

Housing Wealth Effects On Household Decisions

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Abstract

This paper examines the effect of a positive housing wealth shock on married couples' decisions on labor supply, fertility, and education spending by exploiting regional housing price variation from 2003 to 2008 in South Korea. My difference-in-differences and triple difference estimation results show generally weaker housing wealth effects than those in literature: no housing wealth effect on labor force participation, employment, and fertility, and a net positive housing wealth effect on education spending for children. Further analysis suggests that strict regulations on Loan-To-Value (LTV) ratio and Debt-To-Income (DTI) ratio during the period of housing appreciation may prevent significant housing wealth effects from arising as many homeowners have little access to home equity loans under the regulations.

1 Introduction

For many families, their home is their largest asset. As there has been the global increase in housing prices until recently, understanding the relationship between increases in housing prices and household behaviors is particularly important. To help clarify the relationship, I rely on a quasi-experimental design that leverages variation in housing prices in South Korea during the 2000s. Specifically, I study the effect of changes in housing wealth on married couple's labor supply, fertility, and education spending. In the context of South Korea, such an analysis is crucial because the South Korean government actively engages in the housing market to stabilize housing prices although its intervention often backfires, causing more volatility in the housing market and unintended consequences ([Seo, 2008](#)).

When housing prices rise, homeowners experience an increase in their wealth. If such an increase is non-negligible and perceived as a permanent change, it expands their budget constraint, affecting their consumption. Standard economic theory predicts that an increase in housing wealth will decrease labor supply as leisure is a normal good. Moreover, if children are also a normal good, homeowners could have more

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children as a response. Another possibility is that homeowners could instead increase spending on children's education as Becker (1960) argued that there is quantity-quality trade-off of having children.

In the 2000s, housing prices in Korea exhibited a different trend across the capital and non-capital areas. For the remainder of the paper, I define the capital area as Seoul, Incheon, and Gyeonggi province and the non-capital area as the rest of South Korea. As can be seen in Figure 1, housing prices rose rapidly in the capital area between 2006 and 2008, and in the non-capital area after 2010. I exploit the regional housing price variation to identify the effect of housing wealth on married couple's labor supply, fertility decision, and education spending for homeowners in the capital area.

To do so, I use the Korean Labor & Income Panel Study (KLIPS) and define homeowners in the capital area (non-capital area) as households that owned homes in 2003 in the capital area (non-capital area), which was before the observed housing price fluctuations across the two areas. Then I compare changes in the outcome variables of homeowners in the capital area to those of homeowners in the non-capital area by using difference-in-differences estimation. To deal with the possibility of differential labor market conditions across the regions, I also use renters, defined as households that rented homes in 2003, as another comparison group in triple-difference estimation.

I find that homeowners in the capital area did not change their labor force participation, employment, or fertility decision when they experienced rapid increases in their home values. On the other hand, the net effect on education spending suggests that homeowners in the capital area increased education spending for all household members. I further investigate why a positive housing wealth effect on labor supply or fertility is not detected in South Korea and find that the Korean government's strict loan regulations during the period of housing appreciation was likely to play a role in having a generally weak housing wealth effect.

My work contributes to several strands of literature. First, my contribution comes from examining the effect of housing wealth on homeowners' labor supply and fertility decision in South Korea. Although previous studies analyze the effect of housing wealth on labor supply (Johnson, 2014; Disney and Gathergood, 2018; Atalay et al., 2016; Li et al., 2020), and on fertility (Dettling and Kearney, 2014; Lovenheim and Mumford, 2013; Atalay et al., 2021; Aksoy, 2016; Liu et al., 2021) in other countries, there has been no such study, to my knowledge, that uses exogenous variation in regional housing prices for South Korea. Given the fact that the South Korean government actively engages in the housing market, particularly through changing loan regulations such as Loan-To-Value (LTV) ratio and Debt-To-Income (DTI) ratio, it provides a unique and interesting setting where the general financial system is similar to other developed countries but the

government plays a more active role in the housing market.

Second, I contribute to the literature by measuring the housing wealth effect on two different types of education spending. Although Liu et al. (2021) and Dong and Hui (2022) found that homeowners increase education spending when housing prices rise in China, it is also important to understand what kind of education spending changes, especially in the context of South Korea, as private tutoring is very common in South Korea. Therefore, I distinguish households' spending on formal education and private tutoring, and measure the housing wealth effect on each education spending type separately. This allows us to understand how households allocate their resources for their children's education. For example, when there is a positive housing wealth shock, it is possible that more homeowners send their children to private schools rather than public schools. In this case, if households decrease spending on private tutoring since they are satisfied with education quality of private schools, then the total spending on education might not change significantly, generating a null effect of housing wealth on education spending. For this reason, my analysis with the two types of education spending provides more accurate estimates of the housing wealth effect on educational outcomes.

2 Housing Wealth Shocks and Homeowner Outcomes

Housing wealth shocks can induce changes in homeowners' behaviors in two ways when there are non-negligible changes in housing values. First, if such changes in housing values are perceived as permanent, they generate the traditional wealth effect. Second, even if the changes in housing values are transitory, if homeowners can borrow against their current home values, credit constrained households with sub-optimal consumption levels can adjust their consumption by utilizing access to additional financing, experiencing the housing wealth effect through home equity extraction. Therefore, standard economic theory predicts that an increase in home values will increase household consumption of normal goods. This indicates that homeowners will decrease labor supply as leisure is a normal good, or that they will have more kids assuming that children are a normal good, when they experience housing appreciation. In this paper, I focus on changes in married couple's labor force participation, employment, fertility, and education spending as the outcome variables of interest.

Previous studies have analyzed the housing wealth effect on labor supply in other countries, such as the United States (Johnson, 2014; Klein, 2014), United Kingdom (Disney and Gathergood, 2018), Australia (Atalay et al., 2016), and China (Li et al., 2020). In general, they find that positive housing shocks decrease

married women's labor force participation and hours worked, suggesting that the housing wealth effect is particularly present for marginally attached workers. While they also examine heterogenous wealth effects by ages and thereby life-cycle stages, I focus on relatively younger married couples for whom retirement decision is less relevant because the other variable of interest is fertility.

Theoretically, a positive housing wealth effect on fertility is expected under the assumption that children are a normal good. While such effects have been found empirically in developed countries (Dettling and Kearney, 2014; Lovenheim and Mumford, 2013; Atalay et al., 2021; Aksoy, 2016), where increased home values can be used to borrow money, a recent study on China did not find a positive effect on fertility and it speculated that limited resources for home equity financing is likely to mute the housing wealth effect (Liu et al., 2021). Although home equity loans are available in Korea, the Korean government tends to strengthen regulations on Loan-To-Value ratio (LTV) and Debt-To-Income (DTI) ratio when housing prices are surging, as a housing market stabilization policy. Therefore, if such financial regulations limit an access to home equity loans for a significant number of homeowners, a positive housing wealth effect might not arise in the wake of housing appreciation.

Considering that there is a quantity-quality trade-off when it comes to having children, some of the housing wealth effect could operate on the quality margin, instead of the quantity margin. Literature on the housing wealth effect on educational outcomes has found that a positive housing wealth shock increases college enrollment in the US (Lovenheim, 2011), the quality of schools that students attend in the US (Lovenheim and Reynolds, 2013), and the education spending for children in China (Liu et al., 2021). It is particularly relevant and important to investigate this quality margin for Korea as Anderson and Kohler (2013) argued that extremely low fertility in Korea partly results from the Korean culture where parents invest significant amounts of time and money in children's education. For married couples with children, when there is a positive housing wealth shock, they might not decide to have one more child but decide to spend more on existing children's education. For this reason, examining both fertility and education spending is crucial to understand how a positive housing wealth shock affects households' decision on how to allocate resources to childbearing and investment in quality of children.

3 Regional Housing Price Trends

Economic recovery from the Asian financial crisis in the late 1990s and global low interest rates have led to housing prices increasing continuously since the early 2000s in South Korea. Figure 1 shows increases in the

housing price index from 2000 in Seoul and all metropolises but Gwangju, but it slowed down around 2003. However, housing prices rose rapidly in Seoul, Gyeonggi, and Incheon, which consist of capital area of South Korea, from 2006 to 2008 while it remained stable in all the other regions. After 2008, while the capital area had stable housing prices, all the other regions experienced increases in housing prices.

The capital area is the center of economic, political, and cultural activities in the country as 48% of the South Korean population reside in the area, which is only 11.8% of the size of the nation¹. In 2003, the Korean government decided speculators were the main culprit of soaring housing prices across the country. As a response, it introduced a series of regulations, such as tightening loan-to-value ratio and debt-to-income ratio and raising property-related taxes, to stabilize housing prices. The regulations seemed to tame the housing market through suppressing demand for home purchases, but the effects were temporary as housing prices in the capital area increased rapidly in 2006. The timing of soaring housing prices in the capital area coincided with reconstruction projects in Gangnam district, one of the wealthiest cities in Seoul, and new town projects around Seoul².

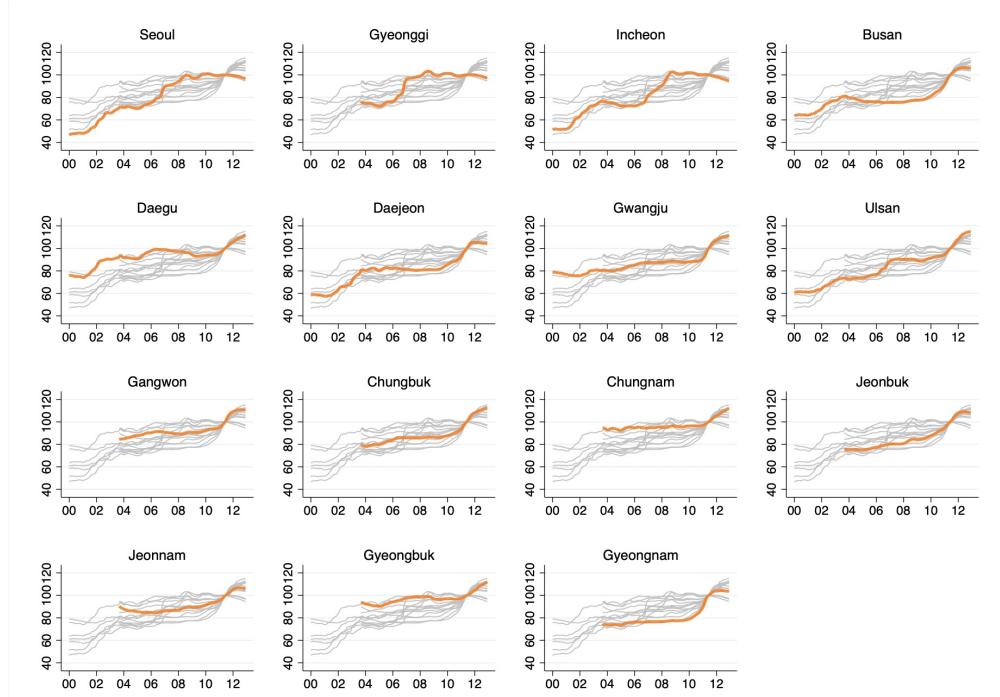
As the global financial crisis in 2008 cooled down the Korean housing market, the Korean government softened housing market regulations. Unlike the capital area that had stable housing prices after 2008, the non-capital area experienced housing price increases between 2009 and 2012. Choi (2013) found that the global financial crisis had a smaller effect on the local economy in the non-capital area than in the capital area, and that employment in the non-capital area recovered quickly, boosting the housing market as well.

In this paper, I exploit regional housing price variation that occurred between 2003 and 2008 to measure the housing wealth effect on various household behaviors. To be specific, housing price trends were relatively similar across regions until 2006 while rapid housing appreciation occurred in the capital area from 2006 to 2008. Therefore, I estimate the housing wealth effect that was likely present in the capital area between 2006 and 2008.

¹Population as of 2006 based on the Resident Registration Statistics. Area as of 2006 from the Cadastral Statistical Annual Report

²The Korean government has a monopoly of the supply of land for residential housing. To mitigate housing shortage in the capital area, it launched new town projects by which undeveloped land around Seoul was converted to developable land and towns were created. The first five new town projects were done in the early 1990s and the subsequent nine new town projects were initiated in 2003.

Figure 1: Housing Price Index By Regions



Source: Trend of National Housing Price, January 2000 to December 2012 (June 2011 =100). Seoul is the capital of South Korea. Six metropolises are Incheon, Busan, Daegu, Daejeon, Gwangju, and Ulsan. Provinces are Gyeonggi, Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, and Gyeongnam. Housing price indices at the province level were not available until September 2003.

4 Data

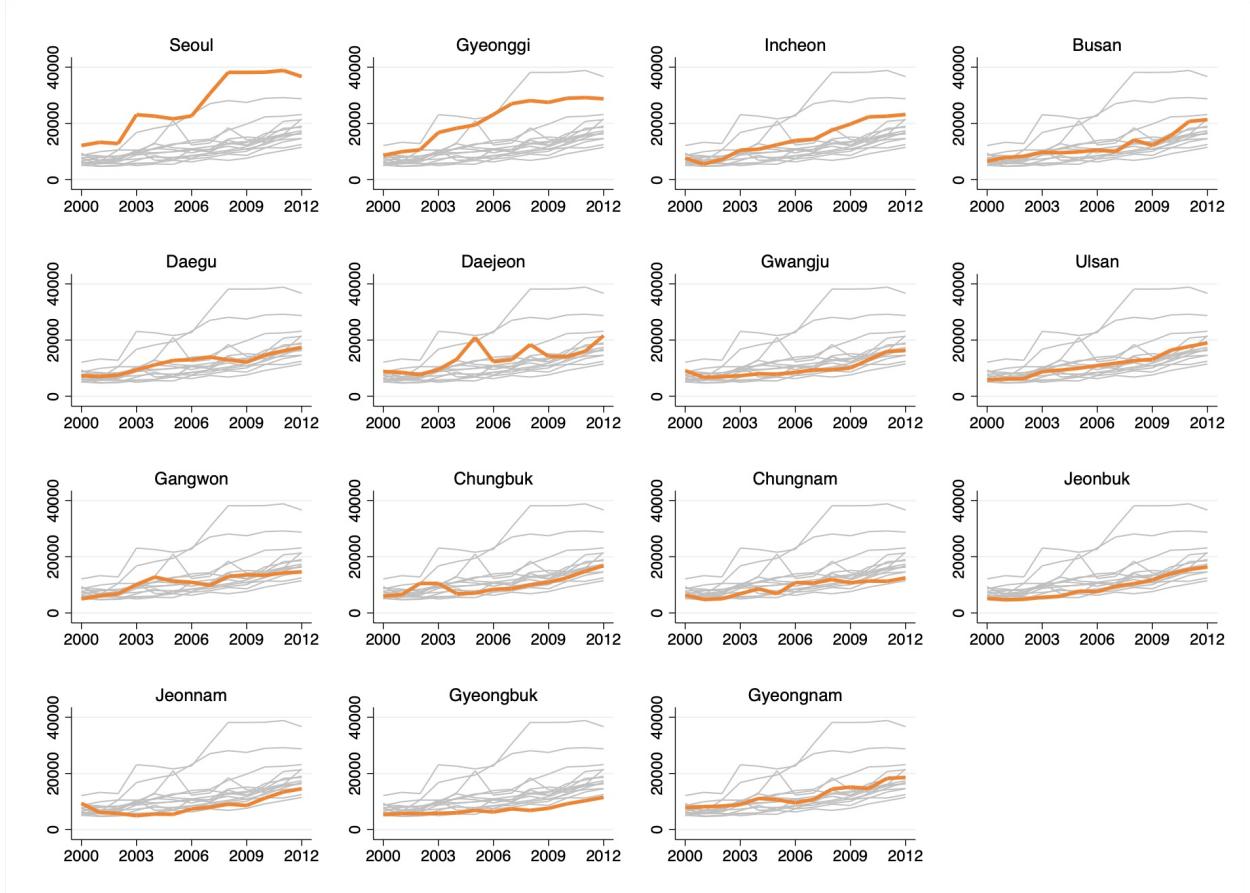
4.1 Dataset and Sample

My empirical analysis draws on data from the Korean Labor & Income Panel Study (KLIPS). KLIPS is a longitudinal survey of the labor market and income activities of households and individuals residing in urban areas. It is an annual survey that started in 1998 and the most recent survey data available are from 2020. The initial sample size was 5,000 households when it began in 1998, but 1,415 households and 5,044 households were added in 2009 and 2018, respectively, due to sample attrition over time. The survey is conducted between April and September each year for every household member older than the age of 15.

I restrict the sample to households that consist of married women aged 20 to 40 as the household head or spouse of the household head in 2003. There are 2,501 such married women in 2003 and my sample includes all the available observations for these women's households through 2009. Figure 2 illustrates trends in home

values that are at least 10 Million Won³, reported by the sample of 2003 homeowners. According to Figure 2, there were rapid increases in the reported home values between 2006 and 2008 in the capital area.

Figure 2: Housing Price Trends Across Regions (Homeowners in 2003)



Capital area is defined as households that resided in one of Seoul, Gyeonggi, and Incheon in 2003. Non-capital area is defined as households that resided in all other regions in 2003.

4.2 Outcome Variables

The outcome variables of interest are labor force participation and employment for married couples, household's spending on education and private tutoring, and fertility. For married couple's labor force participation, I use individual survey files that provide information on individuals' labor market activities. I construct the labor force participation variable in the following way. If an individual has a job at the time of the survey interview, or she does not have a job but has been looking for a job over the last week and is available to

³0.58% of sample reported that their home values are below 10 Million Won. The exchange rate between Korean Won and US Dollars in 2003 was 1,200 KRW per 1 USD, which translates houses with a market value above 10 Million Won to those with a market value above \$8,333.33. In 2003, the US median home price was around \$189,000.

work, I assign the value of 1, and 0 otherwise. For employment, I generate the employment variable by assigning the value of 1 to those who are currently employed, and 0 otherwise.

For households' education spending, I use household survey files that contain information on households' spending on various items. Specifically, the household survey files have the amount of spending on formal education and private tutoring in the previous year. Formal education spending includes fees for elementary, middle, and high schools and college tuition. The amount of formal education spending can vary across households depending on school types, such as public or private schools and general or specialized schools, and the number of extracurricular activities that students participate in through their schools.

Private tutoring spending includes any fees paid to private academies, outside formal schools, such as English tutoring for any household member. It may include tutoring spending for adult household members as many unmarried adult children live with their parents and use private academies for career development. A large proportion of households in the sample have both formal education and private tutoring spending, and private tutoring spending is, on average, larger than formal education spending. Although it is common for adults to use private academies, it is very common for young people below the age of 20 to use them after regular school classes. For this reason, KLIPS also collects private tutoring spending for each child below the age of 20 in a household, and I exploit this information to construct private tutoring spending for children of school-age or younger.

For fertility, I use household survey files that include information on each household member's birthday and their relationship to the household head. Considering the gap between fertility decision and an actual birth, I analyze births that occurred between 2004 and 2009. To be specific, if a household member's birth year matches with a given year between 2004 and 2009, I assign the value of 1 to the corresponding household for that year, and 0 if none of the household members' birth years match with the given year.

5 Identification Strategy

Figure 1 and Figure 2 show that housing prices appreciated significantly between 2006 and 2008 in the capital area, compared to changes between 2003 and 2005 and to those in the non-capital area. I identify the impacts of housing price appreciation on married women's labor force participation and employment, household's education spending, and fertility by using a difference-in-differences estimation strategy. To measure the housing wealth effect which was likely to be present for homeowners in the capital area between

2006 and 2008, I first focus on the homeowner group, defined as households that owned homes in 2003. I fixed the homeowner group based on homeownership status in 2003 to avoid bias coming from endogenous homeownership status changes as a response to changes in housing price. Similarly, I assign homeowners that resided in one of Seoul, Incheon, and Gyeonggi in 2003 to the capital area while assigning those living in all other regions to the non-capital area, to avoid endogenous changes in area of residence.

It is possible, however, that there were unobserved shocks that affected the outcome variables of interest differently in the capital and non-capital areas. To difference out unobserved heterogeneity, I also use a triple difference estimation strategy by using the renter group which is defined as households that rented homes in 2003. On the other hand, using the renter group also differences out some of the true housing wealth effect. This is because some renters who later become homeowners can potentially experience an increase in housing wealth. Figure 3 shows that 36.5% of renters in 2003 became homeowners and 18.8% of homeowners in 2003 became renters by 2008.

Figure 3: Homeownership Status Changes Over Time

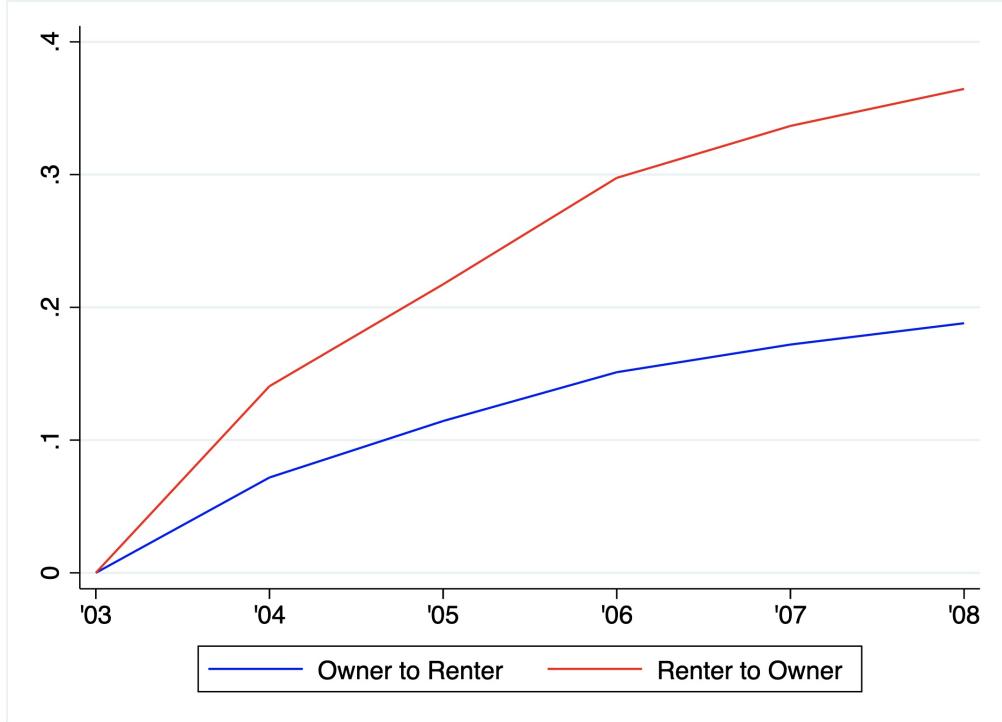


Table 1 shows summary statistics of outcome variables and household characteristics from 2003 to 2005 for owners and renters in the capital and non-capital areas, respectively. According to Table 1, homeowners tend to be slightly older and educated more than renters in both areas, and they are also more likely to be

Table 1: Summary Statistics for 2003 to 2005

	Capital Area				Non-capital Area			
	Owners		Renters		Owners		Renters	
	# obs	Mean (s.e.)	# obs	Mean (s.e.)	# obs	Mean (s.e.)	# obs	Mean (s.e.)
A. Outcome variables								
Female labor force participation	876	0.4868 (0.0190)	1,120	0.4906 (0.0176)	952	0.4713 (0.0184)	1,122	0.4850 (0.0187)
Female employment	876	0.4685 (0.0189)	1,120	0.4733 (0.0175)	952	0.4539 (0.0183)	1,122	0.4634 (0.0186)
Male labor force participation	839	0.9517 (0.0086)	1,022	0.9594 (0.0070)	915	0.9752 (0.0054)	1,021	0.9607 (0.0074)
Male employment	839	0.9386 (0.0095)	1,022	0.9320 (0.0092)	915	0.9610 (0.0066)	1,021	0.9275 (0.0100)
B. Outcome variables for households with children								
Formal education spending (10K Won)	799	9.5863 (0.5226)	958	7.3365 (0.5268)	855	8.5721 (0.4948)	977	5.6428 (0.3882)
Private tutoring spending (10K Won)	799	42.3112 (1.3735)	959	30.9447 (1.0743)	855	37.7886 (1.3009)	977	22.8072 (0.8576)
Private tutoring spending for children of school age or younger (10K Won)	822	28.0796 (1.2048)	987	29.1313 (0.9786)	871	26.4507 (1.0274)	987	21.7013 (0.8989)
C. Household characteristics								
Women's age	876	35.8262 (0.1526)	1,120	35.1210 (0.1429)	952	35.7490 (0.1569)	1,122	33.6086 (0.1775)
Women's education	875	2.5260 (0.0366)	1,120	2.4508 (0.0346)	952	2.4565 (0.0355)	1,122	2.4119 (0.0399)
Men's age	839	39.2009 (0.1845)	1,022	38.1144 (0.1677)	915	39.1846 (0.1738)	1,021	36.6093 (0.1997)
Men's education	839	2.8646 (0.0402)	1,022	2.6670 (0.0405)	915	2.6792 (0.0378)	1,021	2.5367 (0.0404)
The number of children	846	1.8642 (0.0193)	1,025	1.8923 (0.0216)	904	1.9919 (0.0195)	1,035	1.8389 (0.0213)
The number of children below the age of 20	846	1.8317 (0.0205)	1,025	1.8761 (0.0211)	904	1.9593 (0.0203)	1,035	1.8253 (0.0213)
Age of youngest child	846	7.9518 (0.1672)	1,025	6.8922 (0.1418)	904	7.9902 (0.1644)	1,035	6.3093 (0.1518)
Eldest child in elementary school	846	0.3799 (0.0187)	1,025	0.3566 (0.0171)	904	0.3506 (0.0177)	1,035	0.3757 (0.0183)

Notes: Standard errors are in parentheses. Employment status takes the value of 1 if an individual is currently employed, and 0 otherwise. Education takes the value of 1 if she did not graduate from high school, 2 if graduated from high school, 3 if obtained an associate degree, 4 if obtained a bachelor's degree or higher. The number of children includes all children in a household, regardless of cohabitation status. Eldest child in elementary school takes the value of 1 if eldest child is in elementary school, and 0 otherwise.

employed and spend more on formal education and private tutoring. On the other hand, homeowners and renters in the capital area are more likely to be in the labor market and employed while spending more on formal education and private tutoring than those in the non-capital area.

I use fixed effect models to measure the housing wealth effects that arose among homeowners in the capital area compared to those in the non-capital area, by using the following estimating equation:

$$Y_{irt} = \alpha_i + \beta CapitalArea_{ir} \times Post_t + \delta_t + \rho X_{irt} + \varepsilon_{irt}, \quad (1)$$

where Y_{irt} is an outcome variable of interest in year t of individual or household i who resided in province r in 2003, α_i is individual/household fixed effects, and δ_t captures year fixed effects. $CapitalArea_{ir}$ is a binary variable that takes the value of one if the province r that individual or household i resided in 2003 is one of Seoul, Gyeonggi, and Incheon, and zero otherwise. $Post_t$ is a binary variable that takes the value of one if t is between 2006 and 2008, and zero if t is between 2003 and 2005. Since household's fertility decision is made at least nine to ten months before births, I define $Post_t$ as one if t is between 2007 and 2009, and zero if t is 2004 and 2006 for fertility. X_{irt} is a set of individual and household characteristics: women's age, women's education level fixed effects, the number of children fixed effects, the age of youngest child, and a dummy variable of whether eldest child is in elementary school. I use the last two control variables because many Korean women change their labor force participation and employment status when their children are very young or about to start elementary school. For men's labor force participation and employment, I replace women's age and education with men's age and education. For private tutoring spending for children of school age or younger, I replace categorical variables for the number of children with those for the number of children below the age of 20. All the three education spending variables are log transformed.

Next, I use the same estimating equation for the renter group to compare with the results for the homeowner group. Since some renters transition to homeowners over time, some wealth effects are likely to exist even in the renter group. However, given the timing of becoming a homeowner and level of housing price when a purchase was made, such effects should be smaller than those for the homeowner group.

For triple difference estimation, I use the following estimating equation:

$$\begin{aligned} Y_{irt} = & \alpha_i + \beta Owner_i \times CapitalArea_{ir} \times Post_t + \delta Owner_i \times Post_t \\ & + \gamma CapitalArea_{ir} \times Post_t + \lambda_t + \rho X_{irt} + \varepsilon_{irt}, \end{aligned} \quad (2)$$

where $Owner_i$ is a binary variable that takes the value of 1 if individual or household i owned a home in 2003 and 0 otherwise. In all regressions, standard errors are clustered at the province of 2003 level. For the time-varying impact of housing wealth change, I also conduct event-study estimation.

6 Results

I first present event-study estimation results for home values for homeowners and housing costs for renters, respectively to see the magnitude of housing appreciation and following housing cost changes in the capital area over time, controlling for household and individual characteristics. Then I show female and male labor force participation and employment, fertility, and household spending on formal education and private tutoring for homeowners and renters, respectively. I also present triple difference event-study estimation for the same outcome variables except for housing prices.

Panel A of Figure 4 shows that home values for homeowners in 2003 in the capital area did not change significantly between 2003 and 2006, but they rose after then. On the other hand, Panel B of Figure 4 illustrates that housing costs for renters in 2003 in the capital area did not change statistically significantly between 2006 and 2008.⁴ Panel C and Panel D of 4 show that similar trends are observed even when the current homeowner and renter groups are used, instead of those groups at baseline. This eliminates a concern that the increasing trend in the home values for homeowners in 2003 might have resulted from homeowners with relatively lower home values switching to renters over time, raising the average home values for the rest of the homeowner group.

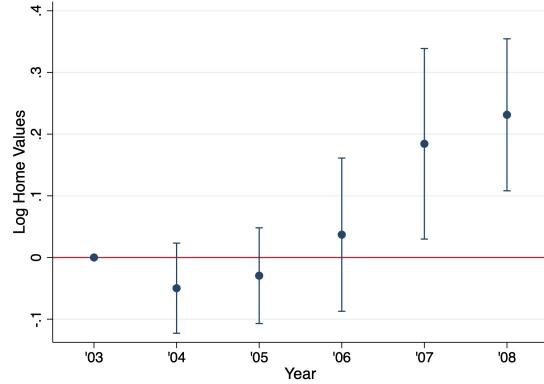
Figure 5 shows that homeowners in the capital area did not change any of the outcome variables of interest in a noticeable way as a response to rapid housing price increases between 2006 and 2008. On the other hand, Figure 6 illustrates that households that rented homes in the capital area, on average, decreased employment for married women and private tutoring spending for all household members over time. They also had higher likelihood of having a child than those in the non-capital area, especially from 2007 to 2009 during which the estimates are statistically significant at 5% level. Given that renters are not expected to have housing wealth effect between 2006 and 2008, it is possible that there was a unobserved negative labor demand shock in the capital area, affecting married women's employment and education spending. If this

⁴There are two widely used forms of rental contracts: Jeonse and Wolse. Jeonse requires a lump-sum deposit at the beginning of contract and practically no monthly rent payment. On the other hand, Wolse requires a relatively smaller amount of deposit and regular monthly rent payment. I converted the deposit amount into effective monthly rent amount by dividing it by 100. This follows the convention used by real estate agencies. Then I add this converted rent and regular monthly rent payment to construct one measure of housing costs for both types of rental contracts.

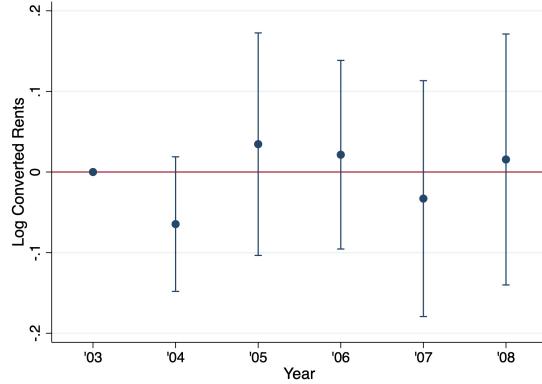
is the case, it is necessary to difference out differential labor market trends by using the renter group when analyzing the housing wealth effect for homeowners. The triple difference event-study estimation results, presented in Figure 7, show that there is no clear evidence that homeowners in the capital area changed their labor supply, fertility decision, nor education spending when their home values rapidly increased between 2006 and 2008.

Figure 4: Event Study Estimates on Housing Prices and Housing Costs

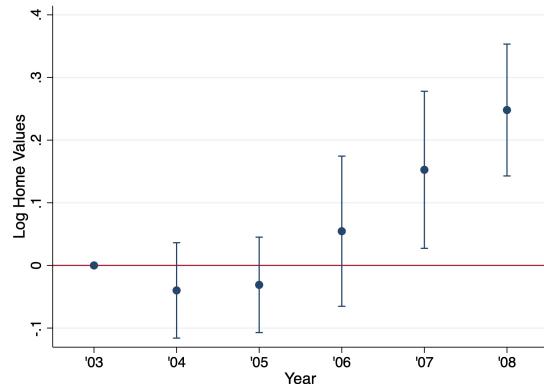
(a) Homeowners in 2003



(b) Renters in 2003



(c) Current Homeowners



(d) Current Renters

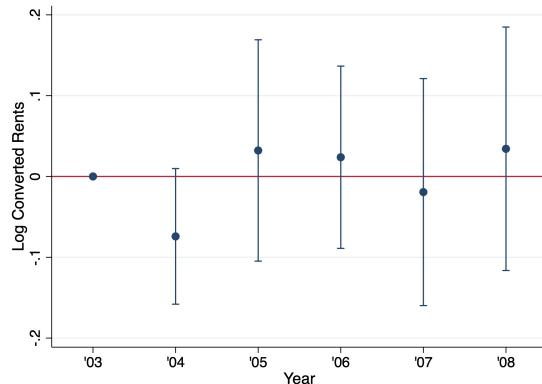
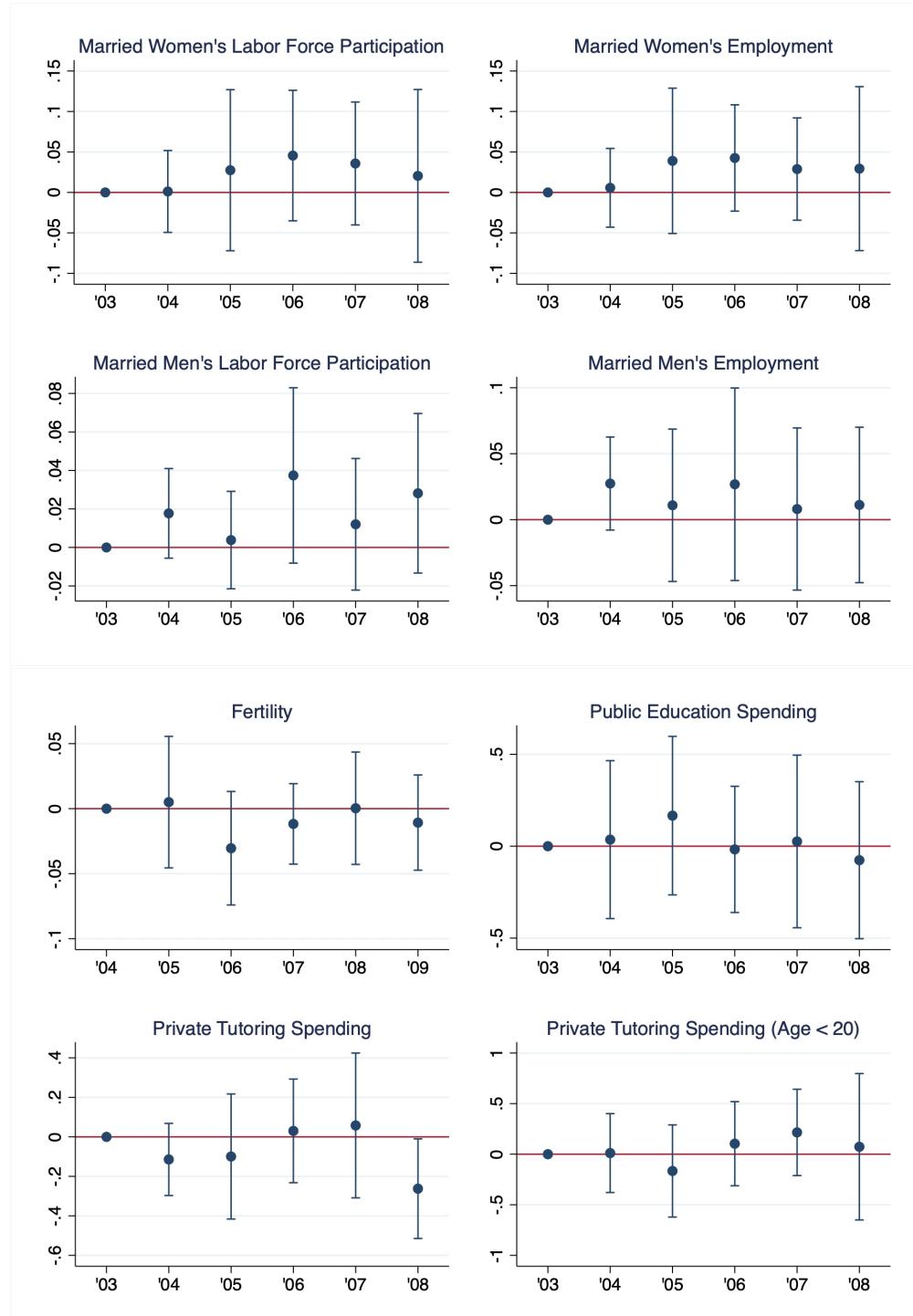
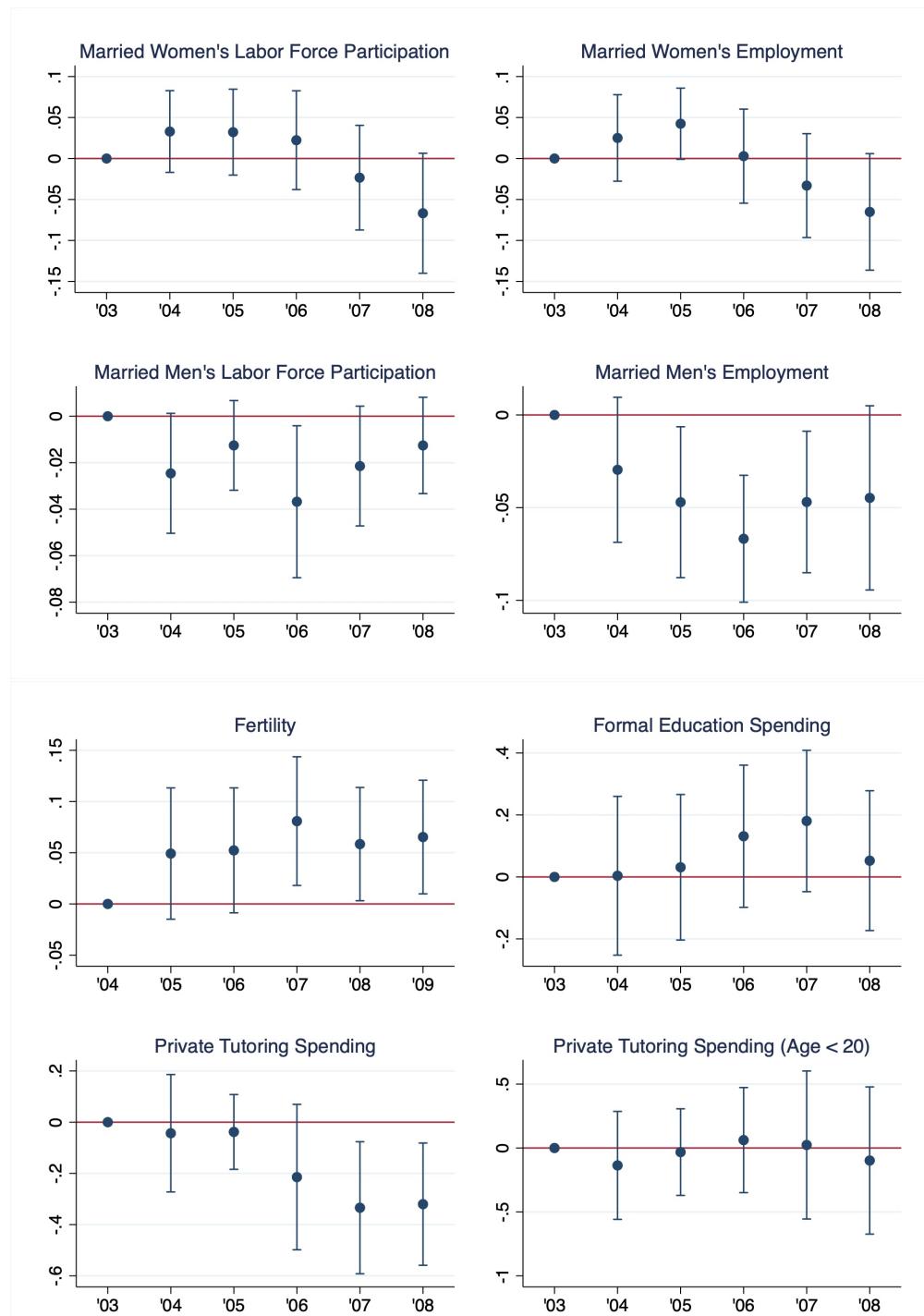


Figure 5: Event Study Estimates (Homeowners)



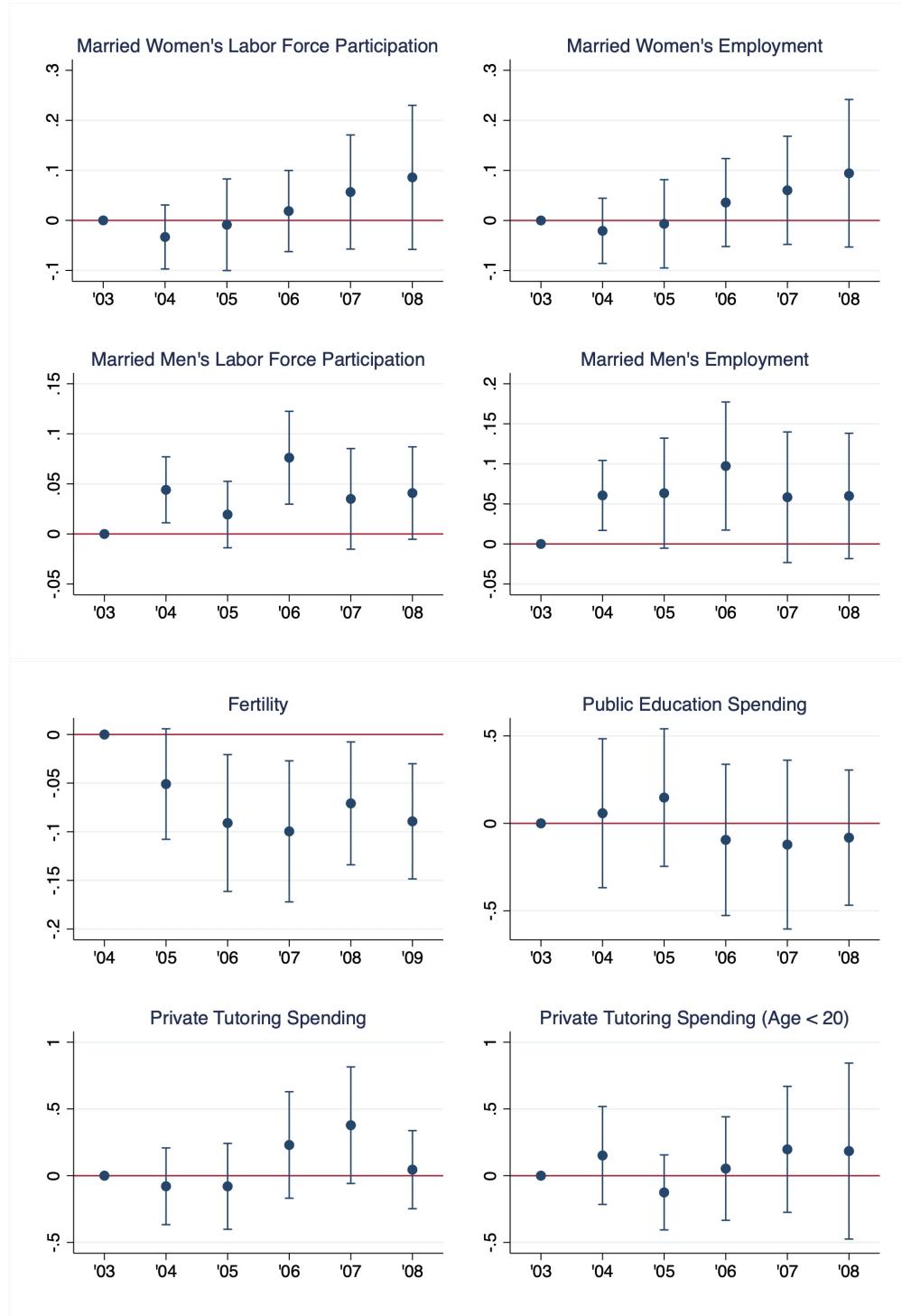
Homeowners are those who owned homes in 2003. Residence of capital area is defined as those who lived in Seoul, Gyeonggi, and Incheon in 2003.

Figure 6: Event Study Estimates (Renters)



Renters are those who rented homes in 2003. Residence of capital area is defined as those who lived in Seoul, Gyeonggi, and Incheon in 2003.

Figure 7: Event Study Estimates (DDD)



Homeowners are those who owned homes in 2003. Renters are those who rented homes in 2003. Residence of capital area is defined as those who lived in Seoul, Gyeonggi, and Incheon in 2003.

Results from difference-in-differences estimation for homeowners, seen in Panel A of Table 2, show that none of the estimates are statistically significant and most signs are estimated to be the opposite of the predicted housing wealth effect except for private tutoring spending for all household members and children of school age or younger. Contrary to results for homeowners, Panel B of Table 2 show that renters in the capital area, on average, decreased the probability of being in the labor force, employed while increasing the probability of having a child, spending on formal education and private tutoring for children below the age of 20. Those estimates are also statistically significant except for the two education-related spending outcomes.

The above results from separate regressions for homeowners and renters might be biased by unobserved heterogeneity across the capital and non-capital areas. Panel C of Table 2 shows results from triple difference estimation that deal with the possibility. Compared to Panel A of Table 2, homeowners in the capital area had lower probability of having a child and decreased spending on formal education while increasing spending on private tutoring for all household members during the period of rapid housing appreciation, compared to those in the non-capital area and renters in the capital area. Although these estimates are statistically significant at the conventional significance level, the estimate on fertility should not be interpreted as a causal effect because event-study estimates in Figure 7 shows that fertility was already decreasing prior to 2006. In sum, there is no evidence that homeowners decrease labor supply or increase the likelihood of having a child when they have a positive housing wealth shock, but the net effect on education spending suggest that they increase the overall spending on education for all household members.

Table 2: Regression Results

	Female LFP	Female Emp	Male LFP	Male Emp	Fertility	Formal Education Spending	Private Tutoring Spending	Private Tutoring (Age < 20)
A. Homeowners								
Yrs 2006-2008 × Capital Area (Yrs 2007-2009 for Fertility)	0.0263 (0.0200)	0.0202 (0.0236)	0.0209 (0.0165)	0.0065 (0.0202)	-0.0003 (0.0061)	-0.0595 (0.0646)	0.0367 (0.0876)	0.1800 (0.1470)
R ²	0.024	0.028	0.010	0.012	0.105	0.384	0.070	0.013
Observations	3,289	3,289	3,147	3,147	3,164	3,119	3,119	3,137
B. Renters								
Yrs 2006-2008 × Capital Area (Yrs 2007-2009 for Fertility)	-0.0321 (0.0219)	-0.0449** (0.0206)	-0.0129* (0.0068)	-0.0323** (0.0123)	0.0381*** (0.0119)	0.1140* (0.0548)	-0.2730*** (0.0776)	0.0196 (0.1530)
R ²	0.031	0.036	0.020	0.018	0.161	0.344	0.181	0.027
Observations	3,946	3,946	3,622	3,622	3,843	3,725	3,726	3,815
C. Triple Difference								
Yrs 2006-2008 × Capital Area × Owners (Yrs 2007-2009 for Fertility)	0.0569 (0.0362)	0.0647 (0.0396)	0.0324 (0.0198)	0.0377 (0.0299)	-0.0375** (0.0162)	-0.1720* (0.0867)	0.3020** (0.1160)	0.1640 (0.1950)
R ²	0.025	0.029	0.009	0.008	0.140	0.362	0.131	0.020
Observations	7,235	7,235	6,769	6,769	7,007	6,844	6,845	6,952

Homeowners are those who owned homes in 2003. Renters are those who rented homes in 2003. Residence of capital area is defined as those who lived in Seoul, Gyeonggi, and Incheon in 2003. The first period is from 2003 to 2005 and the second period is from 2006 to 2008. Labor force participation (LFP) takes the value of 1 if individual is currently employed or unemployed and looking for jobs, and 0 otherwise. Employment takes the value of 1 if individual is currently employed and 0 otherwise.

7 Mechanism Analysis

Despite the substantial housing appreciation between 2006 and 2008 in the capital area, I do not find evidence that homeowners changed their labor supply or fertility decision in a way that is found in other developed countries. Liu et al. (2021) found that there was a negative housing effect on homeowners' fertility outcomes in China as Chinese homeowners have little access to home equity loans, and thus the negative effect of increased housing costs dominates the positive effect of housing wealth. Although home equity loans are generally available in South Korea, the access to them is likely to become harder during the period of housing appreciation because the Korean government tightens regulations on Loan-To-Value ratio (LTV) and Dept-To-Income ratio (DTI) when the housing market shows a rising trend.

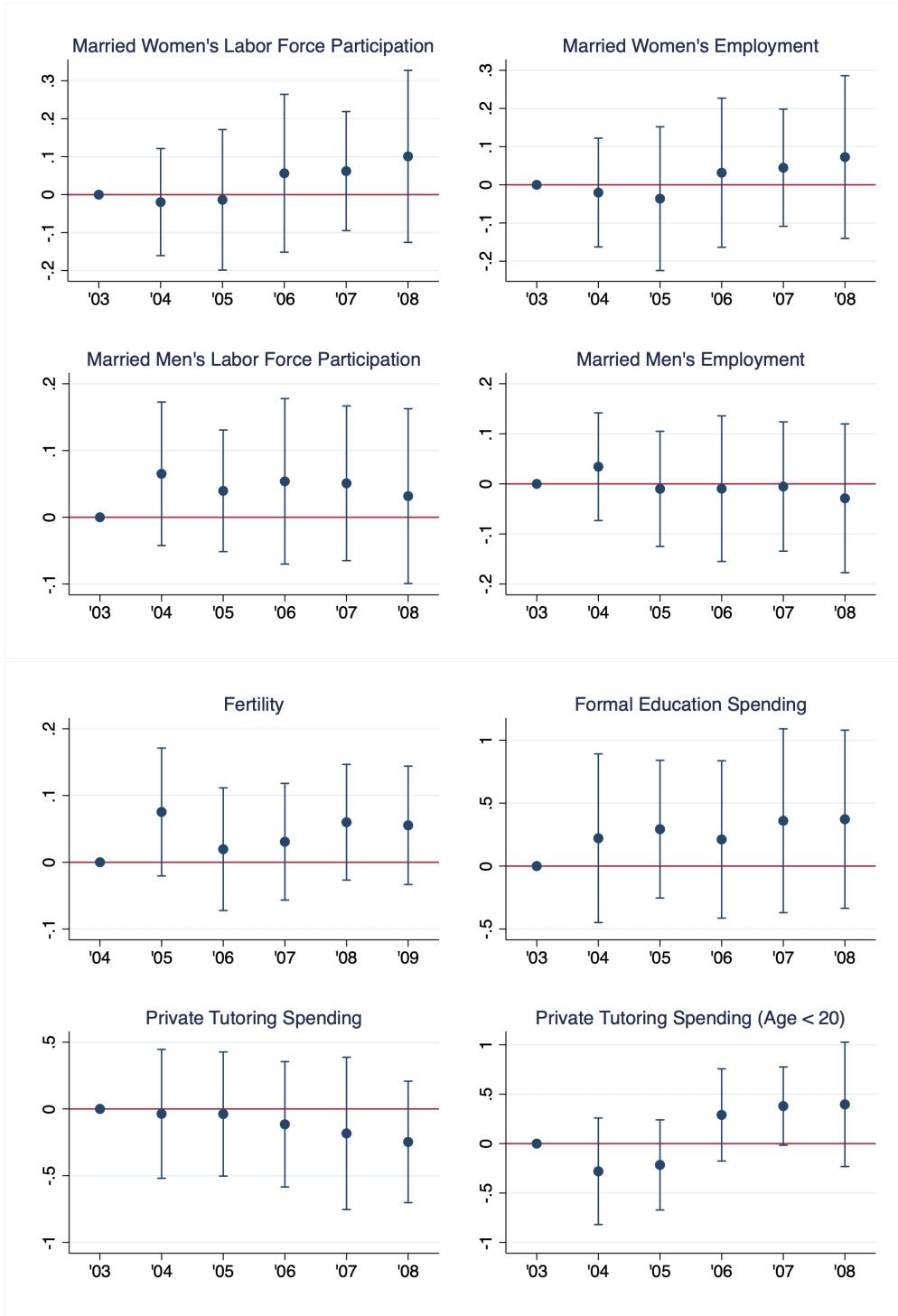
In fact, the Korean government can designate areas with faster housing price growth than the national consumer price level as a designated area, and impose more strict loan regulations on homes within the area. Most of the capital area was designated as such, from as early as 2003 to November 2008. As a result, homeowners in the capital area were able to borrow up to 40% of their home values in 2007 if the total annual payment for all outstanding loans did not exceed 40 to 60% of one's annual income (Kim, 2017). On top of that, if homeowners already have mortgages for their homes, then the loan amount shrinks because those mortgages are also included as part of their Loan-To Value ratio. Therefore, it is very likely that the tight loan regulations imposed on the capital area prevented a positive housing wealth effect during the period of rapid housing appreciation in the area.

To further analyze the hypothesis that the strict loan regulations in the capital area prevented the positive housing wealth effect, I compare changes in the outcome variables for homeowners with more or less restricted access to home equity loans. To be specific, I define homeowners with restricted access to home equity loans as those with higher than 40% of loan-to-value or debt-to-income ratios as of 2005. I manually calculate each household's loan-to-value ratio by dividing the balance of debt from all financial institutions by the reported home value. Since the survey questionnaire does not specify how much of the debt collateralizes by homes of current residence, I simply assume that the debt balance they report mainly accounts their home mortgages. It should be noted, however, that the constructed loan-to-value ratio could be bigger than the actual value, if the reported debt balance includes more of credit loans or mortgages backed by other properties. I also calculate each household's debt-to-income ratio by dividing annual payment for outstanding debt to all financial institutions by the household's annual income in the previous year. The sample size for this exercise shrinks by more than a half since some households did not respond to questions

on debt or did not participate in the survey in 2005 at all.

Figure 8 illustrates that homeowners in the capital area with relatively more financing availability increased spending on private tutoring for children of school age or younger between 2006 and 2008. On the other hand, Figure 9 does not show such response. Table 3 shows that homeowners with more availability for home equity loans increased, on average, private tutoring spending for children of school age or younger between 2006 and 2008, and this increase is statistically significant at the 1% significance level. Although homeowners with limited access for home equity loans also increased private tutoring spending for children below the age of 20, it is not statistically significant. Overall, I find a stronger effect on education spending, through private tutoring spending for children of school age or younger, which is indicative of the possibility that strict loan regulations in the capital area limit the housing wealth effect. However, I still do not find evidence that there is significant housing wealth effects on labor supply or fertility, which suggests that the housing wealth effect requires larger home equity extraction than what was allowed in South Korea.

Figure 8: Event Study Estimates (Homeowners with less than 40% of LTV and DTI)



Homeowners are those who owned homes in 2003. Residence of capital area is defined as those who lived in Seoul, Gyeonggi, and Incheon in 2003. LTV and DTI values are as of 2005.

Figure 9: Event Study Estimates (Homeowners with more than or equal to 40% of LTV and DTI)



Homeowners are those who owned homes in 2003. Residence of capital area is defined as those who lived in Seoul, Gyeonggi, and Incheon in 2003. LTV and DTI values are as of 2005.

Table 3: Regression Results By LTV And DTI Values

	Female LFP	Female Emp	Male LFP	Male Emp	Fertility	Formal Education Spending	Private Tutoring Spending	Private Tutoring (Age < 20)
A. Homeowners with less than 40% of LTV and DTI as of 2005								
Yrs 2006-2008 × Capital Area (Yrs 2007-2009 for Fertility)	0.0775 (0.0605)	0.0627 (0.0543)	0.0132 (0.0269)	-0.0193 (0.0326)	0.0166 (0.0194)	0.1330 (0.1540)	-0.1370 (0.1360)	0.5200*** (0.1180)
R^2	0.028	0.027	0.010	0.023	0.098	0.321	0.127	0.030
Observations	903	903	874	874	888	882	882	849
B. Homeowners with more than or equal to 40% of LTV and DTI as of 2005								
Yrs 2006-2008 × Capital Area (Yrs 2007-2009 for Fertility)	-0.1010 (0.0740)	-0.1000 (0.0794)	0.0151 (0.0151)	-0.0194 (0.0219)	-0.0099 (0.0173)	-0.0346 (0.1580)	-0.2630 (0.3790)	0.0238 (0.2170)
R^2	0.053	0.066	0.040	0.068	0.126	0.461	0.136	0.022
Observations	504	504	483	483	491	492	492	482

Homeowners are those who owned homes in 2003. Residence of capital area is defined as those who lived in Seoul, Gyeonggi, and Incheon in 2003. The first period is from 2003 to 2005 and the second period is from 2006 to 2008. LTV and DTI values are as of 2005. Labor force participation (LFP) takes the value of 1 if individual is currently employed or unemployed and looking for jobs, and 0 otherwise. Employment takes the value of 1 if individual is currently employed and 0 otherwise.

8 Conclusion

Until recently, we have observed rapid housing appreciation worldwide. Since homes are a substantial portion of assets for many households, it is important to understand how a positive housing wealth shock affects households' decision. That becomes particularly beneficial in the context of South Korea as the South Korean government actively steps in in the housing market, either to stabilize housing prices or to boost housing prices as a measure to stimulate economy.

In this paper, I exploit regional variation in housing prices in the 2000s to estimate the causal effect of a positive housing wealth shock on home-owning married couples' labor force participation, employment, childbearing, and education spending. I compare changes in the outcome variables for homeowners in the capital area to those for homeowners in the non-capital area, by using difference-in-differences estimation. I also use renters in both areas as another comparison group in triple difference estimation, to avoid a concern about regional heterogeneity of labor market condition. I find that homeowners in the capital area did not change their labor supply and fertility decision, decreased formal education spending, and increased private tutoring spending. I further explore why there is only weak housing wealth effect on education spending, unlike other developed countries, and find that the South Korean government's strict loan regulations are likely to deter it.

Although it has been argued that the high level of housing prices has contributed to extremely low fertility in Korea, the analysis of the renter group finds that renters in the capital area actually had a higher likelihood of having a child during the period of rapid housing appreciation in the area. This could indicate the existence of unobserved regional heterogeneity that affects fertility decision differently across the region. On the other hand, it could imply that people tend to have a child or two regardless of homeownership status once they get married, and if they become homeowners and able to have access to large enough home equity loans, they might decide to have one more child. This point is also in line with a limitation that my analysis has. When it comes to the general effect of housing prices on fertility, my analysis does not provide a comprehensive explanation because my sample is restricted to married couples. Since about 97% of births are within marriages and this percentage has been stable over time ([Statistics Korea, 2021](#)), it would be ideal to take into account the housing price impact on marriage decisions as well as fertility.

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