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A Study on the Determinants of Childbirth in Primary Local Government Districts in South Korean 'Do' Metro Provinces

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April, 2019

Martin School of Public Policy and Administration

Graduate Capstone

Directed by J. S. Butler, PhD

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Executive Summary

Korea is experiencing a very serious low fertility rate. As of 2017, Korea has a fertility rate of 1.05, which is the lowest among the G20 countries. The low fertility rate can lead to pension burden problems and economic recession problems. In particular, the Primary Local Government Districts (PLGDs) in "Do" Metro provinces in Korea may have a problem of a decrease in the agricultural population, and the reduction of organizational and administrative functions due to the reduction of fiscal income. To solve the low fertility rate, we need to identify factors that affect childbirth, and to engage in policy related to these factors. Through literature review, I have identified several variables related to childbirth. In my analysis, I examine the effect of the following factors in particular on the childbirth rate in Primary Local government Districts: childbirth celebration grant, international marriage, obstetrics and gynecology clinics. I set the childbirth celebration grant for the first child and second child, the employment rate for women, the employment rate for men, the number of international marriages, the number of marriages (excluding international marriages), the number of obstetrics and gynecology clinics, and the number of daycare facilities as independent variables, and the number of childbirths as dependent variable.

I performed multiple regression analysis, using all 152 PLGDs in DOMPs as the analysis unit, with independent variables for 2016, and dependent variables for 2017 data due to the time lag in pregnancy. The results of multiple regression analysis show that the birth celebration grant for first child, the number of international marriages, the employment rate of women, the number of obstetrics and gynecology clinics and the number of marriages statistically significantly affect the childbirth. These results suggest that primary local governments need policy intervention in the childbirth celebration grant policy, international marriages, obstetrics and gynecology clinics, and employment rate of women to increase childbirth.

1. Introduction

The total fertility rate[1] for South Korea in 2017 was 1.05, the lowest level since Korea National Statistical Office (NSO) issued statistics in 1970.

Figure1. The fertility rate of South Korea (1970~2017)
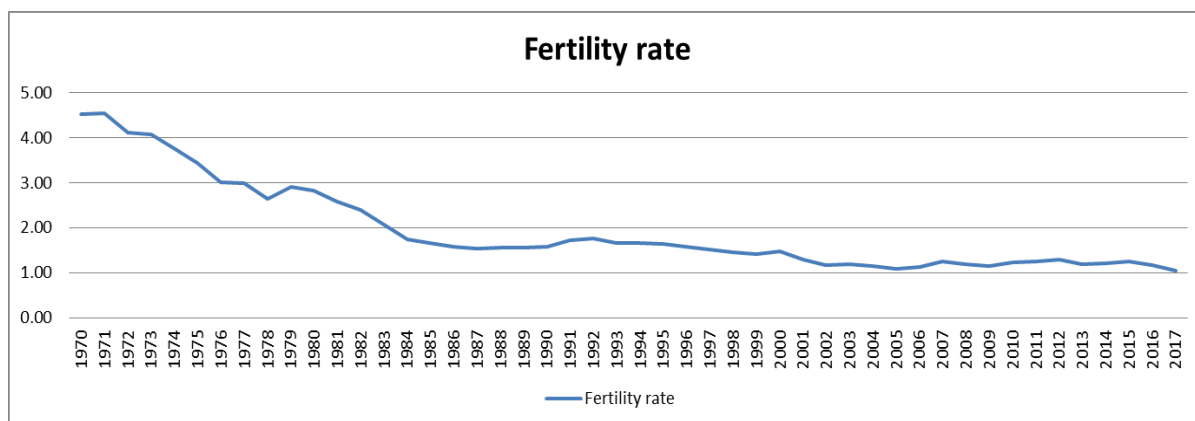
< source : Korean statistical information service(KOSIS) >

According to OECD data, the fertility rate was 1.2 as of 2016. Korea has the lowest birth rate among the G20 countries in 2015 and 2016.

Figure2.　Fertility Rate of the G20 Countries in 2015 and 2016

<source : https://data.oecd.org/pop/fertility-rates.htm>

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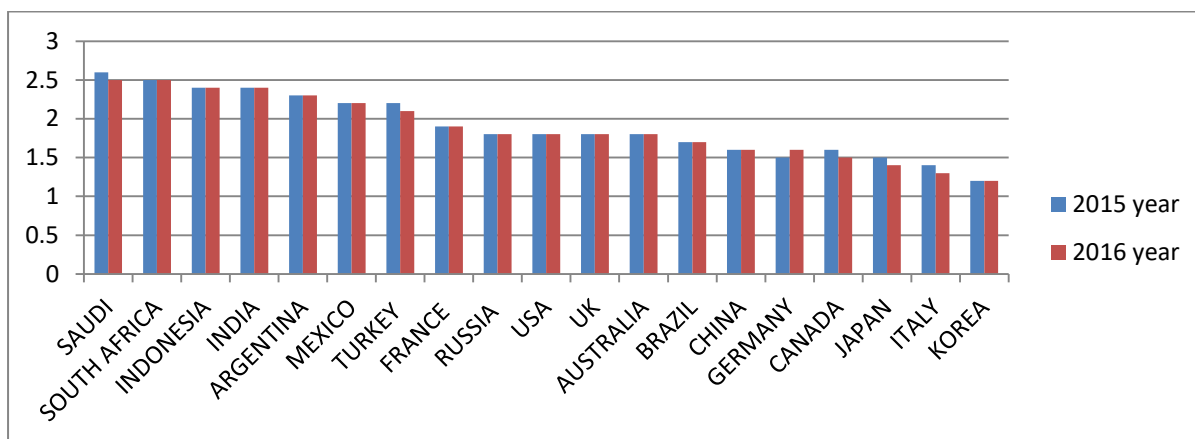
[1] Total Fertility Rate(TFR) : the average number of births a woman is expected to have during the period of childbearing (15 to 49 years).　After calculating the fertility rate by age, adding all the fertility rates for each age is the total fertility rate.

The low rate of childbirth in Korea may cause several problems. The biggest problem is the pension problem. In order to give pensions to the elderly, it is necessary to raise taxes from the young. When the elderly population is large and the number of young people is small, the young have to pay more taxes. Koreans receive a national pension from the age of 65. From figure 3, according to the population forecast made by Korea National Statistical Office (NSO), the number of people aged 65 or older (green) will increase continuously from 2000 to 2045, and from Table 1, it increased from 3,395,000 persons in 2000 to 18,179,000 persons in 2005. However, there is a decrease in the working age population (blue) aged 15 to 64 who have to pay the pension.   As shown in Table 1, the working age population will decrease from 33,702,000 persons in 2000 to 27,718,000 persons in 2045.

Figure3. Working age population, Population aged 65 over, Elementary student population
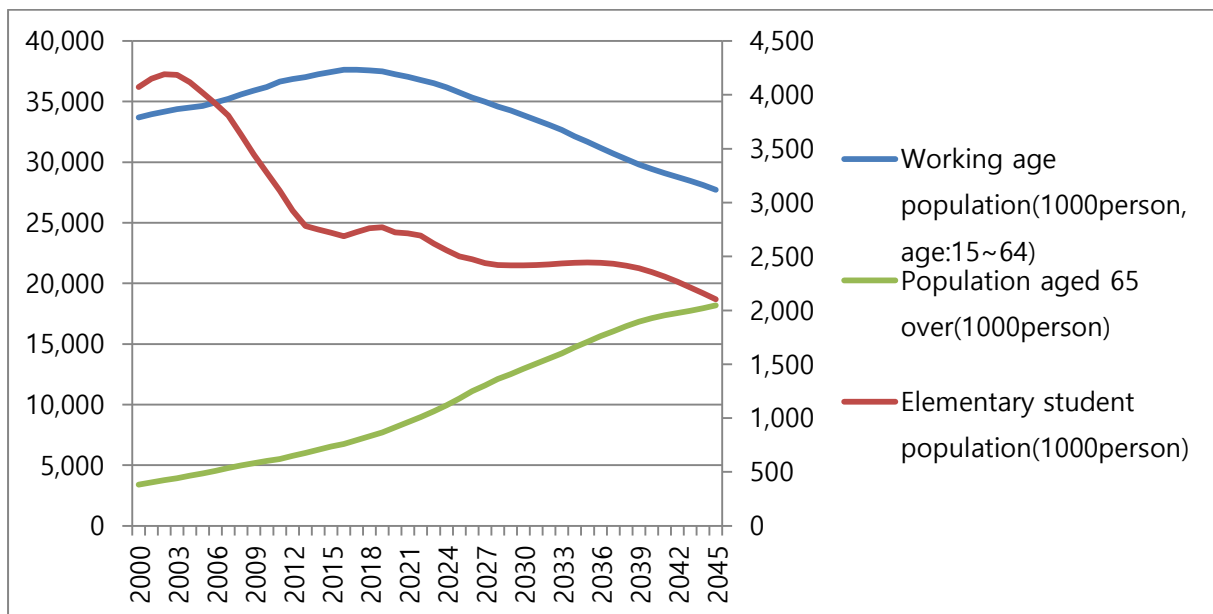

Table1. Working age population, Population aged 65 over, Elementary student population

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045
Working age population	33,702	34,641	36,209	37,444	37,266	35,757	33,878	31,677	29,431	27,718

(1000person, age:15~64)										
Elementary student Population (1000person)	4,073	4,018	3,280	2,720	2,725	2,502	2,417	2,444	2,356	2,104
Population aged 65 over (1000person)	3,395	4,321	5,366	6,541	8,134	10,508	12,955	15,176	17,120	18,179

< source : Korean statistical information service(KOSIS) >

Second, the economy is likely to decline. If the population of economically active workers is reduced, the gross national product will be reduced due to the decline of labor provided by the working age population, which is a factor of production.

Third, unemployment may occur in the field of education due to changes in social structure. When the fertility rate is lowered, the schooling population will decrease due to the decrease in population due to the low birthrate. Looking at Figure 3, the number of elementary school students (red) shows a trend of declining. The number drops from 4,073,000 in 2000 to 2,104,000 in 2045. This means that the number of schools and of teachers may be reduced by half.

In the case of Primary Local Government District (PLGD)[2], which called "GUN" or "City", in DO Metro Province (DOMP), there are additional problems due to the decrease in the population.

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[2] In Korea, Primary Local Government District (PLGD) is the basic administrative unit. In Korea, there are PLGD in 'DO' metro province and PLGD in metropolitan cities. They are the same administrative unit, but they are different in character. Since the PLGD in the metropolitan city is an area inside the metropolitan city, it has the same as the metropolitan character. However, the PLGD in 'DO' metro province is rural. Compared to the United States, there is no exact match, but it is similar to county or city (town). PLGD in a metropolitan city is similar to a county in New York or Chicago, and PLGD in a 'DO' metro province is similar to a county near Lexington.

The decline in population can have a significant impact on the finance and administrative structures of the PLGDs in DOMPs. Population, by itself, affects the income of the local tax, and the population is also an important criterion for the central government to calculate the general grants-in-aid on the PLGDs in DOMPs. Many PLGDs in DOMPs have a low level of financial independence and depend heavily on the central government's general grants-in-aid.[3] The greater is the population, the greater the general grants-in-aid from the central government.[4] The population is also a criterion that determines the size of the administrative organization of PLGDs.[5] According to the presidential decrees, the number of PLGDs' officials and the number of organizations (the number of bureaus or departments) of PLGDs is determined by the population. The larger the population, the more civil servants and organizations can be set up. This means that various kinds of administrative services can be provided professionally.

Another problem is the steady decline in farm population and rice farming. One of the main functions of PLGD in DOMP is agriculture. In particular, Koreans eat rice as a staple food, so many farmers cultivate rice. Rice farming in Korea is labor-intensive. Unlike the USA, the mountainous terrain characteristic of Korea makes it impossible to produce rice through machines. Looking at Figure4 and Table2, the population of farm households is gradually decreasing, and the rice farming family is also decreasing. In the long run, the decline in rice farming could be a threat to food security because rice may depend on foreign

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[3] According to the statistics of the KNSO in 2016, the average financial independence of the DOMP is (local tax + extra revenue) * 100 / general account budget), with an average of 37.33%.

[4] (Enforcement decree of Local finance law) §36-③ : In the distribution of general grants-in-aid, an amount equivalent to 50/100 of the total amount of general grants-in-aid shall be distributed in proportion to the population size of a relevant PLGD(City/Gun)

[5] Decree on the standard of the administrative organization and capacity of civil servants of PLGD §13 The installation standards of the bureaus or departments in PLG shall be in accordance with Table 3 Number of departments by population size and §22 PLGD should determine the number of civil servants based on their population.

imports.

Figure4. The number of Farm Families and Rice Farming Families
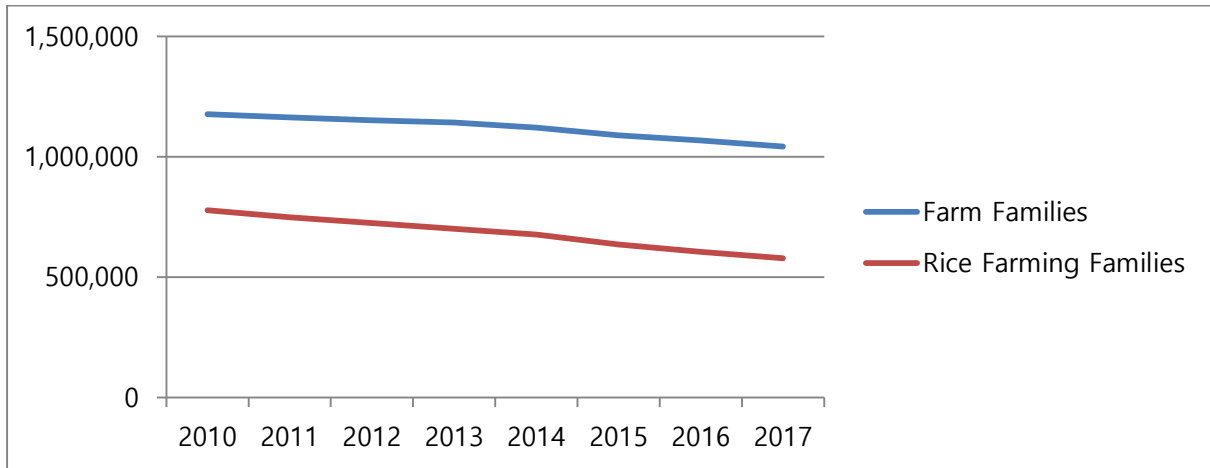
Table2. The number of Farm Families and Rice Farming Families

	2010	2011	2012	2013	2014	2015	2016	2017
Farm Families	1,177,318	1,163,209	1,151,116	1,142,029	1,120,776	1,088,518	1,068,274	1,042,017
Rice Farming Families	777,467	748,398	724,058	700,079	676,257	635,364	605,116	578,760

< source : Korean statistical information service(KOSIS) >

Therefore, the PLGDs in DOMPs try to raise the childbirth of that area. Increasing childbirth in local governments ultimately can help raise childbirth across the country.

In this capstone, I research what factors contribute to the childbirth of PLGDs in DOMPs. In addition to the factors found in previous studies, I identify the factors that are more characteristic of the PLGDs in DOMPs and how they affect childbirth.

There are two important features of the PLGDs in DOMPs.

First, many PLGDs in DOMPs provide childbirth celebration grants (BCG) to encourage childbirth. Out of total 152 PLGDs in DOMPs, 107 PLGDs (70.4%) have implemented this policy. In contrast, 18 PLGDs (24.3%) out of total 74 PLGDs in metropolitan cities provide childbirth grants. It is necessary to check whether this policy affects the childbirth rate. Moreover, it is necessary to check whether the difference in the amount of the grant given by each municipality differs according to the region, and whether it affects childbirths. If the childbirth celebration grants (BCG) contribute to the births, the BCG policy could be further expanded and the level of the support amount be raised.

Second, another characteristic of PLGDs in DOMPs can be compared with PLGDs in metropolitan city, which is the imbalance of sex ratio of marriage age, which is severe. The imbalance in sex ratio reduces the possibility of marriage. Having a low possibility of marriage may reduce the chances of giving birth.

Table 3 shows that sex ratios are unbalanced when we look at the most common marriageable population (25-44years). According to the data of NSO, the average male to female ratio of metropolitan cities is 102.89%, and in all provinces there are more men than women. The average male to female ratio of the DOMPs is 107.94%. In particular, the average male to female ratio of the DOMPs excluding Gyeonggi - DOMP which is located near Seoul metropolitan city is 111.73%. The sex ratio imbalance appears higher in DOMPs than in the metropolitan city.

Table3. The sex ratio in Metropolitan Cities and DOMPs (DO-metro provinces)

Administrative District (age : 25-44years, person)	2016		
	Men	Women	Ratio
Metropolitan Cities	3,390,522	3,295,220	102.9%
DO-metro provinces	3,860,799	3,576,726	107.9%
DO-metro provinces (except Gyeonggi-do)	1,963,550	1,757,453	111.7%

<source:KOSIS >

In detail, this sex ratio imbalance appears greater at PLGDs in DOMPs. Table 4 shows the male to female sex ratio of the PLGs in North JEONRA-DOMP. Therefore, it is not easy for men to marry.

Table4. The sex ratio of some PLGDs in North JEONRA-DOMP

Administrative District (age : 25-44years)	2016 year		
	Men	Women	Ratio
MUJU-GUN	2,273	1,841	123.5%
IMSIL-GUN	2,583	1,882	137.2%
GOCHANG-GUN	5,216	4,155	125.5%
BUAHN-GUN	5,192	4,233	122.7%

<source:KOSIS >

A low possibility of marriage can be alleviated by the international marriage. According to the statistics of the Korea National Statistical Office (NSO), the international

marriage rate is higher in the PLGDs in DOMPs than those in metropolitan cities.[6]

The high number of international marriages means that there is a possibility that the chance of giving birth will increase. Therefore, it is necessary to understand how the international marriage rate affects the childbirth of the PLGD in DOMPs. If it has a positive effect, a policy that encourages international marriage can be implemented.

I research how these factors affect the childbirth of PLGDs in DOMPs, considering the characteristics of PLGDs in DOMPs. Therefore, my research topic is what factors affect the childbirth of PLGDs in DOMPs.

2. Literature review

Childbirth and Various factors

Previous researchers have examined variables that may affect childbirth. There are studies that divided economic factors and social factors (Choi, 2010; Lee 2013), and there are also studies that mention government policy factors (Lee, 2006) and parenting factors (Min, 2013). However, apart from economic factors, the same variables are classified into different factors according to the researcher, and there is no particular classification standard. For the sake of clarity, I divide the variables of past research into economic factors and non - economic factors. In detail, the economic variables include mothers' occupation, unemployment rate, BCGs, monthly income, private education expenses, and government budget for childcare facilities (Lee, 2006; Song, 2012; Kim 2014; Ahn 2015). Non-economic variables include divorce rate, marriage age, marriage rate, number of day care facilities, and number of kindergartens (Min 2013; Lee 2013; Kim 2016).

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[6] According to the NSO, the international marriage rate of the metropolitan cities in 2015 is 5.91% and that of DOMPs is 7.06%.

Among the economic variables, female labor market participation may reduce childbirth (Choi, 2010). Becker (1981) suggested that an increase in female economic activity means that stable income can be obtained, which means that the opportunity cost of giving birth is increased, and eventually the birth rate is lowered. On the contrary, an increase in the husband's participation in labor market may be a factor in reducing the cost of childcare since it can bring stable income to households. Therefore, I will add variable (the male's participation in labor market) to the model, judging that increasing the male's participation in labor market can also be a factor that affects childbirth.

The provision of childcare facilities increases childbirth by relieving the burden of childcare. Especially for women with jobs, it reduces the opportunity cost of giving birth. In this way, the existing literature suggests that when there is a favorable environment for raising a child, childbirth increases (Lee, 2013).

I add the number of the obstetrics & gynecology clinics[7] as one of the environmental factors that are beneficial for giving birth to a child. If there are obstetrics & gynecology clinics in a residential area, pregnant women can get medical services promptly to avoid problems, or if they are physically unwell. Especially in Korea, the number of the obstetrics & gynecology clinics can affect childbirth. In Korea, all citizens are enrolled in national health insurance and pay premiums in proportion to their income. As a result, people can easily get medical services by a specialist at very low prices ($ 10~15). So, in Korea, a large number of specialist doctors start up private clinics for their specialty in residential areas. Korean people can easily find a specialist clinic in which a specialist doctor is operating. Since many people can easily receive specialist medical care, Korean people do not want to

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[7] Unlike the United States, Korea does not separate obstetrics and gynecology, but operates them in combination.

go to general clinics, but they go to specialist clinics such as ophthalmology, dermatology, psychiatry, pediatrics, orthopedics, and obstetrics & gynecology. Therefore, families planning to give birth should carefully consider whether there are obstetrics & gynecology clinics in their area of residence. If there are obstetrics & gynecology clinics, the environment to give birth to a child is more favorable.

Childbirth Celebration Grant (BCG)

There is a need to look at the study of grants of PLGDs among economic factors. Many primary local governments in Korea provide childbirth celebration grants(BCG) to increase childbirth. The BCG is a cash payment by the primary local governments to the household when the child is born. These grants are intended to increase the number of births in the area. Policy makers enact and implement this policy because they believe the theory that increasing disposable income of households with cash subsidies will help encourage having children. Households can use this income for a combination of goods and childbirth expenses, in which expenses on a child are consumption composition of the household. If household income increases, the income effect occurs, which leads to an increase in demand for children, which ultimately leads to a higher rate of childbirth (Becker, 1981; Hong, 2011). In addition, raising the household income artificially can alleviate the cost of raising the child, which has a positive effect on the decision to give birth.

Since 2005, the policy of BCGs has been implemented in Korea, and there have been ongoing empirical studies to determine the effectiveness of BCGs. However, despite this theoretical basis, different studies produce different results on the policy effects of the BCGs. There has been no consensus yet, as a result of a study in which BCGs increase statistically significantly childbirth and a study in which there is no statistical significance. Lee (2014) conducted a panel regression analysis on the effects of BCG on the number of births for 230

primary local government districts (PLGDs) nationwide from 2001 to 2010. The study found that that the BCG increased the number of births and the effects were statistically significant. Drago, et al. (2009) analyzed the cash subsidized child grant 'Baby Bonus' in Australia since 2004 using the Australian Household Panel Data (HILDA) and found that child grant has a significant positive effect. In addition, there are other studies that have found statistical significance by analyzing the quantitative data on the BCGs (Hah, 2011, Park & Song, 2014)

There is also a finding from studying attitudes and opinions about the policy effect of the officials in charge of childbirth through questionnaires. The government officials in charge of childbirth expressed their perception of the current policy. Lee (2013) surveyed 181 government employees in charge of childbirth measures among 228 PLGDs nationwide and asked them the degree of effect of policies on the BCGs. According to an analysis of public officials' perceptions, they are judging that economic support for the policy of giving birth has a positive effect on childbirth. The survey method, however, has the disadvantage of being involved with the subjectivity of the responsible government employees, but it is meaningful in that it is the experience of the government employees working first at the policy implementation site.

However, there are also studies showing that the effect of BCGs is not statistically significant. Kim (2016) analyzed the impact of the BCG on the birthrate in the 25 PLGDs in Seoul from 2012 to 2014, using demographic and sociological and economic factors. The analysis found that the BCG did not have a significant effect on the birth rate, and marital status. In addition, a study has analyzed the effects of BCGs by using Seoul and 15 metropolitan cities as analysis units (Chae, 2015) and a study that analyzed by using 25 PLGDs in Seoul during 2005-2009 as analysis units found effects that were not statistically significant (Seok, 2011).

However, the similarities of the above studies that did not find statistical significance were limited to the unit of analysis as PLGDs in metropolitan city or metropolitan cities themselves. Therefore, further study is needed to see if there is any effect in case of PLGDs in DOMPs only as the unit of analysis. The policy might be more effective in DOMPs.

Childbirth and International marriage

The existing literature on international marriage is mainly about the settlement of international married women and the status of raising children of international marriages. There has been no study of whether international marriages affect childbirth. Among the studies, a survey of 126 international marriage couples found that clear language communication enhances the satisfaction of couples (Jee, 2008). Therefore, the government needs to push for systematic support of Korean language education programs aimed at foreigners like ESL in the U.S.A.

Although it is not a study on international marriages, there has been a study in which unmarried men living in PLGDs in North Gyeongsang-DO point out that the imbalance of male and female sex ratio is the reason why it is difficult to get married (Kim, 2013).

3. Research Design

1) Basic framework of the study

This capstone analyzes the factors that affect the childbirth of PLGDs in DOMPs[8]. I

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[8] The reason I did not make the whole of Korea as a population is that the PLG in the metropolitan city and the PLG in the 'Do' metro provinces (DOMP) are heterogeneous (population, social infrastructure, etc.). I think that researching regions with different characteristics on the same basis and then generalizing the results distort the phenomenon.

have identified several variables related to childbirth through the literature review. Among them, I would like to explain whether the independent variables such as the level of BCG for the first child, that of BCG for the second child, the number of international marriages, the number of marriages (except international marriages), female employment rate, male employment rate, the number of obstetrics & gynecology clinics, and the number of daycare center facilities affect the number of childbirths which is the dependent variable. These independent variables can be categorized into economic factors and non-economic factors.

Figure5. The conceptual framework on the determinants of child birth
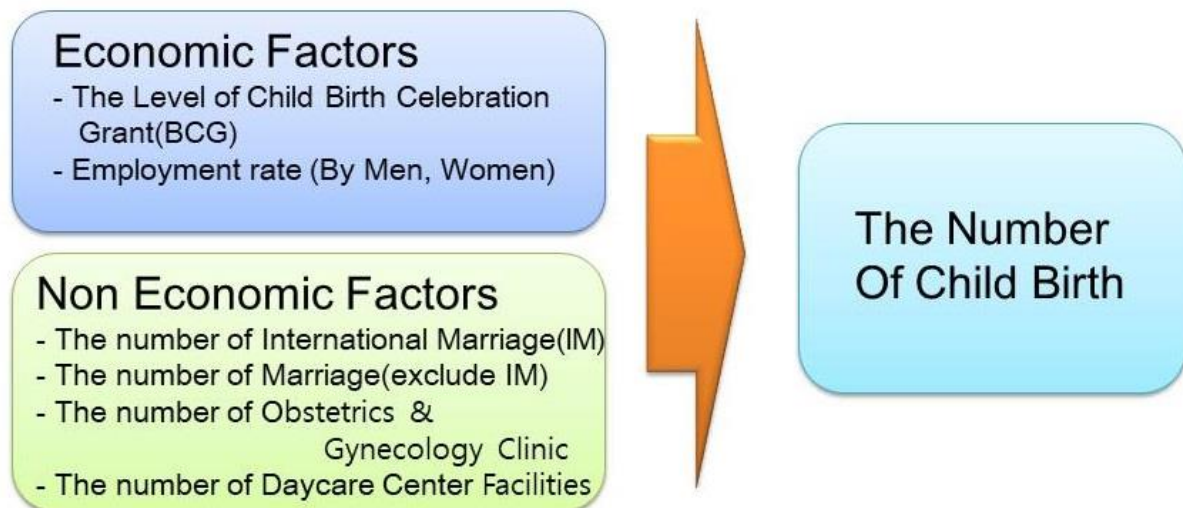
2) Data Source

The data used in this capstone were collected from the statistical data of KOSIS, the national official statistical system in Korea, and the relevant ministry (Ministry of Health and Welfare). Specifically, the number of childbirths, the number of international marriages, the number of marriages (except international marriages), male and female employment rates, the number of obstetrics & gynecology clinics, and the number of daycare center facilities were all collected through KOSIS. The birth celebration grants for the first child and the second child at PLGDs in DOMPs are not included in KOSIS, so I collected the data directly from

the relevant ministry (Ministry of Health and Welfare).

The population is all PLGDs that are located in DOMPs. Statistical data collection was carried out on all 152 PLGDs. I used statistical information collected during the period of 2017 for the dependent variable, the number of childbirth, and used statistics collected during the period of 2016 for the independent variables. The reason is that it takes an average of 280 days to give birth to a child, so I applied the time lag of 1 year.

3) Independent Variables

Among economic factors, the BCGs are the cash amount that the PLGDs pay each time a child is born. The larger the amount of BCGs support, the smaller the burden of childcare costs, so the number of childbirths is expected to increase as BCGs increase. It varies from Min 0 KRW(Korea currency won, 1,000 KRW≒0.9 US Dollar[March, 8, 2019]) to Max 5,000,000 KRW by PLGDs. The average is 621,052 KRW

Some PLGD give an additional BCG when women give birth to a second child. Therefore, it is expected that the larger the BCG for the second child, the greater the number of childbirths of PLGDs. The level of BCG for a second child varies from a minimum of 0 KRW to a maximum of 6,000,000 KRW. The average is 1,308,421KRW.

Other variables included in economic factors are male employment to population ratio (EPR) and female employment to population ratio.[9] If the EPR of men is high, it makes it easier for the family to bear the cost in most cases because it increases the income for the

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[9] Employment to population ratio (EPR) is the proportion of workers out of the population aged 15 years or older. The National Statistical Office collects EPR by age, but they divided the categories 15 to 29 years old, 30 to 49 years old, 50 to 64 years old. EPR(%) = (worker ÷ the population aged 15 years or older) × 100

http://kostat.go.kr/understand/info/info_lge/1/detail_lang.action?bmode=detail_lang&cd=SL3972

household. I selected the variables with EPR ranging from age 30 to 49 for men in particular. According to the National Statistical Office, the average age of first marriage for males in the 'Do' metro province is 32.57 years. In fact, Korean men usually graduate from high school at the age of 20, take four years of university[10], two years of mandatory military service, and usually take two to three years to go to university and to get a job. According to the collected data analysis, the EPR of men vary from a minimum of 81.7% to a maximum of 98.9% by PLGDs. The average is 91.5%.

The higher the EPR of women is, the greater the time to work in the workplace and the greater the burden of raising children in most cases. Though women's employment increases the income of households, women who have jobs are more likely to feel the burden of childbirth because they have both the burden of childcare and the burden of work in most cases. Therefore, it is expected that the higher the EPR of women, the more negative effects will be on childbirth. I particularly chose the EPR of women aged 15-29 as a variable. The National Statistical Office collects EPR by age, but they divided the categories 15 to 29 years old, 30 to 49 years old, 50 to 64 years old. So I choose the 15 ~29 rather than 30~49. According to the National Statistical Office, the average age of first marriage for women in the DOMPs in 2016 is 29.7 years, but I assumed that women are more likely to get a job and marry before the age of 30. Because women do not have military service obligations, they are likely to get a job after graduating from university for four years. According to the collected data analysis, the EPR of women vary from a minimum of 20% to a maximum of 64.9% by each PLGD. The average is 36.4%

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[10] According to the Social Indicators surveyed by the National Statistical Office in 2018, 82.7% of students and 90.7% of parents want to receive or family members to receive education at the university level.

http://kostat.go.kr/portal/korea/kor_nw/1/6/3/index.board?bmode=read&bSeq=&aSeq=371501&pageNo=1&rowNum=10&navCount=10&currPg=&sTarget=title&sTxt=

There are the number of international marriages, the number of marriages (except international marriages), the number of obstetrics & gynecology clinics, and the number of daycare center facilities as independent variables that are non-economic factors. The number of international marriages means the total number of international marriages that occurred during a one-year period. For the comparison between PLGDs, the number of international marriages per 100,000 populations was measured.

As mentioned in the introduction, the sex ratio imbalance of the PLGDs in the DOMPS is much higher than that of PLGD in metropolitan city. An increase in the number of international marriages is expected to show a positive effect on the increase in childbirth. According to the collected data, the number of international marriages per 100,000 populations is displayed from a minimum of 0 to a maximum of 96 by each PLGD. The average is 44.

The number of marriages refers to the total number of marriages (excluding international marriages) during the year. For comparison between PLGDs, the number of marriages per 100,000 populations was measured. The number of marriages (excluding international marriages) is a variable that has a great influence on birth. Omission of these variables can lead to distortions in the results of the study. By adding these variables, we can compare how international marriages and marriages (excluding international marriages) affect childbirth. According to the collected data, the number of marriages per 100,000 populations is displayed from a minimum of 245to a maximum of 766 by each PLGD. The average is 441.

The independent variables, the number of obstetrics & gynecology clinics and daycare center   facilities, will create favorable conditions for giving birth and raising children and have a positive effect on childbirth. If there are few obstetrics & gynecology

clinics in the area where the married couple live, the family wishing to give birth will more likely have plans to have a child after moving to an area with more obstetrics & gynecology clinic. The more obstetrics & gynecology clinics there are, the more likely it is to have a positive impact on the number of childbirth. For the comparison between PLGDs, the number of obstetrics & gynecology clinics per 100,000 women's population was measured. According to the collected data analysis, the number of obstetrics & gynecology clinics per 100,000 women's population varies from a minimum of 0 to a maximum of 11.9 by each PLGD. The average is 3.1.

The number of daycare center facilities as an independent variable means the number of daycare centers per 100,000 infants' population[11] for the comparison between PLGDs. Daycare center facilities can reduce the burden of infant rearing by reducing, usually, women's time to care for children. Especially in the case of a woman who has a job, daycare center enables her to keep work. For these reasons, it is expected that as the number of daycare centers increases, positive effects are displayed on childbirth. According to the analysis of the collected data, the number of daycare center facilities per 100,000 infants' population is displayed from the minimum 646 to the maximum 2,730 for each PLGD. The average is 1,454.

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[11] The NSO measures infants as 0 to 4 years old.

Table5. Independent Variables

Variable	Measurement	Mean	S.D	Min	Max	Predicted effect
BCG1	Cash amount that the PLGD pays when a first child is born (per 100,000KRW)	6.2	8.7	0	50	Positive
BCG2	Cash amount that the PLGD pays when a second child is born(per 100,000KRW)	13.1	13.1	0	60	Positive
The EPR of men	EPR(%)of men = (men worker aged 30-49 ÷ the population aged 15 years or older) × 100	91.5	2.7	81.7	98.9	Positive
The EPR of women	EPR(%)of women = (women worker aged 15-29 ÷ the population aged 15 years or older) × 100	36.4	7.5	20	64.9	Negative
International nal	the number of international marriages	44	14	0	96	Positive

marriages	per 100,000 population					
Marriages (except international marriages)	the number of marriages(excluding international marriages) per 100,000 population	441	112	245	766	Positive
the number of obstetrics & gynecology clinics	the number of obstetrics & gynecology clinic per 100,000 women's population	3.1	2.8	0	11.9	Positive
The number of Daycare center facilities	the number of daycare centers facilities per 100,000 infants population	1,454	362	646	2,730	Positive

4) Dependent Variable

The dependent variable is the number of childbirths. In the case of the birth rate, it is 1.05 in 2017. Therefore, for convenience of analysis, I chose childbirth number which is a natural number instead of birth rate. For the comparison between PLGDs, the number of

childbirth per 100,000 populations was measured. As can be seen in the literature review, there is also a study in which the number of childbirths is a dependent variable.

Table6. Dependent Variable

Variable	Measurement	Mean	S.D	Min	Max
The number of Childbirth	Number of childbirth per 100,000 population	640	170	290	1,060

5) Analytical Method

In this study, I use a multiple linear regression model to examine the impact of independent variables on the childbirth at PLGDs in South Korea DOMPs.

The regression equation is as below:

$N_i = \alpha_0 + \beta_1* BCG1_i + \beta_2*BCG2_i + \beta_3*Memploy_i + \beta_4*Wemploy_i + \beta_5*Intermar_i + \beta_6*Marriage_i + \beta_7*Obst\&Gyne_i + \beta_8*Daycare_i + \varepsilon_i$ (i = PLGD entity)

Where N_i : the dependent variable, The number of childbirths

$BCG1_i$: cash amount that the PLGD pays when a first child is born (per 100,000KRW)

$BCG2_i$: cash amount that the PLGD pays when a second child is born (per 100,000KRW)

$Memploy_i$: the EPR of men aged 30-49 , - $Wemploy_i$: the EPR of women aged 15-29

$Intermar_i$: the number of international marriage per population ,

Marriage$_i$: the number of marriages(excluding international marriages) per population

Obst&Gyne$_i$: the number of obstetrics & gynecology clinic per women's population

Daycare$_i$: the number of daycare centers facilities per infant population

ε_i: error term, α_0 : intercept , β_n : coefficient for that independent variable

4. Findings

Table 7 shows estimation results for the relationship between the number of childbirths of PLGDs in DOMPs and the independent variables of PLGDs in DOMPs.

Table7. Regression Estimation Results

The number of childbirth	Coefficient	P-value
BCG1	**4.28****	**0.035**
BCG2	-1.05	0.438
The EPR of women	**-2.03***	**0.083**
The EPR of men	-5.08	0.150
The number of international marriages	**2.30*****	**0.002**
The number of marriages (except international marriages)	**1.26*****	**<0.001**

The number of obstetrics & gynecology clinic	**6.47***	**0.098**
The number of Daycare center facilities	-0.02	0.595

- ***p<0.01, **p<0.05, *p<0.1(Robust, P-value)

- Number of obs = 152,   R-squared = 0.6474

First, the number of international marriages and marriages (except international marriage) were found to be statistically significantly correlated to the number of childbirths at the 95% confidence level. Both variables have a positive impact on the number of childbirths. If the number of international marriages increases by one, the childbirth is expected to increase by 2.3. If the number of marriages (except international marriages) increases by one, the childbirth is expected to increase by 1.26. An important finding is that international marriages have more impact than marriage (except international marriages). It can be seen that international marriage contributes more to the childbirths of the PLGDs.

Second, the level of BCG for the first child has a statistically significant positive effect the number of childbirth. The effect of an increase of 100,000 KRW is 4.28, comparable to the effects of international marriages and 2/3 of the effect of clinics. Therefore, the evidence supports the importance of the BCG for the first child. The level of BCG for the second child has no statistically significant impact on the number of childbirth.

Third, the number of obstetrics & gynecology clinics is statistically significantly correlated with to the number of childbirth at the 95% confidence level. The number of obstetrics & gynecology clinics shows highly positive impact on the number of childbirths. If

the clinic increases by one unit, the childbirths increase by 6.46. It may suggest that obstetrics and gynecology provides a favorable environment for childbirth. One of the interesting things is that the number of daycare center facilities has no statistically significant impact on the number of childbirths.

Finally, the female employment rate was found to be statistically significantly correlated to the number of childbirth at the 95% confidence level. It has a negative impact on the number of childbirth as suggested in economics and other research. This confirms the studies of the existing literature that participation in economic activities of women is negatively related to childbirth and that the opportunity cost of birth is large. However, the male employment rate has no statistically significant impact on the number of childbirth.

5. Limitation

First, the findings of this study are not necessarily causal. This topic cannot be randomized. My research has no experimental group or control group. In the case of PLGD, it is difficult to set up experimental groups and control groups because they do not have exactly the same properties. Therefore, it should be considered carefully to infer causal relationships from my findings. In addition, there may be a reverse causal relationship between the number of obstetrics & gynecology clinics and childbirth. However, since the number of obstetrics & gynecology in 2016 is compared with the number of births in 2017, there is a possibility that the inverse causal relationship between the two variables may be lowered, but it is not completely excluded.

Second, I used only the data for one year period even though I analyzed it with a time lag of one year. The reason I used only one year of data is because the BCG data of the

PLGD were not computerized, so I received only one year of paper data from the Ministry of Health and Welfare. In order to make a more accurate reasoning, it is necessary to carry out research with longitudinal panel data, and the Ministry of Health and Welfare also need to build computerized systematic data.

Finally, there is a limit to the finding of accurate age category data for male and female employment rates. Since the National Statistical Office (NSO) classifies and publishes age categories, I have chosen the age statistics that are most suitable for the study according to the statistical office classification. I choose the EPR of aged 15 ~29 rather than that of aged 30~49 because I assumed that women are more likely to get a job and marry before the age of 30.

6. Conclusion and Policy implications

As of 2017, the fertility rate in Korea is 1.05. In order to maintain the current population, there should be more than two childbirths, and if the current fertility rate is maintained, Korea will gradually lose its population. This could lead to pension problems, economic recession problems and unemployment in the education industry, as examined in the introduction, as well as the reduction of local governments' financial income and the reduction of rice farming population. Therefore, in order to increase childbirths, it is necessary to examine the factors influencing childbirth. I examined the existing literature and conducted multiple regression analysis by selecting the factors influencing childbirth and the factors taking into consideration the characteristics of the PLGDs in DOMPs.

As results of regression analysis, I found statistically significant factors in childbirth. First, BCG for first child had a statistically significant effect on childbirth. Therefore, PLGs that do not currently implement BCG policies need to consider implementing BCG policy. If

the PLG is currently implementing a BCG payment policy, the amount of BCG needs to be larger. There is an income increase effect, and the larger the amount of income, the less the burden of child rearing costs. No statistical significance was found in the effect of BCG for the second child. Therefore, it can be a good alternative to combine the BCG amount for the second child with the BCG amount for the first child, because PLG can do so without increasing the budget further.

Second, international marriages have a strong statistically significant impact on childbirth. In particular, the impact of international marriages on childbirth (2.30) is greater than that (1.26) of domestic marriages. Therefore, the government needs to create an environment where international marriage can be actively made in the PLGDs in DOMPs. It can consider relaxing visa requirements[12] for international marriage, providing assistance (tax relief) to expand the establishment of an international marriage brokerage office, opening online brokerage websites of local governments, and expanding the Korean language education system for foreigners to successfully settle spouses of international marriages.

Third, the number of obstetrics and gynecology clinics also had a statistically significant effect on childbirth. Therefore, the government needs a policy to induce obstetrician and gynecologist to establish clinics in PLGD in DOMOs. For example, a policy of giving tax relief and setting up a publicly operated obstetrics and gynecology clinic can be considered. However, further research is needed using long-term data since there may be a reverse causal relationship between obstetrics & gynecology clinics and childbirth.

Finally, the employment rate of women has a statistically significant negative impact on childbirth. This is to reaffirm the previous research that it is difficult for a woman who

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[12] As of December 2018, for an international marriage, Koreans must meet their income and residence requirements so that foreign spouses can receive international marriage visas

goes to work to bear work and nurture at the same time. However, female employment effects on the birthrate can be offset by the other policies, and female employment is good for other purposes, e.g. economic development, increasing GDP, and providing closer to equal economic opportunity for women in Korean society. Therefore, in order to boost childbirth, the policy of easing the burden of childcare felt by working women should be spread. It could be considered to expand the mandatory[13] establishment of daycare facilities within the workplace where women work.

Acknowledgement

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[13] Under the current legislation, workplaces with more than 500 permanent workers are obliged to install daycare centers. The number of regular workers should be significantly reduced (for example, 100 permanent workers)

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