The Effects of Regional House Prices on Consumption in Korea: Heterogeneous Behaviors According to Homeownership Status and Lifecycle Stage

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Abstract: This paper investigates the effects of regional house prices on consumption growth, with a focus on heterogeneity across homeownership statuses and lifecycle stages, using household-level panel data in Korea from 2004 to 2017. The empirical estimation results indicate, firstly, that the growth of regional house prices has overall positive effects on consumption growth in the full sample including homeowners and renters. Secondly, house prices have significant and large effects on consumption growth for homeowners, while the effects are sharply reversed for renters, being weakly negative. Thirdly, the sensitivity of homeowners’ consumption in response to house prices differs across different stages of the lifecycle. The consumption sensitivity is greatest in the old age cohort for the sample covering the owners of single and multiple homes. When using a subsample of only single homeowners, however, the young cohort turns out to have the highest sensitivity, implying that young single homeowners face high borrowing constraints and expected income volatility. Finally, renters’ consumption sensitivity in response to house prices becomes more negative over the lifecycle.

Keywords: house prices; consumption; homeownership; renter; household panel; fixed effect

1. Introduction

House prices can be crucial to the real economy from two perspectives. They can affect the real economy through the household consumption channel. Additionally, they can be deeply correlated with household debts, which can be beneficial for resource allocation over time for liquidity-constrained households. The debt overhang, however, can weaken financial stability and subsequently hamper the real economy. For the relationship between house prices and consumption, the wealth and substitution effects entail a positive impact of house prices on consumption, while the income effect has a negative impact, as discussed by [1–5]. Thus, the total effect could be determined by the relative magnitudes of these three effects. Figure 1 shows the growth rates of real housing prices and real household consumption, and the growth rates of real housing prices and household debt as aggregate variables in Korea, respectively. The degree of co-movement between real housing prices and real household consumption appears to be low. The correlation coefficient between the real housing price growth rate and real household consumption growth rate was 0.19, and the correlation coefficient between the real housing price growth rate and household debt growth rate was 0.48.

The empirical literature analyzing the relationship between house prices and household consumption reports that the elasticities of household consumption in response to house prices range from 0.1% to 0.6% for a 1% increase in housing prices [2,4–7]. In addition, some previous studies using micro data for the Korean case, such as [8–10], investigate the effects of the valuation of the real assets of homeowners on consumption. The reported elasticities range from 0.1% to 0.2%, showing relatively weak wealth effects compared to those from the international evidence.
Studies specifically considering the heterogeneous characteristics of households have been increasing recently; a study shows that the positive effects of house prices on consumption growth are different across homeownership statuses and lifecycle stages and significant for older homeowners [11]. By contrast, many studies argue that the effects are stronger for young homeowners through the relaxation of household borrowing constraints [4,7,12,13]. These household-level micro datasets, however, are heavily focused on advanced economies, such as the U.S., the U.K., Denmark and Australia, due to data limitations in terms of financial and household information.

Against this background, this study contributes to literature on the relationship between consumption and house prices in three ways. Firstly, to the best of our knowledge, this study is the first analysis more clearly dealing with two heterogeneous household characteristics simultaneously—homeownership status and lifecycle stage—for an emerging economy. Secondly, this paper identifies the borrowing constraints that homeowners face by separating them into single homeowners and multiple homeowners. The consumption decision behaviors of multiple homeowners in response to house prices would be fundamentally different from those of single homeowners, who are likely to face more borrowing constraints. The existing studies on differing consumption responses across single or multiple homeowners are very limited, except for [14]. Finally, this paper can, overall, fill the gap in the literature by exploring the case study of Korea, an emerging market economy, given that advanced economies are heavily focused on by previous works.

This paper compiles household-level panel data from 2004 and 2017 by matching household information about consumption, income, financial variables and other household characteristics from KLIPS (Korea Labor and Income Panel Studies) with provincial and county-level house prices from Kookmin Bank. Following [2,7,11], the determinants for the consumption growth of households involving regional house prices are estimated in the frame of a fixed effect model.

The estimation results can be summarized as follows. Firstly, the growth of provincial and county-level house prices has overall positive effects on consumption growth in the full sample including homeowners and renters. Secondly, house prices have significant and large effects on consumption growth for homeowners, while the effects are sharply reversed and become weakly negative in the renter sample.

Thirdly, homeowners’ consumption sensitivity in response to house prices changes across the lifecycle. More specifically, the size of consumption sensitivity when including single and multiple homeowners is greatest in the old age cohort, implying that, overall, wealth and substitution effects become greater in old age. Young single homeowners, however, turn out to have the highest sensitivity, while older single homeowners show nonsignificant responses. This indicates that young single homeowners could face more borrowing constraints and more long-term income volatility than
older single homeowners. These findings are generally consistent with those of previous studies, such as [4,7,12,13]. Finally, renters’ consumption sensitivity across the lifecycle in response to house prices becomes more negative as age increases. This can be attributed to the fact that the older generation in Korea has been suffering sharp declines in income flows without a sufficient public pension system.

The remainder of this paper proceeds as follows. In Section 2, we review the related literature. In Section 3, the data and basic specification are presented and explained, and in Section 4, estimations are conducted to investigate whether the consumption decisions of households in response to house prices differ across homeownership status and over the lifecycle. Finally, in Section 5, we conclude.

2. Literature Review

The relationship between housing prices and consumption can be viewed as a choice problem for households between two goods: consumption goods and housing goods. Subsequently, the transmission channels from house prices to consumption can be decomposed into wealth, substitution and income effects, as noted by [1–3].

Firstly, the wealth effect can be summarized as follows: higher house prices lead to higher household wealth over the lifecycle, and accordingly, households can distribute this increased wealth across all consumption periods. Secondly, the substitution effect indicates that higher housing prices imply relatively cheaper consumption goods, and subsequently, households can allocate more expenditure to cheap consumption goods. Finally, the income effect implies that higher house prices lead to a decrease in the real purchasing power of household income, which can directly cause a reduction in consumption. In summary, an appreciation of house prices can have positive effects on consumption through the channels of the wealth and substitution, while the effects can be reversed through the income channel. Thus, the overall effects of house prices on consumption could be determined by the total sum of those effects.

Empirical studies using aggregated macro data indicate significant positive correlations between the values of housing or total wealth and consumption [15–17]. Relatedly, a study argues that the impacts of housing prices on consumption in micro studies are smaller than the effects shown in studies using macro data [18]. Some international studies using household (or regional) panel analyses explore the elasticity of household consumption in response to house prices [2,4–7]. The studies report that the elasticities range from 0.1% to 0.6% for a 1% increase in housing prices. Meanwhile, the housing wealth effect on consumption can differ by the measurement of housing wealth and financial market structures. Some studies such as [19] document that the consumption effect of home-equity extraction channel is greater than the conventional housing wealth effect. The home-equity extraction would represent the degree of borrowing constraints better than house prices. Additionally, a study shows that the housing wealth effect on consumption in China is much larger than has been found in developed economies [14]. This larger impact could be related to legal arrangements limiting other financial investments in China.

In addition, there have been some previous studies for the Korean case using micro data, such as [8–10], which explore the effects of the valuation of the real assets of homeowners on consumption. These studies indicate elasticities ranging from 0.1% to 0.2%, indicating relatively weak wealth effects compared to those in international evidence.

Moreover, increasingly more studies specifically consider the heterogeneous characteristics of households using micro data, such as [11,12]. In the study of [11], it is shown that residential house prices can have positive effects on consumption when the household head is older than 40, while many studies, such as [4,7,12,13], argue that house prices have greater effects on the consumption of young homeowners, because they can more sensitively respond to capital gains and better mitigate borrowing constraints by the appreciation of house prices. These household-level micro datasets, however, are heavily focused on advanced economies, such as the U.S., the U.K., Denmark and Australia, due to data limitations in terms of ample financial and household information.
3. Data and Specifications

3.1. KLIPS Data

For the household-level panel dataset, the KLIPS (Korean Labor and Income Panel Studies) from Wave 6 (2004) to Wave 20 (2017), which is the most recent dataset as of December 2019, is used because it offers two advantages. Firstly, it provides a direct measure of household consumption. The lack of a direct measure of consumption is often an obstacle to exploring the wealth effects of house prices, in that several studies used inferred or estimated consumption according to changes in household saving [12,13,20,21]. Relatedly, the previous study constructs a pseudopanel from consumer expenditure surveys [11], and another study uses consumption growth based on credit card spending from six issuers in Hong Kong [22]. The study, closely related to this paper, finally considers the direct measurement of consumption in the empirical analyses using the Household, Income and Labor Dynamics in Australia (HILDA) panel dataset [7].

Secondly, the dataset provides a time period that is long enough to observe the household’s consumption behavior in response to house price changes. Thirdly, it includes sufficient information regarding the residential address of households in two layers, at the provincial and county levels, which is subsequently well matched with the house prices in the regions. These advantages of the KLIPS stand out when the dataset is compared to another dataset providing household-level panel data in Korea, the HFLC (Household Finance and Living Condition), which covers the relatively short period from 2012 to 2017 and provides insufficient residential information, only indicating two categories, the Seoul-metropolitan area and the non-Seoul-metropolitan area.

In the KLIPS, flow data are recorded on the basis of the previous year, while stock data are recorded on the basis of the current year. Thus, household consumption or income data, the flow data, in the KLIPS correspond to the years from 2003 to 2016, with a one-year lag behind the survey years, which cover the period from 2004 to 2017. The starting year of the panel data is set to 2003 because the county-level housing prices have been publicly available since 2003. Throughout the paper, the value of a variable in year t refers to the value in the corresponding year. For example, if year t is 2016 for consumption, Ct, then this corresponds to the expenditure of a household during 2016, according to the survey in 2017.

3.2. Basic Specification

For the basic specification, the household-level micro data are combined with regional housing prices, following [2,7,11]. The basic specification lets us explore the consumption behaviors of not only homeowners but also renters, as displayed in Equation (1), which indicates determinants of the consumption growth of households and involves regional house prices in the framework of a fixed effect model. In Equation (1), the log indicates the natural logarithm and subsequently the log-difference (Δlog) in the growth rates of the variables. Year fixed effects are included to control country-level factors, such as changes in interest rates, stock market returns and economic shocks, along with business cycles. eit are residuals.

$$
\Delta \log (C_{i,t}) = \beta_0 E_t \Delta \log (HP_{j,t+1}) + \beta_1 \Delta \log (Y_{i,t}) + \beta_2 DTI_{i,t} + \beta_3 Age_{i,t} + \beta_4 Family_{size_{i,t}} + \beta_5 Schooling_{i,t} + \beta_6 \Delta \log (GRDP_{p,t}) + \alpha_i + \eta_t + \epsilon_{it}
$$

(1)

In Equation (1), i indicates an individual household in a balanced panel from 2004 to 2017, involving its consumption-level observations from 2003 and subsequently its growth observations from 2004 to 2016. j represents regions in two levels, provinces and counties, in South Korea. Relatedly, the p in GRDP represents the provinces in South Korea. As discussed in [23,24], the specification can be further controlled by economic shocks such as GDP and stock returns, which are presumably associated with consumption movements. In addition, the house prices and stock prices can closely move leading to a lead-lag relationship through the channels of wealth and credit-price effects as
discussed in [25]. In this paper, the economy-wide factors such as GDP growth and stock prices closely correlated with the business cycle can be represented by the year fixed effect, i.e., year dummies. Additionally, the gross regional domestic products (GRDPs) in 16 province-levels can be a proxy for the GDP, which consists of 16 GRDPs.

Equation (1) has a timing issue such that we analyze the impact of expected housing prices, not the current housing prices, on consumption. This is because consumption expenditure information corresponds to retrospective variables in the panel survey. In other words, in the survey data on consumption expenditure, each household reported information for year \( t \), but since the survey was conducted at time \( t + 1 \) year, it is likely that considerable information regarding the consumption expenditure at time \( t + 1 \), i.e., at the time of survey year, was included. Reflecting this, the actual correlations between the current consumption growth rate and the growth rates of real regional housing prices turned out to be very low.

3.3. Consumption and House Prices

Table 1 illustrates the variables and related explanations for the data compilations. Consumption, denoted by \( C \), is a real nondurable variable including the expenditure on food, education, clothing, housing services, leisure goods and services, healthcare, public transportation fees, vehicle maintenance, daily necessities, and other items. It is worth noting that non-consumption items, such as social contributions, principal and interest payments, and donations, are not included in nondurable consumption. Following [7,11,22], spending on durable goods is not considered since the consumption flows provided by these goods cannot be measured. Additionally, all nominal level variables are denominated by the consumer price index (CPI) and are subsequently transformed into real variables.

| Variables | Compilations and Explanations |
|-----------|--------------------------------|
| C         | Real non-durable consumption less non-consumption including social contributions, principal and interest repayments, and donations; denominated by CPI |
| HP        | Real regional house prices from Kookmin Bank; 16 provinces and 145 counties are covered; denominated by CPI |
| Y         | Real gross income, including labor income, financial income, property income, and social and private transfer incomes; denominated by CPI |
| DTI       | Total liability as of year \( t \) over disposable income as of year \( t-1 \); total liability including debts from financial institutions, debts from private transactions and security deposit for rents (monthly rent or Jeonse) |
| HP        | 16 province-level housing prices from Kookmin Bank; alternatively using county-level housing prices; denominated by CPI |
| Age       | Age of household head |
| Family_size | Number of household members |
| Schooling | Total years of schooling of the household head |
| GRDP      | Real gross regional domestic product for 16 provinces |

The house prices, denoted by \( HP \), represent two regional real prices, that is, 16 province-level and 145 county-level house prices. There are several reasons why the regional house prices are involved instead of real asset valuations in the household panel or economy-wide house prices. Firstly, we adopt the estimation framework in previous studies incorporating the regional prices such as [2,7,11]. Secondly, we are more interested in identifying the differences of homeowners’ or renters’ responses to house prices instead of economy-wide aggregate responses. Subsequently and thirdly, we need to observe both households’ responses to the identical shocks to regional housing prices. Relatedly, using the real asset valuations reported in the panel can only provide the homeowners’ response without the renters.’ The raw data are obtained from Kookmin Bank, which is one of the five major commercial banks in South Korea. Kookmin Bank has provided county-level house prices for 145 of the 228 counties in South Korea since 2003. The housing price data of Kookmin Bank have been widely
used as representative ones in Korea from two perspectives: firstly, it is an official statistic proved and regularly reviewed by government statistics authority. Secondly, it provides the longest time series dataset due to being compiled since 1986. If county-level data are not available, provincial housing prices are used instead.

During the 13 years from 2004 to 2017 in the KLIPS, homeownership status could have changed. There are four categories: non-moving homeowners, non-moving renters, those moving from renters to homeowners, and those moving from homeowners to renters. In the empirical analyses, moving status does not matter since we focus on households’ heterogeneous responses to house prices across homeownership status. That is, a household can be involved in both the homeowner sample and the renter sample throughout the period depending on its status. For example, if a household was a renter until 2008, it is included in the renter sample; if the household bought a home in 2009, it then belongs to the homeowner sample.

3.4. Income, Debt-to-Income Ratio and Other Variables

The household income, denoted by $Y$, is real gross household-level income, which is deflated by the CPI. Gross income involves income from all sources, such as labor, financial holdings, property, and social and private transfers.

The DTI, the debt-to-income ratio, is compiled by total nominal liability as of year $t$ over the nominal gross income as of year $t-1$, in which both the numerator and the denominator are reported in the same surveyed year in the KLIPS. The liability includes not only financial debts but also down payments or security deposits for Jeonse. Jeonse is a real estate term unique to South Korea that refers to the two-year lease of a house subject to a lump-sum deposit ranging from 50% to 80% of the market value of the rented house instead of paying monthly rent. The rent system of Jeonse has been recognized as providing benefits to both tenants and landlords. For the former, it can provide housing at a lower cost when compared to monthly rent. For the latter, it can offer financial leverage through the deposit without borrowing from conventional financial institutions.

Household-specific characteristics are also involved as control variables, such as household head age (Age), the number of family members (Family_size) and the years of schooling of the household head (Schooling). Other unobserved characteristics of households are represented by the fixed effect. The GRDP, the real gross regional domestic product for 16 provinces, represents the regional business cycle.

It is worth noting that the endogeneity problem in Equation (1) can be mitigated in the household-level panel data structure on the grounds that the consumption at time $t$ can hardly affect household income, regional housing prices, and GRDP at time $t$. This is a virtue of the micro dataset compared to the macro dataset, in which the endogeneity problem across dependent and explanatory variables should be dealt with in a more rigorous manner.

3.5. Basic Statistics

Table 2 illustrates the basic statistics for the variables, where the growth of real non-durable consumption involves 38,797 observations. Some outliers, such as the upper 1% from the quintile distribution of debt-to-income ratio from, are deleted. Additionally, households that are currently living in rented houses but own houses somewhere else are deleted from the sample, because the address for the houses owned is different from their residence address. Subsequently, an unbalanced panel of 37,630 observations for 3344 households from 2004 to 2017 is constructed. The regional data, such as housing prices and GRDP, are matched to each household by its residential address at two levels: province and county.
Table 2. Basic Statistics.

| Variable          | Obs.       | Mean     | Standard Deviation | Min       | Max       |
|-------------------|------------|----------|--------------------|-----------|-----------|
| \( \Delta \log (C) \) | 38,797     | 0.0028   | 0.3340             | -3.7235   | 2.8614    |
| \( \Delta \log (HP) \) (province-level) | 41,224     | 0.0049   | 0.0449             | -0.0659   | 0.1408    |
| \( \Delta \log (HP) \) (county-level)  | 41,429     | 0.0029   | 0.0495             | -0.1410   | 0.2419    |
| \( \Delta \log (Y) \) | 39,669     | 0.0228   | 0.5936             | -6.2603   | 6.2470    |
| \( DTI \)         | 38,903     | 0.7899   | 1.6209             | 0.0000    | 14.0135   |
| \( Age \)         | 39,091     | 56.4     | 14.0               | 17.0      | 96.0      |
| \( Family\_size \) | 39,091     | 3.0      | 1.3                | 1.0       | 10.0      |
| \( Schooling \)   | 40,745     | 10.1     | 4.9                | 0.0       | 25.0      |
| \( \Delta \log (GRDP) \) | 42,767     | 0.0331   | 0.0233             | -0.0367   | 0.1114    |

For a brief summary of the basic statistics, the household-level average annual growth of real non-durable consumption and real gross income are 0.3% and 2.3%, respectively. The average DTI, the debt-to-income ratio, is 79.0% across the sample periods, with a minimum value of 0%, indicating non-debtors. The annual average growth of real housing prices at the province and county levels is 0.5% and 0.3%, respectively, reflecting considerable fluctuations across the 2008 financial crisis. The average GRDP annual growth is 3.3%, which is quite similar to the GDP growth across all periods. The average age of the household head is 56.4 years old, which roughly means 45.3 years old in 2004 and 60.7 years old in 2017. The average family size is three members. Finally, the average years of schooling of the household head is more than 10 years, indicating first grade of high school.

4. Estimation Results

4.1. Baseline Results across Homeownership Statuses

Table 3 shows the baseline estimation results across homeownership groups. The \( p \)-values for cluster-robust standard errors at the household level are reported in parentheses. Columns (1) and (2) show the results using the growth of province- and county-level real house prices, respectively, using the whole sample including homeowners and renters, while Columns (3) and (4) only involve the subsample of homeowners and Columns (5) and (6), the subsample of renters. The dependent variables across specifications are the growth of real non-durable consumption from 2003 to 2016.

The estimation results for the whole sample indicate that the growth of provincial and county-level house prices has overall positive effects on household consumption growth, indicating that the combined wealth and substitution effects overall exceed the income effects of house prices on consumption, as discussed in [2]. More specifically, substitution and wealth effects imply that homeowners are likely to allocate more expenditures to relatively cheaper consumption goods with enhanced wealth when house prices are appreciating even though the real purchasing power of income declines, the income effect. The positive effects on consumption, however, can be reversed in renters without the wealth effect. The ratios of homeowners and renters in Korea are reported to be around 60% and 40%, respectively, which can lead to an overall positive of effect of house prices on consumption in the whole sample. The magnitudes of the effects, however, are smaller than those found in previous literature. The elasticities of consumption growth for a 1% increase in house prices are reported to range from 0.1 to 0.6 [2,4–7].

Other independent and control variables are overall consistent with the theoretical expectations. That is, income growth can enhance consumption growth, while a high level of debt can reduce it, which is overall consistent with the findings of [26]. Family size is a highly significant factor in accounting for consumption growth, as expected. The years of schooling of household head, denoted by Schooling, show insignificant effects on household consumption growth, which implies that a level variable like Schooling does not have much explanatory power in accounting for the changes
in consumption growth across 13 years, a relatively long horizon in the framework of the household fixed effect model. Finally, households’ consumption decisions are much more correlated with their income changes than developments in regional economic conditions represented by the GRDP growth rate, i.e., 16 provinces’ business cycles. 

Age has overall negative effects on consumption as the household becomes older, which is inconsistent with the notion of [27], in which housing is more affordable for the elderly as many of them have paid off their mortgages, which accordingly leads to higher consumption for them. The weakly negative effects of age can be attributable to the fact that the average age of the household head is 56.4 years old, as shown in Table 2, which is relatively higher than the average household age in the population of Korea. This high average age in this study is related to the way in which the balanced panel from 2003 and 2017 was constructed, which raises the mean value of ages as time goes by. Accordingly, old age of a household head implies that a considerable share of retirees with weak income flows are included in the panels, given that the public pension system is evaluated to provide relatively insufficient benefits to the elderly when compared to those in advanced economies. Another possible explanation is the nonlinear relation between the age and consumption growth as discussed in [9,11]. Particularly, the study exploring the Korean case, documents that consumption expenditure has its peak at 49 years of age and then starts to decline after 50 years [9].

The small magnitudes of the effects of house prices on consumption can be clearly explained when separating the whole sample into homeowner and renter subsamples. As shown in Columns (3) and (4), the growth of house prices has more significant and larger effects on consumption growth in the homeowner sample. A 1% increase in the province-level real house prices yields an increase in consumption growth of approximately 0.14%, which is consistent with the findings from previous studies in Korea using the real asset valuations of micro data.

Interestingly, homeowners respond more sensitively to provincial house prices than county-level prices. As [11] noted, province-level house prices could be more directly correlated with national business cycles and financial market conditions, while county-level house prices might be more directly related to collateral and, subsequently, the wealth effect. In addition, our conjecture is that homeowners might regard the appreciation of provincial house prices to indicate more long-term and persistent movements than the appreciation of county-level house prices, which can lead to expanding consumption expenditure. The estimation results for the renter sample in Columns (5) and (6) are strikingly different from the results for the homeowner sample. The house prices at both levels show overall weakly negative effects on consumption growth, implying that the income effects of housing prices surpass the sum of the wealth and substitution effects for renters. Meanwhile, the negative effects for renters in response to increasing house prices are relatively weak when compared to those in [11], where the dummy variables representing renters show more significant negative signs. We conjecture that the weaker impact in the Korean dataset is related to the Jeonse renting system, which still accounts for around 40% of total renters in Korea. The system represents a real estate term unique to Korea that refers to the way in which houses are leased. The Jeonse contract involves the tenant providing a large lump-sum deposit of money ranging from 50% to 80% of market value of the rented house, and in return, the tenant is allowed to stay in the house for two years without additional monthly payments. The two-year contracting period in the Jeonse system, accordingly, may cause renters to be less sensitive to changes in regional house prices, and additionally, the system can decrease the degree of correlation between house prices and housing costs in each region.
Table 3. Baseline estimations across homeownership groups (1).

|                      | Whole Sample Including Both Homeowners and Renters | Homeowners Subsample | Renters Subsample |
|----------------------|-----------------------------------------------------|-----------------------|-------------------|
|                      | (1)                                                 | (2)                   | (3)               | (4)               | (5)               | (6)               |
| \( \Delta \log (HP) \) (province-level) | 0.0931 *** (0.0340)                                 | 0.1436 *** (0.0417)   | -0.1177           |                   |                   |                   |
| \( \Delta \log (HP) \) (county-level)   | 0.1609 *** (0.0056)                                 | 0.1609 *** (0.0071)   | 0.1620 *** (0.0020) | 0.1578 *** (0.0010) | 0.1578 *** (0.0010) | 0.1578 *** (0.0010) |
| \( \Delta \log (Y) \)                    | -0.0025 -0.0026 * (0.0015 -0.0016)                  | -0.0019 -0.0019       | -0.0021           |                   |                   |                   |
| DTI                                | 0.0344 (0.0006)                                     | 0.0927 ** (0.0010)    | -0.1324 *         |                   |                   |                   |
| Age                                | -0.0014 ** (0.0000)                                 | -0.00108 -0.00108     | -0.0031*          |                   |                   |                   |
| Family size                       | 0.0437 *** (0.0030)                                 | 0.0492 *** (0.0045)   | 0.0455 *** (0.0069) |                   |                   |                   |
| Schoolings                        | 0.0018 (0.0023)                                     | 0.0024 0.0024         | 0.0041 0.0041     |                   |                   |                   |
| \( \Delta \log (GRDP) \)            | -0.0146 -0.0143 (0.0176 -0.0176)                    | 0.0264 0.0271         | -0.0257 -0.0259   |                   |                   |                   |
| Household fixed effects            | YES YES YES YES YES YES                            | YES YES YES YES YES YES |
| Year fixed effect                 | YES YES YES YES YES YES                            | YES YES YES YES YES YES |
| # of obs.                          | 37,630 37,630 23,878 23,878 9230 9230               | 37,630 37,630 23,878 23,878 9230 9230 |
| # of groups                       | 3344 3344 2621 2621 1294 1294                        | 3344 3344 2621 2621 1294 1294 |
| Within R-square                   | 0.0850 0.0858 0.0858 0.0858 0.0858 0.0858          | 0.0850 0.0858 0.0858 0.0858 0.0858 0.0858 |

Note: *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively, and the residuals are clustered along the household dimension.

4.2. Estimation Results across the Lifecycle: Homeowners

Following [7,11], the sample is divided into a young age cohort if the household head is less than 40 years old as of 2004, a middle-age cohort if the household head is between 40 and 59 years old and an old age cohort if the household head is at least 60 years old. In addition, we identify multiple homeowners from a full homeowner sample because approximately 27% of homeowners in Korea are multiple homeowners [28]. This high ratio of multiple homeowners might be attributable to the Jeonse renting system, which has been evaluated to provide private financial leverage to landlords through the lump-sum deposit of around 50% to 80% of the house values. The Jeonse deposit can be easily converted into additional funds for homeowners to purchase another house with mortgage borrowings from regular financial institutions.

Homeowners’ consumption sensitivity across the lifecycle in response to provincial house prices is displayed in Table 4. Columns (1), (3) and (5) present the overall positive response across the three age cohorts covering single and multiple homeowners, while the significance of the sensitivity is higher in the old age cohort than in the young age cohort, implying that overall wealth and substitution effects become greater in old age.
Table 4. Response to province-level house prices across the lifecycle: homeowners (1)(2).

|                  | Young (≤39) | Middle (40–59) | Old (≥60) |
|------------------|-------------|----------------|-----------|
|                  | All         | Single Homeowners | All       | Single Homeowners | All         |
|                  | (1)         | (2)             | (3)       | (4)             | (5)         | (6)         |
| ∆ log (HP) (province-level) |           |                 |           |                 |           |           |
| (0.0798)         | 0.1593 **   | 0.1967 **       | 0.0715    | 0.0728          | 0.2478 *** | 0.1978     |
|                  | (0.0566)    | (0.0977)        | (0.0126)  | (0.0124)        | (0.0124)   | (0.0170)   |
| ∆ log (Y) |           |                 |           |                 |           |           |
| (0.0190)         | 0.1295 ***  | 0.1382 ***      | 0.1531 ***| 0.1513 ***      | 0.1757 *** | 0.1732 *** |
|                  | (0.0241)    | (0.0097)        | (0.0126)  | (0.0124)        | (0.0124)   | (0.0170)   |
| DTI              | 0.0021      | −0.0052         | −0.0052   | −0.0010         | 0.0040     | 0.0062     |
|                  | (0.0043)    | (0.0029)        | (0.0056)  | (0.0035)        | (0.0045)   | (0.0054)   |
| Age              | −0.0029 *   | −0.0056         | −0.0025   | −0.0008         | −0.0001    | −0.0010    |
|                  | (0.0037)    | (0.0028)        | (0.0026)  | (0.0012)        | (0.0020)   | (0.0028)   |
| Family_size      | 0.0209 **   | 0.0373 ***      | 0.0524 ***| 0.0616 ***      | 0.0588 *** | 0.0569 *** |
|                  | (0.0089)    | (0.0052)        | (0.0081)  | (0.0094)        | (0.0127)   | (0.0127)   |
| Schooling        | −0.0189 *   | −0.0245 **      | 0.0069    | 0.0077          | 0.0031     | −0.0077    |
|                  | (0.0092)    | (0.0079)        | (0.0111)  | (0.0042)        | (0.0049)   | (0.0049)   |
| ∆ log (GRDP)     | 0.0187      | −0.0440         | −0.0319   | 0.0565          | 0.1093 *** | −0.0767    |
|                  | (0.0372)    | (0.0536)        | (0.1005)  | (0.0651)        | (0.0658)   | (0.0658)   |
| Household fixed effects | YES         | YES             | YES       | YES             | YES        | YES        |
| Year fixed effect | YES         | YES             | YES       | YES             | YES        | YES        |
| # of obs.        | 4421        | 3281            | 11,888    | 6821            | 7569       | 4193       |
| # of groups      | 591         | 526             | 1245      | 945             | 785        | 566        |

Notes: *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively, and the residuals are clustered along the household dimension. The age cohorts are based on the age of the household head as of 2004.

The estimation results, however, are sharply reversed in the case of single homeowners; the sensitivity of single homeowners is significant only in the young cohort, while the middle and old age cohorts show nonsignificant responses, as displayed in Columns (2), (4) and (6). The findings are logical in the sense that single homeowners could face more borrowing constraints than multiple homeowners. In addition, young single homeowners could face more long-term income volatility than older single homeowners. Thus, the expected appreciation of regional housing prices can ease the constraints and volatility for young households.

This finding of the higher consumption sensitivity of young homeowners is, overall, consistent with the findings in previous literature, such as [4,7,12,13]. This explanation is also supported given that the significance of consumption sensitivity disappears in the estimation results regarding multiple homeowners, as illustrated in Table 5. The multiple homeowners in the young, middle and old households, who are unlikely to face borrowing constraints, hardly respond to the changes in regional housing prices, as expected. The estimation results of the greater consumption sensitivity of single homeowners are also overall consistent with those in [14], maintaining that those having sole homeownership consume the most in response to an appreciation in housing wealth over multiple homeowners. Moreover, Table A1 in Appendix A represents the consumption sensitivity of homeowners over the lifecycle to county-level house prices. The estimation results are, overall, consistent with those using province-level house prices in Table 4.
Table 5. Response to house prices across the lifecycle: multiple homeowners (1).

|                      | Young (≤39) | Middle (40–59) | Old (≥60) |
|----------------------|-------------|---------------|-----------|
| \(\Delta \log (HP)\) (province-level) | 0.1082      | -0.0678       | -0.0357   |
| \(\Delta \log (HP)\) (county-level)   | 0.1305 ***  | 0.1316 ***    | 0.1701 ***|
| \(\Delta \log (Y)\)           | -0.0160     | -0.0013       | -0.0090 * |
| \(DTI\)                  | 0.0049      | 0.0056        | -0.0013   |
| \(Age\)                  | 0.0049      | 0.0044        | 0.0348 ***|
| \(Family\_size\)         | 0.0401 *    | 0.0435 *      | 0.0009    |
| \(\Delta \log (GRDP)\)    | -0.2104     | -0.2087       | 0.0432    |

Note: *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively, and the residuals are clustered along the household dimension.

4.3. Estimation Results across the Lifecycle: Renters

Renters’ consumption sensitivity across the lifecycle in response to regional house prices is displayed in Table 6. Columns (1) and (2) present nonsignificant responses to province- and county-level prices in the young age cohort. The sensitivities, however, are consistently negative as age increases, implying that the income effects become greater than the substitution effects, as displayed in Columns (3) through (6). The weakly nonnegative signs in young renters implies that the income effect, a reduction of consumption in response to house price appreciation, in the young cohort is relatively smaller than in the middle or old age cohorts. We conjecture that young renters can respond less sensitively to changes in house prices because essential consumption expenditures account for a greater proportion of the total when compared to those for the older renters. Additionally, the young renters can expect to stay for a more extended period of time in labor markets to accumulate their funds for purchasing houses in the future. By contrast, the middle and old age renters can be more pronounced in terms of reductions in current consumption expenditure in response to increases in house prices. It can be understood from two perspectives. Firstly, their extra saving burden for purchasing a house can be more urgent when regional house prices increase, given the relatively short period of working years. Secondly, they may need to reduce their expenditure growth when higher house prices cause higher housing costs, given poor income flows after retirements.

Relatedly, the reduction in renters’ consumption growth in response to house prices largely comes from the old age cohort, which can be explained by the fact that people aged over 60 face sharp declines of income flows, as they have already retired from their regular jobs and are poorly supported by public or private pensions.
Table 6. Response to house prices across the lifecycle: renters (1) (2).

|                     | Young (≤39) | Middle (40–59) | Old (≥60) |
|---------------------|-------------|----------------|-----------|
| (1)                 | (2)         | (3)            | (4)       |
| ∆log (HP) (province-level) | 0.0971 (0.1259) | −0.2193 * (0.1231) | −0.3510 ** (0.1699) |
| ∆log (HP) (county-level) | 0.1405 *** (0.0175) | 0.1835 *** (0.0186) | 0.1470 *** (0.0209) |
| DTI                 | −0.0018 (0.0062) | −0.0011 (0.0064) | −0.0011 (0.0111) |
| Age                 | 0.004 (0.0020) | −0.0073 ** (0.0033) | −0.0074 ** (0.0033) |
| Family_size         | 0.0367 *** (0.0120) | 0.0607 *** (0.0113) | 0.0584 *** (0.0163) |
| Schooling           | −0.0058 (0.0117) | −0.0197 ** (0.0084) | 0.0162 ** (0.0081) |
| ∆log (GRDP)         | −0.0502 (0.0318) | 0.0244 (0.0483) | 0.0304 (0.0509) |

| Household fixed effects | YES | YES | YES | YES | YES | YES | YES |
| Year fixed effect      | YES | YES | YES | YES | YES | YES | YES |
| # of obs.              | 3216 | 3216 | 3712 | 3712 | 2257 | 2257 | 2257 |
| # of groups            | 504  | 504  | 503  | 503  | 287  | 287  | 287  |
| Within R-square        | 0.0686 | 0.0685 | 0.0967 | 0.0967 | 0.1056 | 0.1056 | 0.1056 |

Notes: *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively, and the residuals are clustered along the household dimension. The age cohorts are based on the age of the household head as of 2004.

5. Concluding Remarks

House prices are a critical factor associated with household consumption, in that real estate represents a relatively higher share of household assets in Korea than in OECD countries. In this regard, the investigation of household decisions regarding consumption behavior in response to house prices can be significant to evaluate economic consequences since consumption represents a large portion of GDP from a macro perspective.

Related theories suggest that the overall effects of house prices on consumption can be determined by three effects: wealth, substitution and income. The wealth and substitution effects explain the positive effects of prices, while the effect of income can be negative. In the related empirical literature, micro-level studies considering heterogeneous household characteristics have been growing, but the datasets have been heavily focused on a few advanced economies, and little is known about emerging economies, such as Korea. Thus, finding stylized facts about these relationships in Korea and comparing them with the findings in advanced economies can contribute to the literature.

This paper investigates the relationship between house prices and consumption using household-level panel data in Korea, with a focus on the heterogeneity of homeownership status and stage of the lifecycle. The unbalanced panel, with 37,630 observations of 3344 households from 2004 to 2017, is constructed by matching household information involving nondurable consumption and other financial data with province- and county-level house prices by residential address. The determinants for the consumption growth of households are estimated using panel data in fixed effect models.

The estimation results indicate that, firstly, the growth of provincial- and county-level house prices have overall positive but relatively small effects on consumption growth, which implies that the sum of the wealth and substitution effects exceeds the income effect. The magnitudes of the effects are relatively small; i.e., consumption increases by approximately 0.1% in response to a 1% increase in house prices, compared to the range from 0.1% to 0.6% found in previous studies.
Secondly, further estimations are executed using two subsamples: homeowners and renters. The results indicate that house prices have more significant and larger effects in the subsample of homeowners, while they have overall weakly negative effects in the subsample of renters.

Thirdly, the homeowners’ consumption sensitivity in response to house prices turns out to be greater in the old age cohort than in the young cohort, implying that the overall wealth and substitution effects become greater over the lifecycle. Young single homeowners, however, turn out to have the highest sensitivity, while the response of older single homeowners is less significant, indicating that young single homeowners could face more borrowing constraints and long-term income volatility than old single homeowners. This finding of higher consumption sensitivity in young homeowners is overall consistent with the findings in previous literature.

Finally, renters’ consumption sensitivity across the lifecycle in response to house prices becomes more negative as age increases. This can be attributable to the fact that the older generation in Korea has been exposed to sharp declines in income flows given the poor public pension systems. The overall estimation results indicate that household consumption decisions in response to regional house prices can differ fundamentally across two dimensions of heterogeneity—homeownership status and lifecycle stage.

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Appendix A

Table A1. Responses to county-level house prices across the lifecycle: homeowners (1) (2).

|                | Young (≤39) | Middle (40–59) | Old (≥60) |
|----------------|-------------|----------------|-----------|
|                | All (1)     | Single Homeowners (2) | All (3) | Single Homeowners (4) | All (5) | Single Homeowners (6) |
| Δ log (HP)     | 0.1023      | 0.1692 *        | 0.0630    | 0.0788              | 0.1372 * | 0.1200                 |
|                | (0.0724)    | (0.0875)        | (0.0553)  | (0.0738)            | (0.0817) | (0.1079)               |
| Δ log (Y)      | 0.1296 ***  | 0.1381 ***      | 0.1531 ***| 0.1513 ***          | 0.1758 ***| 0.1733 ***              |
|                | (0.0190)    | (0.0241)        | (0.0089)  | (0.0126)            | (0.0124) | (0.0170)               |
| DTI            | −0.0022     | −0.0052         | −0.0052 * | −0.0010             | 0.0039   | 0.0062                 |
|                | (0.0043)    | (0.0064)        | (0.0029)  | (0.0056)            | (0.0035) | (0.0045)               |
| Age            | −0.0029 *   | −0.0056         | −0.0025   | −0.0008             | −0.0001  | −0.0010                |
|                | (0.0016)    | (0.0037)        | (0.0028)  | (0.0026)            | (0.0012) | (0.0020)               |
| Family_size    | 0.0211 **   | 0.0372 ***      | 0.0525 ***| 0.0617 ***          | 0.0590 ***| 0.0571 ***              |
|                | (0.0089)    | (0.0129)        | (0.0053)  | (0.0081)            | (0.0094) | (0.0127)               |
| Schooling      | −0.0191 **  | −0.0244 **      | 0.0069    | 0.0077              | 0.0030   | −0.0077                |
|                | (0.0092)    | (0.0107)        | (0.0079)  | (0.0111)            | (0.0042) | (0.0049)               |
| Δ log (GRDP)   | 0.0199      | −0.0409         | −0.0319   | 0.0561              | 0.1111 * | −0.0720                |
|                | (0.0365)    | (0.1034)        | (0.0536)  | (0.1006)            | (0.0647) | (0.0647)               |
| Household fixed effects | YES       | YES            | YES       | YES                | YES      | YES                    |
| Year fixed effect | YES        | YES            | YES       | YES                | YES      | YES                    |
| # of obs.      | 4421        | 3281           | 11,888    | 6821               | 7569     | 4193                   |
| # of groups    | 591         | 526            | 1245      | 945                | 785      | 566                    |
| Within R-square | 0.0603     | 0.0661         | 0.0746    | 0.0725             | 0.1101   | 0.1109                 |

Notes: *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively, and the residuals are clustered along the household dimension. The age cohorts are based on the age of the household head as of 2004.
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