

Does the increase in private education expenditures drive down the total fertility rate?

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Abstract

This study empirically examines how the increase in private education expenditures affects fertility rate. Delivery itself doesn't cost much, but child rearing and education cost significantly, and the loss of household income due to parental leaves should also be recognized as the expenses of child care. The low fertility rate is being discussed as a critical issue in Korean society, but the benefits of not having children can be greater than the costs related to having children including education and housing expenditure as they continue to increase. This study examines the relationship between private education expenditures and the total fertility rate in 16 cities and provinces in Korea from 2009 to 2018. The result shows that the increase in private education expenditure tends to lower the total fertility rate. In particular, the group with high participation in private education is more affected by the decline in the fertility rate due to the increase in private education expenditures compared to the low participation group.

Keywords: Private education cost, total fertility rate, housing price

JEL Classification: I22, J13

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1 Introduction

The total fertility rate has decreased since it was first surveyed in Korea in 1970, and has been continuously declined from 4.53 to 0.92 per women in 2019. Moreover, Korea is the only country whose fertility rate declines below 1, becoming an even more critical issue for the country. This continuously declining fertility rate leads to a decrease in the economically active population, and can have a negative impact on the economy in the mid to long-term. Various studies explain several factors affecting such a low fertility rate including demographic, economic and sociocultural factors. For example, demographic factors account for the increase in late marriages and unmarried men & women, economic factors attribute to rising housing prices, increasing education and child-rearing expenditures, employment instability, lack of childcare supporting infrastructure, and finally sociocultural factors explain changing values towards having children.

This study focuses on the economic factors among these as the cause of the low fertility rate. In general, married couples gain utility from having children, but the cost incurs in return. Education and child-rearing expenses are major expenditures for childcare, and education expenditures have risen remarkably as the quality of children's education significantly improved (Chung, 2012). Human capital in society is not fully provided through school education, and in fact, private education makes up a large proportion in providing it, so that private education expenditure takes a relatively high share in total household consumption expenditure. For this reason, private education expenditure can be a primary reason for declining fertility rate (Song, 2012).

From this point of view, this study aims to analyze the relationship between private education expenditures and low fertility rate in 16 cities and provinces in Korea. Previous studies on this subject explain the roles of private education burden in fertility decision-making in households with children, primarily based on micro level data, but there are not many studies at the macro-level. This study hypothesizes that the average private education expenditures in a region has a significant impact on fertility decision-making. In addition to private education expenditure, various

economic factors including housing price, unemployment rate, regional economic growth rate, and income change rate are examined to determine a key factor influencing fertility decision-making.

The remainder of the paper is structured as follows. The next section reviews the existing literature on the determinants of fertility decision and attempts to identify the differences between this study and previous researches. Section III describes the regression analysis model and data used in this study. Section IV then, examines the result of regression analysis on the relationship between private education expenditures and fertility rate, and reviews the regression analysis using divided samples according to the level of participation in private education. The final section summarizes major findings, and discusses contributions and policy implications, limitations and future research directions.

2 Literature Review

The purpose of this study is to analyze the effect of the financial burden of private education expenditures on having children. This chapter reviews the main factors that influence couples in fertility decision. This study focuses on education expenditures, particularly on private education expenditures among economic factors such as the burden of education and child support expenses, rising housing prices, instability of employment, and lack of childcare infrastructure. Thus, main results and limitations in the relation between education expenditure and private education expenditure are reviewed, and the differences of this study from existing research are derived in this chapter.

Theories dealing with low fertility include rational choice theory, gender equality theory, and preference theory. Rational choice theory explains that there is a rivalry between utility and cost that couples get from having children, so that they decide to have a child when utility exceeds cost, and avoid having a child when cost exceeds utility (Chapman et al., 1999). It also explains that those who have a high preference for other goods over having children or regard the cost incurred of having a child is high in the future, may postpone or give up having a child. According to this theory, education expenditure and relocation for education opportunities are

expenses incurred by having children, and high expenditure of education and housing may lead to intensify the low fertility phenomenon (Chung, 2012; Park and Lee, 2016). Gender Equity Theory pinpoints that the higher level of gender equality can lead to lower fertility). In the past, the gender roles were clearly distinguished due to the innate differences between men and women, but gender equality has improved as women's rights to education and labor rights have increased. Therefore, the study explains that women's participation in the labor market improves gender equality, resulting in a change in social structure in which leads to lower fertility (Kim, 1996). Preference theory explains how one's preference between work and family can affect low fertility (Hakim, 2000). It shows that heterogeneous individuals have their own preferences for their lifestyle and these preferences are heavily influenced by the social culture they experience. In this study, we are in favor of rational choice theory and attempt to explain the low fertility rate in Korea in the perspective of this theory. This study also focuses on the fact that education expenditures for children account for a significant share of the consumption expenditure of households with children in Korea. Moreover, this study recognizes that housing cost is a primary cause of low fertility as it is the largest household expenditure item.

Most of empirical studies on education expenditures and low fertility rates were conducted based on the data obtained through questionnaires or micro-level data. These studies take "Respondents have an intention to have children" as a dependent variable, and don't take into account that the burden of education expenditure differs according to school level.

Shin (2008) conducted a telephone survey of 1,500 married women aged 25 to 39 residing across the country and examined whether respondents are willing to change their opinions on having children if their current child-rearing & education expenditures can be reduced to the level they perceive to be reasonable. The result shows that the reduction of child-rearing, and elementary & high school education expenditures has a significant positive effect on women's intention to have children. Moreover, the effect of such cost reduction is likely to be more effective on women who don't intend to have children, suggesting that the cost reduction is effective in making women intend to have children, and its effect is stronger to women who don't intend to have children. Some studies show that current childcare and education expenditures don't have a significant

impact on fertility intentions. It's because parents make a fertility decision based on current and future childcare & education expenditures.

Song (2012) conducted an empirical analysis on the factors affecting the decision to have another child in households with children using Korean Labor & Income Panel Study. His result shows that mother's age, the number and age of existing children, household net worth, and private education expenditures were the factors influencing decision-making. Furthermore, women who are older, have older children and greater number of children, were less likely to have more children. Households with higher net worth were likely to have children, while the burden of private education expenditures lowered the likelihood of having children. Considering that this study examines households with children, the respondents have already a good understanding of private education expenditures of their existing children, resulting in that they are likely to avoid having another child due to the burden of future private education expenditures which exceeds the utility gained. However, only the average age of children was controlled in this study, and school level by age such as elementary, middle, and high school, where private education expenditures are clearly different, were not taken into consideration. Apparently, education expenditure will be relatively higher for high school students who prepare for college entrance exams. If households consider current education expenditure for their fertility plan, they also may refer to private education expenditures by school level. Therefore, this should be taken into account in hypothesis and analysis.

Ha (2012) examined the factors affecting total fertility rate using the data on income bracket and marital fertility rate published by Statistics Korea in 2010. The determinants of having children were analyzed only for the households with spouses and simplified by using the average value of each income bracket. The result showed that an increase in household income leads to higher total fertility rate, and the increase in education expenditure per capita or percentage of education expenditure per capita relative to income lowers fertility rate. This study which takes the number of children as a dependent variable, demonstrated that an increase in household income also leads to lower number of children, whereas the increase in education expenditure per capita or percentage of education expenditure per capita relative to income, is associated with lower fertility rate. However, the study has limitations as it demonstrated conflicting

results depending on the model applied; i.e. the increase in the age of household head is related to the increase or decrease in the number of children. Although this study assumes that the relationship between the age of parents and the number of children is linear, it may be more reasonable to regard it as a nonlinear relationship. Such a problem can be solved by adding a square term for the age of the parents, but it was not controlled in this study.

A summary of the research is as follows. Although education expenditure is unrealized consumption which will occur in the future, the utility for having children decreases when the level of education expenditure increases, which can increase the likelihood to avoid having children. The result of an empirical study on this subject also suggests that the increase in education expenditure or private education level reduces the likelihood of having children. However, previous studies have some limitations as follows; First, these empirical studies focus on individual choices as most analysis was done on the basis of micro-level data. They can serve as basic data explaining the macroscopic trend of changes in demographic structure, but are limited in interpretation since they are not based on actual total fertility rates. Second, although a number of studies concluded that private education expenditures are a factor reducing fertility rate, there has been no research on the discriminative impact of private education expenditures by school level. It is evident that high school students who prepare for college entrance exams are likely to have the highest private education expenditures. It's worth noting that households are highly likely to be more affected by private education expenditures incurred in high school if they are influenced by private education expenditure. Third, housing prices also need to be controlled. There is a risk that housing price will skyrocket in regions where there are massive supplies of private education, and this phenomenon has been pointed out by some studies (Kim and Hwang, 2016), but there are not enough studies to back up the low fertility rate. For these reasons, this study is designed to complement the limitations of existing studies.

3 Estimation and Data

This study aims to examine the relationship between private education expenditures and fertility rate. Private education expenditure refers to the expenses that are spent after childbirth and some are paid on a monthly basis, making up a significant share of household expenditures. Households with children who feel burdened by education expenditures might avoid having children due to possible additional education expenditures. From this perspective, households with certain income without education expenses can afford having children more than those who have already education expenditures, therefore households with children are more likely to give up having children. However, even households without children cannot neglect future education expenditures, which consume a significant share of household income in the fertility decision-making process. In this respect, this study hypothesizes that fertility rate is likely to be driven down if private education expenditure is high in the region, and a regression analysis is applied for data analysis.

$$F_{it} = \beta_0 + \beta_1 PE_{it} + \gamma'X + \alpha_i + \varepsilon_{it} \quad (1)$$

Where F_{it} is the total fertility rate in region i at time t . The region i includes 16 upper level local governments in Korea excluding Sejong where time series analysis is not applicable due to insufficient data. Time series analysis was conducted using 10 years of data from 2009 to 2018. The main explanatory variable, PE_{it} indicates the average private education expenditure in i region at t time, then the log was converted to examine the relationship between the average private education expenditure in the region and the total fertility rate. If the average private education expenditure increases in the region, households will give up having children because they perceive the costs exceeds the utility gained. Therefore, it is expected to have a negative (-) relationship. Following (2) is a regression equation based on the expenditures divided into three school levels; i.e, private education expenditures at elementary school (PE_{it}^e), at middle school level (PE_{it}^m), and at high school level (PE_{it}^h). The Equation (1) estimates the overall effect of the average private education expenditure, while Equation (2) provides more detailed results by estimating the effect

of each expected education expenditures by school level at the time of planning to have children. The absolute value of the coefficient is expected to increase If the burden of expected private education expenditures increases.

$$F_{it} = b_0 + b_1PE_{it}^e + b_2PE_{it}^m + b_3PE_{it}^h + r'X + a_i + e_{it} \quad (2)$$

Assuming that people planning to have children decide by comparing the utility gained and the costs to be paid from having children, housing price change rate, unemployment rate, regional economic growth rate, and income change rate were chosen as control vectors X . Having children is not limited to deliver a child, and costs to raise children continue to incur. Among the household expenditures that compete with education expenditure, housing cost is the highest so that people are likely to give up having children to avoid the costs of having children when housing price and its volatility goes up (Seo, 2013; Park and Lee, 2016). Unemployment rate is a variable related to employment status and affects fertility decision and children-rearing. Career breaks due to parental and childcare leave can be perceived as a heavy burden when employment status in the labor market is poor (Chung, 2012). Therefore, the increase in unemployment rate may be associated with the decline in the fertility rate. By the same token, it can be hypothesized that economic growth or personal income growth has a positive effect on fertility rates.

In this study, an interaction term was added for private education expenditures and housing prices. Housing prices in the regions where great school districts with good educational environment are formed are likely to be high (Jin and Son, 2005). Also, great advancement results and student test scores are associated with housing prices in the neighborhood (Fack and Grenet, 2010; Nguyen-Hoang and Yinger, 2011). In addition, it is worth noting that private educational facilities tend to be concentrated in areas with great accessibility (Han and Lee, 2012). Previous papers confirm that housing prices are higher in areas where educational facilities are concentrated, and higher educational outcome tends to increase housing prices. They have also confirmed that education supply is concentrated in areas where housing prices are high because these facilities are located in areas with high accessibility by various types of transportation. This points out that there is an interaction between private

education expenditures and housing prices, and therefore an interaction term was introduced in this study.

This study examines the relationship between the increase in private education expenditures and fertility rate at a macro level. As a result, it seems that private education expenditure can have a discriminatory effect on fertility rates depending on the degree of participation in private education by the region. This is because that households planning to have children in the region with high demands for private education are likely to be affected by their neighbors and the locals. In consequence, the average level of participation in private education by year was calculated, and then samples were divided into the high and low participation groups, above the average and below the average respectively. Regression analysis was followed to estimate the discriminatory effects. Considering that private education is heavily influenced by neighbors and the locals, the result will be able to show how social influences differ by groups.

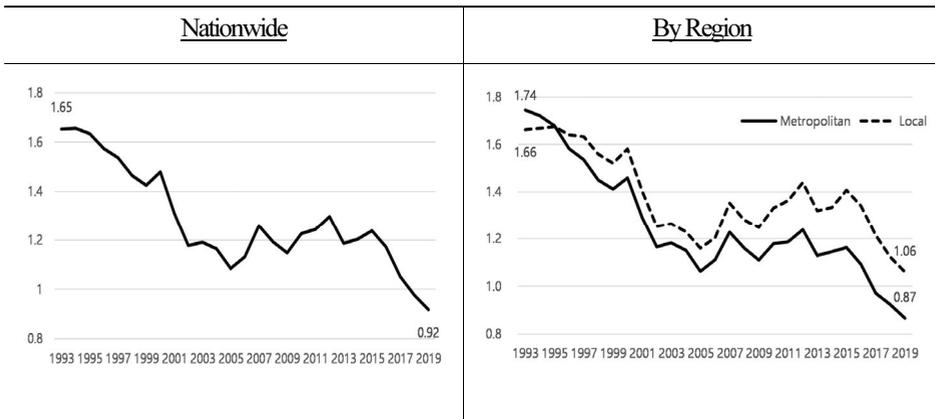
The data used in this study are as follows. Fertility rate refers to the total fertility rate from Survey of Demographic Trends published by Korea Statistics. Data on private education expenditures including average private education expenditures by region & by school level, and the participation rate in private education, are obtained from Private Education Expenditures Survey by Korea Statistics. Private education expenditure data was log-transformed for the analysis and the average participation rate by year was calculated to identify two groups with high and low participation in private education. The log difference was taken in housing prices to estimate the responses of fertility rate by price fluctuations using apartment sales prices from National Housing Price Trend Survey published by Korea Appraisal Board. Private education expenditures and housing sales prices are present values using Consumer Price Index of Korea Statistics. The unemployment rates are obtained from Economically Active Population Survey published by Korea Statistics and economic growth rate is based on GRDP provided by Korea Statistics. Income in this study is per capita personal income published in Regional Income by Korea Statistics and the log difference is taken to estimate fertility rates according to individual income changes.

4 Empirical Results

4.1 Statistical analysis

The total fertility rate in Korea was 1.65 child in 1993, 0.98 in 2018, and slipped to 0.92 in 2019, becoming the only OECD country to record below one child. Moreover, the fertility rate in Seoul metropolitan region where more than half of Korean population resides, is 0.97 on average in 2019, which is 0.19 less than regional average of 1.06. Existing studies have discussed various causes of such low fertility rate including increasing education and child-rearing expenses, rising housing prices, employment instability, and lack of childcare supporting infrastructure. In particular, housing prices have been actively discussed (Seo, 2013; Park and Lee, 2016, Kim and Hwang, 2016; Lee and Park, 2020), and educational factors are raised as the potential cause of the low fertility rate (Kim and Hwang, 2016). While many studies empirically demonstrated the relationship between housing prices and fertility rate, the scope of this study, private education expenditures and fertility rate has not been much investigated.

Figure 1. Total fertility rate



Data: Statistics Korea

<Table 1> shows the national average private education expenditures from Private Education Expenditures Survey published by Korea Statistics. The overall average private education expenditures increased by about 20.2% over 10 years from 242,000 won in 2009 to 291,000 won in 2018. In terms of expenditures by school level, private education expenditures of elementary school students increased by 7.3% over 10 years, while that of middle and high school students increased by 20% and 39.8% respectively, indicating that the expenditure for high school students increased the most. If current private education expenditures are regarded as future costs by those who consider having children, such a high expenditure for high school can be a huge burden for them. In addition, if the cost of having children is proportional to the number of children, then households with children are more likely not to have another child.

Table 1. Average private education expenditures by school level
(10 thousand won, %)

| Year | Avg. private education expenditures | Elementary school | Middle school | High school |
|-------------------------|-------------------------------------|-------------------|---------------|-------------|
| 2009 | 24.2 | 24.5 | 26.0 | 26.9 |
| 2010 | 24.0 | 24.5 | 25.5 | 26.5 |
| 2011 | 24.0 | 24.1 | 26.2 | 25.9 |
| 2012 | 23.6 | 21.9 | 27.6 | 26.5 |
| 2013 | 23.9 | 23.2 | 26.7 | 26.2 |
| 2014 | 24.2 | 23.2 | 27.0 | 26.9 |
| 2015 | 24.4 | 23.1 | 27.5 | 27.6 |
| 2016 | 25.6 | 24.1 | 27.5 | 30.4 |
| 2017 | 27.1 | 25.3 | 29.1 | 33.0 |
| 2018 | 29.1 | 26.3 | 31.2 | 37.6 |
| Increase rate ('09~'18) | 20.2 | 7.3 | 20.0 | 39.8 |

Data: Statistics Korea

This study predicts that the effect of private education expenditure on fertility rate will vary according to the level of participation in private education. If residents tend to receive a lot of private education, it is likely that households living in the same region are affected in the same way.

Therefore, the average of participation in private education by year was calculated¹ and then samples were divided into high and low participation groups in each region, above the average and below the average respectively. <Table 2> shows the private education expenditures by year. The high participation regional group was found to spend more on private education than the low participation regional group did, and the increase rate of the expenditure over 10 years from 2009 to 2018 was also higher in the high participation group. For private education expenditures on high schools, the high participation group had an increase rate of 63.8% over 10 years, while the low participation group showed 48.8%, indicating that the high participation group spent much more on private education than the low participation group did.

Table 2. Average private education expenditures by school level and the level of private education participation (10 thousand, %)

| Year | High Participation Group | | | | Low Participation Group | | | |
|-------------------------|--------------------------|------------|--------|------|-------------------------|------------|--------|------|
| | Overall | Elementary | Middle | High | Overall | Elementary | Middle | High |
| 2009 | 24.0 | 25.0 | 25.4 | 24.8 | 17.8 | 18.2 | 21.3 | 17.3 |
| 2010 | 24.0 | 24.3 | 25.3 | 26.0 | 17.7 | 18.6 | 21.4 | 15.8 |
| 2011 | 23.8 | 23.6 | 26.0 | 25.5 | 17.8 | 18.2 | 22.1 | 15.9 |
| 2012 | 24.4 | 23.1 | 28.1 | 26.4 | 18.6 | 19.0 | 22.6 | 17.3 |
| 2013 | 24.8 | 23.8 | 27.9 | 27.1 | 18.4 | 19.4 | 21.3 | 16.8 |
| 2014 | 25.0 | 24.0 | 27.7 | 27.8 | 19.0 | 19.4 | 22.4 | 18.4 |
| 2015 | 24.8 | 23.3 | 28.1 | 28.3 | 18.7 | 19.4 | 22.1 | 17.8 |
| 2016 | 27.5 | 25.6 | 29.5 | 33.4 | 20.0 | 20.3 | 22.4 | 21.1 |
| 2017 | 28.3 | 26.4 | 29.9 | 35.1 | 20.7 | 20.2 | 23.5 | 23.2 |
| 2018 | 30.8 | 27.7 | 32.7 | 40.6 | 22.5 | 21.1 | 26.1 | 25.8 |
| Increase rate ('09-'18) | 28.3 | 10.8 | 28.7 | 63.8 | 25.9 | 15.9 | 22.7 | 48.8 |

Data: Statistics Korea

¹ In 2019, the participation rate in private education is 72.1% on a national simple average, and areas with higher than average participation are Seoul 80.0%, Gyeonggi 78.3%, Busan 75.9%, Daegu 75.5%, Incheon 75.1%, Daejeon 74.5%, Gwangju 73.7%, Ulsan 73.0%, Jeju 72.1%. Low participation areas were Gyeongnam 72.0%, Gyeongbuk 69.7%, Chungnam 69.4%, Chungbuk 69.0%, Jeonbuk 68.3%, Gangwon 65.7%, Jeonnam 60.9%.

<Table 3> shows the relationship between private education expenditures and fertility rate. There was a negative relationship between them, and this negative relationship gets stronger over time as shown in column (1). This is because private education expenditures continue to increase while the fertility rate keeps falling. Column (2) and (3) are the result of analysis by dividing the sample into the high and low participation group. In particular, the high participation group was found to have higher correlation coefficients and a higher statistically significant frequency. There seemed to be a high possibility that private education expenditure is more strongly related to the decline in fertility rate in the high participation group than the other group, however further empirical analysis through regression needs to be performed.

Table 3. Correlation between private education expenditures and fertility rate by participation level in private education

| Year | (1) Overall | (2) High Participation Group | (3) Low Participating Group |
|---------|-------------|------------------------------|-----------------------------|
| 2009 | -0.638*** | -0.666* | -0.631 |
| 2010 | -0.713*** | -0.428 | -0.275 |
| 2011 | -0.715*** | -0.498 | 0.031 |
| 2012 | -0.779*** | -0.733** | -0.337 |
| 2013 | -0.772*** | -0.697* | -0.466 |
| 2014 | -0.738*** | -0.871** | -0.616* |
| 2015 | -0.784*** | -0.770** | -0.496 |
| 2016 | -0.774*** | -0.823** | -0.543 |
| 2017 | -0.854*** | -0.916*** | -0.758** |
| 2018 | -0.818*** | -0.864** | -0.678** |
| Overall | -0.740*** | -0.744*** | -0.674*** |

Data: Statistics Korea

*** p<0.01, ** p<0.05, * p<0.1

4.2 Regression analysis

<Table 4> shows the result of regression analysis on the effect of the increase in private education expenditures on the total fertility rate. The null hypothesis is rejected through Hausman Test, and only the results of fixed effects models are presented. Column (1) is the result of the entire sample, indicating that if the average private education expenditure

increases by 1%, the total fertility rate decreases by about 0.005. Considering that the national average private education expenditure increased by 29.2% from 242,000 Won in 2009 to 291,000 Won in 2018, the impact of the decline in fertility rate due to the increased burden of private education expenditure is estimated to be about 0.118. Column (2) and (3) are the results of analysis divided into two groups whose private education participation rates are above average and below average respectively. For the high participation group in column (2), the coefficient for the 1% increase in private education expenditure is -0.658, while it is -0.607 for the low participation group in column (3), suggesting that the high participation group is more likely to reduce fertility when private education expenditure increases. This is because the high participation group has a relatively larger burden of private education expenditure compared to the low participation group, so the expected increase in the cost of having children is higher in high-participation group. For this reason, it suggests that reducing private education expenditures could alleviate the rivalry between expected the cost and utility of having children, which could help solve the problem of low fertility rate in the mid to long-term.

Concerning housing price among the controlled variables, column (1) shows that the increase in housing prices is related to the decline in fertility rate. This result is consistent with previous studies (Park and Lee, 2016; Kim and Hwang, 2016; Lee and Park, 2020). From the economic point of view, having children is a kind of consumption because child-rearing and education expenses continuously incur, so that it creates a rivalry with other expenses (Lee and Park, 2020). In particular, housing cost, the largest share among household consumption expenditures, competes with these expenditures for children. In consequence, if there is a large fluctuation in housing prices, uncertainty increases, which can increase the likelihood of avoiding having children (Park and Lee, 2016). Such influences were shown to be different depending on the level of participation in private education. In the group with high participation, shown in column (2), the increase in housing prices was associated with the decrease in fertility rate. On the other hand, this relationship was not significant in the group with low participation. Moreover, the interaction term added for private education expenditures and housing prices was significant only in the high participation group. This suggests that the high

participation group is likely to avoid having children due to the high level of private education expenditures and rising housing prices. When the government establishes a policy to prevent changes in demographic structure, the current structure of human capital formation which relies on private education should come to an end. To achieve this, private education expenditure should be reduced. At the same time, it is necessary to control housing prices to prevent a sharp rise and to keep them stable, especially in areas with high demands of private education.

For other controlled variables, unemployment rate has a statistically significant negative (-) relationship in all regression analysis. This indicates that if the employment in the labor market deteriorates, the likelihood of giving up having children is very high because stable income for raising children cannot be obtained. Although a policy for job security concerns the labor market in the short term, it can affect the Korean demographic structure in the mid to long-term by affecting fertility decisions.

Table 4. The effect of the increase in private education expenditures on the total fertility rate

| | (1) Total | (2) High Participation Group | (3) Low Participation Group |
|---|----------------------|------------------------------------|-----------------------------------|
| Total private education expenditure, log value | -0.584*** (0.111) | -0.658*** (0.169) | -0.607*** (0.169) |
| Housing price change rate | -0.043*** (0.011) | -0.036** (0.015) | 0.022 (0.034) |
| Interaction term for private education expenditures and housing price | -0.030*** (0.007) | -0.024** (0.011) | 0.008 (0.021) |
| Unemployment rate | -0.090*** (0.016) | -0.064*** (0.023) | -0.118*** (0.026) |
| Regional economic growth rate | 0.006** (0.002) | 0.008** (0.003) | 0.004 (0.004) |
| Income change rate | 0.003 (0.003) | 0.002 (0.004) | 0.005 (0.004) |
| Constant | 0.638*** (0.178) | 0.499* (0.273) | 0.628** (0.275) |
| Observations | 170 | 87 | 83 |
| R-squared | 0.477 | 0.484 | 0.523 |
| Hausman Test | 29.89*** | 15.56*** | 11.01* |

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In particular, the increase in unemployment rate is more likely to lead to the decline in fertility rate in the low participation group. Although the decision to participate in private education is influenced by family preference and educational philosophy, there are cases where households want to receive private education but cannot afford it in this group, indicating that the improvement of employment rate for this group is an important agenda for Korea to advance towards a sustainable economy in the mid to long-term. Regional economic growth rate also had an impact on the fertility rate. The high participation group was influenced by economic growth rate, while it was not identified in the low participation group.

Table 5 shows the results of fertility decisions when future private education expenditures by school level are presented. Column (1) is the result for the entire sample. Unlike the result of middle school, the results for elementary & high school are statistically significant. It is noticeable that the coefficient value of private education expenditure for high school is significantly high. This result is consistent with a pattern of increasing percentage of people who feel financially burdened when upper grades require more education expenses (Shin, 2008). Households considering having children estimate future expenditures from the current education expenses and feel the financial burden of high school private education expenditure. This is similar to the current situation in which a considerable amount of private education expenditures is spent for college entrance exams in Korea. This implies that the government should provide opportunities to develop competencies through the expansion of learning experiences outside of school by introducing various policies such as high school credit system and after-school educational programs to shift attention from private education in academic achievement. The high participation group shown in column (2) was most affected by the decline in the fertility rate when private education expenditure increases, suggesting that measures to reduce private education expenditures are needed, mainly in regions with high demands for private education. The low participation group shown in column (3) feel a huge financial burden of the private education expenditures of elementary school as well as those of high school.

It should be noted that the consistently incurred education expenditures can account for a significant share of household consumption, which

causes social distortion. Private education has an impact on college entrance, but it has not been confirmed whether it contributes to the formation of human capital. If fertility rate continues to decline, younger generation will have more social burdens. To sum up, education policies need to be geared towards preventing excessive private education expenditures, and public education should be able to fully aid students to prepare college entrance exams.

Table 5. The effect of the increase in private education expenditure by school level on total fertility rate.

| | (1) Overall | (2) High Participation Group | (3) Low Participation Group |
|---|----------------------|------------------------------------|-----------------------------------|
| private education expenditure for elementary school, log value | -0.120* (0.067) | -0.066 (0.094) | -0.186* (0.110) |
| private education expenditure for middle school, log value | -0.043 (0.079) | -0.174 (0.106) | 0.086 (0.128) |
| private education expenditure for high school, log value | -0.497*** (0.047) | -0.568*** (0.079) | -0.447*** (0.068) |
| Housing price increase rate | -0.027*** (0.009) | -0.025* (0.013) | 0.015 (0.030) |
| Interaction term for private education expenditures and housing price | -0.019*** (0.006) | -0.017* (0.009) | 0.006 (0.018) |
| Unemployment rate | -0.056*** (0.014) | -0.042** (0.020) | -0.068*** (0.024) |
| Regional economic growth rate | 0.005** (0.002) | 0.004 (0.003) | 0.003 (0.003) |
| Income change rate | 0.003 (0.002) | 0.004 (0.004) | 0.002 (0.004) |
| Constant | 0.363** (0.150) | 0.203 (0.228) | 0.488** (0.239) |
| Observations | 170 | 87 | 83 |
| R-squared | 0.658 | 0.665 | 0.666 |
| Hausman Test | 38.810*** | 41.840*** | 5.378 |

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5 Conclusions

This study examines the relationship between private education

expenditure and low fertility rate in 16 cities and provinces in Korea. Previous researches on this subject mainly focus on the effect of private education on fertility decision-making in households with children based on micro-level data, and much study has not been done at the macro level. Regression analysis empirically shows that the increase in private education expenditure can lead to low fertility. Moreover, the high participation group is more likely to be affected by the increases in private education expenditure. The analysis on private education expenditures by school level demonstrates that the burden of private education expenditures for high school is likely to lower fertility rate, and this effect is stronger for the high participation group in private education. Furthermore, our empirical results demonstrate that the increase in housing price is also the major factor in declining fertility rate. An interaction term for private education expenditure and housing price indicates a statistically significant negative (-) relationship with fertility rate in the high participation group, so that it is highly likely to lead to decline in fertility rate when housing prices increase in regions with high demands for private education.

This research makes several academic contributions to the existing studies. First, former research was conducted at a micro-level and used private education expenditure as a variable affecting fertility decisions. These studies showed that this variable was operated differently, with or without children. However, these studies have a limitation in evaluating whether private education expenditure contributes to decline in total fertility rate in Korea. By assessing at a macro level data, our study empirically demonstrates that the low fertility rate in Korea is caused by private education expenditures. Second, by estimating the effect of private education expenditures by the level of participation in private education and housing prices, this study provides policy directions for the government. The supply of private education is concentrated in certain regions such as Gangnam, Seoul and Pyeongchon in Gyeonggi-do, and the housing prices in these regions have been rising. As private education expenditure makes up a significant portion of household expenditures, further increase in education expenditure will force households to reduce other spending. The supply and demand for education can trigger a family relocation, so the housing price will be high in the regions where the supply of education is concentrated. Since housing consumption is

household's the biggest expenditure, rising housing price leads to reduce consumption for non-homeowners. This study made a model of these relationships so that they can be discriminated in a single regression equation, laying the foundation for a better understanding of the social phenomena in Korea.

Our findings have several policy implications. First, a foundation of forming human capital through public school system is needed. Private education should be a complement to public education. In reality, public education became a means of obtaining a diploma for college entrance and private education plays a key role to improve the abilities that are required to study in universities. High quality school education will allow students to develop competence without relying on private education, so students have no reason to participate in private tutoring (Countermeasure Committee against Private Tutoring, 2000). Normalization of public education through discovery of high-quality schools and program developments should be achieved along with policy enforcement to reduce private tutoring. Second, more professionals or teachers are urgently needed for the college admission system. As the college admission system is so diverse and often changes, private educational institutes provide more services about college admissions than public schools do. If public education provides similar quality services, private education market is likely to decrease. For this reason, it is necessary to increase the number of professionals for college admissions. Third, a housing policy that combines the demands for education is needed. In Korea, the period of demand for education coincides with the period of household relocation, and housing price rises during this period. Regions with excellent education infrastructure have much higher housing price than other regions with similar conditions. In the short to mid-term, a policy to control housing prices in regions with high demand for education is needed, and a policy to decentralize educational demands is needed in the long-term.

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