	5.2	4.6	8.3	9.9	11.5	64.2	59.1	54.1	53.6	44.0

Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample.



Figure 1. Changes in Distribution (by %) of Men and Women Ages 30–34 by Education, Location, and Jobs since 1990. Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample.

may also be important as young people may be wary of entering a marriage in which either they or their partners have uncertain income streams. We use the term ‘unemployment rate’ to refer to anyone who is not working. For men we calculate the economically inactive rates for men aged 30–59 as the male adult unemployment rate, and for single men aged 20–29 as the male youth unemployment rate. Since most single women who are not students work prior to marriage, we calculate the economically inactive rates for single women aged 20–29 as the female youth unemployment rate.

Next, we wish to analyse the role of local wages and income inequality on the age at marriage. As the Census data does not contain information on income, we utilise the Korea Labor & Income Panel Study (KLIPS). Since the KLIPS has only around 5,000 respondents per year, the sample sizes in many of the 209 areas are too small to provide useable averages. Instead, we use the KLIPS data to create a regression equation based on city/province, age, sex, and education and use this equation to impute income for the Census respondents.⁴ These variables were selected as they existed in both surveys, but we recognise that important factors that determine income are missing from this regression. Despite this, it is important to note that the individual imputed incomes are only used to create region-level averages. Following Loughran (2002) and Gould and Paserman (2003), we use the standard deviation of the log of male's monthly income in each of the 209 regions as a measure of income inequality. We compute average monthly income (measured in 10,000 Korean Won: US\$1 = about 1,000 Korean Won) for both male and female workers in each region.

In a novel analysis, we include the log of the average real apartment price for 209 city/county/wards in Korea. Apartment unit sales price data (in 1,000 Korean won per m²) is available for 162 of the 209 cities/counties/wards beginning in March 2013 from the Korean Institute of Real Estate Appraisal. For the missing data for 47 regions we used the average real apartment price of a nearby city/county/ward, which is in the same metropolitan area/province as its imputed price.

Kukmin Bank produced an apartment sales price index beginning in 1989. However, it has only been available for all 162 areas since 2003. Before 2003, this data is only available for the whole nation and eight areas in Korea including Northern Seoul, Southern Seoul, and six metropolitan areas.

To calculate the real apartment sales price, we used the apartment sales price index and the March 2013 apartment sales prices as follows:

- (1) For 2005 and 2010, the Apartment Price for each of the 162 cities/counties/wards from 2013 is multiplied by the Apartment Price Index then divided by 100 to get the average apartment sales price (10,000 Korean won/m²) for each of the 162 cities/counties/wards.
- (2) For 1990, 1995, and 2000, the apartment sale price index is only available for the eight areas listed above. So, the Apartment Price for each of the 162 cities/counties/wards from 2013 is multiplied by the Apartment Price Index for the area where the city/county/ward is located in (Northern Seoul, Southern Seoul, or one of six metropolitan areas) then divided by 100 to get the average apartment sales price (1,000 Korean won/m²). Thus, the housing prices in these years will be less accurate than in 2005 and 2010.
- (3) To fill in data for the few remaining missing city/county/ward areas, the Apartment Price from 2013 is multiplied by the national Apartment Price Index then divided by 100 to get the average apartment sales prices for different city sizes in different provinces across the whole nation.

Finally, Kukmin Bank also provides a CPI for each area, which we use to convert the apartment prices into real prices and take the natural log.

3.2. Determinants of age at marriage

In our central analysis, we estimate logit regressions in Tables 2 and 3 for the probability of ever being married for women and men aged 30–34 and aged 35–39. Logit regressions are estimated separately by census year to explore the changing effects that each of the variables has on the probability of marriage. The age at first marriage is not used as a dependent variable in our regression to avoid sample selection bias.⁵ In all logit regressions, the odds ratio is presented: $\text{Pr}(\text{Ever Married}=1)/\text{Pr}(\text{Ever Married}=0)$. Thus, an estimated value greater than 1 indicates the probability of ever being married increases with an increase in the regressor. The excluded categories in all logit regressions are: High School Degree, Other Cities (50,000+ people), and Sales and Services industries. To supplement this more rigorous analysis, Figures 2–4 show trends in the fraction ever married among men and women with different education levels, living in different-sized cities, and working in different industries.

The analysis here confirms that a ‘success gap’ in marriage exists for highly educated Korean women and that highly educated Korean men tend to have more success in marriage markets (as found by Jones & Gubhaju, 2009). Figure 2 illustrates that the fraction ever married has declined for both men and women at all levels of education. However,

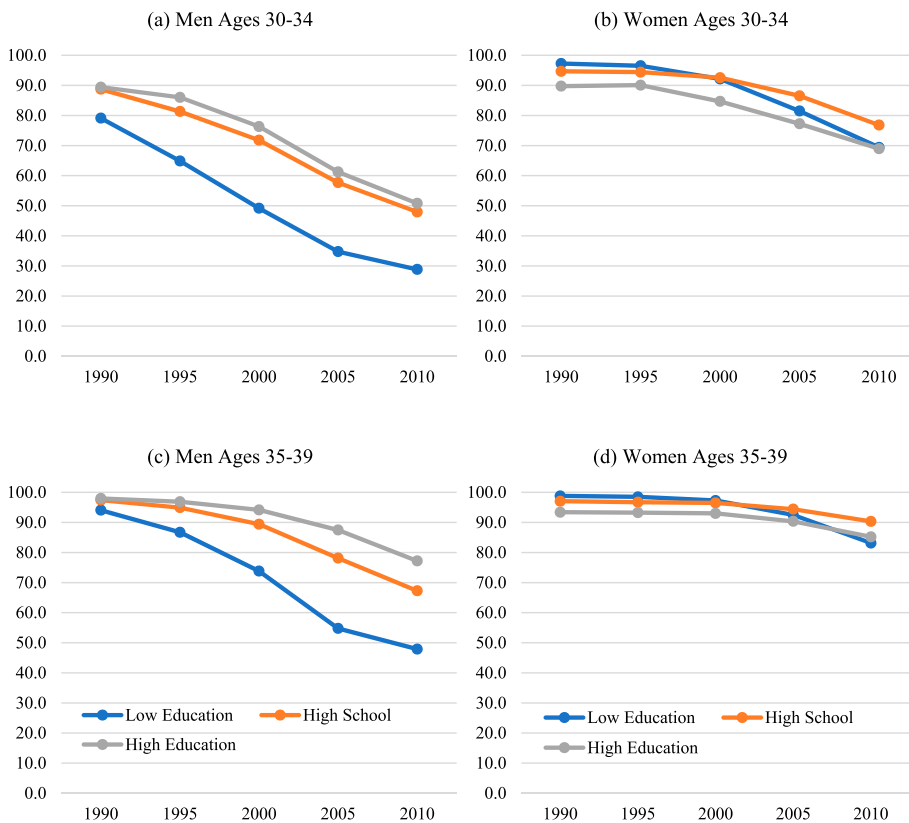


Figure 2. Proportion (by %) Ever Married for Men and Women by Education over Time. Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample.

Table 2. Logistic regression: ever married for women Ages 30–34 and 35–39.

Year Variable	Age 30–34					Age 35–39				
	1990 Odds ratio	1995 Odds ratio	2000 Odds ratio	2005 Odds ratio	2010 Odds ratio	1990 Odds ratio	1995 Odds ratio	2000 Odds ratio	2005 Odds ratio	2010 Odds ratio
Education:										
No Education	0.39*** (0.10)	0.10*** (0.02)	0.11*** (0.03)	0.13*** (0.05)	0.12*** (0.05)	0.42*** (0.11)	0.29*** (0.08)	0.14*** (0.03)	0.07*** (0.02)	0.11*** (0.03)
Elementary School	2.33*** (0.25)	1.94*** (0.27)	0.63*** (0.11)	0.40*** (0.09)	0.47*** (0.12)	2.44*** (0.35)	2.47*** (0.36)	1.15 (0.17)	0.46*** (0.08)	0.34*** (0.07)
Middle School	2.09** (0.14)	1.93*** (0.15)	1.32*** (0.13)	0.75** (0.09)	0.75** (0.10)	2.84*** (0.33)	2.21*** (0.20)	1.53*** (0.15)	0.95 (0.10)	0.62*** (0.07)
College Degree	0.65*** (0.04)	0.65*** (0.03)	0.54*** (0.02)	0.64*** (0.02)	0.81*** (0.02)	0.63*** (0.07)	0.58*** (0.04)	0.57*** (0.03)	0.66*** (0.03)	0.72*** (0.03)
Graduate Degree	0.38*** (0.07)	0.35*** (0.05)	0.39*** (0.04)	0.47*** (0.03)	0.69*** (0.04)	0.25*** (0.06)	0.29*** (0.05)	0.24*** (0.03)	0.34*** (0.03)	0.46*** (0.03)
City Sizes:										
Seoul	0.59*** (0.03)	0.46*** (0.02)	0.38*** (0.02)	0.46*** (0.02)	0.49*** (0.02)	0.68*** (0.07)	0.52*** (0.04)	0.55*** (0.03)	0.46*** (0.02)	0.48*** (0.02)
Metropolitan Areas	1.02 (0.07)	0.76*** (0.04)	0.71*** (0.03)	0.67*** (0.02)	0.69*** (0.02)	0.88 (0.09)	0.90 (0.07)	0.87** (0.06)	0.86*** (0.05)	0.74*** (0.03)
Rural Areas	0.84* (0.09)	0.98 (0.08)	1.14** (0.09)	1.34*** (0.09)	1.27*** (0.07)	0.75 (0.13)	1.01 (0.13)	1.02 (0.11)	1.08 (0.10)	1.21*** (0.08)
Industries:										
Agriculture	7.87*** (1.68)	5.21*** (1.17)	3.37*** (0.78)	3.59*** (0.73)	2.32*** (0.37)	9.10*** (3.26)	4.63*** (1.28)	2.71*** (0.65)	3.76*** (0.93)	2.23*** (0.41)
Manufacturing	1.14 (0.10)	1.03 (0.08)	0.95 (0.06)	0.96 (0.06)	1.36*** (0.08)	1.33** (0.19)	1.55*** (0.17)	1.13 (0.11)	1.18** (0.10)	1.25*** (0.09)
Communication/ Finance	1.59*** (0.23)	1.64*** (0.18)	1.24** (0.11)	1.41*** (0.10)	1.33*** (0.08)	0.78 (0.16)	1.34** (0.20)	1.19 (0.17)	1.35** (0.17)	0.93 (0.07)
Public Administration	1.10 (0.11)	1.18** (0.09)	0.96 (0.06)	1.06 (0.05)	1.28*** (0.05)	0.75* (0.12)	1.06 (0.12)	1.01 (0.09)	1.01 (0.07)	1.07 (0.05)
Other Industries	1.12 (0.12)	0.73*** (0.06)	0.63*** (0.04)	0.74*** (0.04)	1.07 (0.05)	0.99 (0.18)	0.72*** (0.07)	0.62*** (0.06)	0.70*** (0.05)	0.92 (0.05)
Not Working	6.43*** (0.40)	5.26*** (0.30)	3.56*** (0.18)	3.85*** (0.16)	4.36*** (0.17)	4.03*** (0.41)	4.00*** (0.30)	2.19*** (0.15)	2.17*** (0.12)	2.54*** (0.12)
# of observations	40,972	42,365	39,756	37,801	34,091	30,423	40,955	40,888	38,735	38,328
LR Chi-square	1796.0	2035.8	2661.7	3398.4	3174.5	697.4	992.6	795.2	1134.5	1438.2

Robust standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The excluded categories are: High School Degree, Other Cities (50,000+ people), and Sales and Services industries.

Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample.

Table 3. Logistic regression: ever married for Men Ages 30–34 and 35–39.

Year Variable	Age 30–34					Age 35–39				
	1990 Odds ratio	1995 Odds ratio	2000 Odds ratio	2005 Odds ratio	2010 Odds ratio	1990 Odds ratio	1995 Odds ratio	2000 Odds ratio	2005 Odds ratio	2010 Odds ratio
Education:										
No Education	0.26*** (0.04)	0.28*** (0.06)	0.36*** (0.11)	0.22*** (0.08)	0.43*** (0.14)	0.10*** (0.02)	0.10*** (0.02)	0.18*** (0.04)	0.14*** (0.04)	0.39*** (0.09)
Elementary School	0.40*** (0.02)	0.36*** (0.02)	0.29*** (0.03)	0.44*** (0.08)	0.38*** (0.10)	0.38*** (0.03)	0.28*** (0.02)	0.27*** (0.02)	0.34*** (0.04)	0.48*** (0.07)
Middle School	0.64*** (0.03)	0.56*** (0.02)	0.49*** (0.03)	0.50*** (0.04)	0.61*** (0.06)	0.63*** (0.05)	0.52*** (0.03)	0.48*** (0.03)	0.49*** (0.03)	0.56*** (0.04)
College Degree	1.04 (0.04)	1.40*** (0.04)	1.22*** (0.03)	1.05** (0.03)	1.03 (0.03)	1.25** (0.13)	1.61*** (0.10)	1.75*** (0.07)	1.70*** (0.05)	1.41*** (0.04)
Graduate Degree	1.06 (0.11)	1.65*** (0.13)	1.45*** (0.03)	1.57*** (0.08)	1.58*** (0.08)	0.89 (0.20)	1.59*** (0.23)	1.94*** (0.20)	2.48*** (0.18)	2.56*** (0.14)
City Sizes:										
Seoul	0.56*** (0.02)	0.55*** (0.02)	0.54*** (0.02)	0.58*** (0.02)	0.59*** (0.02)	0.66*** (0.05)	0.54*** (0.03)	0.60*** (0.03)	0.61*** (0.02)	0.67*** (0.02)
Metropolitan Areas	0.85*** (0.03)	0.84*** (0.03)	0.87*** (0.03)	0.79*** (0.02)	0.81*** (0.02)	1.13 (0.10)	0.78*** (0.04)	0.94 (0.04)	0.88*** (0.03)	0.86*** (0.03)
Rural Areas	0.71*** (0.04)	0.96 (0.04)	0.87*** (0.04)	0.85*** (0.04)	0.90*** (0.04)	0.75*** (0.08)	0.87* (0.06)	0.96 (0.06)	0.86*** (0.04)	0.89*** (0.04)
Industries:										
Agriculture	0.68*** (0.05)	0.43*** (0.03)	0.50*** (0.04)	0.49*** (0.04)	0.55*** (0.05)	0.86 (0.12)	0.55*** (0.05)	0.49*** (0.04)	0.53*** (0.04)	0.56*** (0.04)
Manufacturing	0.99 (0.04)	0.87*** (0.03)	0.96 (0.03)	1.03 (0.03)	1.23*** (0.04)	1.01 (0.10)	0.87** (0.06)	0.95 (0.05)	1.12*** (0.05)	1.18*** (0.04)
Communication/ Finance	1.07 (0.10)	1.02 (0.08)	1.10 (0.07)	1.33*** (0.07)	1.13*** (0.05)	1.56 (0.45)	1.07 (0.17)	1.25** (0.14)	1.57*** (0.14)	1.19*** (0.06)
Public Administration	1.21*** (0.09)	1.06 (0.06)	1.25*** (0.06)	1.22*** (0.06)	1.40*** (0.06)	1.13 (0.18)	1.16 (0.13)	1.22*** (0.11)	1.23*** (0.08)	1.42*** (0.07)
Other Industries	0.81*** (0.04)	0.81*** (0.03)	0.89*** (0.03)	0.91*** (0.03)	1.04 (0.04)	0.66*** (0.07)	0.62*** (0.04)	0.74*** (0.04)	0.86*** (0.04)	1.03 (0.04)
Not Working	0.16*** (0.01)	0.15*** (0.01)	0.18*** (0.01)	0.20*** (0.01)	0.36*** (0.02)	0.12*** (0.01)	0.14*** (0.01)	0.16*** (0.01)	0.19*** (0.01)	0.35*** (0.01)
# of observations	41,700	42,917	39,640	37,317	34,282	32,405	42,125	41,308	37,971	38,660
LR Chi-square	2608.1	2947.6	3104.6	2903.4	1710.1	1214.4	2182.1	3166.6	3417.3	2223.8

Robust standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The excluded categories are: High School Degree, Other Cities (50,000+ people), and Sales and Services industries.

Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample.

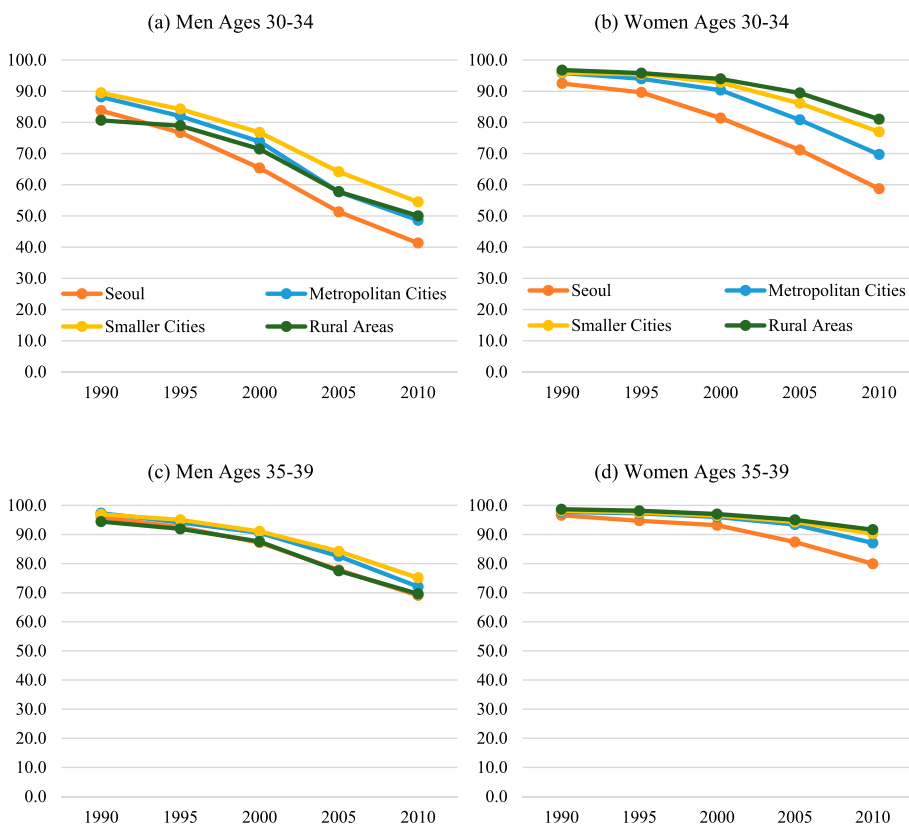


Figure 3. Proportion (by %) Ever Married for Men and Women by City Size Over Time. Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample.

we note that since 2005, women with a high school degree are more likely to be married by 30–34 than either women with less education or some college or more education. This illustrates the U-shaped relationship between education and age at marriage for women. For men, Figure 2 shows that those with higher education are more likely to be ever married in both age groups.

The logit regression models confirm these relationships while also controlling for size of the city of residence and industry. Table 2 shows that women with less than a high school education (particularly, women with middle school education) were more likely to have ever married in the early census years (odds ratios greater than one); however, beginning in 2005 they have been less likely to have ever married compared to those with a high school degree. In addition, women with college degrees or higher are less likely to have married by age 40 compared to women with high school degrees. In Table 3, we see less educated men are less likely to have ever married compared to those with a high school degree, and men with college degrees or higher are more likely to marry.

Looking at Figure 3, we explore the effect of city size on the age at marriage. For all age groups, women in rural areas are the most likely to have married compared to all other city sizes. Given that in all other areas about 90 per cent of women have been married by age 40, it is a notable exception that 20 per cent of women living in Seoul have never married

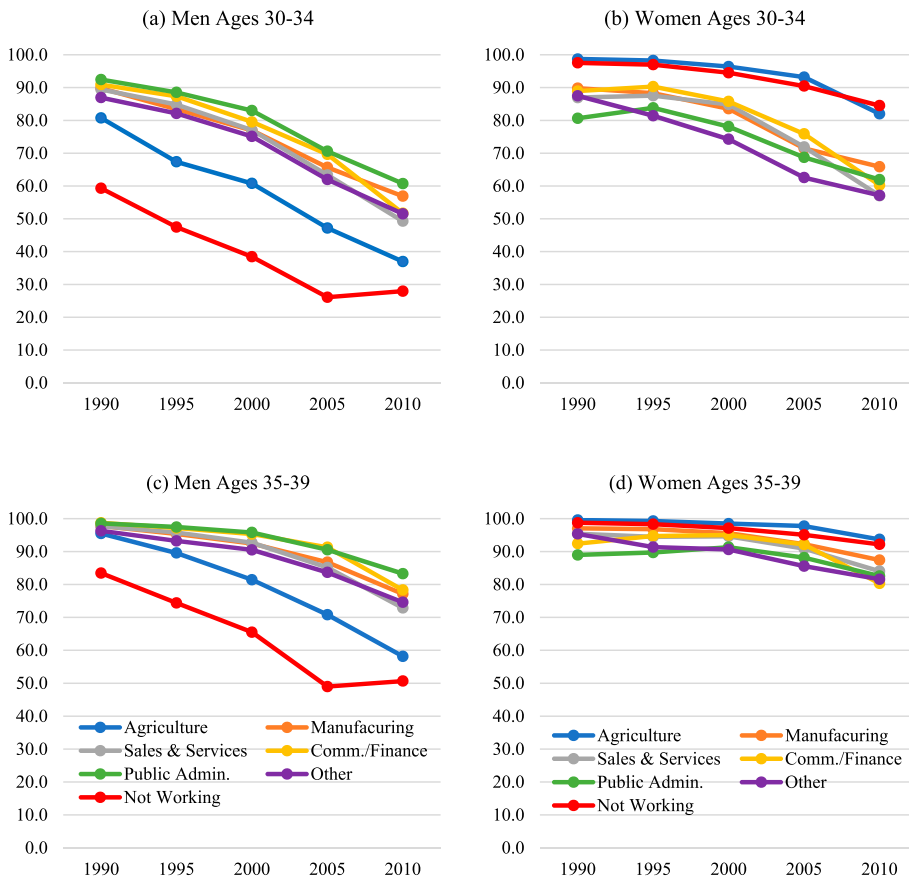


Figure 4. Proportion (by %) Ever Married for Men and Women by Industry Over Time. Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample.

by age 40 as of 2010. Men at all ages have a smaller fraction of ever being married than women, and it is men living in the smaller cities who are most likely to be married by age 40.

From Tables 2 and 3, we observe that both men and women living in Seoul are less likely to be ever married by age 40 compared to those living in other small and medium cities. The search for a suitable spouse may be more difficult here due to higher income inequality among men compared to the other three city sizes⁶, men and women in Seoul working longer hours (Jones & Gubhaju, 2009), and much higher housing prices in Seoul. We explore the influence of some regional characteristics in more detail in Section 4.

Table 3 shows that men in rural areas are less likely to have ever been married by age 40 compared to men living in Other Cities. However, we also see the odds ratios being less than one for men living in Seoul and in the other large metropolitan areas. Therefore, it is difficult to claim that rural young men have a unique problem in the marriage market. This unexpected result might be because men in rural areas who could not find a spouse in their own age cohort might have instead married either an older woman or

a woman from Southeast Asia (Lee & Klein, 2017; Sung et al., 2015). On the other hand, women in rural areas are more likely to have ever been married compared to those living in Other Cities. However, this effect is less prominent among the older age group.

As a novel contribution to the literature, we next explore the impact that a person's job has on their probability of ever marrying. For the industry categories (and a category for Not Working), Sales and Services is the excluded category in the regression models. Of course, the industries in which men and women currently work could be different from those industries in which men and women worked at the time of their marriages. Furthermore, the causation could work in reverse, as marital status could affect the industry in which a married woman currently works. However, marriage decisions are likely to be based on their own future job prospects and those of their potential spouses. Therefore, we believe that using the industry where the current job is located instead of the industry at the time of marriage could be justified given that the data on the latter is not available in Korean Population Census.

These jobs can be divided into three categories: (1) industries in decline in Korea (Agriculture and Manufacturing as illustrated in Table 1), (2) industries with lower pay and unstable jobs (Sales and Services and Other Combined Industries), and (3) industries with high-paying and prestigious jobs (Communication/Finance and Public Administration). To support the notion that some industries have low-paying and unstable jobs that may be less than ideal as jobs for potential spouses, we utilise data from the Korean Labor & Income Panel Study from 1998 to 2012 (roughly the same time frame as the Census samples). Table 4 shows data on monthly wages, hours of work per week, and the fraction of men and women aged 30–39 who report that they are in temporary jobs. While women earn less, work fewer hours, and are more likely to be in a temporary position, the other patterns are similar for both genders. Workers in jobs in the Sales and Services and Other Industries groups receive lower wages on average and are more likely to be in temporary jobs compared to those working in Communication/Finance and Public Administration.

Figure 4 shows that the proportion of men and women working in Agriculture ever being married is consistently the lowest for men and the highest for women compared to other currently employed workers. We confirm this finding in the logit regressions in Tables 2 and 3, which controls for education and city size as well. For women, the odds

Table 4. Wage, hours, and job stability of industries for Men and Women Ages 30–39.

	Men			Women		
	Avg Monthly Income	Avg Hours per Week	% Irregular or Seasonal Job	Avg Monthly Income	Avg Hours per Week	% Irregular or Seasonal Job
Agriculture	195.39	57.3	45.5%	105.65	40.2	43.7%
Manufacturing	238.98	47.2	3.5%	117.80	45.0	15.3%
Sales & Services	212.66	53.5	7.1%	125.31	47.3	7.3%
Communication/Finance	299.52	45.3	2.0%	222.92	40.1	3.4%
Public Administration	243.60	44.1	1.6%	181.36	40.6	3.5%
Other Industries	229.00	48.4	16.9%	153.87	42.8	10.1%

Source: Korean Labor & Income Panel Study, 1998–2012, waves 1–15.

Note: Real income (measured in 10,000 Korean Won: US\$1 = about 1,000 Korean Won) shown in terms of 2010 prices.

ratios are all significant and greater than one, and this is by far the largest effect of any of the covariates for women. Men have odds ratios of less than one, indicating they are less likely to have been ever married (compared to those working in Sales and Services). This might be because the sex ratios in rural areas where there are many agricultural jobs tend to be unfavourable to men who are responsible for caring for their parents as they get older. Young women may not consider these men as ideal marriage partners as they do not want to take on the care burden or work in the farming industry.⁷ The evidence is a bit more mixed for men and women working in Manufacturing, another industry in decline in Korea. When the effect of working in Manufacturing is statistically significant for women, it is positive. For men, it appears that working in Manufacturing used to decrease the likelihood of ever being married, but more recently in 2005 and 2010 this effect has turned positive, which is surprising given the fact that the industry has lost its vitality.

Next, Sales and Services and Other Combined Industries represent sectors with relatively low-paying, unstable jobs that often require long hours. As [Table 1](#) shows, while there has only been a slight decline in employment in Sales and Services for men, there has been a much larger decline among women from 33 per cent employed in the sector in 1990 for those aged 30–34 to 23 per cent in 2010. Many of these women appear to be moving into the Public Administration, Communication/Finance, or Other Industries. The category of Other Industries, which includes construction, real estate, entertainment and other businesses, has seen increased employment since 1990. The logit regression results show a significant negative effect for both men and women for most years except the most recent year of 2010. [Table 4](#) shows that workers in jobs in Other Industries are more likely to be in temporary positions compared to those working in Sales and Services.

Jobs in Communication/Finance/Insurance and Public Administration/Education/Health Services are viewed by young people in Korea as secure, high-paying and prestigious. In controlling for education and city size in [Tables 2](#) and [3](#), the odds ratios for both men and women are greater than one for employment in the Communication, Finance, and Insurance industries. The results are significant for men in both age groups, particularly in 2000, 2005, and 2010. For women, the evidence is more mixed, with significant results mainly for younger women. This suggests that in terms of one's marriage prospects, these are good industries to be employed in compared to Sales and Services. Working in Public Administration also has a positive effect for both men and women on the probability of ever being married but this is not statistically significant in most years for women. This is interesting to note since the Public Administration sector is an especially important industry for women since it displays one of the lowest levels of gender discrimination in Korea. Perhaps for this reason, [Table 1](#) shows that there has been significant growth in employment among women in this industry.

The final industry category, 'Not Working' includes individuals who are both unemployed and those not in the labour force. We should note that the logit regression results for this variable should not be taken as causal effects since marital status could influence labour market status, especially for women. [Table 1](#) shows that the fraction of Not Working for men has continuously increased since 1995 after the Asian Financial Crisis of 1997–2000 and after increasing competition from China in the world export market. However, the fraction of Not Working for women has declined over time with

72 per cent Not Working in 1990 for those aged 30–34 decreasing to 44 per cent in 2010. This reflects the increase of labour force participation for the young and single, as well as married women. Looking at [Figure 4](#), we see that the fraction ever married for both men and women who are Not Working looks most similar to the Agriculture industry. Men who are Not Working tend to have the lowest fraction ever married, and women who are Not Working tend to have the highest fraction ever married.

3.3. Test of the marriage squeeze hypothesis

Jones and Gubhaju (2009) and Jones (2012) explored the idea of a ‘marriage squeeze’ for highly educated women and less educated men. This hypothesis is tested in [Table 5](#), which shows the sex ratios for single men aged 25–40 to single women who are three years younger than the men for different education levels and Census years. The three-year age gap was chosen since the average age difference between spouses in Korea in 2005 was 3.2 years, with women marrying at 28.8 years old (Jones, 2012).⁸ In these tables, having a sex ratio near 1 would indicate a relative balance of single men and single women for a specific education level in that age group.

In panel (a) of [Table 5](#), we see all of the sex ratios are greater than one, indicating an excess of single men for less educated men and women. Compared to 1990, the sex ratios are much larger in 2010 for male ages 35–39 indicating the marriage squeeze has become much worse for less educated men. However, the sample sizes are extremely small by 2010 due to the large decline in less educated men and women. Panel (b) in [Table 5](#) shows an imbalance favouring women with high school degrees starting in 2000 after age 35 (sex ratios equalling 2.10–2.34 for males aged 35–40 in 2010). Though these men are somewhat better off than less educated men, they are worse off compared to college educated men. In panel (c), we see many year-age combinations with sex ratios at or below one, indicating an advantage for highly educated men. There is an obvious marriage squeeze for college educated women in 2010 at the male ages of 30–34, which corresponds to female ages of 27–31.

4. Influence of regional characteristic variables on marriage timing

While the effects of education and city size in this analysis confirm what has been found previously in the literature, we further contribute to the understanding of the age at marriage in Korea by exploring the role of several regional characteristics. Where the results from [Table 2](#) and 3 focus on individual characteristics that are linked to delayed marriages, [Table 6](#) complements those findings by adding various regional characteristics to the logit regressions that might delay marriage – changes in housing prices, sex ratios, various measures of youth unemployment rates, average income, and male income inequality in 209 cities, counties, and wards over time. These region level averages from several other data sources (as stated in section 3.1) are merged into the Census data. Unlike the previous regressions, here we pool data from the five census years of 1990, 1995, 2000, 2005, and 2010. This allows us to utilise the time variations of the regional variables.

The sex ratio variable has significant positive effect on the probability of marriage for women aged 30–34. Unexpectedly, there is a negative effect on the probability of marriage for women aged 35–39. However, this coefficient is significant only at the 10 per

Table 5. Sex ratios of Single Men Ages 25–40 to Single Women who are three years younger than men by Male's Current Age, Education Level, and Census Year.

(a) Low education					
Male Age	1990	1995	2000	2005	2010
25	1.26	2.02	2.11	2.18	1.80
26	1.57	2.18	2.86	1.60	1.89
27	1.92	1.89	2.52	1.70	1.59
28	2.39	2.58	3.69	1.78	2.86
29	2.98	3.37	3.82	2.24	2.86
30	2.58	4.47	3.40	2.87	2.79
31	3.35	5.43	4.08	3.97	2.72
32	2.93	5.09	3.50	3.47	2.26
33	2.52	6.05	4.20	5.21	2.69
34	2.91	4.88	4.65	3.68	2.28
35	2.05	4.44	6.13	4.63	3.69
36	1.66	5.00	6.03	5.18	3.24
37	1.22	4.44	6.26	4.88	6.95
38	1.91	2.87	4.69	4.73	3.53
39	1.86	2.96	5.83	4.18	3.75
40	1.42	3.92	6.36	5.12	3.37
(b) High School Degree					
25	0.74	0.91	1.22	1.26	1.44
26	0.80	0.87	1.29	1.03	1.75
27	0.85	0.81	1.37	1.01	1.61
28	0.97	0.85	1.38	1.02	1.78
29	1.02	1.07	1.33	1.25	1.78
30	1.04	1.08	1.25	1.53	1.68
31	1.07	1.51	1.41	1.89	1.27
32	0.94	1.50	1.44	2.00	1.29
33	0.81	1.52	1.53	2.16	1.31
34	0.89	1.64	1.58	2.05	1.62
35	0.60	1.17	1.70	2.03	2.10
36	0.71	1.11	1.69	1.88	2.43
37	0.55	1.04	1.97	1.95	2.70
38	0.61	0.78	1.39	1.68	2.72
39	0.38	0.77	1.59	1.77	2.51
40	0.40	0.81	1.28	1.89	2.34
(c) High (college) education					
25	1.16	1.06	0.94	1.06	1.02
26	1.20	0.96	0.93	0.91	1.07
27	1.17	0.88	0.90	0.78	1.13
28	1.05	0.78	0.90	0.79	1.07
29	1.00	0.93	0.91	0.75	1.03
30	0.95	0.92	0.86	0.86	0.94
31	1.00	1.04	0.87	0.96	0.81
32	0.77	1.16	0.78	1.02	0.74
33	0.62	1.01	0.77	1.07	0.78
34	0.63	0.78	0.81	1.00	0.94
35	0.58	0.73	0.84	0.97	1.09
36	0.37	0.68	0.89	0.94	1.10
37	0.50	0.81	0.97	0.76	1.36
38	0.45	0.42	0.67	0.85	1.13
39	0.20	0.49	0.77	0.74	1.16
40	0.23	0.43	0.57	0.87	1.12

Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample.

cent level. This might reflect the fact that the sex ratio is an imperfect measure of local marriage market conditions in rural areas where the sex ratio is large. For some rural women who have delayed marriages beyond age 35, a higher sex ratio may not mean more qualified young men are available in the rural area of residence (see Morgan & Hoffmann, 2007). For males, the sex ratio variable has significant negative effect for

Table 6. Logit models for ever married for Women and Men Ages 30–34 and 35–39, regional analysis, pooled years.

Regional Variables:	Women		Men	
	Ages 30–34 Odds Ratio	Ages 35–39 Odds Ratio	Ages 30–34 Odds Ratio	Ages 35–39 Odds Ratio
Avg. Men's Income	3.21*** (0.46)	6.19*** (1.13)	1.98*** (0.20)	2.11*** (0.28)
Avg. Women's Income	0.37*** (0.08)	0.16*** (0.05)	0.72** (0.12)	0.67** (0.15)
S.D. Men's Income	0.064*** (0.050)	2.29 (2.51)	0.044*** (0.024)	0.044*** (0.031)
Sex Ratio	1.42*** (0.18)	0.79* (0.04)	0.42*** (0.04)	0.42*** (0.04)
Log (Real Apart. Price/m ²)	0.80*** (0.03)	0.78*** (0.04)	0.82*** (0.02)	0.80*** (0.03)
Male Adult Unemp. Rate	0.009*** (0.003)	0.021*** (0.011)	0.035*** (0.009)	0.019*** (0.007)
Male Youth Unemp. Rate	0.62*** (0.09)	0.60** (0.12)	0.71*** (0.07)	0.98 (0.13)
Female Youth Unemp. Rate	1.22 (0.18)	1.03 (0.21)	1.53*** (0.15)	1.60*** (0.20)
<i>Individual: Education</i>				
No education	0.16*** (0.02)	0.18*** (0.02)	0.27*** (0.03)	0.13*** (0.01)
Elementary School	1.47*** (0.10)	1.45*** (0.10)	0.37*** (0.01)	0.31*** (0.01)
Middle School	1.60*** (0.06)	1.63*** (0.08)	0.57*** (0.01)	0.52*** (0.01)
College Degree	0.68*** (0.01)	0.67*** (0.02)	1.14*** (0.01)	1.55*** (0.03)
Graduate Degree	0.54*** (0.02)	0.38*** (0.02)	1.58*** (0.04)	2.39*** (0.10)
<i>Individual: City Size</i>				
Seoul	0.65*** (0.02)	0.68*** (0.03)	0.71*** (0.02)	0.80*** (0.02)
Metropolitan Areas	0.85*** (0.02)	0.91*** (0.03)	0.90*** (0.01)	0.96* (0.02)
Rural Areas	0.96 (0.04)	0.94 (0.05)	0.88*** (0.02)	0.91*** (0.03)
<i>Individual: Industry</i>				
Agriculture	3.51*** (0.31)	3.30*** (0.36)	0.53*** (0.02)	0.58*** (0.02)
Manufacturing	1.07** (0.03)	1.25*** (0.05)	0.99 (0.02)	1.05** (0.02)
Comm./Finance	1.40*** (0.05)	1.08 (0.05)	1.10*** (0.03)	1.19*** (0.05)
Public Admin.	1.12*** (0.03)	1.03 (0.04)	1.21*** (0.03)	1.25*** (0.04)
Other Industries	0.86*** (0.02)	0.81*** (0.03)	0.90*** (0.01)	0.85*** (0.02)
Not Working	4.27*** (0.09)	2.58*** (0.07)	0.21*** (0.004)	0.21*** (0.01)
N	194,985	189,329	195,856	192,469

Robust standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The excluded categories are: High School Degree, Other Cities (50,000+ people), and Sales and Services industries. Time fixed effects are included.

Source: Korean Population Census, 1990, 1995, 2000, 2005, and 2010, 2% Public Use Sample, Korean Labor & Income Panel Study, 1998, 2000, 2005, and 2010, Korean Institute of Real Estate Appraisal Apartment Sale Price, March 2013, and Kukmin Bank Apartment Price Index, 1990, 1995, 2000, 2005, 2010.

both age groups. An increase in the sex ratio in the area causes a shortage of young female Korean partners and thus should have positive (negative) influence on women's (men's) probability of marriage (Abramitzky et al., 2011; Angrist, 2002).

Table 6 shows the influence of local unemployment rates on women's and men's marriage rates. We see that a higher men's unemployment rates have a significant negative effect on the probability of marriage for both age groups for both men and women. It may be that high unemployment among men in the area leads to delayed marriages because young people there are encouraged to invest in their own human capital rather than make long term commitment to marriage and children. A higher unemployment rate among young women does not appear to affect women's probability of marriage, but it does increase the likelihood of ever being married for men. Perhaps these are the age groups of women the men are marrying, and the higher unemployment rates mean that the women have fewer outside options to marriage.

As expected, the results in Table 6 show significant odds ratios of less than one for the effect of male income inequality on women's probability of being ever married for the younger age group of 30–34, supporting the hypothesis by Jones and Gubhaju (2009). The regional average income for men has a significant positive effect and the regional average income for women has a significant negative effect on the probability of marriage for both age groups for both men and women. The former reflects the income effect of husband's income on women's marriage and the latter reflects the substitution effect of wife's wage (opportunity cost) on women's marriage.

Finally, Table 6 shows that for both age groups 30–34 and 35–39 for both men and women, higher housing prices have a significant and negative effect on the probability of ever being married. This confirms that high housing prices in Korea have contributed to the delay of marriage in the population.

5. Conclusion

This paper studies the determinants of the age at marriage in Korea using the Korean Population and Housing Census 2 per cent Sample data for years 1990, 1995, 2000, 2005, and 2010. The delay of marriage is seen as the most important determinant of low fertility in Korea. While a number of papers have documented particular characteristics that affect the age at first marriage or have explored one particular year of census data, this paper provides a much broader overview of many contributing factors including a number of regional factors. Since using the actual age at marriage is likely to introduce sample selection bias, we used a logit regression model to explain the probability of ever being married for men and women in the 30–34 and 35–39 age groups.

First, we confirm that while Korean women with high education (college or higher) are less likely to have been ever married than women with less education (high school or lower), no such success gap exists for Korean men. The relationship between education and the probability of ever being married for women of all ages is a U-shaped relationship, while the probability of marriage increases monotonically for men with increasing education levels. Men and women in Seoul are less likely to have been married than those in other cities.

We find that employment in particular industries affects the probability of marriage. In general, individuals who work in industries with high-paying and stable jobs such as

Communication/Finance/Insurance and Public Administration/Education/Health Services tend to be more likely to marry by age 40 and those in low-paying and unstable industries such as Sales and Services and Other Industries are less likely to marry. Interestingly, men who work in Agriculture or who are Not Working are much less likely to have been ever married, while women in these groups have the highest rates of marriage by age 40.

Next, we supplement the Census data with regional data on income and housing prices using data from the Korean Labor & Income Panel Study, the Korean Institute of Real Estate Appraisal, and Kukmin Bank as these variables were not available in the Korean Census 2 per cent sample. The paper explores the effects of several regional variables on the probability of ever being married. When male income inequality is high in the regions, women there are less likely to be married because their search for a marital partner is longer. High income for men in the region encourages early marriages, whereas high income for women discourages marriage as it increases the opportunity cost of potentially leaving the labour market. Higher local 'economically inactive' rates for young men and adult men negatively affect the probability of marriages for both men and women. Higher extended unemployment for young women in the region encourages young men to marry early.

In a novel analysis using more localised housing price data we were able to assess the influence of higher house prices on marriage timing. Combining data on apartment prices and an apartment price index, we find that higher apartment sales prices are associated with a lower probability of ever being married for both men and women. Thus, rising costs of housing over time are an important contributor to the increasing age at marriage in Korea.

One caveat of the regional analysis is that these variables may not be accurate for every individual since they are taken from other data sources and not everything is available in all years. Since there was no income data in the Census, we used individual characteristics that we could match between the Census and KLIPS data to create income variables to find area level averages. There may be individual characteristics that affect income that are not controlled for in this imputation process. For the housing data, the very specific area level Apartment Price Index is only available in 2005 and 2010, which meant we used less specific locations to create the price index in the other years. These accommodations due to the lack of data could affect the estimates for those variables, as it is in effect measurement error. However, it is our hope that the evidence in this paper will encourage future data collection of these variables and encourage future researchers to consider the importance of regional variables on marriage in Korea.

Notes

1. According to Kim (2005) and Suzuki (2012), Korea reached the replacement TFR of 2.1 births in 1983. Since then TFR continued to decline to 1.3 in 2001 and 1.08 in 2005. TFR has risen slightly to 1.19 in 2013 (Choe & Retherford, 2009; Lee & Lee, 2014).
2. Whang (2014) reports that the percent of population ages 65 and over is predicted to become 14% in 2017, and exceed 20% by 2026. In addition, the median age in Korea is expected to exceed 50 by 2034.
3. Tsuya et al. (2000) show that on average, Korean husbands worked longer hours (52.3 h per week) at jobs compared to Japanese husbands who work 49.2 h per week.

4. We use the 1998 survey data for both the 1990 and the 1995 Census years, since 1998 was the first year of the survey. The KLIPS data has surveys for the remaining Census years of 2000, 2005, and 2010. The full specification for this regression can be found in the appendix.
5. Bergstrom and Schoeni (1996) and Loughran (2002) restrict their analyses of the age at marriage regressions to individuals who are 40 and older to avoid sample selection bias because almost all first marriages have taken place by this age.
6. Based on data from the Korean Labor & Income Panel Study.
7. The age at marriage is only available in the 1990, 2005, and 2010 census. However, looking at matched husband/wife data, we observe that among women aged 30–34 working in agriculture, the age gap between the woman and her husband is 4.6 years while the corresponding age gap is 4.8 years among women aged 35–39. This is quite a bit larger than the average age gap between husbands and wives of 3.1 years.
8. There is also about a 3-year age gap between husbands and wives in the Census data used in this paper. Tables of sex ratios for a 2-year or 4-year age gap display similar patterns and can be provided upon request.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix

Below is the full regression from the Korea Labor and Income Panel Study. The dependent variable is log of monthly income and is estimated separately for men and women.

Variable	Male		Female	
	Coefficient	Std. Err.	Coefficient	Std. Err.
<i>Respondent Characteristics:</i>				
Age 25–29	0.305***	(0.028)	0.184***	(0.020)
Age 30–34	0.434***	(0.029)	0.240***	(0.027)
Age 35–39	0.523***	(0.030)	0.188***	(0.028)
Age 40–44	0.584***	(0.031)	0.182***	(0.029)
Age 45–49	0.628***	(0.032)	0.213***	(0.031)
Age 50–54	0.570***	(0.034)	0.230***	(0.034)
Age 55–59	0.464***	(0.036)	0.152***	(0.041)
Married	0.225***	(0.012)	0.034**	(0.016)
No Education	–0.498***	(0.067)	–0.430***	(0.055)
Elementary School	–0.414***	(0.024)	–0.239***	(0.024)
Middle School	–0.263***	(0.016)	–0.177***	(0.021)
College	0.216***	(0.010)	0.341***	(0.017)
Graduate School	0.443***	(0.021)	0.501***	(0.056)
<i>City/Province:</i>				
Busan	–0.102***	(0.017)	–0.096***	(0.023)
Daegu	–0.125***	(0.020)	–0.124***	(0.029)
Incheon	–0.077***	(0.018)	–0.040	(0.026)
Gwangju	–0.043	(0.030)	–0.190***	(0.047)
Daejeon	–0.106***	(0.024)	–0.079**	(0.038)
Ulsan	0.123***	(0.023)	–0.022	(0.039)
Kyunggi	–0.021*	(0.012)	–0.005	(0.019)
Gangwon	–0.128***	(0.030)	–0.115**	(0.047)
Chungbuk	–0.035	(0.029)	–0.060	(0.045)
Chungnam	–0.055**	(0.026)	–0.095**	(0.040)
Junbuk	–0.137***	(0.027)	–0.105***	(0.040)
Junnam	–0.007	(0.034)	–0.070	(0.047)
Kyungbuk	–0.108***	(0.023)	–0.119***	(0.032)
Kyungnam	–0.006	(0.018)	–0.076***	(0.027)
Jeju	–0.404***	(0.118)	–0.095	(0.068)
<i>Year:</i>				
2000	0.014	(0.012)	–0.024	(0.019)
2005	0.377***	(0.012)	0.322***	(0.019)
2010	0.547***	(0.012)	0.478***	(0.019)
Observations	9,668		6,142	
R-squared	0.4722		0.3431	

Robust standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

The excluded categories are: Age 20–24, High School Degree, Not Married, Seoul, and Year 1998.

Source: Korean Labor & Income Panel Study, 1998, 2000, 2005, and 2010.