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# Analysis of Factors Influencing the First Birth Interval in the Gyeonggi Province, South Korea

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# Abstract

## Analysis of Factors Influencing the First Birth Interval in the Gyeonggi Province, South Korea

**Objectives:** The main purpose of this study was to identify and examine associative factors that affect the first birth interval, the duration between marriage and first birth in the 31 cities and counties of Gyeonggi, the most populous province in Korea. In addition to individual characteristics of parents, focus was also on regional characteristics in order to explore what factors in a certain living environment hasten or postpone a couple's entry into parenthood. The paper covers the period 2008-2014.

**Methods:** This study used the complete birth certificate data for 2008-2014 provided by the Microdata Integrated Service (MDIS) of Statistics Korea and the regional time-series data for the same time period, collected through the Korean Statistical Information Service (KOSIS). Response variable was the first birth interval, defined as the difference between the marriage year and month and the first child's birth year and month. Explanatory variables from the micro dataset were socio-demographic characteristics of parents, which consisted of age at marriage, age difference, education level, occupation and labor force participation status. The macro dataset consisted of explanatory variables categorized by demographic, housing, economic and child care policy-related variables. A multilevel multinomial logistic regression was conducted using SAS 9.4.

**Results:** A multinomial logistic regression was conducted to analyze individual characteristics of couples who gave their first birth 1 to 5 or more years following their marriage compared to those who gave birth within the first year of marriage. Based on the univariate analysis, statistically significant variables at the individual level were education level, father's occupation and mother's labor force participation status; age at marriage, especially paternal age, and age difference between parents were not as significant as the other factors. There was a common tendency among college graduate parents to give birth at a later time compared to their high school graduate counterparts. College graduate parents also showed a low tendency to give first birth within the first year of marriage. Lastly, there was a higher proportion of childbirths occurring progressively later after marriage among the employed in contrast to the unemployed. Results from the multivariate analysis were generally similar to those of univariate analysis. In the multivariate analysis of the aggregate data, most of the variables from each category were statistically significant. The findings were as follows: proportion of women with high education, female employment rate, unemployment rate, housing prices were positively associated with the first birth interval whereas employment rate, GRDP, financial independence and the number of childcare facilities per child mainly showed negative relationships with the first birth interval.

**Conclusions:** This study aimed to examine primarily demographic and socioeconomic factors

that influence the length of time between marriage and first birth in the Gyeonggi province, South Korea both at the individual and aggregate level from 2008 to 2014. Through statistical analyses the general pattern indicated that the majority of the individual and regional variables were significantly affecting the first birth interval. It is highly likely that the findings of this study will serve as a reference for prospective research concerning first birth intervals and also contribute to the implementation of more effective low fertility and policy response at the provincial level in Korea.

**Keywords:** First birth interval, fertility, entry into parenthood, tempo effect, Gyeonggi province, Korea

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# 1. Introduction

## 1.1 Background

Korea has experienced a pronounced fertility decline since the 1960s, when the total fertility rate was 6.0. Since then the country has continued to witness an extremely low fertility rate and as of 2015 the total fertility rate of Korea was at 1.19 (Statistics Korea, 2016), clearly below the replacement level. Persistent declining levels of fertility are to a great degree linked with the postponement of childbearing (Sobotka, 2004), which has gradually become a common phenomenon in Korea. Postponement or choice to forgo having a child in the Korean society can be explained by various factors, the most prominent being increased age at marriage, universally high achievement of education for both men and women, a rapid transition from prosperity in the economy to downfall, and the overall change in the way people view the necessity for marriage and family formation. The choice of geographical area targeted for the analysis was the Gyeonggi province, consisting of 28 cities and three counties. It has experienced a rapid increase in population due to the modernization and urbanization of Korea. The population of the Gyeonggi province is 12,522,606 (Statistics Korea, 2016), which has well exceeded the population of Korea's capital city, Seoul, as of 2003 thereby being settled as the most populous province in the country. There are urban, rural and semi-urban areas almost equally positioned and the province is evenly developed in heavy industry, light industry and farming, livestock, and fisheries industry. The Gyeonggi province is recognized as a sample that adequately represents the country, often labeled as "Little Korea."

Fertility changes can occur due to both quantum effect, defined as changes in the actual average number of children that women of a real cohort have by the end of their childbearing years (completed fertility rates), and tempo effect, which refers to the distortion in the timing of childbearing (Bongaarts and Feeney, 1998). However, a vast majority of previous research has focused on the quantum component as a primary determinant of fertility level whereas relatively less attention has been paid to the tempo component, the other equally important determinant of fertility level. When analyzing any change in fertility rate, perhaps a more important question is the time at which childbearing occurs as opposed to how many children are ever born in a certain period of time; the very basic and foremost driving force for causing change in fertility rate has been the temporal variations in cohort fertility rates (Ryder, 1980). This is particularly common in the Korean society where concerns about low fertility are often attributed to the quantum component of fertility, the number of children born in a specific time period or whether couples give additional births, rather than the tempo component, when or how frequently childbearing takes place (Eun, 2001). In addition, while there have been ongoing studies with regards to the parity progression among women participating in the labor force, not much research has been conducted on the progression from first marriage to first birth and factors that affect the length of time between the two events. In the Korean context, pre-marital conception is rare and because it has been presumed that pregnancy and childbirth naturally happen immediately following marriage in this culture, there is a limited number of studies that have scrutinized the time

interval between the two events. In contrast to the past where marriage and childbearing represented events of the same thread occurring consecutively, the situation is quite different nowadays. Nowadays, with recent changes in perception of family values, the rising trend among the younger generation is that marriage and childbearing are perceived as two separate events, occurring only according to people's needs and choices. The elevated trend of delayed marriage hence an increase in the age at first birth, the anticipation of substantial opportunity cost of childbearing and economic uncertainty and financial pressure associated with childrearing all lead couples to delay or even forgo their first births (Lee and Choi, 2014). As seen through the common reasons mentioned above there is an increasing tendency among married couples to persist the delay in first childbirth or remain childless, which calls for active promotion to initiate the planning of first birth from the national perspective.

The timing and interval of births as defined by the tempo component of fertility level is critical because it is strongly connected to women's biological and health status (Woo, 2012). With women's age at first marriage already having significantly increased, if the length of time between first marriage and first birth is further extended, it is only natural that the end of women's reproductive years will have reached sooner. In this case substantial postponement of childbearing poses a threat to maternal and child health. Biologically as well as socially adverse outcomes, such as infecundity or infertility as women's ability to conceive first child may diminish, difficulty in the delivery or the birth of an unhealthy child and socially imposed sanctions for having a child over a certain age norm, are highly likely to result from prolonged first child intervals (Mynarska, 2010). Thus women's biological limitation serves as a salient concept in the intention and the planning of transition to parenthood.

Another importance of the timing and interval of births is evident by the fact that the longer it takes for childbearing to occur and the longer the birth interval, the higher the possibility that the period fertility will decrease (Rindfuss and Morgan, 1983). The upward shift in the mean age at both first marriage and first birth plays a key role in lowering the period fertility rate but findings suggest that when the first birth interval is shortened the period fertility accelerates (Rindfuss and Morgan, 1983). The numbers and rates of births, parity progression and son preference have been some of the widely discussed discourses that we are accustomed to in the sphere of fertility in Korea. However, as stated above, evidence indicates that the time and pace of childbearing influences the overall fertility level. The implication is that there is an immense need to place greater emphasis on the time as well as interval of first birth, along with its determinants in all aspects in an attempt to recover the low fertility level of Korea.

Most research on the subject matter of fertility in Korea has been conducted solely through the use of individual data, with which policy preference and changes in values were analyzed. The present study is distinct from previous studies in that regional aggregate data was included in the research in addition to individual data obtained from the national birth certificate data. The combined use of micro and macro set of data in the analysis will allow for the investigation of both individuals' socio-demographic characteristics and the socioeconomic characteristics of a certain living environment and how or to what extent they influence the time at which couples decide to enter parenthood.

## 1.2 Objective

The aim of this research was to explore the importance of the relatively less recognized concept of first birth interval among other various discourses on low fertility in Korea. Specifically, the initial stage of this study was to construct a comprehensive database consisting of demographic and socioeconomic variables at the individual and regional level in the 31 cities and counties of Gyeonggi, the most populous province in Korea. The subsequent task was to analyze the general trend in the average time women of reproductive age residing in the province take to give first birth following their marriage. The main purpose of this study was to identify and examine associative factors that affect the first birth interval, the duration between marriage and first birth. In addition to individual characteristics of parents, focus was also on regional characteristics in order to address what factors in a certain living environment hasten or postpone a couple's entry into parenthood. The paper covered the period 2008-2014.

Research of this kind, one that involves a particular region as a unit of analysis pertaining to its regional variables along with individual variables, has not been substantiated adequately in Korea and the appropriate research method and the findings of this study could supplement prospective studies on not only first birth intervals but also other tempo-related fertility issues in Korea.

## 2. Literature Review and Hypotheses

### 2.1 Literature Review

Marriage and entry into parenthood mark important stages of not only an individual's life cycle but also at the population level for shaping the overall patterns of marital fertility (Hayford et al., 2014). The first birth interval, defined as the length time taken between first marriage and the onset of childbearing, is known as one of the most influential determinants of fertility. In many developed countries, postponement of marriage and the subsequent first childbirth have become more prevalent and contributed tremendously to fertility declines (Bumpass & Mburugu, 1977; Trussel & Menken, 1978). Such demographic changes in the family formation behavior are perhaps due to the gradually increasing disconnect in the timing of marriage and entry of parenthood especially among later cohorts (Hayford et al., 2014). In other words, whereas the concept of marriage implied or was even synonymous for raising a family in the past, now the emphasis on childbearing and childrearing has been attenuated in the meaning and context of marriage. Figure 1 depicts the conceptual model of analysis around which theoretical review was organized.

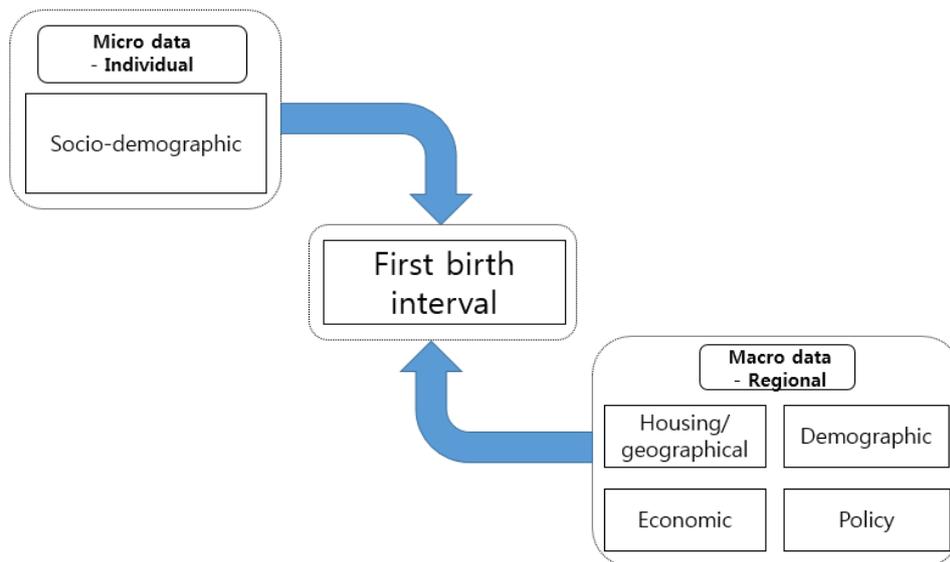


Figure 1. Conceptual model of analysis

### *2.1.1 Age at first marriage and first child birth*

Age at first birth is considered a crucial variable associated with the tempo component of fertility level among the other tempo-related variables, which are age at first marriage and the first birth interval. Numerous previous studies have come to an agreement that with minor variations, age is positively correlated with the length of the time-interval under consideration. This correlation is applied to both males and females, signifying that in general the younger the couple at marriage the shorter the time-interval between that marriage and the birth of the first child (Christensen, 1953). In Korea, out of wedlock births are quite rare occurrences in comparison to the Western societies. In this sense, it is generally accepted that the increase of age at first marriage inevitably means the increase of age at first birth. The persistence of such a phenomenon has partially, but inevitably, led to the country having one of the lowest level of fertility in the world (Eun, 2001). The first birth interval is prone to change according to the age at marriage and first birth and there are two pronounced cases illustrating this phenomenon. For those who married at a late age they may try to compensate for delays in marriage by planning and conceiving their first child immediately in an effort to reach the same level of fertility as they would have achieved had they married earlier (Luc et al., 1993). In other words, as marriage is delayed, women may feel social and biological burden to have children soon after marriage, which then leads to a reduced interval between marriage and first birth. Couples who marry late obviously have a shorter effective reproductive period which triggers them to try to compensate their lost reproductive period by producing the desired number of children quickly; this behavior results in short birth intervals among late-marriage cohorts (Prakash et al., 2011). In contrast, if marriage is postponed to the point where ages at which women's fecundity starts to decline, the interval between marriage and first birth might increase due to physical challenges in conceiving (Hayford, 2014). Difficulty in conceiving in spite of regular coital frequencies without any use of contraceptives within one year, infertility is diagnosed and high frequency of infertility has been identified as a factor that directly interferes with the fertility rate at the aggregate level (Hwang, 2007). In fact, the Korean government has recently started to envision the implementation of policies to bolster the treatment of infertility as a rising solution to the problem of low fertility as consequence.

In a recent qualitative research conducted on Korean women, it demonstrated through a series of in-depth interview that women who married around or above the age of 35 generally expressed a negative and reluctant attitude towards their first childbearing, let alone successive births (Woo, 2014). This particular phenomenon is likely to persist as there is an abundance of research highlights on the association between pregnancy of advanced maternal age and the health status of the child reported in the medical field and mass media, which may cause more women to prolong and eventually avoid childbirth post marriage due to the issue of age norm if the age at first marriage continues to reach 35. Holistically the fertility rate will be affected negatively.

### *2.1.2 Education and first child birth*

Among the vast socioeconomic developments Korea has experienced, perhaps the most drastic expansion lies in the educational sector as seen through the advancement in women's level of educational attainment. Women's involvement in education, more so than that of men, is one of the most critical measures in the increase in birth interval and the reduced fertility (Eun 2001; Khan et al., 2016). Education is often negatively associated with fertility, for which several reasons exist as to why women with a higher education tend to marry and plan for pregnancy later than their less educated counterparts (Bongaarts, 2003). According to literature, behavioral perspective and autonomy perspective, also referred to as independence hypothesis, are fundamental in grasping the how education is affiliated with elongating the length of time between marriage and entry into parenthood. Kye (2008) has highlighted that while neither of the two perspectives expect obvious change in the evident association between education and the timing of marriage and childbearing, they do suggest that the delay in marriage and childbearing can be explained by educational differentials. The behavioral perspective simply accentuates the fact that as women in late cohorts stay in school longer, they need to delay their marriage and childbearing more than earlier cohorts. However, the important idea is that it is not lucid if later childbearing is observed among the better educated. That is, if a college graduate woman marries later than a high school graduate woman does only because the former stays longer in school, there is no adequate rationale to anticipate that the former will also delay childbearing upon getting married in spite of the common belief that students will want to avoid becoming a parent immediately. On the other hand, the independence hypothesis predicts that better educated women will decide on either later childbearing or avoiding motherhood partly because they may have heightened knowledge and easier access to contraception or have autonomy being able to negotiate with their husbands about delaying childbearing. Women with a high education often earn roles and positions in the society through various work-related benefits and opportunities and tend to avoid childbearing which poses a greater risk of career discontinuity and high opportunity cost (Goldstein and Kenney, 2001). The link between married women's decision on their first birth interval and their academic achievement appears to be particularly strong with regards to attending and completing college (Sonfield et al., 2013).

### *2.1.3 Economic status and first birth interval*

Following the discussion regarding the impact of educational attainment on the first birth interval, it is essential to consider a broad but complex spectrum of economic status of the household, especially including women's participation in the labor force and their wages and incomes influencing a couple's level of fertility (Gupta, 2016). The question of whether or not wages, incomes and potential financial assets of a household matter in the context of fertility has been consistently brought forth in the economic demography literature but without sufficient factual basis. The universal finding among previous studies is that women's participation in the labor force and rising wage from accumulated work experience are expected to increase the opportunity cost of having a child, causing many women to deter childbearing. The economic

status of a married woman is critical when considering the timing of her first birth. The general notion is that when women take time from their careers to have children, they clearly suffer deficits in income relative to what they would have earned had they not had children. Taniguchi (1999) reported that early child bearers are likely to experience a higher wage penalty, possibly because their career interruptions due to childbirth occur during a critical period of career building. Such a repercussion makes married women to become reluctant to have their first child shortly after marriage and elongating the first birth interval as much as possible may seem a better option. Another study has shown that women who delay childbearing have been more likely to remain in the labor force throughout their working lives (Pienta, 1999). Economic independence outside domestic life incites much conflict between work and family life especially for women (Becker, 1974) but their attention has now shifted to continuation of career building rather than struggling between motherhood and economic participation or solely engaging in the domestic ground and childrearing.

Although women's employment is more predominant in fertility discourses, the relationship between men's employment and fertility is also found in the recent literature. Tolke and Diwald (2003) found that job insecurities and a difficult start in the career path do have an impact on the transition to fatherhood to a large extent. Results show that not being gainfully employed significantly decreases the probability that men will make the transition to fatherhood. Insecurities resulting from not being employed and uncertain prospects for the future reduce the likelihood for parenthood as sufficient financial assets are required in the process of raising a child. This is in accordance with the spillover hypothesis, which postulates that insecurities in the working life carry over into the private life, postponing or preventing long-lasting family commitments. There are substantial differences in the consequences of job insecurity on intentions to have a first child; a relatively secure job career that promises a certain level of affluence is expected to precede family formation and hasten the timing of the first child, especially in the case of men (Bernardi et al., 2008).

#### *2.1.4 Housing and fertility*

A burgeoning literature has examined the relationship between housing prices and fertility level (Mulder 2006; Lovenheim & Mumford, 2013; Dettling & Kearney, 2014; Iwata, 2012; Kim & Hwang, 2016; Bae & Han, 2016). The cost of home ownership is a pertinent factor that competes with the cost of childrearing (Iwata, 2012). The question of how real estate markets affect family formation is often viewed as straightforward to consider because changes in housing prices do not directly affect the cost of parental time spent on childbearing and childrearing (Dettling & Kearney, 2014). With the intention to investigate how housing prices affect period birth rates concurrently, Dettling & Kearney (2014) revealed that housing prices are a germane factor in a couple's decision to have a child. In their research empirical evidence illustrated that short-term increases in house prices resulted in a decline in births among non-owners and an overall net increase among owners. Although the amount of increase differed across demographic groups, at the mean US home ownership in the period of analysis, the net effect of a \$10,000 increase in house prices signified a 0.8% increase in the number of total births. As seen through

such a finding, there is positive relationship between housing prices and the level of fertility and it can be inferred that couples partially rely on their accumulated housing wealth to “fund” their childbearing goals, exerting a greater effect on period birth rates. Another study conducted by Lovenheim and Mumford (2013) on the same subject matter, utilized housing market variation to estimate the fertility response to a change in housing wealth using individual-level data. This study again confirmed a significantly positive effect of both two-year and four-year housing price growth on the likelihood that a woman has a child in the preceding year. Such results are consistent with a small but growing body of existing literature that champion the traditional notion that fertility and family resources exhibit a positive association. The empirical results of this study also implied that fertility decisions are among the established behaviors that are affected by fluctuations and the volume of housing transactions in the real estate market.

In the Korean society where the lowest-low fertility rate has persisted for years, there is limited literature on how housing prices and fertility are linked. As one of the key considerations prior to marriage and childbearing, the excessively high and unaffordable cost of housing in Korea explains not only why it is rare for the newly wed or the young generation to own their own homes but also the fact that they feel burdened to get married, let alone have children in the absence of such assets. The increased financial pressure to find a home appropriate for family formation is the primary reason that parents choose to delay or forego their entry into parenthood, thereby bringing about the low fertility phenomenon Kim and Hwang (2016) performed an empirical analysis of the impact of housing price, measured by owner housing price and rental housing price, on the level (total fertility rate) and timing (women’s mean age at first birth) of fertility using 16 regional panel data in Korea for the duration of 2009-2013. Results showed that housing price had a negatively significant impact on the total fertility rate whereas a positive relationship was seen between the housing price and women’s mean age at first birth. This implies that there is a clear tendency to postpone or forgo marriage and/or birth as the housing prices increase. In accordance with previous research, the study conducted by Bae and Han (2016) examined how a newly married couple’s housing assets influence the timing of first childbirth. Major findings included that newly married couples who have their own matrimonial home are more probable to have a child earlier than those who do not, indicating that the value of housing assets is positively linked to a shorter first birth interval. Much of current research has demonstrated that both positive and negative relationships exist between housing prices and the level and timing of fertility depending on the status of home ownership.

### *2.1.5 Urban-rural differentials and first birth interval*

Place of residence distinguished by urban and rural is a notable factor at the aggregate level for understanding attitudes toward first childbearing; there are small but significant differences between urban and rural couples (Feng and Quanhe, 1996). Considerable part of the explanation for spatial differences in cumulative fertility may be found in urban-rural disparities in age at first marriage, age at first birth as well as first birth interval (Heaton et al., 1989). Several studies found that a difference in mean length of the first birth interval between urban and rural couples was apparent. Rural women had significantly shorter intervals from marriage to first

birth compared to urban women, among whom the process of fertility postponement was becoming gradually more prevalent (Luc et al., 1993). Circumstantial issues such as employment and housing should be accounted for. The fact that most urban women have a job not in close proximity to home while most rural women participate in domestic work and that housing is a major concern for newly married couples in urban areas as opposed to those in rural areas mean that the desire to plan or delay first birth will be different for rural and urban couples (Cao et al., 2000). Research has shown that rural couples lack a motive to delay first birth since women do not work away from home and thus there is significantly less use of contraception in rural areas. Mynarska (2007) confirmed in her research that the more common tendency towards fertility postponement following marriage mostly concerned couples with a medium level of education living in urban areas. In the Korean context, similar results were reported. Chung et al. (2006) concluded that not only did rural women had a shorter first birth interval compared to urban women but also noted that women whose longest time of residency prior to marriage was in a rural area exhibited a shorter first birth interval. The pattern of delaying first childbearing in urban settings can be seen as a way of accumulating consumer items before childbearing and it is expected to diffuse faster in more liberal urban settings where mostly highly educated people choose to reside. It can be inferred that this trend in family formation behavior distinct in urban and rural settings is emerging throughout the world as a result of modernization and urbanization.

There is a limited amount of relevant literature that delves into the relationship between first birth interval and variables at the aggregate level with the exception of the urban-rural classification and geographical division on the place of residence. It can be speculated that the process of matching between birth certificate data and aggregate data consisting of regional variables such as fertility-related policies, GRDP, employment rate, and housing variables to list a few, has yet to be conducted. In lieu of such an advanced technique, most work of literature on this subject matter is heavily concentrated on reaffirming how individual determinants affect the first birth interval.

## 2.2 Hypotheses

The hypotheses of this study are as follows:

1. Higher age at first marriage will result in an increased first birth interval
2. Parents with a higher level of educational attainment will have a shorter first birth interval than their less educated counterparts.
3. There will be a difference in the first birth interval across the occupation groups for fathers and the labor force participation status for mothers.
4. At the aggregate level, the first birth interval will vary across cities and counties in the Gyeonggi province.

### 3. Method

#### 3.1 Data and Sample

This study used the complete national birth certificate data and marriage registration data for 2008-2014 provided by the Microdata Integrated Service of Statistics Korea (<http://www.mdis.kostat.go.kr>) and the regional time-series data for the same time period, collected through the Korean Statistical Information Service (<http://www.kosis.kr>). Open access was permitted for both sources. Other sources from which regional data was extracted included Onnara Real Estate Information Portal, Gyeonggi Statistical Information Service, and Ministry of Land, Infrastructure and Transport.

The total number of births between the period of 2008-2014 was 825,910, of which certain criteria were considered to filter the initial dataset. Exclusion criteria were all non-first births, out-of-wedlock births, unknown marriage year and month of the parents, and any missing value in the individual variables from the birth certificate data. From the final database filtered and obtained from the birth certificate data (n=395,563), an additional step was taken to exclude any case in which marriage registration occurred later than birth registration. The final step was to extract only the birth data where the parents of the first childs were married in the year of 2008. As a result, the total sample size of n=55,137 was used in the analysis. Figure 2 below is the inclusion and exclusion criteria that illustrates the process of data selection.

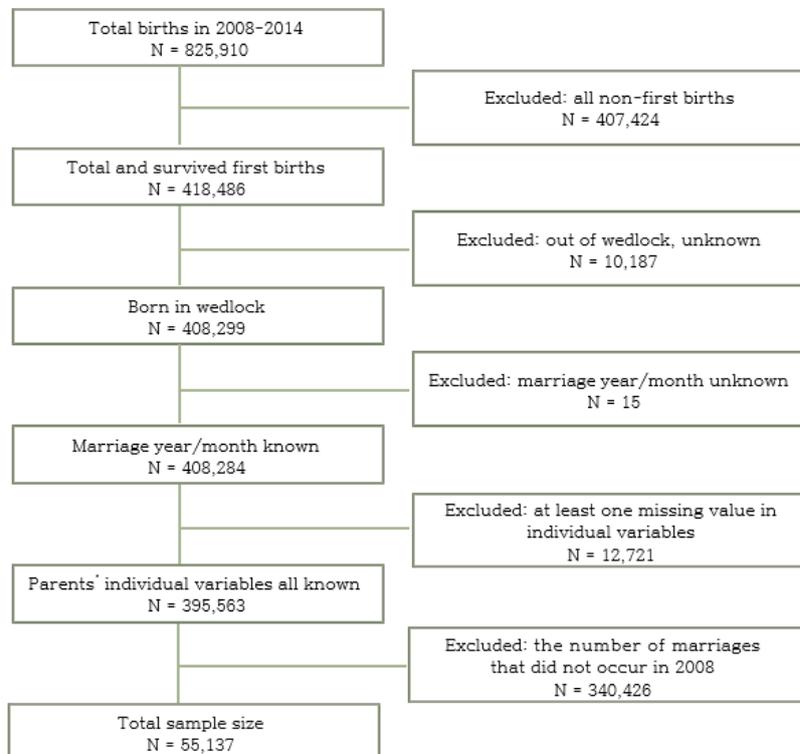


Figure 2. Inclusion and Exclusion Criteria

## 3.2 Variables and Measures

The response variable was the first birth interval, obtained from the birth certificate data. The first birth interval was defined by subtracting the parents' marriage year and month from the first child's birth year and month. The measure of this variable was in months in a total of six categories (under 10 months, 11-24 months, 25-36 months, 37-48 months, 49-60 months, and over 61 months), the first group being the reference group. The explanatory variables from this micro dataset used for analysis pertained to the demographic and socioeconomic characteristics of both parents. The characteristics of both parents included for analysis were age, difference in the age of the parents, education level categorized as high school graduates and university graduates, and occupation classifications. In the case of fathers, occupations were sorted into four main categories: professional or administrative occupations, office positions, sales service and general labor jobs, and the unemployed. In the case of mothers, they were regrouped into participants and non-participants in the labor force. The classification adhered to the list of occupations in the regional employment survey.

The second part of the explanatory variables in addition to those obtained from the micro dataset described above was obtained from the time-series macro dataset, which consisted of various characteristics of the cities and counties of the Gyeonggi province between 2008 and 2014. The macro dataset included but were not limited to demographic, housing, economic and child care policy related variables. This particular database can serve as a holistic summary of the context of each city and county in the province from which a pattern as to how each city and county has transformed yearly can be observed. Independent variables included in the macro dataset are further explained in the next sections with regards to their specifications and measurements.

### *3.2.1 Demographic variables*

Four major variables that illustrate the demographic trend across the 31 cities and counties in the Gyeonggi province during the period of investigation were examined. Average age at first marriage was obtained by calculating the sum of all women's age at first marriage in a given geographical area divided by the number of all married women in the given geographical area. Crude marriage rate was calculated as the number of total marriages occurring among the population of a given geographical area during a given year, per 1,000 mid-year total population of the given geographical area during the same year (OECD, 2016). In order to see the trend in migration among the population in their most fecund periods, age-specific migration into the Gyeonggi province was considered; the proportion of population aged 25-39 years migrating to a given city or county in the Gyeonggi province from Seoul, the capital city was calculated. Proportion of women in reproductive years with high educational attainment was found by calculating the number of women in their reproductive years (aged 15-49 years) with a university degree divided by the total female population in the same age range. All of the above data was collected from KOSIS.

### *3.2.2 Housing and geographical variables*

The rate of land price fluctuation was included as one of the housing variables. Focus was on land prices because most of the fluctuations in housing prices are driven by land prices in a particular geographical area rather than by the cost of structures (Davis and Heathcote, 2007). Measurement was conducted based on the sample of 70,000 lots of land out of total land transactions; the variable represents the change in the land price index, which is measured between January 1<sup>st</sup> of every year and the same date of the subsequent year. Other housing variables also included were the apartment *jeonse* and sales price indices, which measured the changes in rental housing prices and owner housing price of residential apartments, respectively. *Jeonse*, defined as rental housing price, refers to a real estate system specific to Korea that involves depositing a large sum of money, usually 30-80% of the property value or price, with the landlord for the duration of the lease. The diffusion ratio of houses refers to the ratio of the number of present houses in total to the number of total households, deducting one-person, institutional, and foreigner households from the total number of households; in simple terms, it is the house provision ratio. Finally the ratios of real estate transactions by the transaction type, and size of houses were included. The values of the above housing variables derived from housing data were supplied primarily by the Onnara Real Estate Information Portal that provides information about actual transaction prices, publicly notified land prices and officially posted housing prices. Proximity to Seoul refers to the distance between each city hall or county office in the province and the city hall in Seoul. The Euclidean distance was taken between Global Positioning System coordinates indicating the latitudes and longitudes of each city hall or county office in the province and the city hall of Seoul. The urban-rural and north-south geographical classification of a given city was made according to the classification of administrative districts provided by Gyeonggi Statistical Information Service. The count of new towns, which is a generic term for a planned city development or expansion, was obtained from the database of Ministry of Land, Infrastructure and Transport.

### *3.2.3 Economic variables*

Gross regional domestic product (GRDP) and GRDP per capita which measure the size of the region's economy, and the financial independence of the local government are traditional determinants that draw the economic situation of a region. The number of businesses per capita provides an overview of the business enterprise population and the level of economic activity in a particular region. The Organization for Economic Co-operation and Development defines the employment rate as the employment-to-population ratio, which is a macroeconomic statistic that indicate the ratio of the labor force currently employed to the total working-age population of a region, municipality or country. The employment rate of each city in the Gyeonggi province was calculated by dividing the number of people employed in a given city by the total population of working age in the same city. Female employment rate is the proportion of employed women out of the entire population in a given city. Total unemployment rate is defined as the percentage of the total labor force that is unemployed but actively seeking employment and willing to work (International Labor Organization, 2016); it was calculated by dividing the number of

unemployed workers by the total labor force. Age-specific employment rate was further considered for the 30-49 age group.

#### *3.2.4 Policy variables*

In order to examine the effect of policies aimed to promote childbearing and support childrearing, number of total day care facilities per child, the proportion of only public-run day care facilities out of the total, the existence of baby bonus scheme for the second child in each city, and the amount of cash incentives for the third child were the variables considered. The presence of daycare facilities in near proximity and the monetary aid from the local government to support childrearing are highly assumed to be an important determinant for parents in their decision to have their first child. Table 1 below is a list of all the dependent and independent variables included in the analysis.

Table 1. List of Variables from the Micro and Macro Dataset included in the Analysis

Variables		Contents	Note	Data
<b>Dependent</b>	First birth interval	<ul style="list-style-type: none"> <li>- The length of time between marriage and the first birth (months)</li> <li>&lt;10, 11-24, 25-36, 37-48, 49-60, 61+</li> </ul>		Microdata
<b>Independent</b>	Socio-demographic	<ul style="list-style-type: none"> <li>- Age at the time of marriage</li> <li>- Education level</li> <li>- Father's occupation</li> <li>- Mother's labor force participation status</li> </ul>		
	Demographic	<ul style="list-style-type: none"> <li>- Net migration rate of population aged 25-39 years</li> <li>- Proportion of women with a high education level</li> </ul>		Macrodata
	Housing/geographic	<ul style="list-style-type: none"> <li>- New towns - none/primary/secondary†</li> <li>- Urban/rural classification - urban/rural/semi-urban</li> <li>- Geographical classification - north/south</li> <li>- Proximity to Seoul</li> <li>- Rate of land price fluctuation</li> <li>- Apartment <i>jeonse</i> price index (Rental housing price)</li> <li>- Apartment sales price index (Owner housing price)</li> <li>- House provision ratio</li> <li>- Real estate transactions by type</li> <li>- Real estate transactions by house size††</li> </ul>	<p>† Primary: new towns built earlier Secondary: new towns built recently</p> <p>†† Proportion of houses with surface area less than 60m<sup>2</sup> out of the total number of houses</p>	
	Economic	<ul style="list-style-type: none"> <li>- Gross regional domestic product†††</li> <li>- Gross regional domestic product per capita†††</li> <li>- Financial independence rate</li> <li>- Number of businesses per capita</li> <li>- Employment rate</li> <li>- Female employment rate</li> <li>- Unemployment rate</li> <li>- Age-specific employment rate (30-49 years)</li> </ul>	†††Logarithm transformation used	
	Policy	<ul style="list-style-type: none"> <li>- Number of day care facilities per child</li> <li>- Proportion of public day care facilities</li> <li>- Baby bonus scheme for the second child</li> <li>- Amount of cash incentives for the third child†††</li> </ul>	†††Logarithm transformation used	

### 3.3 Statistical analysis

For this retrospective cohort study, the first part of the analysis was a descriptive summary of the distributions of the first birth interval categorized into six time periods by demographic and socioeconomic characteristics of the sample population, which refers to the parents of each first child considered in the study. Following the descriptive analysis of the sample, a multilevel multinomial logistic regression was conducted to investigate the effect of the various independent variables on the first birth interval both at the individual and aggregate levels. In the model for analyzing the relationship between individual variables and the response variable, a generalized logit was used as a link function and whereas the other model for multilevel analysis was performed with a log-normal distribution. This procedure was preceded by a stepwise regression. It is an automated tool utilized in the exploratory stages of the model building, performed to select a useful and appropriate subset of predictors by adding the most significant variable or removing the least significant variable during each step. All statistical analyses were conducted using the SAS 9.4 software.

The following describes the formula used to compute the first birth interval, the length of the time between marriage and the first birth at the individual level with the link function of a generalized logit:

$\pi_1$ : Reference group where the length of the interval is 0-10 months

$$\text{model 1: } \log \frac{\pi_j(x)}{\pi_1(x)} = \alpha_j + \beta_{j1}x_1 + \beta_{j2}x_2 + \beta_{j3}x_3 + \beta_{j4}x_4 + \beta_{j5}x_5 + \beta_{j6}x_6, \quad j = 2, \dots, 6$$

$x_1$ : paternal education,  $x_2$ : maternal education,  $x_3$ : paternal occupation,

$x_4$ : maternal labor force participation,  $x_5$ : paternal age at first marriage,

$x_6$ : maternal age at first marriage

$$\text{model 2: } \log \frac{\pi_j(x)}{\pi_1(x)} = \alpha_j + \beta_{j1}x_1 + \beta_{j2}x_2 + \beta_{j3}x_3 + \beta_{j4}x_4 + \beta_{j5}x_5, \quad j = 2, \dots, 6$$

$x_1$ : paternal education,  $x_2$ : maternal education,  $x_3$ : paternal occupation,

$x_4$ : maternal labor force participation,  $x_5$ : age gap between parents

## 4. Results

### 4.1 Regional characteristics

When the total number of first births in the Gyeonggi province were resorted into the six categories of time periods (the length of time it takes to proceed from marriage to first birth), it can be observed that approximately 42% of the total first births occurs within the first two years of marriage as shown by Figure 3. After the two-year interval, however, the proportion of the first births falls drastically to approximately 15% in the 25-36 months range. In the subsequent intervals a gradual decrease in the number of first births can be seen. In addition, a notable observation is that in the recent years, there is a significant proportion of pre-marital conception and thus the birth interval is less than 10 months, which has reached almost 30% of the total number of first births.

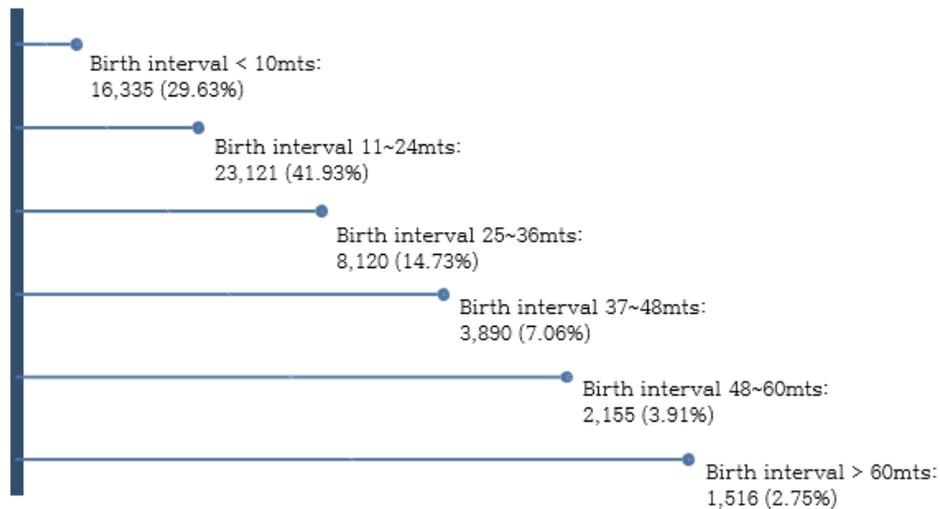


Figure 3. Distribution of the number of first births according to the six categories of birth intervals

Table 2. Number and proportion of first births 2008-2014 from couples married in 2008 by cities and counties.

City	2008		2009		2010		2011		2012		2013		2014	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Suwon	803	14.1299	2438	42.8999	1295	22.7873	577	10.1531	307	5.4021	173	3.0442	90	1.5837
Seongnam	447	9.4204	2043	43.0558	1198	25.2476	525	11.0643	273	5.7534	181	3.8145	78	1.6438
Uijeonbu	278	15.8857	735	42	403	23.0286	163	9.3143	98	5.6	48	2.7429	25	1.4286
Anyang	305	10.339	1203	40.7797	773	26.2034	347	11.7627	166	5.6271	98	3.322	58	1.9661
Bucheon	514	12.3885	1735	41.8173	1017	24.5119	455	10.9665	244	5.8809	117	2.82	67	1.6148
Gwangmyeong	188	10.1021	695	37.3455	516	27.727	267	14.3471	111	5.9645	53	2.8479	31	1.6658
Pyeongtaek	340	17.7453	864	45.0939	406	21.19	145	7.5678	85	4.4363	39	2.0355	37	1.9311
Dongducheon	44	13.4969	137	42.0245	87	26.6871	28	8.589	15	4.6012	10	3.0675	5	1.5337
Ansan	495	14.9728	1511	45.7048	723	21.8693	305	9.2257	157	4.7489	69	2.0871	46	1.3914
Goyang	446	11.8114	1551	41.0752	903	23.9142	420	11.1229	255	6.7532	126	3.3369	75	1.9862
Gwacheon	20	7.1174	118	41.9929	65	23.1317	36	12.8114	24	8.5409	14	4.9822	4	1.4235
Guri	106	11.804	387	43.0958	219	24.3875	99	11.0245	46	5.1225	25	2.784	16	1.7817
Namyangju	287	13.0218	825	37.4319	526	23.8657	303	13.7477	136	6.1706	73	3.3122	54	2.4501
Osan	152	11.7194	555	42.7911	316	24.3639	148	11.4109	72	5.5513	32	2.4672	22	1.6962
Siheung	292	15.4171	827	43.6642	403	21.2777	191	10.0845	80	4.2239	61	3.2207	40	2.1119
Gunpo	208	12.3662	678	40.3092	439	26.0999	190	11.2961	101	6.0048	41	2.4376	25	1.4863
Uiwang	78	12.2642	258	40.566	150	23.5849	64	10.0629	49	7.7044	23	3.6164	14	2.2013
Hanam	77	11.7021	298	45.2888	162	24.6201	68	10.3343	30	4.5593	16	2.4316	7	1.0638
Yongin	453	10.8089	1621	38.6781	1030	24.5765	525	12.5268	311	7.4207	157	3.7461	94	2.2429
Paju	210	14.3836	535	36.6438	349	23.9041	169	11.5753	106	7.2603	52	3.5616	39	2.6712
Icheon	155	16.0455	453	46.8944	203	21.0145	85	8.7992	41	4.2443	21	2.1739	8	0.8282
Anseong	133	14.3629	454	49.0281	185	19.9784	81	8.7473	42	4.5356	19	2.0518	12	1.2959
Gimpo	106	11.5092	368	39.9566	213	23.127	99	10.7492	56	6.0803	51	5.5375	28	3.0402
Hwaseong	418	11.6014	1521	42.2148	897	24.8959	421	11.6847	177	4.9126	120	3.3306	49	1.36
Gwangju	129	11.4769	492	43.7722	247	21.9751	121	10.7651	72	6.4057	40	3.5587	23	2.0463
Yangju	89	14.4013	248	40.1294	146	23.6246	77	12.4595	31	5.0162	19	3.0744	8	1.2945
Pocheon	71	15.368	237	51.2987	93	20.1299	30	6.4935	19	4.1126	7	1.5152	5	1.0823
Yeosu	73	18.6701	201	51.4066	66	16.8798	28	7.1611	11	2.8133	6	1.5345	6	1.5345
Yeoncheon	14	16.092	49	56.3218	16	18.3908	4	4.5977	2	2.2989	2	2.2989	0	0
Gapyeong	19	11.5854	85	51.8293	29	17.6829	15	9.1463	11	6.7073	4	2.439	1	0.6098
Yangpyeong	21	9.8131	108	50.4673	41	19.1589	17	7.9439	14	6.5421	6	2.8037	7	3.271

There are 28 cities and 3 counties in the Gyeonggi province. Densely populated cities, for instance Suwon and Seongnam are often industrialized and urbanized therefore the majority of their regional characteristics tend to be higher in values, indicating a larger proportion of residents with high education attainment, higher GRDP, a higher employment rate, a lower unemployment rate, and a larger number of businesses per capita, all of which represent a more stabilized but active economic cycle. Table 2 displays the number and proportion of first births in each region between 2008 and 2014 from couples married in 2008, with the assumption that the place of marriage and birth are the same. Across the cities and counties, most of births occurred in 2009, followed by 2010. In the vast majority of the cities, the proportion of premarital conception or premarital pregnancy was often higher than that of later interval births. In addition to the table above, a city-by-city comparison can be made (see Appendix I), which shows how a city has transformed in the duration of seven years from the demographic, socioeconomic and policy perspectives.

## 4.2 Demographic and Socioeconomic Characteristics of Individuals

Table 3. Descriptive statistics for the first birth interval by demographic and socioeconomic characteristics of parents in the Gyeonggi province.

Individual characteristics	First birth interval						
	< 10 months	11-24 months	25-36 months	37-48 months	49-60 months	> 61 months	
Paternal age at marriage *	30.38(4.43)	30.72(4.11)	30.37(3.72)	30.32(3.81)	30.23(3.66)	30.23(3.64)	
Maternal age at marriage *	27.67(3.92)	27.93(3.54)	27.90(3.17)	27.76(3.19)	27.81(3.15)	27.84(2.99)	
Age gap between parents *	3.34(3.48)	3.31(3.73)	2.95(3.14)	3.06(3.29)	3.01(3.02)	2.91(3.09)	
Paternal education**	High school	6041(37.60)	6371(39.65)	1901(11.83)	918(5.71)	481(2.99)	355(2.21)
	University	10294(26.35)	16750(42.87)	6219(15.92)	2972(7.61)	1674(4.28)	1161(2.97)
Maternal education**	High school	6337(37.43)	6713(39.65)	2006(11.85)	962(5.68)	542(3.20)	372(2.20)
	University	9998(26.17)	16408(42.95)	6114(16.00)	2928(7.66)	1613(4.22)	1144(2.99)
Paternal occupation**	Prof/admin	3699(25.00)	6131(41.43)	2340(15.81)	1238(8.37)	793(5.36)	597(4.03)
	Office	6560(28.26)	10073(43.40)	3708(15.98)	1613(6.95)	773(3.33)	484(2.09)
	Sales/service	5267(34.89)	6118(40.53)	1848(12.24)	921(6.10)	542(3.59)	400(2.63)
	unemployed	809(39.81)	799(39.32)	224(11.02)	118(5.81)	47(2.31)	35(1.72)
Maternal labor force participation**	Yes	5094(25.38)	8737(43.54)	3163(15.76)	1535(7.65)	891(4.44)	648(3.23)
	No	11241(32.05)	14384(41.01)	4957(14.13)	2355(6.72)	1264(3.60)	868(2.48)

\* mean (SD); \*\*N (%)

According to the descriptive statistics for the first birth intervals by the demographic and socioeconomic characteristics of parents in the province in Table 3, the number of first births in each category of the birth intervals differed by the demographic and socioeconomic characteristics of parents. With regards to education, there was a distinct difference between high school graduates and university graduates for both husbands and wives. Results show that a greater number of children were born to parents who are university graduates than high school graduates. In addition, first births occurring within the 10 months of marriage, thereby interpreted as pre-marital conception, were most prevalent among both husbands and wives with lower education level, accounting for 37.60% and 37.43%, respectively. In contrast, among those who were university graduates, the general pattern for both husbands and wives was that pre-marital conception is significantly reduced (26.35% and 26.17%, respectively) and that there was a greater number of births as the interval between marriage and the time of first childbearing was increased. As for husband's occupation, the general trend was that they tended to have their first child within the first two years of marriage. The proportion of pre-marital conception was the lowest in the first group, consisting of professional and administrative-related occupations, while unemployed husbands exhibited a substantial portion of first child births within 10 months of marriage. Women who participated in labor force have fewer children than their counterparts, those who did not participate in labor force. There was a higher proportion of pre-marital conception among the non-participants in the labor force and the birth intervals tended to be shorter in this group.

Table 4. The effect of individual characteristics of parents on the first birth interval – Univariate multinomial logistic

Individual characteristics		First birth interval (ref= 0-10 months)				
		11-24months	25-36months	37-48 months OR (95% CI)	49-60 months	>61 months
Paternal age at first marriage		1.020 (1.015-1.025)	0.999 (0.993-1.006)	0.996 (0.998-1.005)	0.991 (0.980-1.022)	0.991 (0.978-1.004)
Maternal age at first marriage		1.021 (1.015 - 1.027)	1.019 (1.011 - 1.027)	1.008 (0.998 - 1.018)	1.011 (0.999 - 1.024)	1.014 (0.999 - 1.029)
Age gap between parents		0.998 (0.993 - 1.004)	0.967 (0.959 - 0.975)	0.977 (0.967 - 0.987)	0.972 (0.959 - 0.986)	0.963 (0.947 - 0.979)
Paternal education	Ref: high school					
	University	1.543 (1.478 - 1.610)	1.920 (1.807 - 2.039)	1.900 (1.753 - 2.059)	2.042 (1.836 - 2.271)	1.919 (1.697 - 2.171)
Maternal education	Ref: high school					
	University	1.549 (1.485 - 1.616)	1.932 (1.820 - 2.050)	1.929 (1.782 - 2.089)	1.886 (1.703 - 2.090)	1.949 (1.727 - 2.200)
Paternal occupation	Ref: unemployed					
	Prof/admin	1.678 (1.510 - 1.866)	2.285 (1.953 - 2.673)	2.295 (1.872 - 2.813)	3.690 (2.723 - 5.001)	3.731 (2.631 - 5.290)
	Office	1.555 (1.403 - 1.723)	2.041 (1.751 - 2.380)	1.686 (1.379 - 2.060)	2.028 (1.498 - 2.747)	1.705 (1.201 - 2.422)
	Sales/service	1.176 (1.059 - 1.306)	1.267 (1.083 - 1.483)	1.199 (0.976 - 1.472)	1.771 (1.303 - 2.408)	1.755 (1.233 - 2.499)
Maternal labor force participation	Ref: no					
	Yes	1.340 (1.285-1.398)	1.408 (1.332-1.448)	1.438 (1.338-1.546)	1.556 (1.419-1.705)	1.647 (1.480-1.833)

Table 4 presents results from the univariate analysis of the multinomial logistic regression; the results have been converted into odds ratios to be less affected by the sampling scheme. As paternal age at first birth increased the odds of having a first birth decreased in later intervals, which means that the likelihood for having a first birth within the reference interval, within the 10 months of marriage, was higher. Paternal age at first marriage was only significant when the birth interval was in 11-24 month-range and subsequently the statistical significance disappeared. Maternal age at first marriage had a larger effect on the first birth interval than paternal age at first birth as it was statistically significant in the two groups of birth interval in the ranges of 11-24 months and 25-36 months; there was a higher probability of women having their first child in the former interval as their age at first marriage increased. As maternal age at first marriage increased the odds of having a first birth slightly increased in later intervals, decreasing the probability of first birth within the reference interval group. However such a result was not statistically significant.

As for both paternal and maternal education, those who were university graduates generally exhibited a higher odds of having their first child in later intervals compared to those who were high school graduates; the higher educated were less exposed to pre-marital conception. The relationship between education level and the first birth interval was statistically significant for both parents. Employment variables were strong determinants of the first birth interval. Among the groups of paternal occupation, professionals and administrative workers showed a stronger tendency, towards statistical significance, to have a first child at a progressively later time following marriage. The odds of professionals and administrative workers having their first child were the highest in the last two birth intervals in the ranges of 49-60 months and over 61 months. This group of people also were found to delay their first birth more than the rest of the groups. Finally, mothers who participated in the labor force were more likely to delay their first birth

compared to their counterparts who did not participate in the labor force. The odds of female labor force participants delaying their first childbearing were higher in the later intervals and was also statistically significant. As seen through results, assumptions can be made that socioeconomic variables pertaining to education level, occupation groups and labor force participation status had much stronger relationships with the first birth interval whereas age of parents was not a robust factor in determining the first birth interval.

Table 5. The effect of individual characteristics of parents on the first birth interval – Multivariate multinomial logistic I

Individual characteristics		First birth interval (ref= 0-10 months)				
		11-24months	25-36months	37-48 months OR (95% CI)	49-60 months	>61 months
Paternal age at first marriage		1.023 (1.017 - 1.028)	0.998 (0.990 - 1.006)	1.001 (0.990 - 1.011)	0.990 (0.976 - 1.003)	0.988 (0.973 - 1.004)
Maternal age at first marriage		0.996 (0.990 - 1.003)	1.003 (0.994 - 1.013)	0.990 (0.978 - 1.001)	0.999 (0.983 - 1.015)	1.002 (0.984 - 1.021)
Age gap between parents						
Paternal education	Ref: high school					
	University	1.252 (1.189 - 1.319)	1.376 (1.281 - 1.478)	1.374 (1.249 - 1.512)	1.524 (1.345 - 1.727)	1.383 (1.196 - 1.599)
Maternal education	Ref: high school					
	University	1.289 (1.226 - 1.356)	1.470 (1.371 - 1.575)	1.487 (1.355 - 1.631)	1.355 (1.203 - 1.526)	1.448 (1.258 - 1.668)
Paternal occupation	Ref: unemployed					
	Prof/admin	1.385 (1.243 - 1.543)	1.848 (1.576 - 2.166)	1.861 (1.514 - 2.288)	2.937 (2.161 - 3.992)	2.947 (2.071 - 4.194)
	Office	1.336 (1.204 - 1.483)	1.729 (1.481 - 2.020)	1.432 (1.169 - 1.754)	1.695 (1.249 - 2.301)	1.417 (0.995 - 2.301)
	Sales/service	1.177 (1.059 - 1.307)	1.327 (1.133 - 1.555)	1.257 (1.022 - 1.545)	1.870 (1.374 - 2.545)	1.837 (1.288 - 2.618)
Maternal labor force participation	Ref: no					
	Yes	1.186 (1.134 - 1.239)	1.153 (1.088 - 1.221)	1.187 (1.101 - 1.280)	1.271 (1.155 - 1.398)	1.352 (1.210 - 1.511)

Table 6. The effect of individual characteristics of parents on the first birth interval – Multivariate multinomial logistic II

Individual characteristics		First birth interval (ref= 0-10 months)				
		11-24months	25-36months	37-48 months OR (95% CI)	49-60 months	>61 months
Paternal age at first marriage						
Maternal age at first marriage						
Age gap between parents		1.014 (1.009 - 1.020)	0.988 (0.979 - 0.996)	0.998 (0.987 - 1.009)	0.993 (0.979 - 1.007)	0.982 (0.965 - 0.999)
Paternal education	Ref: high school					
	University	1.254 (1.191 - 1.321)	1.367 (1.272 - 1.469)	1.368 (1.243 - 1.505)	1.520 (1.341 - 1.723)	1.372 (1.186 - 1.587)
Maternal education	Ref: high school					
	University	1.301 (1.237 - 1.368)	1.459 (1.361 - 1.564)	1.472 (1.342 - 1.615)	1.345 (1.194 - 1.515)	1.431 (1.243 - 1.648)
Paternal occupation	Ref: unemployed					
	Prof/admin	1.422 (1.277 - 1.583)	1.853 (1.581 - 2.172)	1.846 (1.503 - 2.269)	2.892 (2.129 - 3.928)	2.914 (2.049 - 4.144)
	Office	1.368 (1.233 - 1.517)	1.731 (1.483 - 2.021)	1.421 (1.161 - 1.740)	1.671 (1.231 - 2.267)	1.400 (0.984 - 1.992)
Maternal labor force participation	Ref: no					
	Yes	1.199 (1.079 - 1.332)	1.333 (1.138 - 1.561)	1.253 (1.019 - 1.540)	1.851 (1.360 - 2.518)	1.826 (1.281 - 2.601)
		1.185 (1.134 - 1.239)	1.147 (1.083 - 1.215)	1.182 (1.096 - 1.274)	1.268 (1.153 - 1.395)	1.345 (1.203 - 1.503)

Table 5 and 6 shows results of the multivariate analyses from the multinomial logistic regression. In the multivariate analysis, when one variable was examined, all other variables were controlled; and it excluded any variable that had proven to be statistically insignificant in the previous univariate analysis. Paternal age at first birth and maternal age at first marriage and the age difference between parents were not as important as the other individual variables. Those variables were omitted in the multivariate analysis because not only were they statistically not significant, they also had a very weak relationship with the first birth interval even when statistical significance was attained in a few response groups. The first analysis was performed without the age difference between parents and the second analysis was performed without the paternal and maternal ages at first marriage. The results of the multivariate analysis were similar to those the univariate analysis with the exception of the age gap between parents, which was the only variable with reduced significance.

## 4.2 Effect of Various Regional Characteristics on the First Birth Interval

Table 7. Effects of individual and regional predictors on the first birth interval – Multilevel analysis (log-normal distribution)

	variable	First birth interval					
		Model 1	Model 2	Model 3	Model 4	Model 5	
		Estimate (SD)					
Micro - socio-demographic	Paternal age at first marriage	0.005117*** (0)	0.006297*** (0.000512)	0.006549*** (0.000521)	0.005359*** (0)	0.007112*** (0.000430)	
	Maternal age at first marriage	0.003146*** (0.000689)	0.00423*** (0.000596)	0.004038*** (0.000607)	0.003615*** (0.000634)	0.004314*** (0.000501)	
	Paternal education	Ref: high school					
		University	0.06081*** (0.005601)	0.04100*** (0.004851)	0.04021*** (0.004936)	0.05019*** (0.005159)	0.2989*** (0.004079)
	Maternal education	Ref: high school					
		University	0.05742*** (0.005437)	0.04592*** (0.004708)	0.04263*** (0.004791)	0.04771*** (0.005008)	0.03011*** (0.003957)
	Paternal occupation	Ref: unemployed					
		Prof/admin	0.1124 (0.01188)	0.08298 (0.01029)	0.07832*** (0.01047)	0.08751 (0.01094)	0.05139 (0.008645)
		Office	0.08869 (0.01157)	0.07231 (0.01002)	0.05150 (0.01019)	0.06376 (0.01066)	0.03987 (0.008419)
		Sales/service	0.07165*** (0.01173)	0.05004*** (0.01016)	0.04336*** (0.01033)	0.05355*** (0.01080)	0.03098*** (0.008532)
	Maternal participation in labor force	Ref: no					
	Yes	0.03624*** (0.004576)	0.01982*** (0.003962)	0.02227*** (0.004031)	0.02619*** (0.004215)	0.01771*** (0.003329)	
Demographic	Net migration rate of 25-39 population	-28.5762*** (1.2178)				-6.5286*** (1.3205)	
	Women with high education	43.2484*** (0.2327)				17.0875*** (0.3287)	

\* p<0.005; \*\* p<0.01; \*\*\* p<0.001

	Variables	First birth interval					
		Model 1	Model 2	Model 3	Model 4	Model 5	
		Estimate (SD)					
Housing/geographical	ref: none						
	Newtown status	Primary	0.4272 (0.01078)			0.1142 (0.009704)	
		Secondary		0.3140*** (0.03056)			-0.6503*** (0.02885)
		Ref: rural					
	Urban/rural classification	Urban	0.5393 (0.3293)				-4.0976 (2.9489)
		Semi-urban		0.5242 (0.2646)			-0.4789 (2.4510)
		Ref: south					
	Location of city	North	0.01948 (0.1708)				-2.1062 (1.5278)
	Proximity to Seoul		-0.001133 (0.006649)				-0.2431*** (0.05571)
	Rate of land price fluctuation		1.8458*** (0.03177)				0.2658*** (0.03102)
	Rental housing price		4.0334*** (0.02738)				2.2069*** (0.03942)
	Owner housing price		-3.9935*** (0.06304)				-1.9509*** (0.05770)
	House provision rate		0.004202*** (0.000283)				0.007033*** (0)
	Housing transaction_sale		4.2989*** (0.7340)				4.0948*** (0.6399)
	Housing transaction_new houses for sale		0.9877 (0.7660)				-2.5804*** (0.6802)
	House size_ <60m <sup>2</sup>		-24.3387*** (0.7563)				-11.8128*** (0.6769)

\* p<0.005; \*\* p<0.01; \*\*\* p<0.001

	Variables	First birth interval				
		Model 1	Model 2	Model 3 Estimate (SD)	Model 4	Model 5
Economic	GRDP (log)			6.7293*** (0.05561)		2.9849*** (0.05676)
	GRDP per capita (log)			-1.6372*** (0.04329)		-0.5936*** (0.03750)
	Financial independence rate			-0.02554*** (0.000760)		-0.00084 (0.000684)
	Total businesses per capita			16.9505*** (0.4736)		0.4245 (0.4880)
	Employment rate			-0.04821*** (0.003194)		-0.1170*** (0.003077)
	Female employment rate			0.03179*** (0.002203)		0.007751*** (0.001930)
	Unemployment rate			0.03732*** (0.003873)		-0.00269 (0.003508)
	Employment rate 30-49			-7.9171*** (0.1578)		-3.7605*** (0.1396)
Policy	Daycares - total				-0.5200 (0.6474)	-0.5955 (0.8278)
	Daycares - public				0.000773 (0.000938)	0.004574*** (0.001360)
	2nd child policy	ref: no Yes			-0.05908 (0.08022)	0.4543*** (0.06546)
	3rd child policy - incentive (log)				0.1575*** (0.005478)	-0.02088*** (0.004961)

\* p<0.005; \*\* p<0.01; \*\*\* p<0.001

As shown in Table 7, the effect of regional characteristics on the first birth interval was examined through a multilevel analysis. When individual characteristics were controlled there was a set of variables at the regional level that had a significant effect on the first birth interval. Most of the explanatory variables at the regional level exhibited significant relationships with the first birth interval, the response variable. As the net migration rate of the population aged 25-39 years in the Gyeonggi province increased, the first birth interval was decreased by 28.57 units. As the proportion of women with a high level educational attainment increased, it can be assumed to take longer for first childbearing to occur after marriage. The values of the estimates for these predictor variables were quite high indicating a greater impact on the criterion variable.

There are significant relationships between real estate transactions. The rate of land price fluctuations has a significant impact on the first birth interval in that when rigorous fluctuations of land price will likely to widen the first birth interval. This phenomenon is further clear when the interactions between housing prices and the first birth interval are taken into account. As the rental housing price increases, the birth interval tends to increase whereas the interval tends to decrease when the owner housing price increases. There is also a positive, but weak, relationship between a city's diffusion ratio of houses and the first birth interval in the same city. When there is a higher number of real estate transaction that is classified as not a rental or installment payment but a sale, the first birth interval increases by approximately 4 units. Lastly, the probability of having a shorter first birth interval was higher in cities with new towns

compared to their counterparts without new towns.

The relationships between economic variables and the first birth interval at the regional level were parallel with those at the individual level, presenting consistent results. As a city's GRDP increased first childbearing was delayed for a longer interval. However, a contrasting effect was observed: as the GRDP per capita of a city increased, the first birth interval decreased overall. The higher the financial independence of a city, the city's first birth interval decreased. There was a positive relationship between the total number of businesses per capita and the first birth interval. Moreover, a higher employment rate in a city indicated a reduced first birth interval, which was parallel with the result where a higher unemployment rate increased the first birth interval. However, a higher female employment rate in a city led to an increased first birth interval; this result also aligned with the result of the individual analysis that women who participated in the labor force exhibited a longer birth interval. Age-specific employment rates were also all statistically significant factors of the first birth interval. In the three age groups, only the employment rate of the population aged 30-49 years showed a negative relationship with the first birth interval. The employment rate of the population aged 15-29 years and that of the population aged 50 years and over were both positively correlated with the first birth interval.

As the number of total day care facilities in a city increased, the first birth interval was shown to increase substantially. Of the total day care facilities, when the number of public-operated day care facilities increased the first birth interval increased, but by very little. A city that offered a baby bonus scheme for the second child had a shorter first birth interval than a city without such policy, although with less significance. Among the cities that offered such a policy, the first birth interval was reduced when the amount of the incentive was increased, indicating a negative relationship between the two variables.

## 5. Discussion

Previous studies have shown the importance of the length of time between first marriage and first childbearing on the subject of low fertility. Various individual characteristics are known to be associated with the first birth interval. However, research that focuses on the first birth interval has been somewhat lacking in Korea. The main findings of the present study related to the specific associations between both individual characteristics of parents and various regional characteristics on the first birth interval in the Gyeonggi province based on the cumulated data from each of the 31 cities and counties in the province. According to the findings of several analyses performed, some of the findings at the individual level were consistent with those at the regional level, confirming they were robust and conspicuous predictors of the first child birth. In particular, the likelihood for mothers who were university graduates to delay their first childbearing was higher than that of those who with a lower level of educational attainment, which matched with the finding that a city with a larger proportion of highly educated women tended to exhibit a longer first birth in general. Since education is a well-established proxy variable for employment and income, a similar outcome, or direction of relationship could be expected when female employment rate was considered. There was also a significantly positive relationship between a female employment rate of a particular region and the first birth interval; as a region's female employment rate was higher the overall first birth interval tended to be increased. Such phenomena were evident from other previous literature. As expected, a city's economic situation reflected the decision for the time of childbearing after marriage. Employment rate negatively affected the first birth interval and accordingly, unemployment rate exerted an opposite effect, both of which confirmed the notion that the economic stability of a living environment played a key role in influencing its constituents' first birth intervals. Del Bono et al. (2015) also came to similar conclusion that labor market instability are at the roots of recent trends in low fertility observed in many countries. Their research demonstrated that unemployment exerts a negative effect on the level and time of fertility, implying that career and employment considerations are important determinants of fertility.

Another noteworthy outcome of this study was that fluctuations in the real estate market and housing prices accordingly in a given city were significant factors that affect a couple's timing of their first birth. The general trend was that the higher the housing price regardless of rental or sales, the longer the duration between first marriage and first childbearing. As already discovered in previous studies, rising home values had a negative effect on birth rates since they represent heavy living costs; on average, it is the largest component of the cost of raising a child: larger than food, childcare or education (Dettling and Kearney, 2014). It can be inferred that when the price of housing rises, the price of having children also rises, leading couples to delay childbearing, have fewer children or even forgo having a child altogether. From a contrasting perspective in the context of homeowners, since housing constitutes a substantial portion of household affluence, when the price of housing escalates, the wealth of homeowners also rises accordingly, thereby leading them to readily available in terms of resources, to have a child sooner or have additional children. Another study that examined the relationship between housing price and urban fertility rate at the aggregate level confirmed that fertility rate is higher in cities where housing is more

spacious or housing price is lower (Pan and Xu, 2012). Couples become more reluctant towards planning their first birth when they realize their affordability for a matrimonial home, an utmost resource for raising children, is limited.

The Gyeonggi provincial government has been successful in the recent implementation of a new housing policy ("Ddabok House Policy, 2015") as a trial aiming to recover from the low fertility crisis at the regional level. This policy entails the provision of rental housing targeted at newly married young couples to encourage family formation with at least two children in as many communities as possible in the province. The incentive is based on a differential approach where the subsidy for the rent increases and the period allowed for residence can be extended for those who give additional births. The ultimate pursuit of this provisional policy is to incentivize newly married couples to have at least two children per household so as to prevent the postponement of childbirths or childless families, helping couples to shift their first childbirth to an optimal time following their marriage.

While environmental factors may exert a stronger impact on the couple's fertility intention and the time of their first childbearing, direct incentives in the form of maternity payments have been shown to have an impact, though it may be only temporal. The study's findings noted that in cities that offered a "baby bonus" scheme to encourage more births, couples had a higher propensity to reduce their first birth interval. However, the result may convey skepticism and thus should be interpreted meticulously since the baby bonus policy itself in most cities had not been activated for long enough at the time of data collection and it should also be noted that the baby bonus payment is a one-time only incentive. Considering these demerits of the baby bonus scheme, it may be merely extrapolating to acknowledge that first birth intervals can be reduced from the implementation of such a policy. There are similar policies in many countries in an attempt to boost their fertility rate. Drago et al. (2009) examined in his research that a similar policy was initially implemented in Australia to encourage women to have more children and has been effective; fertility intentions grew after the announcement of the baby bonus and the birth rate is estimated to have risen modestly as a result. It can also be speculated that more births occur in earlier periods following marriage.

The findings of this study were generally consistent with results from the previous research project conducted by the Gyeonggi provincial government and Seoul National University (Cho et al., 2016). According to the research report, major determinants of childbearing at the aggregate level were crude marriage rate, GRDP, rate of land price fluctuation and total employment rate. The retaining of matrimonial home prior to marriage must become less onerous. Housing and housing assets are influential factors for childbirth and that housing policy for newly married couples should be enhanced to increase childbirth. A higher housing price can be an important factor for fertility decline and postponement of having children. Economic stability along with employment growth must be maintained in order to proceed from marriage to the first birth. Intriguing outcome was produced by simulations that were run by adjusting several significant variables to estimate future fertility rate; when the employment rate, the GRDP, and the crude marriage rate of the Gyeonggi province were raised by 15%, 20% and 10%, respectively, the total fertility rate of the province also moved from 1.23 to 1.43. Another recent

report (Cho et al., 2016) on the projection of future fertility rate in the Gyeonggi province stated that the level of education attainment of parents is a primary associative factor of both marriage rate and fertility rate. The established relationship was that the higher the level of one's education level, the more likely marriage and childbirth occur. The primary interpretation of this result was that as the gap in the level of education becomes wider, it can also lead to a larger differential in the marriage and fertility rate. There was a higher proportion of university graduates than that of high school graduates among the total number of marriages and fertility rate, and in conjunction with the present study, while it was those highly educated people, especially men rather than women, that proceeded to marriage and chose to have their first child, but the duration between the two events simply happened to be longer among this group of population. While the two research projects concentrated solely on the quantum aspect of fertility, these served as supplementary resources for the present study to build background knowledge on the regional characteristics of Gyeonggi province and its current fertility issues.

Along with the results mentioned above, an interesting finding was that in the Gyeonggi province, first births from premarital conception or premarital pregnancy took up a noticeable portion of the total number of first births, signifying that premarital coitus among young adults may have become sufficiently ubiquitous compared to the past in the conservative Korean culture. The rise in premarital pregnancy can be attributed to several factors, one of which may be marriageability of men, which refers to whether or not they can afford to get married even before the consideration of having children. England et al. (2013) proposed the rationale for premarital pregnancy in their study that when men are less marriageable, because they are not economically active due to non-employment, or earn low wages due to poor job prospects, marriage is often delayed or forgone, putting women at risk of a premarital conception for longer, and making marriage a less viable option when a premarital conception does occur. Thus it can be deduced that individual socioeconomic status is partially intertwined with the occurrence of premarital pregnancy, an increasingly important social issue. Although premarital pregnancy has long been frowned upon and regarded as a taboo in the Korean culture, because marriage and childbirth are the two events that occur one after another, premarital pregnancy may be viewed as a triggering factor that would provoke marriage imminently whether it takes place before or after childbearing due to the traditional values and perception that the process of raising a child must occur within a family setting.

## 5.1 Implications

Important implications of the present study derive from the finding that the timing and the interval of births can directly affect women of reproductive ages and the overall fertility rate. Late marriages and the subsequent pregnancy of advanced maternal age can serve as the major causes of infertility from the biological perspective and thereby carrying over to decline in the overall fertility rate. Also the second major contribution of the this study is that it has achieved to identify not only demographic grounds for the decline in fertility but also understand with public health perspectives in which population groups old age marriage and pregnancy of advanced maternal age are prone to occur. In this sense, it may be of great benefit to recommend policy

means under which regular obstetrics and gynecology medical examinations can be provided at the regional level targeted to those who are at risk of late pregnancy. For instance, in those population groups where the length of the first birth interval appears to be low in general, psychological therapy programs for family planning and prevention programs may be offered at the local level to prevent health risk behaviors that may trigger an adverse effect postponing the time of childbearing.

As seen through the results of the analysis, individual and regional education level and economic factors, employment variables in particular, were significant in triggering couples to postpone the time of first birth most likely due to time constraints. One possible way to minimize the consequence is to achieve a work-family balance through shortened hours of labor, work schedule that is more flexibly regulated and active recruitment to reduce the frequencies of employment gap especially among women who may hesitate childbearing in the fear of not being able to return to labor force. Achieving work-family balance not only enables women to earn thereby improving the dependency ratio but also helps to recover falling fertility rates so that childbearing at the optimal time of women's reproductive years becomes more feasible.

Efforts to create an environment that encourages the timing of the first birth to occur earlier and first birth intervals to be shortened must be put forth by each region. Local governments should work towards improving fertility from an employment and housing point of view. Another task is to create a "birth-friendly" environment so that the decision to get married and have children does not become a burden to individuals and married couples. One of the first steps towards achieve such a mission is to alleviate the issues in the real estate markets. When a city exhibits wide fluctuations in the housing prices, especially an increase in price, there is a higher tendency for late marriages and the subsequent delays in the first birth because the ability to afford housing is an extreme burden in most circumstances. Although lowering the housing prices or drastically increasing the provision of houses may be difficult to achieve imminently, there is an urgent need for an effective policy that can stabilize the rate of land price fluctuations across the 31 cities and counties in the province.

## 5.2 Limitations

This study has several limitations on the utilization of the data and the findings proposed. First, because the personal identification serial number could not be obtained from Statistics Korea, there was substantial difficulty in carrying out the procedure where birth certificate data and marriage registration data were matched. This implies the occurrence of considerable bias and inaccuracy when the length of time between marriage and first birth is estimated. Another shortcoming of this study is that prior to conducting the analysis, certain assumptions had to be established, one of which was that both events, marriage and first child birth, must have had to occur in the same city or county. The second assumption is that the inflow and outflow of people with similar characteristics are set as equal. These assumptions have to be met in order for the findings to be in effect. Finally, this research would benefit greatly if more individual characteristics were included other than socio-demographic variables. Economic variables that

denote personal income and wealth, status of home ownership, the aftermath of the International Monetary Fund crisis, discontinuity of careers for women may be considered. Psychological-behavioral variables such as change in perceptions of marriage and having children and the degree of motivation for family formation may be included. Finally, biological variables such as reduced fecundity may also be considered. If appropriate data could be acquired accordingly, the inclusion of more variables that represent a more comprehensive range of characteristics of the parents would make this research more useful for the analysis of the first child interval. As for limitation on data, the fact that the right-censored data, the number of first-child births in the interval above 61 months, was not included limits the applicability of the study's findings. The total number of marriages in 2008 was unknown, the ramification of which was that the present study could not compare against people who were married in 2008 *and* never had a child. The absence of a control group makes the design of this study weak, but future research could usefully extend on this matter. In spite of these limitations addressed above, the present study will serve as a valuable addition to the existing literature that pertains to the subject matter of first birth interval in the Korean context examined both at the individual and aggregate levels.

## 6. Conclusion

The present study was able to amplify the importance of the tempo effect of fertility in addition to the importance of quantum effect, which is already widely discussed in preliminary literature. Focusing on the 31 provinces in the Gyeonggi province as the primary residential environment, the study explored the phenomenon of delayed first child birth following marriage and why there are differences in the length of time between the two events. Demographic and socioeconomic factors were primarily examined at the individual and aggregate levels from 2008 to 2014. While paternal age at first marriage was not as significant as assumed and maternal age at first birth was significantly affecting the first birth interval only to a certain extent in the earlier intervals, after which the significance disappeared. Education and labor force participation of parents and active economy along with stable real estate market of a city appeared to be influential factors that can provoke a reduced first birth interval and ultimately mitigate the low fertility rate in Korea (see Fig. 4 and Table 8). The findings of this study may not completely align with the initial hypotheses, but add to the insufficient literature of first birth intervals in Korea. It is highly likely that the findings of this study will serve as a reference for prospective research concerning first birth intervals and also contribute to the implementation of more effective low fertility and policy response at the provincial level for the decrease in the first birth interval in Korea.

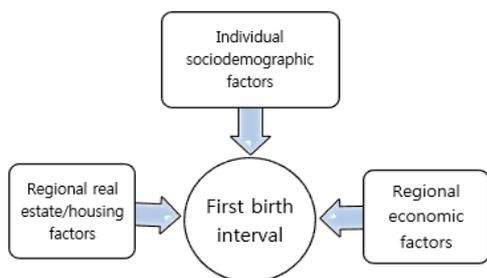


Figure 4. Summary diagram of the main determinants of the first birth interval

Table 8. Significant variables influencing the first birth interval.

Variables	
<b>Individual socioeconomic</b>	<ul style="list-style-type: none"> <li>- Education level</li> <li>- Paternal occupation</li> <li>- Maternal participation in the labor force</li> </ul>
<b>Regional real estate market/housing</b>	<ul style="list-style-type: none"> <li>- Newtown status</li> <li>- Rate of land price fluctuation</li> <li>- Rental housing price</li> <li>- Owner housing price</li> <li>- Housing transaction_sale</li> <li>- Housing transaction_new houses for sale</li> <li>- House size_&lt;60m<sup>2</sup></li> </ul>
<b>Regional economic</b>	<ul style="list-style-type: none"> <li>- GRDP &amp; GRDP per capita</li> <li>- Financial independence rate</li> <li>- Employment rate</li> <li>- Unemployment rate</li> <li>- Female employment rate</li> <li>- Employment rate 30-49</li> </ul>

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## 혼인에서 첫출산 이행간격에 미치는 영향요인 분석 - 경기도 31개 시·군을 중심으로

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**연구배경:** 출산력에 대해 기존에 수행되었던 연구들은 출산력 수준을 결정짓는 요소로서 출산의 양 (자녀 수) 혹은 추가자녀출산 여부에만 주안점을 두었고 그 만큼이나 중요한 출산간격시기에 대한 연구는 미비한 실정이다. 특히 경제활동참여 여성들의 첫째아에서 둘째아 출산 이행 여부에 대한 논의는 꾸준히 시행되었으나 무자녀에서 첫째아 출산 이행까지의 기간을 집중적으로 분석한 연구는 아직까지 활발히 진행되지 않았다. 첫 출산시기가 늦어지거나 출산간격이 길어질수록 전체 출산수준이 낮아질 확률이 높다는 것을 고려하면 단순히 출산 여부나 자녀의 수가 아닌 출산의 시기 및 이에 영향을 주는 결정요인들에 주목해야 할 필요가 있다.

**연구목적:** 본 연구의 목적은 국내에서 인구 규모가 가장 큰 지방자치단체인 경기도 31개 시·군 수준에서 2008-2014년 동안의 인구 및 사회경제적 변수들과 해당 기간의 출생신고 원자료를 활용하여 구축한 시계열 데이터베이스를 바탕으로 경기도에 거주하고 있는 가임기 여성들이 혼인 후 첫째아 출산까지 소요되는 평균 기간의 추이와 현황을 분석하는 것이다. 궁극적으로 본 연구의 분석결과를 통하여 첫째아 출산까지 걸리는 시간에 영향을 미치는 결정요인들을 규명하고 파악할 수 있다. 이 때, 개인적인 특성뿐만 아니라 거주하고 있는 지역의 특성을 추가적으로 반영하여 첫출산 간격의 결정요인을 분석하고 어떠한 환경이 혼인에서 첫출산 이행의 간격을 짧게 혹은 늦추게 하는지 모색한다.

**연구방법:** 본 연구는 통계청의 마이크로데이터통합서비스 (MDIS)에서 제공하는 경기도의 출생신고 원자료(2008-2014)와 국가통계포털(KOSIS)의 시계열 자료를 활용하였다. 종속변수는 첫째아 출생년월과 부모의 결혼년월의 차이를 의미하는 첫 출산간격이며 독립변수로는 부모의 인구사회학적 특성과 경기도 31개 시군의 지역적 특성을 반영한 주거 (부동산), 고용 및 경제, 보육정책 변수들을 포함하였다. 종속변수인 첫 출산간격을 총 6개의 범주로 설정하고 개인 수준과 지역 수준에서 독립 변수들의 영향력을 측정할 수 있는 다수준 다항 로지스틱 회귀분석(Multilevel multinomial logistic regression)을 실시하였다. 모든 연구의 분석은 SAS 9.4를 이용하였다.

**연구결과:** 첫출산 간격에 미치는 영향으로 개인의 인구사회학적 요인과 지역의 경제 및 고용, 그리고 주거 요인이 가장 돋보였다. 개인 수준에서는 부모의 교육수준, 부의 직업군, 모의 경제활동 여부가 첫 출산간격에 유의미한 결과를 미치는 것으로 나타났다. 부모의 학력이 높을 경우, 부의 직업이 전문가 및 관리직에 속할 경우, 그리고 여성이 경제활동에 참여할 경우 첫 출산 간격이 증가하는 것으로 나타났다. 하지만 초혼 연령이나 부모 연령의 차이는 크게 중요하지 않은 요소였으며 특히 부의 초혼 연령은 유의미하지 않은 것으로 나타났다. 지역수준에서는 전체 인구대비 고학력 여성의 비율이 높을수록 그리고 여성의 고용률이 높을수록 시군의 출산간격이 증가하는 것으로 보였는데 이는 개인수준에서의 결과와 일치하는 바이다. 또한 시군의 경제적 상황이 좋지 않을수록 첫 출산 간격이 증가하는데 이러한 현상은 고용이 불안정하거나 자가 마련이 어려울 때 첫 출산을 미루거나 기피하는 것으로부터 기인한다. 뿐만 아니라 주거비용이 증가하거나 부동산 시장에서 지가 변동률이 클 때 첫 출산간격이 늘어나는 것을 확인할 수 있었다.

**결론:** 본 연구는 낮은 출산력을 유지하는 원인의 하나로 첫 출산간격에 변화를 주는 영향요인에 대해 분석하였으며 이를 통해 출산의 양 뿐만 아니라 출산의 속도의 중요성 역시 강조하였다. 경기도에 있는 시군들을 중심으로 거주 환경 측면에서 결혼 후 출산 지연 현상을 파악하였고, 개인의 교육수준 및 직업 그리고 지역의 고용 및 주거 변수의 영향이 중요하다는 결과를 도출하였다. 현재까지 출산력에 관한 주요 연구는 개인 데이터를 수집하여 정책 선호도 및 가치관 변화 등을 분석하는데 그쳤다면 본 연구는 상대적으로 주목 받지 못한 집단 및 지역 데이터를 추가적으로 활용함으로써 그 의의가 더 크다고 사료된다. OECD 국가들 중 꾸준히 하락하고 있는 우리나라의 출산력 수준과 더불어 지역 출산율을 회복하기 위해 결혼 후 첫째아 출산시기까지의 기간을 줄이는데 효과적인 인구 및 저출산 정책 발굴에 필요한 기초연구자료로 활용될 수 있을 것이다. 본 연구를 통해 혼인 후 출산시기를 앞당길 수 있도록 해당 지역의 환경을 고려한 새로운 출산장려 정책의 방향 수립에 기여할 수 있기를 바란다.

**주요어:** 첫출산 간격, 출산력, 초혼연령, 초산연령, 부모진입, 템포효과, 경기도, 한국

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