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Abstract

South Korea has a unique kind of rental contract, called chonsei. The tenant pays an upfront deposit, typically from 40% to 70% of the property value, to the landlord, and the landlord repays the deposit to the tenant upon contract termination. The tenant is not required to make any periodic monthly rental payments. The main goal of this paper is to show why such a unique rental contract exists and has been popular in Korea. The model shows that chonsei is an ingenious market response in the era of "financial repression" in Korea (Renaud (1989)), allowing landlords to accumulate sufficient funds for housing investment without major reliance on a mortgage. The model also shows that the tenant, who suffers from insufficient mortgage borrowings, can access cheaper rental housing via chonsei than when only monthly rental housing is available. The model predicts that the chonsei system should fade out when arbitrage gains from housing investment disappear. An implication of the model is that the chonsei renter may save while the landlord and the owner-occupier put all their assets into housing and thus have no financial savings. This hypothesis is empirically tested and confirmed.

Keywords: Chonsei, Korean housing market, Financial repression, Household saving, Tenure choice

JEL Classification Numbers: R2, G2, D1

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1 Introduction

South Korea (Korea hereafter) has a unique way of renting a house, called chonsei. The tenant pays an upfront lump-sum deposit, which is typically from 40% to 70% of the property value, to the landlord for the use of the property. The landlord repays the nominal value of the deposit to the tenant upon contract termination. There is no additional requirement for the tenant such as periodic rental payments. So, the chonsei deposit, which is held during the contract period and repaid by the landlord, is the substitute for such payments.[1]

Chonsei became increasingly popular in Korea over the past few decades as the country experienced rapid economic development and urbanization.[2] Chonsei is still a popular tenure choice in Korea. As of 2010, about 22% of national households and 33% of households in Seoul live in chonsei rental housing while 54% of the national households reside in owner-occupied housing. Chonsei accounts for about 50% of the rental housing market. Moreover, including the mixed form of chonsei and monthly rent, the portion of chonsei-type contract is 92% in the rental housing market. Only 8% of rental houses are pure monthly rental units.[3]

Many authors point out that financial market imperfection during the period of economic development has led to the popularity of the chonsei rental system in Korea (Renaud (1989), Kim (1990), Son (1997)). Government policies aimed at boosting the national economy helped financial institutions supply cheap credit to the industrial sector. Due to the successful economic development plans, Korea experienced rapid economic growth and urbanization between 1960 and 1990. The Korean housing sector, however, had to undergo

[1] Chonsei-type rental contracts are not entirely unique to Korea. The antichresis lease, which appears in many civil law countries, also requires a lump sum tenant payment that is to be returned in full at the end of the lease. Chonsei can actually be regarded as a version of the antichresis lease contract. The countries where the antichresis lease contract is used include Argentina, Bolivia, Egypt, France, and Spain. Navarro and Turnbull (2010) explore the antichresis from the Bolivian experience, with their emphases being tenant liquidity risk and owner input moral hazard.

[2] It is known that the kind of chonsei rental contract existed hundreds years ago in Korea, but it is unclear when chonsei was first used.

[3] The mixed form of chonsei and monthly rent, which we call "mixed chonsei," requires that the tenant pay a mixture of an upfront deposit and monthly rents. The tenant does not pay the full chonsei deposit, but instead pays monthly rents to fill the gap. The source of the statistics is Statistics Korea (http://kostat.go.kr).

"financial repression" during the same period (Renaud (1989)).[4] Under financial repression, the real returns on financial savings were reduced by interest rate ceilings due to the government policies favoring the industrial sector. On the other hand, household savings via housing ownership were not disadvantaged by the government policies. Rather, investments in housing were encouraged as the rapid urbanization in major cities caused the demand for housing to rise sharply. Meanwhile, housing was in short supply in Korean cities, partly due to strong government land-use controls, and given high demand, people expected high capital gains from house ownership (Kim (1990)). Thus, due to financial repression and the housing shortage problem in major cities, housing has been regarded as a superior investment compared to financial savings, with house price rising faster than real income or any other price variables during the period of economic development (Son (1997)). Moreover, the rate of house price appreciation was much greater than real interest rates during this period (Mills and Song (1977)).[5]

Although the Korean households were inclined to own houses, they were constrained in their ability to borrow to invest in owner-occupied housing. While most financial institutions were geared to supply funds to the industrial sector, Korean households could not access sufficient finances. Especially, mortgage borrowing was almost unavailable to consumers until recently. Only about 10% of homebuyers received mortgage loans, and the loan-to-value (LTV) ratio was less than 30% between 1970 and 1985 (Kim (1990), Gyourko and Han (1989)). Under such a poor housing finance system, Korean consumers with low initial wealth could not purchase a house, despite high expected capital gains from house ownership.

In addition, strong government regulations in the housing and the rental housing markets have caused a lack of organized rental entities. Government policies have been biased toward the supply of new owner-occupied housing units, instead of supplying sufficient rental housing units (Son (1997)). For example, the government's credit rationing policies required

[4] "Financial repression" is a kind of deliberate government policy designed to channel funds to the government or the industrial sector and thus obtain explicit or indirect control over interest rates.

[5] The detailed data on house prices has become available since 1987, much later than the chonsei system gained its original popularity.

that rental housing developers operate with a high capital-to-debt ratio (Ambrose and Kim (2003)). As a result, sufficient rental housing units, which would fill the rapidly increasing demand for housing in urbanizing areas, were not supplied by institutionalized entities such as rental companies and the government. Instead, most rental houses in Korea have been supplied by private households.

The chonsei system was an ingenious response by the housing sector to the conditions of the Korean housing market described above. A chonsei deposit can satisfy the landlord's financial needs to invest in housing. Chonsei is also beneficial to the tenant because the tenant can access cheaper rental housing via a chonsei contract than via a monthly rental contract, which will be explicit in the model below.

Although there is a considerable consensus about the reasons for the existence and the popularity of the chonsei system in Korea, there have been no formal models that explicitly capture the widely recognized sources of the chonsei system. Ambrose and Kim (2003) study the default option in chonsei, and Kim and Shin (2011) focus on the role of financial intermediation in the chonsei system. But, these studies look at different aspects of chonsei, without directly focusing on its main properties. In our model, we explicitly analyze both the landlord's and the tenant's problems, viewing housing as an investment, while incorporating the housing market conditions in Korea. Under our framework, we can show how chonsei emerges in equilibrium and provide better insights about the chonsei rental contract.

Specifically, in our model, a private landlord decides how much housing to buy and what portion of this amount to rent out to tenants, with the balance consumed as an owner-occupier. Owner-occupied housing is viewed as an investment, as in Henderson and Ioannides (1983) and Brueckner (1997). The consumer is faced with several borrowing constraints, reflecting the financial market imperfection in Korea. For instance, the consumer cannot borrow against future incomes. The consumer can instead rely on mortgage borrowing by offering houses as collateral. But, there is a loan-to-value (LTV) constraint, which requires that the mortgage borrowing must be significantly smaller than the property value.

Landlords, seeking a profitable investment return, combine their initial wealth with limited mortgage funds to buy housing. Lacking adequate funds to supplement with mortgage borrowing, consumers with low initial wealth will be unable to buy a house and would instead choose to rent. After analyzing both types of consumers (landlords and renters), we show how chonsei emerges in equilibrium.

The analysis shows that chonsei is a Pareto optimal contract between the chonsei tenant who saves via the chonsei deposit and the landlord who borrows the chonsei deposit and invests in housing. According to our model, the chonsei tenant may save while the landlord and the owner-occupier put all their assets into housing and thus have no financial savings. To test this hypothesis, we estimate an empirical model where the household's saving is the dependent variable and the household's housing tenure type is the key explanatory variable. We find that chonsei renters save a larger portion of their incomes than either owner-occupiers or monthly renters, confirming the prediction of the theory.

The price variables in our theoretical model are ultimately endogenous. Specifically, the house price and the chonsei deposit are determined at the general equilibrium of the housing and rental markets. After setting up the market equilibrium conditions, we carry out a comparative static analysis showing how the house price and the chonsei deposit vary with respect to several parametric changes, such as an increase in the LTV ratio, an exercise that would provide empirical implications.

The rest of the paper is organized as follows. Section 2 proposes the model to explain how chonsei emerges in equilibrium. In Section 3, we carry out a comparative static analysis. In Section 4, we empirically test an implication of the model and show the estimation results. Finally, Section 5 concludes.

2 The model

We adopt Brueckner (1994)'s two-period model, in which the consumer chooses mortgage borrowing jointly with housing investment and the amount of saving. But, we combine it with the housing investment-consumption model of Henderson and Ioannides (1983), taking into account the fact that housing yields investment returns as well as providing consumption benefits. The different investment returns on housing and financial savings are the key factors determining the demand for housing, mortgage borrowing, and the amount of saving. The consumer is faced with several financial constraints, reflecting the Korean housing market.

The main goal of our model is to show how chonsei is achieved as the equilibrium rental contract. The approach is to analyze the landlord's and the tenant's problems, holding fixed values of D and R, where D denotes the chonsei deposit and R denotes monthly rent. Once the problems are analyzed, we can then investigate the values of D and R that emerge in equilibrium. The pure chonsei is a corner solution, with $D > 0$ and $R = 0$. A contract with $D = 0$ and $R > 0$ is the pure monthly rent. Meanwhile, "mixed chonsei" has both a chonsei deposit and monthly rent, with $D > 0$ and $R > 0$ (see footnote 3).

2.1 The landlord

The consumer lives for two periods, denoted zero and one. Period-zero utility depends on housing consumption, denoted by h_c, and non-housing consumption, x, with the period-zero utility function given by $U(x, h_c)$. The indirect utility function of wealth remaining after period zero is given by $V(z)$, where z is the remaining wealth after period zero. The consumer's objective function is then given by $U(x, h_c) + \delta V(z)$, where δ is the discount factor.

The consumer enters period zero with initial wealth w, which is the sum of current income and assets. The consumer buys housing h, consumes h_c for her residence, and rents out the remaining housing, $h - h_c$. The consumer is then a landlord, given $h - h_c > 0$. The landlord

receives a chonsei deposit $(h - h_c)D$, where D is chonsei deposit per unit of housing.[6] The consumer can borrow via a mortgage, denoted by m, by offering the house as collateral. The period-zero budget constraint is then given by $x = w - s - (ph - m) + (h - h_c)D$, where s is the amount of saving and p is the price per unit of housing.

In period one, the landlord repays the chonsei deposit $(h-h_c)D$ to the tenant and receives rent $(h-h_c)R$, where R is the discounted present value of monthly rent per unit of housing.[7] Assuming that the interest rates on savings and mortgage borrowing are the same at r, the consumer's remaining wealth for period one is given by $z = y + (1+r)s - (1+r)m + p(1+g)h - (h-h_c)D + (h-h_c)R$, where y is period-one income and g is the rate of house price appreciation.[8]

The consumer is faced with several financial constraints. First, she cannot borrow against the future income, so that $s \geq 0$. The consumer instead can rely on mortgage borrowing. But, there is an LTV (loan-to-value) ratio constraint, by which the consumer cannot borrow from a bank beyond a certain portion of the house value. The LTV constraint is written $\alpha ph \geq m$, where α is the maximum LTV ratio. Finally, the consumer cannot become a mortgage lender, so that $m \geq 0$.

We also require that housing consumption for the home owner cannot exceed the amount of housing purchased, so that $h \geq h_c$ must hold. Otherwise, consumption would be a mix of owned and rented housing, which is not possible.[9] But, the landlord by definition must have $h > h_c$, so that she rents out $h - h_c > 0$. The consumer cannot become a landlord when the investment constraint is binding, with $h = h_c$. So, the investment constraint for

[6]We assume that the landlord owns her house. But, if the landlord rents, we can think of Dh as the total chonsei deposit that the landlord receives and Dh_c as the deposit the landlord pays for her consumption. Therefore, the consumer's tenure choice does not matter for budget constraint.

[7]We assume that the discounted present value of monthly rents is paid in period-one. We could put the present value of rental revenue in period zero, but where to put monthly rents, $(h - h_c)R$, does not affect the analysis.

[8]The same interest rates on saving and mortgage borrowing may be somewhat unrealistic. However, the implication of a gap between the interest rates on saving and mortgage borrowing is of secondary interest, and the model in any case would just become more complicated with the assumption of two different interest rates.

[9]This investment constraint for owner-occupied housing was introduced by Henderson and Ioannides (1983) and Brueckner (1997).

owner-occupied housing (i.e., $h \geq h_c$) is non-binding for the landlord.

The consumer chooses housing consumption (h_c), housing investment (h), financial savings (s), and mortgage borrowing (m) to maximize the life-time utility, subject to the constraints described above. This maximization problem is given by

$$\begin{aligned} \max_{\{s,m,h,h_c\}} \quad & U\left[w - s - (ph - m) + (h - h_c)D,\ h_c\right] \\ & +\delta V\left[y + (1+r)s - (1+r)m + p(1+g)h - (h - h_c)D + (h - h_c)R\right] \\ s.t. \quad & (i)\ s \geq 0 \\ & (ii)\ m \geq 0 \\ & (iii)\ \alpha ph \geq m \\ & (iv)\ h \geq h_c. \end{aligned} \tag{1}$$

Before solving the above Kuhn-Tucker problem faced by the consumer, it is helpful to make the trade-off among different investments explicit by rewriting x and z as the following:

$$x = w - (s - m) - (p - D)h - h_c D, \tag{2}$$

$$z = y + (1+r)(s - m) + \left[p(1+g) - D + R\right]h + (D - R)h_c. \tag{3}$$

From (2) and (3), we can calculate the rate of return on net financial saving (saving minus mortgage borrowing, $s - m$) and that on housing investment (h), respectively. It can be easily seen that the consumer earns $1 + r$ in period-one per unit of net saving invested in period-zero. Meanwhile, the consumer earns $\frac{p(1+g)-D+R}{p-D}$ in period-one per unit of housing invested in period-zero, which can be seen by diving $\left[p(1+g) - D + R\right]h$ by $(p - D)h$. Note that the consumer spends $(p - D)h$ for her housing investment in period-zero, not the full value of housing (ph), because the consumer can partly be financed via the chonsei deposit (Dh) in period-zero. Housing yields a higher investment return than net financial saving if $\frac{p(1+g)-D+R}{p-D} > 1 + r$ holds. So, if this condition does not hold, no one would want to

be a landlord by setting $h > 0$. In this case, the optimum would be achieved by setting $h = m = 0$ and using s as the only investment decision variable. Since the landlord must have a positive housing investment ($h > h_c > 0$), for it to be the relevant case for the landlord, $\frac{p(1+g)-D+R}{p-D} > 1 + r$ must hold. Put differently, $\frac{p(1+g)-D+R}{p-D} > 1 + r$ is a necessary condition for the consumer to become a landlord.[10]

Moreover, in case where $\frac{p(1+g)-D+R}{p-D} > 1 + r$, it is best to have the largest possible h. At the same time, it is best to set $s = 0$ and m at the largest possible value, so that $m = \alpha ph$, in which h can be maximized. As a result, the borrowing constraints (i) and (iii) are both binding. The remaining decision variables are then h and h_c. This argument is shown more clearly below by solving the Kuhn-Tucker problem.

Letting λ, θ, μ, and ϕ denote the respective Lagrangian multipliers for the constraints (i)-(iv), the Lagrangian expression for the above Kuhn-Tucker problem is written

$$\begin{aligned} L(s, m, h, h_c, \lambda, \theta, \mu, \phi) &= U\left[w - s - (ph - m) + (h - h_c)D, h_c\right] \\ &+ \delta V\left[y + (1 + r)(s - m) + p(1 + g)h - (h - h_c)D + (h - h_c)R\right] \\ &+ \lambda s + \theta m + \mu(\alpha ph - m) + \phi(h - h_c). \end{aligned} \tag{4}$$

Letting subscripts denote partial derivatives, the Kuhn-Tucker optimality conditions for the problem are given by

$$s: \quad -U_x + \delta(1 + r)V' + \lambda = 0, \tag{5}$$

$$m: \quad U_x - \delta(1 + r)V' + \theta - \mu = 0, \tag{6}$$

$$h: \quad (-p + D)U_x + \delta[p(1 + g) - D + R]V' + \alpha p\mu + \phi = 0 \tag{7}$$

$$h_c: \quad -DU_x + U_h + \delta(D - R)V' - \phi = 0. \tag{8}$$

[10]The condition $\frac{p(1+g)-D+R}{p-D} > 1 + r$ can be rewritten as $g + \frac{R+rD}{p} > r$. This condition implies that the rate of house price appreciation (g) plus the capitalization rate ($\frac{R+rD}{p}$) must exceed the interest rate (r).

The accompanying complementary slackness conditions are written

$$\lambda \geq 0, \qquad \lambda = 0 \qquad if \qquad s > 0, \tag{9}$$

$$\theta \geq 0, \qquad \theta = 0 \qquad if \qquad m > 0, \tag{10}$$

$$\mu \geq 0, \qquad \mu = 0 \qquad if \qquad \alpha p h > m, \tag{11}$$

$$\phi \geq 0, \qquad \phi = 0 \qquad if \qquad h > h_c. \tag{12}$$

Among many configurations possible at the optimum, we want to look at the relevant solution for the landlord, which must have $h > h_c > 0$ ($\phi = 0$) and $\frac{p(1+g)-D+R}{p-D} > 1 + r$. To facilitate the comparisons between the Lagrangian multipliers, dividing (7) with $p - D$ yields

$$-U_x + \delta \left[\frac{p(1+g) - D + R}{p - D} \right] V' + \frac{\alpha p \mu + \phi}{p - D} = 0. \tag{13}$$

Since $\frac{p(1+g)-D+R}{p-D} > 1 + r$ must hold for the landlord, for (5) and (13) to both hold, it must be true that

$$\lambda > \frac{\alpha p \mu + \phi}{p - D}. \tag{14}$$

Since $p - D > 0$ holds (chonsei deposit per unit of housing is no larger than house price per unit), and since $\mu \geq 0$ and $\phi = 0$ ($h > h_c$), the right hand side of (14) must be nonnegative. It then follows that $\lambda > 0$. From (5) and (6), $\lambda = \mu - \theta > 0$ then holds, so that $\mu > 0$ holds, given $\theta \geq 0$. Moreover, $\theta = 0$ because $\alpha p h = m > 0$ holds, given $\mu > 0$ and $h > 0$. Therefore, $\lambda = \mu > 0$ holds.[11]

To summarize, assuming $h > h_c$ ($\phi = 0$), which is the relevant case for the landlord, housing must yield a superior investment return compared to financial savings, so that $\frac{p(1+g)-D+R}{p-D} > 1 + r$. Then, the consumer wants to further invest in housing either by

[11] Also, $p - \alpha p > D$ must hold when $\frac{p(1+g)-D+R}{p-D} > 1 + r$. Manipulation from (14) shows that $(p - D)\lambda > \alpha p \mu + \phi$ holds, and using $\lambda = \mu$ and $\phi \geq 0$ yields $p - \alpha p > D$. This condition will be used later in the tenant's problem. The result, $p - \alpha p > D$, reflects a low LTV ratio (low α) in Korea.

reducing s or by raising m. Therefore, both of the borrowing constraints are binding, with the corresponding Lagrangian multipliers given by $\mu = \lambda > 0$ and the landlord's optimal choices given by $s = 0$ and $\alpha ph = m$.

2.2 The tenant

The tenant's utility has the same form as in the landlord's case, with the objective function given by $U(x^T, h_c^T) + \delta V(z^T)$, where the superscripts T denote the tenant's choices. But, the tenant has a different initial wealth, denoted by w^T, and a different period-one income, y^T. This difference in wealth and income makes the tenant's choices of s^T, m^T, h^T, and h_c^T different from the landlord's choices. The tenant has no housing ownership, but rents h_c^T for her residence. Given $h^T = 0$ and $m^T = 0$, the only choice variables for the tenant are then s^T and h_c^T.

The tenant pays the chonsei deposit, Dh_c^T, in period zero and receives the same amount from the landlord in period one. The tenant also pays, Rh_c^T, the discounted value of monthly rents, in period one. There is no LTV constraint for the tenant, given $h^T = m^T = 0$. But the tenant's current saving must be non-negative. The tenant's problem is then written

$$\begin{aligned} \max_{\{s^T, h_c^T\}} \quad & U\left(w^T - s^T - Dh_c^T,\ h_c^T\right) + \delta V\left[y^T + (1+r)s^T + Dh_c^T - Rh_c^T\right] \\ s.t. \quad & (i)\ s^T \geq 0. \end{aligned} \tag{15}$$

Letting ψ denote the Lagrangian multiplier for the constraint (i), the first order conditions are given by

$$s^T: \quad -U_x + \delta(1+r)V' + \psi = 0, \tag{16}$$

$$h_c^T: \quad -DU_x + U_h + \delta(D-R)V' = 0. \tag{17}$$

The accompanying complementary slackness condition is

$$\psi \geq 0, \qquad \psi = 0 \qquad if \qquad s^T > 0. \tag{18}$$

This tenant's problem can be thought of as a second-stage problem, which comes after solving the general problem for the landlord. The consumer with the income path (w^T, y^T) first solves the same problem as the landlord, facing the usual constraint to become an owner-occupier, $h^T \geq h_c^T$. But, the investment constraint for owner-occupied housing would be binding ($h^T = h_c^T$, $\phi > 0$) for this consumer. The consumer would then compare the utility from this solution ($h^T = h_c^T$) to the utility at the solution at (15). For those consumers who become tenants, this latter utility is higher.

A third group of consumers are those for whom the outcome with $h^T = h_c^T > 0$ (i.e., owning) is better than the outcome with $h^T = 0$ (i.e., renting). These individuals own their houses, but they acquire no extra housing for rental to tenants. We call these consumers with $h^T = h_c^T$ "owner-occupiers" below while the other owner-occupiers having $h > h_c$ are called the "landlords." Also, we define "potential tenants" as the consumers with the income path (w^T, y^T) in a sense that some, but not all, of them are actually the tenants. Note that the consumers with (w, y) are all landlords.

To understand these different choices by the tenants and the owner-occupiers, note that owner-occupied housing is an over-investment for the potential tenants, but they may tolerate the inefficiency from the over-investment because owning yields a superior investment return. But, for the consumer to own (so that $h^T = h_c^T$), the consumer must pay the downpayment $ph_c^T - \alpha p h_c^T$ in period zero for outright house purchase, where $\alpha p h_c^T$ is mortgage borrowing.[12] If the consumer instead rents ($h^T = 0$), then the consumer pays the chonsei deposit, Dh_c^T, for her residence in period zero. As shown above (see footnote 11), $p - \alpha p > D$ holds, so that the chonsei deposit per unit of housing (D) is smaller than the downpayment per unit of housing

[12]Note that the amount of mortgage (m^T) equals $\alpha p h_c^T$ because the LTV constraint is binding ($\lambda = \mu > 0$) for the consumers with $\phi > 0$. From (14), $\lambda > 0$ holds given $\mu \geq 0$ and $\phi > 0$. It then follows that $\lambda = \mu > 0$ and $\theta = 0$, as before.

$(p - \alpha p)$. Therefore, if the consumer, who is not provided a sufficient mortgage, cannot pay the downpayment $((p - \alpha p)h_c^T)$ but still can pay the chonsei deposit (Dh_c^T), then renting may be better for the consumer than tolerating the inefficiency from the over-investment in housing.

Thus, the key for tenure choice is the trade-off between a higher investment return from owner-occupied housing versus the downpayment requirement for attaining such a higher return. As noted above, the overall solution comes from comparing the utility level at the $h^T = 0$ solution to the utility at the $h^T = h_c^T$ solution, with the tenants getting a higher utility from the first case. To prevent the case where all the consumers with (w^T, y^T) make the same tenure decisions, we introduce heterogeneous "tastes" toward ownership below. This modification will be discussed in Section 3. Our explanation for tenure decision is in line with Brueckner (1986), who points out that even if owner-occupied housing is less costly due to tax advantages, the presence of the downpayment constraint may prevent some people from owning a house.

2.3 Chonsei as the optimal rental contract

To analyze contract configurations in equilibrium, indifference curves for the landlord and the tenant are drawn by computing the marginal rate of substitution between the chonsei deposit (D) and monthly rent (R). Then, the Pareto optimal contract is achieved when each contract party attains the highest utility with the choice of D and R, without lowering the other party's utility. Pure chonsei is a corner solution, with $D > 0$ and $R = 0$.

The marginal rate of substitution between D and R for the landlord is computed by totally differentiating the landlord's maximized utility (see (4)) with respect to D and R using the envelope theorem, which yields[13]

$$(h - h_c)U_x dD - (h - h_c)\delta V' dD + (h - h_c)\delta V' dR = 0. \tag{19}$$

[13]We can apply the envelope theorem to our Kuhn-Tucker problem as in the standard maximization problem.

Rearrangement of (19) yields the marginal rate of substitution between D and R for the landlord:

$$MRS^L_{D,R} \equiv -\left.\frac{\partial R}{\partial D}\right|_{u^{*L}} = \frac{U_x - \delta V'}{\delta V'}, \tag{20}$$

where u^{*L} denotes the landlord's maximized utility. Substituting (5) and (6) into (20) yields

$$MRS^L_{D,R} = r + \frac{\lambda}{\delta V'} = r + \frac{\mu - \theta}{\delta V'}. \tag{21}$$

Recall that $\lambda = \mu > 0$ and $\theta = 0$ hold for the landlord. Thus, $MRS^L_{D,R}$ is greater than r from (21). Since the landlord can further invest in h using a higher D, which yields a higher return than r, the landlord is willing to give up rent R at a higher rate than r to acquire the additional D. We can draw indifference curves, with the horizontal axis representing D and the vertical axis representing R (see Figure 1). The slope of an indifference curve for the landlord is given by $r + \lambda/\delta V'$.

Next, to derive the marginal rate of substitution for the tenant, the tenant's maximized utility is totally differentiated with respect to D and R using the envelope theorem, yielding

$$MRS^T_{D,R} \equiv -\left.\frac{\partial R}{\partial D}\right|_{u^{*T}} = \frac{U_x - \delta V'}{\delta V'}, \tag{22}$$

where u^{*T} denotes the tenant's maximum utility. Substituting (16) into (22) yields

$$MRS^T_{D,R} = r + \frac{\psi}{\delta V'}. \tag{23}$$

If $s > 0$, so that the saving constraint is non-binding ($\psi = 0$), then $MRS^T_{D,R} = r$ holds, indicating that R must fall at a rate equal to r as D increases to keep the tenant's utility constant. The reason is that a unitary increase in D reduces saving s by one unit, lowering period one income by r. To offset this loss, R must fall by one unit. We can also draw

indifference curves for the tenant in (D, R) space (see Figure 1). The slope of the tenant's indifference curve is given by $r+\psi/\delta V'$. Note that the V' values in (21) and (23) are different because the landlord's and the tenant's choices are different from one another, leading to different V' arguments.

Recall that the potential tenants with (w^T, y^T) solve the general problem (i.e., the problem solved by the landlord), and that their Lagrangian multipliers are given by $\phi > 0$ ($h^T = h_c^T$) and $\lambda = \mu > 0$ under $\frac{p(1+g)-D+R}{p-D} > 1 + r$ (see footnote 12). So, like the landlord, potential tenants initially have $s = 0$ at the solution. However, once the potential tenant decides to rent, the renter just pays the chonsei deposit (Dh_c^T), which is smaller than the downpayment requirement ($(p - \alpha p)h_c^T$). With the smaller cash need in period zero, the tenant may then save. Therefore, the consumer may raise her s^T choice from zero to positive once she chooses renting ($h^T = 0$). Under this story, $\psi = 0$ holds, and the slope of an indifference is simply r.

Chonsei emerges in equilibrium when the landlord's indifference curves are globally steeper than the tenant's indifference curves, which occurs when the tenant saves ($\psi = 0$) and the borrowing constraint is binding for the landlord ($\lambda > 0$). Then, $MRS_{D,R}^L > MRS_{D,R}^T = r$ holds, satisfying the condition for chonsei as the Pareto optimal contract. Even when the tenant's borrowing constraint is binding ($\psi > 0$), chonsei can emerge in equilibrium whenever $MRS_{D,R}^L > MRS_{D,R}^T$ holds so that the borrowing constraint is less tight for the tenant.

Figure 1 depicts pure chonsei as the equilibrium contract. In the (D, R) plane, a higher indifference curve means higher landlord utility while a lower indifference curve means higher tenant utility. Since the landlord's indifference curve is steeper than the tenant's curve in Figure 1, each contract party chooses pure chonsei with $D > 0$ and $R = 0$ to maximize her utility given the other party's utility. The discussion so far is summarized as follows:

Proposition 1 *Given that housing yields a higher investment return than financial savings, the borrowing constraints are binding for the landlord, yielding an $MRS_{D,R}^L$ greater than r. Meanwhile, the consumer with a low wealth may choose to rent, despite the high capital gain*

from owner-occupied housing, due to a large downpayment requirement. If the tenant saves, then her $MRS^T_{D,R}$ *is equal to* r*, and pure chonsei is attained as a Pareto optimal contract.*

[Figure 1 about here]

We need further clarifications. First, the model is so far silent about how the actual equilibrium value of D is determined, although it shows any positive D with zero R is optimal. We endogenize the D value by assuming that the price variables are determined at the general equilibrium of the housing and rental markets. Section 3 describes how the equilibrium price variables (p and D) are determined, conditional on chonsei is the equilibrium rental contract. The claim is that once chonsei is attained as a Pareto-optimal contract, the equilibrium prices in the housing and rental markets are determined by the market-clearing process.

Second, we need to emphasize that the model's main goal is to analyze the choice of rental contract between chonsei and monthly-rent made by the landlord and the tenant conditional on each contract party's tenure status. So, a tenure choice of becoming a landlord or a renter is exogenous in the sense that the consumer with higher w and y becomes the landlord while tenants are consumers among potential tenants with insufficient w and y. However, understanding that the goal of the analysis is to show how the conditions of the Korean economy contributed to the birth and the popularity of the chonsei system, the difference in affluence between the landlord and the tenant is rather explanatory, not something that should be determined endogenously.[14] Although the landlord/renter tenure choice is exogenous, our model has two other kinds of tenure decisions, which are endogenous. The first is the chonsei/monthly-rent decision made by the landlord and the tenant, conditional on their tenure status, which is the main focus of this paper. The other tenure decision is the owning/renting decision made by the potential tenants. The potential tenants have

[14]We could make these wealth and income levels endogenous, but it would involve additional complexity. Alternatively, we could endogenize the process of dividing consumers into the landlord and the tenant groups by assuming that consumers have the same wealth and incomes but are heterogeneous in their attitudes toward risks. But, while this modification can be a natural extension of the current model, it may not fully capture the conditions of Korea that contributed to the popularity of chonsei in Korea, where most consumers have wanted to invest in owner-occupied housing but only part of them have been able to do so.

lower initial wealth and incomes than the landlords and thus have to decide between owning (over-investment in housing) and renting. The latter becomes a chonsei renter under certain conditions, as seen above. Each potential tenant's owning/renting decision is made by comparing the utility at the respective tenure status, where the utility is influenced by the consumer's taste toward ownership. Consumers have heterogeneous tastes toward ownership, so the numbers of owners and renters are determined by the taste distribution of the population, and the population of each tenure group is influenced by the housing and rental market conditions. Section 3 explains this point in detail.[15]

The final remark is about an empirically-testable implication of the theory. According to our theory, chonsei is a Pareto optimal contract between the landlord who borrows and invests in housing and the tenant whose financial saving is positive. An implication of the model is that consumers with different housing tenure types have different amounts of financial savings. First, we have shown that given the superior investment return on housing, the landlord puts all her assets into housing while having no financial savings. Second, the owner-occupiers (who exist among potential tenants) do not save at all, which can be seen from the fact that the investment constraint is binding for the owner-occupiers ($\phi > 0$, $h^T = h_c^T$) and hence the corresponding Lagrangian multiplier is given by $\lambda > 0$ ($s = 0$) (see footnote 12). On the contrary, the other potential tenants may or may not save once they choose to rent. To summarize, chonsei tenants are the only group who may save while the landlords and the owner-occupiers do not save at all. This theoretical connection between the housing tenure and the financial saving is empirically explored in Section 4.

2.4 The effect of changes in economic environment on equilibrium rental contracts

The borrowing constraints faced by the Korean consumers and the high returns from housing investment are the keys to explain the popularity of the chonsei system in Korea.

[15]For space reason, the full version of Section 3 is given as the online appendix.

So, we need to address whether systematic changes in these conditions would make chonsei obsolete. First, suppose that the landlord could borrow via $s < 0$. In the absence of the $s \geq 0$ constraint, $\lambda = 0$ holds from (5), and $\mu = \theta = 0$ follows from (6). Then, $MRS^L_{D,R} = r$ holds, implying that $MRS^L_{D,R}$ cannot be greater than $MRS^T_{D,R}$. In this case, chonsei is no longer the Pareto optimal contract. Thus, if consumers can borrow against future incomes, the chonsei system cannot be an equilibrium.

The model above suggests that given the tenant's indifference curve, the parametric changes that reduce $MRS^L_{D,R}$ would make chonsei obsolete (see (21)). The effects of changes in the LTV ratio (α), the rate of house price appreciation (g), and interest rate (r) on $MRS^L_{D,R}$ are discussed below.[16]

2.4.1 The effect of an increase in the LTV ratio

While $U(x, h_c)$ remains the common quasi-concave utility function, for tractability, the analysis assumes that period-one utility is linear, so that $V' = 1$. Since $MRS^L_{D,R}$ then equals $r + \mu/\delta$, it is sufficient to identify the changes in μ with respect to the parametric changes to see how the indifference curve slope changes. We assume that the initial contract is pure chonsei, with $\lambda = \mu > 0$, $\theta = 0$, and $\psi = 0$.

To determine the sign of $\partial\mu/\partial\alpha$, (6) is rewritten as $U_x - \delta(1 + r) = \mu$. Totally differentiating with respect to α yields

$$U_{xx}\frac{\partial x}{\partial \alpha} + U_{xh}\frac{\partial h_c}{\partial \alpha} = \frac{\partial \mu}{\partial \alpha}. \tag{24}$$

Then, totally differentiating (7) with respect to α gives

$$(-p + D)\left(U_{xx}\frac{\partial x}{\partial \alpha} + U_{xh}\frac{\partial h_c}{\partial \alpha}\right) + p\mu + \alpha p\frac{\partial \mu}{\partial \alpha} = 0. \tag{25}$$

[16] We could also investigate the effects of the parametric changes on $MRS^T_{D,R}$. However, the parameters, α and g, do not influence $MRS^T_{D,R}$ (see (15)). Our approach is thus to focus on the landlord's indifference curve, with the tenant's indifference curve being given.

Substituting (24) into (25) and rearranging yields

$$\frac{\partial \mu}{\partial \alpha} = \frac{p\mu}{p - \alpha p - D} > 0. \tag{26}$$

Thus, μ increases as α increases, which leads to a steeper indifference curve for the landlord. The intuition of this result is as follows. The landlord can increase h when the LTV constraint is relaxed.[17] Then, she can provide the increased h as a collateral to borrow more. Since the available additional borrowing from the increased h is larger at a higher α,[18] given that the landlord is LTV constrained, the benefit from an increase in h is larger as α is higher. Thus, the borrowing constraint becomes tighter as α increases. The analysis suggests that mortgage credit expansions would not lead to a disappearance of the chonsei system.[19] This prediction is contrasted with the effect of the relaxation of the $s \geq 0$ constraint.

2.4.2 The effect of an increase in the rate of house price appreciation

Totally differentiating (6) and (7) with respect to g gives new versions of (24) and (25) with g in place of α and δp in place of μp. Solving for $\partial \mu / \partial g$ yields

$$\frac{\partial \mu}{\partial g} = \frac{\delta p}{p - \alpha p - D} > 0. \tag{27}$$

Thus, a higher g is associated with a higher μ. In other words, the landlord's desire to borrow and invest in h gets stronger as g is higher, increasing the tightness of the LTV constraint. Suppose that g falls. Since μ decreases in response, the landlord's indifference curve gets flatter (see Figure 1). When g falls enough to reduce μ to zero, $MRS^L_{D,R} = r$ holds. Then, since both indifference curves are linear and coincide (see the tenant's indifference curve in

[17] $\partial h / \partial \alpha > 0$ holds (see the online appendix).

[18] This point can easily be seen from $\alpha^1 p \Delta h > \alpha^0 p \Delta h$, where $\alpha^1 > \alpha^0$ and Δh denotes a change in h.

[19] Indeed, mortgage borrowings have become widely available in Korea after the Asian financial crisis in 1997. The ratio of mortgage debt outstanding to gross domestic product increased from about 11% in 1994 to 36% in 2006 (Kim (2004), Kim and Cho (2010)). But, chonsei has been still a popular choice in this period of mortgage credit expansion.

Figure 1), all points on the indifference curves are Pareto-optimal. Thus, mixed chonsei or pure rent may emerge in equilibrium.[20]

2.4.3 The effect of an increase in interest rate

An increase in r has a direct effect on $MRS^L_{D,R}$ $(= r + \mu/\delta)$ and on $MRS^T_{D,R}$ $(= r)$ as well as the effect operating through μ. Since the direct effect is the same for both $MRS^L_{D,R}$ and $MRS^T_{D,R}$, we can again focus on the influence of r on μ. Totally differentiating (6) and (7) with respect to r and solving for $\partial\mu/\partial r$ yields

$$\frac{\partial \mu}{\partial r} = -\frac{\delta(p-D)}{p-\alpha p-D} < 0. \tag{28}$$

Thus, as r is higher, μ is lower, which makes the landlord's indifference curve flatter. Understanding that a positive μ is caused by $\frac{p(1+g)-D+R}{p-D} > 1+r$ and that an increase in r reduces the gap between $\frac{p(1+g)-D+R}{p-D}$ and $1+r$, an increase in r has the opposite effect from an increase in g. When r rises enough to make $\frac{p(1+g)-D+R}{p-D} = 1+r$ and to make $\mu = 0$, the chonsei system will lose its popularity.[21]

The effects of the changes in economic environment on the equilibrium rental contract are summarized as follows:

Proposition 2 *If consumers can borrow against their future incomes, so that $s < 0$ becomes possible, then chonsei cannot be the equilibrium rental contract. On the other hand, mortgage credit expansion (an increase in α) will not make the chonsei system obsolete. As the arbitrage gain from housing investment (i.e., $\frac{p(1+g)-D+R}{p-D} - (1+r)$) decreases, either via a lower g or via a higher r, the chonsei system will lose its popularity.*

[20] If $MRS^T_{D,R}$ is greater than r at high D values, so that the tenant's indifference curve is steeper than r at those D values, mixed chonsei with the conversion rate between D and R greater than r may emerge as the optimal contract. Indeed, this mixed chonsei contract has been increasingly popular in recent days in Korea (see Lee and Chung (2010)). The conversion rates between D and R in mixed chonsei are usually greater than r, which is an implication of our model.

[21] Our model has only two investment options, s and h. But, s may indicate any forms of non-housing investment including stocks, commodities, and any other forms of financial investment. Then, r indicates the returns on these non-housing investments.

3 Endogenous house price and chonsei deposit: comparative static analysis

While we have shown how a pure chonsei is attained as the equilibrium, we have not determined the actual equilibrium value of D. Given that chonsei is the equilibrium contract ($D > 0$ and $R = 0$), the equilibrium D would determine the locations of the contract parties' indifference curves in Figure 1. Moreover, the ratio of house price and chonsei deposit (p/D) provides practically useful information to market participants. We can investigate how p and D are endogenously determined and carry out a comparative static analysis of p and D with respect to several parametric changes such as an increase in α. A shortened description of the analysis is given in this section (see the online appendix for the detailed discussion).[22]

The house price (p) and the chonsei deposit (D) are determined at the general equilibrium of the housing and rental markets. The first equilibrium condition is concerned with the population distribution by tenure choices. The entire population is comprised of landlords with the income path (w, y) and potential tenants with (w^T, y^T). The numbers of landlords and potential tenants are given exogenously, but the numbers of owner-occupiers and renters (both of whom are potential tenants) are endogenous. Recall that part of the potential tenants are owner-occupiers ($h^T = h_c^T > 0$) and the others are chonsei renters ($h^T = 0,\ h_c^T > 0$). As mentioned above, to prevent the case where all potential tenants make the same tenure choice (between owning and renting), we assume that the consumers have heterogeneous tastes toward owning, represented by by an additive utility parameter, which divides the group of potential tenants into the owners and the actual tenants. These endogenous populations determine the total demands for housing and rental housing.

The second equilibrium condition is the housing market equilibrium condition, which requires that the total demand for housing must equal the total housing supply. The total housing supply is exogenous, but the total housing demand is the sum of the landlords'

[22]The online appendix is available at https://sites.google.com/site/jinwonk97/ or upon e-mail request at *jiki@transport.dtu.dk*.

demand and the owner-occupiers' (among the potential tenants) demand, which are endogenous. Letting N^L denote the number of landlords, the landlords' demands for housing are given by $N^L h$, where h indicates each identical landlord's housing demand. In the same manner, the owner-occupiers' total demand for housing is given by the number of owner-occupiers multiplied by the housing demand of each.

The third equilibrium condition is the rental housing market equilibrium condition, requiring that the total demand for rental housing must equal the total rental housing provision. Assuming that the optimal contract is pure chonsei ($D > 0$, $R = 0$), the rental market is entirely a chonsei market. Note that chonsei rental housing is supplied by the landlords who own extra housing for rental after part of their housing consumed for residence. The total rental housing provision is thus given by $N^L(h - h_c)$.

In the simultaneous equation system of the equilibrium conditions, the endogenous variables are p and D as well as the populations of the owner-occupiers and the chonsei renters. The exogenous parameters are the LTV ratio (α), the rate of house price appreciation (g), interest rate (r), the entire population (denoted by N), and housing stock (denoted by $\bar{H}$). Then, we can identify the nature of dependency of p and D on the exogenous variables by totally differentiating the equilibrium conditions described above.[23] The comparative static results for p and D are summarized as follows:

Proposition 3 *The influences of increases in the LTV ratio (α), the rate of house price appreciation (g), the population (N), and interest rate (r) on the equilibrium values of p and D are ultimately ambiguous. An increase in housing stock ($\bar{H}$), however, unambiguously lowers the equilibrium values of p and D.*

[23] As an intermediate step for the derivations, we need to identify the dependencies of the consumer's housing investment (h) and consumption (h_c) on the exogenous parameters.

4 Empirical analysis

4.1 Empirical implications

In this section, we empirically investigate an implication of the theory. The main theory in Section 2 suggests that there is a certain relationship between the consumers' housing tenure choice and their financial savings. Specifically, the chonsei tenant may or may not save while the landlord and the owner-occupier put all their assets into housing and thus have no financial savings.

To review this relationship, first, in the model, the borrowing constraint is binding for the landlord, meaning that the landlord wants to borrow to invest in housing while having no financial savings. Second, the model shows the motivation of tenure decisions by potential tenants. Since part of potential tenants choose owning despite the same wealth and incomes as chonsei renters, they are over-investing in their houses, meaning that their financial saving is also zero. Finally, although the model does not explicitly show the behavior of the monthly renter, it can be easily seen that the monthly renter's indifference curve must be steeper than that of the landlord, which would make the monthly rent the optimal contract (see Figure 1). In this case, the monthly renter is a borrower and has no financial savings.[24]

Unlike the consumers with the other tenure types, the chonsei renter may or may not save. Recall that the chonsei tenants exist among the potential tenants and that they choose renting, despite the high investment return on owner-occupied housing, due to the lack of sufficient mortgage borrowings. Since the chonsei renter's downpayment requirement is smaller than for the owner-occupier's ($Dh_c^T < (p - \alpha p)h_c^T$), it is possible that the chonsei renter saves. Therefore, the chonsei renter is the only group who may save in the theoretical model, and the empirical hypothesis would be a higher tendency to save among the chonsei

[24]However, there is a possibility that the consumer may choose the monthly rent because she is unable to pay the large chonsei deposit, despite the lower rental cost of chonsei housing. In this case, the consumer's indifference curve may not reflect the true valuation of D and R. Since the monthly renter does not pay the large chonsei deposit, the monthly renter may instead save. A more thorough inspection would allow us to have more intuitions about the behavior of the monthly renter. But, an analysis of the monthly rental contract is not the main goal of this paper.

renters than that of the other consumers. To test this hypothesis, the relationship between the household's tenure choice and its financial saving is empirically explored this section.

4.2 Empirical framework and identification

4.2.1 Empirical framework

To test whether chonsei renters save a larger portion of their incomes than owner-occupiers and monthly renters, the following standard panel-data model is estimated:

$$SAVING_{it} = \alpha_i + \lambda_t + \beta_0 CHONSEI_{it} + \beta_1 MONRENT_{it} + \beta_2 INC_{it} + X_{it}\gamma + \epsilon_{it}, \quad (29)$$

where i is household subscript, t is year subscript, α_i is a household fixed-effect, λ_t is a year fixed-effect, and ϵ_{it} is the error term. The dependent variable, $SAVING_{it}$, indicates the household's annual savings. The key independent variables are $CHONSEI_{it}$, which equals 1 if the household lives in a chonsei rental housing, and $MONRENT_{it}$, which equals 1 if the household lives in a monthly rental housing. The household's annual income is indicated by INC_{it}. Finally, the matrix X_{it} includes various household characteristics, such as household size, head's age, employment status, and so on.

Since $CHONSEI_{it}$ and $MONRENT_{it}$ are included in (29), the left-out group is owner-occupiers. Owner-occupiers in the dataset include both landlords and potential tenants becoming owners. It would be helpful to distinguish these two groups for our purpose, but there is no exact way to distinguish them. So, we cannot identify which group (between landlords and owner-occupiers) has a bigger and significant difference in saving from that of chonsei renters, although we can investigate whether chonsei renters save a larger portion of their incomes than at least one of these groups.

The empirical hypothesis is that β_0 is positive, indicating that chonsei tenants save a larger portion of their incomes than owner-occupiers. We are also interested in the sign of $\beta_0 - \beta_1$. The theory predicts that β_0 must be greater than β_1, implying that chonsei renters

save a larger portion of incomes than monthly renters. The coefficient β_2 gives the marginal propensity to save of the average consumer.

As usual, there is a possibility that potential omitted variables that influence the household's savings are correlated with the household's tenure decisions, which would cause biased estimates. For example, the initial endowment of wealth, denoted by w in the model, has a crucial role in determining household's tenure decision. If the initial endowment is also correlated with the household's savings, non-inclusion of this variable would lead to biased estimates of the key coefficients. But, the household's initial endowment is hardly observable.[25] In addition to the household's initial endowment, there may be various unobservable factors inducing different savings by households.

To address this potential omitted variable problem, we use the standard fixed-effect model for panel data as the baseline model. The identifying assumption of this model is the existence of time-invariant fixed-effects, meaning that the unobservable household characteristics are constant over time, i.e., $\alpha_{it} = \alpha_i$ in (29). Under this identifying assumption, the use of the standard fixed-effect model estimation (within-estimator) would allow us to remedy the potential omitted variable problem. However, it is still possible that time-varying unobservable household characteristics may influence both the tenure decision and the savings simultaneously. For this possibility, we include various sets of lagged dependent variables into each empirical model to check whether the main results are robust to the alternative identifying assumptions (see Angrist and Pischke (2008)).

4.2.2 Causality and instrumental-variable estimation

The theory in Section 2 suggests that both tenure choice and the amount of savings are endogenous because the consumer chooses her tenure type jointly with the amount of savings. But, a more relevant story is that once the consumer chooses tenure type, she

[25] We may instead control for the household's current wealth, including financial assets, real estates, and financial debts. But, we already include incomes earned by holding these assets in the empirical model. These incomes are more relevant determinants of savings. Moreover, in the dataset, there are too many missing observations for current asset values, especially in the value of real estate.

then decides the amount of savings jointly with mortgage borrowing and housing investment and consumption. Note that the difference in initial wealth (w) and incomes (y) is the source that divides the consumers into the landlord and the potential-tenant groups and the heterogeneous tastes toward ownership determine the owning/renting choices of the potential tenants. So, once these variables influencing tenure choices (i.e., initial wealth, incomes, and tastes toward ownership) are controlled in the empirical models, so that otherwise-identical households in effect are randomly assigned to different tenure types, then the amount of savings should differ by the households' tenure types. This suggests that the causal link running from housing tenure to the amount of saving is consistent with the theory and thus it should be empirically tested.

Because the consumer's tenure choice is potentially endogenous, however, to identify the causal influence of tenure type on the amount of savings, we need to carry out an instrumental-variable estimation. For instrumental-variable model estimation, we drop all the monthly renters in the estimation sample and make $CHONSEI_{it}$ the only endogenous variable because it is hard to interpret the instrumental-variable models involving two endogenous variables. In any case, we are more interested in the savings of owners and chonsei renters than that of monthly renters.

As an instrumental variable, we use a dummy variable, $ROWH_{it}$, which equals 1 if the household lives in a row house or townhouse and equals zero if the household lives in an apartment or detached house. We also use $SEOUL_{it}$, which equals 1 if the household lives in Seoul (the capital of Korea), as the other instrumental variable. The identifying assumption is that these instrumental variables are strongly correlated with $CHONSEI_{it}$ but not correlated with the unobservable household characteristics influencing the household's savings.

Row houses or townhouses in Korea usually refer to a residential building with a low or medium number of stories (typically of 3-10 stories) and multiple housing units inside the building. This building type is distinguished not only from that of detached houses

but also from that of apartments with higher building heights (typically with 20-30 stories). There is a strong positive correlation between $ROWH_{it}$ and $CHONSEI_{it}$. About 39% of row/townhouses are chonsei-type rental housing while 23% of apartments and 21% of detached houses are chonsei housing (see Table 1). In Korea, private landlords tend to build or purchase low- or medium-density residential buildings in the form of row/townhouses and rent out the houses to renters.[26] Meanwhile, government policy often requires that newly-built apartments be sold only to new owner-occupiers (with no previous housing ownership), being neither rented nor sold to landlords owning multiple units of housing. Moreover, detached houses are not very popular for rental purposes. So, the portion of chonsei rental housing is especially high for row/townhouses. While there must be a strong positive correlation between $ROWH_{it}$ and the probability of chonsei, it is hard to believe that there is a correlation between consumer preferences toward building structures and the consumers' unobservable characteristics that influence their savings, suggesting that $ROWH_{it}$ may be a valid instrument.

The $SEOUL_{it}$ variable may also satisfy the conditions for an instrumental variable. Chonsei is popular in growing big cities, especially in Seoul, where house prices have increased more rapidly than in other regions. About 35% of Seoul residents live in chonsei rental housing while the percentage of chonsei housing in the entire sample is about 26% (see Table 1). Because chonsei is most popular in Seoul, there will be a strong positive correlation between $CHONSEI_{it}$ and $SEOUL_{it}$. But, this location variable is not necessarily correlated with the factors influencing household savings, implying that the variable is exogenous. So, we use this location variable as the potential instrumental variable.

[26]Note that although the model assumes that the landlord buys houses that are already built and rents them out, chonsei in practice can be used to finance construction costs for new housing that would be rented to tenants. Since the chonsei deposit partly satisfies the landlords' needs for financing, landlords can typically build row or medium density residential buildings (row house or townhouse) with only a small fraction of their own money. The landlord's building construction problem could be incorporated, but the model's main implication would be unchanged with this modification. Some Asian countries with a civil law system (e.g., Indonesia, Taiwan, and China) have a similar way of financing construction costs in that owner-occupiers use mortgage finance to pay for houses yet to be built. But, while owner-occupiers pay for construction costs via mortgage borrowing in this case, renters provide part of finances for construction costs in case of chonsei.

As usual, there is a concern about weak instruments, which may lead to large confidence intervals and poor asymptotic approximations for the estimates. We report the standard robust F-statistics to check whether this concern is relevant. As explained below, the generated instrument in each specification is a very strong predictor of the chonsei status.

The instrumental variables must also be uncorrelated with the household saving error term (ϵ), so the preferences for residential building type and residential location (Seoul vs. other places) must not be correlated with household's unobservable characteristics influencing the amount of savings other than through their effect on the chonsei status. As shown below, all specifications using both $ROWH_{it}$ and $SEOUL_{it}$ as the instrumental variables pass the overidentification test, suggesting that we have a valid set of instruments. But, we still need to carefully consider other possibilities that each instrumental variable is invalid.

In case of the $ROWH_{it}$ variable, there is a possibility that the size of each house unit (i.e., housing consumption), which typically differs by the type of building structure, is also correlated with the factors influencing the amount of savings. Table 1 shows that the average housing unit in row/townhouse buildings has a smaller floor space (23 pyong, equivalent to $77m^2$) than that of the average apartment unit (27 pyong) or detached house (24 pyong). Since $ROWH_{it}$ is potentially correlated with housing consumption in this way and housing consumption may also be correlated with the error term in (29), the estimated coefficients may be biased. To account for this possibility, we present the estimation results from the models that include the size of housing (i.e., housing consumption, h_c), which is available in the dataset.

The $SEOUL_{it}$ variable also has some potential problems. First, job opportunities or consumption amenities that are more readily accessible in Seoul than in other regions may induce smaller household savings for Seoul residents, which may lead to biased results. But, the direction of bias depends on how Seoul's specific economic conditions are correlated with the probability of choosing chonsei. If Seoul residents tend to choose chonsei (rather than owning) to enjoy higher consumption amenities in Seoul, then the estimated effect of chonsei

on the amount of saving would be the lower bound of the true effect. On the contrary, if the higher job accessibility encourages Seoul residents to own, the direction of bias will be reversed. Ultimately, we should only say that the controlled household characteristics, such as head's age, education, life-cycle variables, employment status, urban dummy, and so on, capture consumer preferences toward the city-specific economic conditions. Indeed, the estimation results below indicate that the $CHONSEI_{it}$ coefficients in the models where $SEOUL_{it}$ is used as the instrument are not sharply different from those in the models where both $SEOUL_{it}$ and $ROWH_{it}$ are used. In addition, the overidentification test statistics are insignificant, suggesting that this concern is not very serious.

The other concern related to the use of $SEOUL_{it}$ as the instrumental variable is that the relative price of chonsei rental housing to that of owner-occupied housing may tend to vary by regions, which may induce a biased result. Indeed, the average chonsei deposit-house price ratio (D/p) is especially low in Seoul compared to other regions. Table 1 shows that the average chonsei deposit-house price ratio (D/p) for all years in Seoul is 51.2 (%) while the value for the entire sample is 58.8.[27] Since the relative price of chonsei (measured by D/p) may also influence the household's saving behavior, the estimates may be biased unless the indirect effect of $SEOUL_{it}$ on the error term in (29), which operates through D/p, is controlled. So, we present the estimation result from the model that controls the average D/p of region j in year t, denoted by $(D/p)_{jt}$, below.[28]

[Table 1 about here]

[27]The analysis in Section 3 suggests that this unusually low D/p value in Seoul is due to the highest rate of house price appreciation there. Although the influence of the rate of house price appreciation (g) on p and D is ultimately ambiguous (see Proposition 3), if the Γ and Ψ loci move in similar magnitudes when g increases, p increases and D falls, implying a higher D/p value in locations where g is higher.

[28]The information on $(D/p)_{jt}$ is provided by Kookmin Bank, which also reports monthly house price and chonsei deposit indices by regions. The regions include 16 categories, with 7 large cities and 9 provinces. D/p at the household level could instead be included. But, since the household either owns or rents, it is impossible to observe p_i (D_i) if it had been rented (owned), meaning that either p or D is missing at the household level.

4.3 Data

We use the Korean Labor and Income Panel Study (KLIPS) dataset for estimation. The KLIPS is a quite extensive survey dataset on Korean households' income, wealth, employment, and other economic outcomes. The KLIPS is a panel data with 11 survey years. The initial survey was conducted in 1998, and the latest survey-year is 2008. The sample is comprised of 5,000 original households. While the survey fails to include the whole original sample in each year, new households are instead added to the sample mainly because the original households' sons or daughters are married and form new households. Taking these outflows and inflows into account, the number of observations in each year is around 4,500-5,000, with the entire sample of 11 years comprised of 51,709 households. Table 2 gives descriptive statistics for all variables used for estimation.

[Table 2 about here]

4.4 Estimation results

4.4.1 Estimation results from OLS and fixed-effect models

We first estimate the pooled OLS and the fixed-effect (within-estimator) models.[29] Also, since the dependent variable, $SAVING_{it}$, is truncated (negative savings cannot be reported), we estimate the Tobit models. Table 3 presents the estimation results from the OLS, the fixed-effect, and the Tobit models. Most specifications presented below include two lagged dependent variables, although the models with fewer lagged variables yield a stronger result.

The coefficients on $CHONSEI_{it}$ are positive and statistically significant in the OLS models (see columns (1) and (2)), indicating that chonsei renters save a larger portion of their incomes than owner-occupiers, confirming the prediction of the theory. The results are robust to the number of lagged dependent variables included. The $CHONSEI_{it}$ coefficients

[29] We carried out Hausman tests of the fixed-effect and the random-effect models. The test statistics indicate that there is a systematic difference between the fixed-effect model and the random-effect model estimates, implying that the random-effect estimates are inconsistent.

are around 25-28 in the OLS models, implying that all other things equal, the chonsei renter is predicted to save about 250,000-280,000 won (about 5%-6% of the sample average) more annually than the owner-occupier. The coefficient on $CHONSEI_{it}$ in the Tobit model is a bit lower than that in the OLS models, but it is still statistically significant at the 5% level (see column (7)).[30]

The $CHONSEI_{it}$ coefficients in the fixed-effect models are higher than those in the OLS and the Tobit models (see columns (4) and (5)). According the fixed-effect model estimates, all other things equal, the chonsei renter is predicted to save about 350,000-420,000 won (about 7%-9% of the sample average) more than the owner. The greater size of the $CHONSEI_{it}$ coefficients in the fixed-effect models than in the OLS models suggests that the unobservable household characteristics related to the higher household savings are negatively correlated with $CHONSEI_{it}$, leading to a downward bias in the OLS models. In other words, chonsei renters may have some unobservable characteristics, which are associated with a smaller amount of savings for chonsei renters compared to owners.

Section 2 shows that the key condition for the chonsei renter to save is that the chonsei renter's deposit requirement is smaller than the downpayment requirement for the owner-occupier (i.e., $Dh_c^T < (p - \alpha p)h_c^T$). So, we need to test whether the condition, $D < p - \alpha p$, is the driving force making chonsei renters' saving tendency to be higher than that of owners. The testable hypothesis is that assuming that identical households are subject to the same LTV ratio (α is the same for all consumers), when D is smaller than p in a greater scale, chonsei renters' higher tendency to save (measured by β_0 in (29)) would be accentuated. The reason is that once otherwise equivalent household chooses chonsei (rather than owning), the chonsei renter will have more money to save compared to the owner when $p - D$ is higher. To test this hypothesis, we include an interaction term of $CHONSEI_{it}$ and an indicator that the household resides in region where the region's average D/p ratio in year t is smaller than the

[30]This is the pooled Tobit estimation result. Random-effect Tobit models generate similar results. The fixed-effect model is not available for non-linear models such as the Tobit model. The $CHONSEI_{it}$ coefficient is not significant in the Tobit model including two lagged dependent variables.

entire sample's median D/p ratio in year t (in which the household faces a relatively large gap between p and D). The expected sign of the coefficient on this interaction term is positive.[31] The coefficients on the interaction term in both the OLS and the fixed-effect models are significantly positive, confirming the hypothesis (see columns (3) and (6) in Table 3). But, the estimate of the $CHONSEI_{it}$ coefficient in each specification loses its significance with the inclusion of the interaction term. So, the higher tendency to save among chonsei renters than owners is relevant only for the households living in regions where the gap between p and D is relatively large.

The $MONRENT_{it}$ coefficients in Table 3 are negative in all specifications, but they are statistically insignificant in the fixed-effect models. But, we find that the gaps between the $CHONSEI_{it}$ coefficient and the $MONRENT_{it}$ coefficient $(\beta_0 - \beta_1)$ are negative and statistically significant in all specifications (except those with the interaction terms), implying that chonsei renters tend to save a larger portion of their incomes than monthly renters. The theory in Section 2 does not provide a clear prediction about the amount of savings for monthly renters. As explained above, the monthly renter's indifference curve should be steeper than that of the landlord for monthly-rent to be the optimal contract (see Figure 1). In this case, the monthly renter is a borrower and has no financial savings, and therefore a smaller amount of savings for monthly renters than that of chonsei renters would be consistent with the theory. But, there could be another possibility that this is not the case (see footnote 24).[32]

The coefficients on the household's labor income range 0.14-0.18, implying that the

[31] We could directly test this hypothesis if we had both D and p at the household level, but we don't have both D and p information at the household level (see footnote 28).

[32] Also note that although the model predicts that the owner-occupier group has no savings at all, most owner-occupiers in the dataset naturally have a positive amount of savings. One strong assumption in the model is that the consumer faces a "knife edge" choice between housing investment and financial savings and the consumer puts all her assets into housing as long as it gives a higher investment return. But, because there is uncertainty about the investment returns in the real world and consumers need liquidity, consumers have some positive amount of financial savings even when housing yields superior expected investment returns. Since owners have a positive amount of savings, the negative coefficient on $MONRENT_{it}$ does not mean that monthly renters' savings are negative. The negative coefficient on $MONRENT_{it}$ only implies that monthly renters tend to save less than owners.

marginal propensity to save of the average household is around 14-18%. However, the marginal increase in savings from an increase in non-labor incomes is around 0.02-0.03, which is much lower than that from labor incomes. Table 3 also shows the influences of other household characteristics on the household savings. We find that as the number of family members or the head's age increases, the household saves a smaller portion of its income. On the contrary, as the number of workers increases, household's saving rises. The head's employment status also has a strong influence on household's saving: the amount of saving is smaller for households whose head is a temporary worker and for those with a family business.

[Table 3 about here]

Table 4 presents estimation results from the models using the household's annual consumption as the dependent variable. Since the household's income is controlled, the coefficients in these models must have the opposite signs of those in the models using $SAVING_{it}$ as the dependent variable. As expected, the coefficients on $CHONSEI_{it}$ are all negative and statistically significant in both the OLS and the fixed-effect models, which again confirms the prediction of the theory. According to the fixed-effect model with two lagged dependent variable shown in column (5), all other things equal, the chonsei renter is predicted to consume 790,000 won (about 5% of the sample average of consumption) less than the owner. However, unlike the models using $SAVING_{it}$ as the dependent variable, the interaction term of $CHONSEI_{it}$ and the indicator of low-D/p region is statistically insignificant (see columns (3) and (6)).

The $MONRENT_{it}$ coefficients in Table 4 are negative and statistically significant in most cases, suggesting that monthly renters tend to consume a smaller portion of their incomes than owners. We also find that the gaps between the $CHONSEI_{it}$ and the $MONRENT_{it}$ coefficients (i.e., $\beta_0 - \beta_1$) are negative, implying that chonsei renters tend to consume a smaller portion of their incomes than monthly renters. Together with the evidence that $SAVING_{it}$ is greater for chonsei renters than monthly renters, this evidence would support

the hypothesis that chonsei renters show a higher propensity to save than monthly renters.

To summarize, the chonsei renters' tendency to save is higher than that of owners (including both landlords and potential tenants becoming owners) and monthly renters, regardless of whether the household's saving or consumption is used as the dependent variable. The results are robust to the uses of alternate empirical models.

[Table 4 about here]

4.4.2 Instrumental-variable estimation results

For estimation of the instrumental-variable models, we drop all the monthly renters in the estimation sample and make $CHONSEI_{it}$ the only endogenous variable. Table 5 shows the first-stage regression results. Since the $CHONSEI_{it}$ variable is binary, the regression is a linear probability model.[33]

As anticipated, there is a strong positive correlation between $ROWH_{it}$ and $CHONSEI_{it}$ and also between $SEOUL_{it}$ and $CHONSEI_{it}$. The high F-statistics indicate that the null hypotheses of weak instrumental variables are rejected in all cases. Therefore, each instrumental variable is a strong predictor of the household's chonsei status. We also include various household characteristics in the tenure choice models. We find that the variables including household incomes, number of household members, number of kids, head's age, and head's employment status are strongly correlated with the household's tenure choice.

As explained above, $ROWH_{it}$ is potentially correlated with housing consumption and housing consumption may also be correlated with the amount of savings, which may lead to a biased result. So, the housing consumption variable is included (see columns (2) and (3)). The coefficient on the housing consumption variable is negative, meaning that the probability of choosing chonsei is higher for smaller housing units. The coefficient on $ROWH_{it}$ gets lower with the inclusion of the housing consumption variable, but it does not lose its significance

[33]We also estimated the models in which the first-stage regression is a probit model. The estimation results are qualitatively the same as the case where the first-stage regression is OLS. We do not include the interaction term of $CHONSEI_{it}$ and the indicator of low-D/p region in the instrumental-variable models because this variable should be treated as endogenous in such cases.

(see columns (2) and (3) in Table 5).

We additionally include the regional D/p values, which vary by years, to control its effect on the amount of savings (see column (3)). The probability of choosing chonsei is higher in regions where the gap between chonsei deposit and house price is higher (i.e., D/p is lower), which is a natural result. But, the coefficient on $SEOUL_{it}$ is largely unchanged with the inclusion of this variable.

[Table 5 about here]

Table 6 presents the second-stage instrumental-variable estimation results. The best specifications use $SEOUL_{it}$ and $ROWH_{it}$ as the instrumental variables and include two lagged dependent variables. The over-identification p-values in columns (1)-(3) are large enough, indicating that the instrumental-variable set is valid. The models using $ROWH_{it}$ as the only instrumental variable are presented in columns (4), and the models using $SEOUL_{it}$ as the only instrumental variable are presented in column (5). We use the Wooldridge's score test to see whether $CHONSEI_{it}$ can actually be treated as exogenous (see Wooldridge (2010)). The test statistics reject the null hypothesis that $CHONSEI_{it}$ is exogenous in all specifications except the one in column (4).

According to the estimation result presented in column (1) in Table 6, all other things equal, the chonsei renter is predicted to save about 1,400,000 won (about 30% of the sample average) more annually than the owner-occupier. The higher coefficients in the instrumental-variable models than those in the OLS models indicate that the unobservable household characteristics related to larger savings are negatively correlated with $CHONSEI_{it}$ (and thus positively correlated with owning), consistent with the fixed-effect model results shown in Table 3. In other words, chonsei renters have some unobservable characteristics, which are associated with a smaller amount for savings of chonsei renters compared to owners. Therefore, the positive coefficients on $CHONSEI_{it}$ in the OLS models must be a lower bound of the true effect.

Columns (2) and (3) present the estimation results from the models including two addi-

tional control variables. The over-identification p-value increases and therefore the validity of the instruments improves with the inclusion of these variables. But, it is important to note that the housing consumption variable is endogenous since consumers would choose housing consumption jointly with the amount of savings. So, the model including the endogenous housing consumption variable may not generate a reliable estimation result. But, we can nevertheless check the direction of potential bias that may arise when this effect is not controlled at all. The estimation results indicate that the coefficients on $CHONSEI_{it}$ get higher with the inclusion of the housing consumption variable (see columns (2) and (3)).

We also include the regional D/p values in year t, denoted by $(D/p)_{jt}$, since Seoul has a especially low D/p ratio. When $(D/p)_{jt}$ is included, the estimated effect of $CHONSEI_{it}$ on $SAVING_{it}$ gets much higher. But, the model including $(D/p)_{jt}$ alone without the housing consumption variable does not pass the over-identification test. This fact, together with the endogeneity of housing consumption, suggests that the estimated coefficients on $CHONSEI_{it}$ in columns (2) and (3) are not a reliable indicator for the true effect of $CHONSEI_{it}$. However, the useful information is that while both the housing consumption and the chonsei deposit-house price ratio variables are negatively correlated with $CHONSEI_{it}$, both of these control variables are positively correlated with $SAVING_{it}$. This result suggests that these additional control variables are correlated with $CHONSEI_{it}$ and $SAVING_{it}$ in the same way that the other unobservable household characteristics influencing the error term in (29) are correlated with $CHONSEI_{it}$. This in turn suggests that we can stick to the conclusion that the coefficients on $CHONSEI_{it}$ in the OLS models are a lower bound of the true effect.

Columns (4) and (5) present the estimation results from the models using only one instrumental variable. The coefficient on $CHONSEI_{it}$ is 97 when $ROWH_{it}$ is used and it is 215 when $SEOUL_{it}$ is used as the instrumental variable. The models including housing consumption and $(D/p)_{jt}$ are not presented because the estimates from such models would be unreliable by the reasons mentioned above. But, the $CHONSEI_{it}$ coefficients get higher

with the inclusion of the control variables, the same pattern as in the models in columns (2) and (3).

We also estimated several fixed-effect instrumental-variable models. Then, we implemented Hausman tests for the null hypothesis that the time-varying variables in the fixed-effect model are exogenous. Since the test statistic does not reject the null hypothesis, we therefore conclude that the standard fixed-effects estimates are consistent and more efficient than the instrumental-variable fixed effects estimator. Thus, we do not present any fixed-effect models involving instrumental variables.[34]

From the empirical investigation in this section, we find that chonsei renters tend to save a greater portion of their incomes than owners and monthly renters. The results are fairly robust to alternative identifying assumptions and various empirical models. Therefore, the empirical results confirm the predictions of the theory.

[Table 6 about here]

5 Conclusion

This paper has explored a unique rental agreement to Korea, called chonsei. The main goal of this paper was to show why such a unique rental system exists and has been so popular in Korea. In the Korean economic development period, government economic policies were biased toward the industrial sector while Korean households had to undergo financial repression. The model shows that chonsei is an ingenious market response in the era of financial repression. Chonsei allows landlords to accumulate sufficient funds for housing investment without major reliance on a mortgage. At the same time, tenants can access cheaper rental housing via chonsei lease agreement than when only monthly rental contracts are available. The model predicts that chonsei renters would show a higher tendency to

[34]We also estimated the instrumental-variable models using the household's annual consumption as the dependent variable. But, none of the pooled instrumental-variable models pass both the endogeneity and the over-identification tests. Moreover, the Hausman test statistics indicate that the fixed-effect instrumental-variable estimation results are no better than the fixed-effect models with no instrumental variables. So, any instrumental-variable models using the household's consumption as the dependent variable are not presented.

save than consumers with other housing tenure types. We empirically test this hypothesis using various identifying strategies, and the estimation results strongly support the main implication of the model.

We finally comment on possible directions for future research. First, while this paper suggests that the high investment return on housing is the primary source of the development of the chonsei system in Korea, lump-sum payments (key money deposit) may also be used as side payments from tenants to landlords under rent control (Skelley (1998)). So, the key money deposit under rent control is similar to mixed chonsei in Korea for its contract features. While rent control has not been prevalent and thus it cannot explain the popularity of chonsei in Korea, it is still possible that rent control could partly contribute to the development of chonsei-type contracts (especially mixed chonsei) in some other countries. For example, Hardman (1987) explores Egypt's housing and rental markets, where rent control actually contributed to the development of key money deposits as side payments. So, there is room for further studies on the relationship between rent control and the development of chonsei-type rental system.

Second, while our model implies a sharp difference in saving between the landlord and the chonsei renter, it is unclear whether a similar pattern would emerge in other countries including the US. On the one hand, as Brueckner (1986, 1997) points out, owner-occupiers may be over-investing in their houses partly due to a large downpayment requirement for owner-occupied housing, which would lower the tendency to save among the owner-occupiers, the same pattern as in this paper. On the other hand, since only monthly rental contracts exist in the US and monthly renters would show a different saving pattern from the chonsei renters in Korea, we cannot easily assure whether a similar or a different pattern would emerge in the US. Therefore, it seems worthwhile to further investigate the link between household saving and tenure choice in other countries including the US.

Finally, in addition to the empirical investigation on the link between household saving and tenure choice, theoretical modifications of the current model could also be carried out.

One strong assumption in our model was that the consumer faces a "knife edge," where on one side she wants to invest as much as possible in housing and on the other side nothing at all. This somewhat unrealistic portfolio choice might be a consequence of the absence of uncertainty or the simple linear structure of investment returns on different assets, assumptions made for analytical tractability. To relax these assumptions, the investment returns could be varied with the amount of housing, or interest rates could depend on the size of the loan, etc. More importantly, we could assume stochastic investment returns on housing and financial savings. Then, we could derive various solutions chosen by heterogeneous consumers who have different attitudes toward risk. These modifications would not only be helpful in describing the Korean housing market but could also generate a more general model describing the US housing market.

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Table 1: Descriptive statistics concerning instrumental-variable estimation

		By region		By building type		
	Whole sample	Seoul	Urban	Detached house	Apartment	Row/Townhouse
Percentage of households living in chonsei housing	26.0	**35.1**	28.8	20.8	23.0	**38.5**
Percentage of households living in owner-occupied housing	58.6	48.9	55.9	63.7	66.7	40.7
Average housing consumption[a]	25.5	24.6	25.6	23.8	27.0	**23.4**
Yearly average D/p ratio[b]	58.8	**51.2**	57.1			

[a] *The unit of housing consumption is pyong (1 pyong = 3.3m^2 = 35.6 sq. feet).*
[b] *D/p ratio varies by regions and years. The regions include 16 categories, with 7 cities and 9 provinces.*

Table 2: Descriptive statistics

Variables	Observations	Mean	Std. Dev.
Tenure choice[c]			
Households is owner-occupier	51709	0.59	
Household is chonsei renter	51709	0.26	
Household is monthly renter	51709	0.10	
Saving, consumption, and income[d]			
Household annual saving	49312	474	750
Household annual consumption	51371	1724	1231
Labor income	51622	2243	2148
Non-labor income[e]	51566	386	1510
Household characteristics			
Number of household members	51709	3.26	1.34
Number of kids (age under 17)	51707	0.78	0.97
Single-family household	51709	0.13	
Head's age	51679	49.35	14.04
Number of workers[f]	51084	1.32	0.87
Head is temporary worker	51084	0.10	
Head is doing family's own business	51084	0.26	
Head is highschool graduate	49387	0.36	
Head is college graduate or post-graduate	49387	0.29	
Household lives in urban area[g]	51709	0.73	
Household lives in Seoul	51709	0.23	
Household lives in row house (or townhouse)	50672	0.25	

[a] *The sample is comprised of 11 years, which span from 1998 to 2008.*
[b] *Variables with missing Std. Dev. are dummy variables.*
[c] *About 5% of the entire sample responded that they have other forms of housing tenure, not any of these regular choices. These households are dropped in the estimation sample. The survey does not distinguish mixed-chonsei from chonsei or monthly rents.*
[d] *Monetary units are in 10,000 Korean won, which is approximately equivalent to 10 US dollars. The survey asks the monthly saving and consumption of the household. But, the values are multiplied by 12 to give annual savings and consumption.*
[e] *Non-labor incomes include investment returns on financial assets, rental revenue from real estates, social-welfare benefits, transferred incomes, and any other sources of income.*
[f] *Workers include family members employed at the household's own business.*
[g] *Urban areas include 7 large cities (Seoul, Busan, Daegu, Daejeon, Incheon, Gwangju, Ulsan) and Gyeonggi Province.*

Table 3: Household saving as a function of housing tenure choice

Empirical model:	OLS	OLS	OLS	FE	FE	FE	Tobit
Dependent variable: Household annual saving							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tenure decisions[c]							
Chonsei	**27.96*** **	**25.32*** **	**9.10**	**42.84*** **	**34.99** **	**-0.85**	**20.55** **
	(7.19)	(8.19)	(8.66)	(13.64)	(15.89)	(16.21)	(9.33)
Monthly rent	**-32.09*** **	**-23.51** **	**-23.32** **	**-4.43**	**-16.45**	**-18.20**	**-134.26*** **
	(9.79)	(11.42)	(11.43)	(20.54)	(24.85)	(24.78)	(14.34)
Interaction terms of chonsei and low D/p ratio indicator							
Chonsei $*$ Low D/p ratio indicator[d]			**28.93** **			**64.21*** **	
			(12.25)			(20.27)	
Lag of saving							
Saving in t-1	0.3807***	0.3371***	0.3373***	0.0898***	0.0702***	0.0700***	0.4170***
	(0.0172)	(0.0210)	(0.0210)	(0.0187)	(0.0224)	(0.0224)	(0.0181)
Saving in t-2		0.1511***	0.1510***		-0.0467***	-0.0468***	
		(0.0183)	(0.0183)		(0.0172)	(0.0172)	
Household characteristics							
Labor income	0.1582***	0.1438***	0.1438***	0.1577***	0.1548***	0.1548***	0.1847***
	(0.0076)	(0.0081)	(0.0081)	(0.0097)	(0.0106)	(0.0106)	(0.0088)
Non-labor income	0.0263***	0.0273***	0.0272***	0.0164***	0.0185***	0.0184 ***	0.0333***
	(0.0047)	(0.0056)	(0.0056)	(0.0058)	(0.0066)	(0.0066)	(0.0053)
Number of household members	-55.70***	-50.43***	-50.47***	-25.56***	-30.47***	-30.54***	-53.80***
	(4.63)	(4.95)	(4.95)	(7.91)	(9.26)	(9.26)	(6.07)
Number of kids (under 17)	12.32***	9.90*	9.95*	-10.12	-1.57	-1.54	-0.97
	(4.68)	(5.29)	(5.30)	(6.85)	(11.98)	(11.98)	(6.07)
Single-family household	-23.41**	-11.46	-11.76	-73.09***	-71.63**	-73.85***	-117.71***
	(9.14)	(10.43)	(10.43)	(24.71)	(27.78)	(27.71)	(16.12)
Head's age	-1.06***	-0.85**	-0.88**	-5.43**	-6.59*	-6.50*	-9.49***
	(0.30)	(0.35)	(0.35)	(2.70)	(3.86)	(3.83)	(0.44)
Number of workers	26.04***	26.13***	26.26***	56.71***	64.38***	64.39***	101.60***
	(6.82)	(7.74)	(7.74)	(7.47)	(8.78)	(8.78)	(7.98)
Head is temporary worker	-47.88***	-38.96***	-39.29***	-44.20***	-48.46***	-47.94***	-64.33***
	(7.90)	(8.97)	(8.97)	(12.11)	(14.23)	(14.26)	(11.81)
Head is doing family's own business	-47.67***	-44.83***	-45.21***	-40.01***	-40.34**	-39.68**	-59.01***
	(7.99)	(9.05)	(9.05)	(13.90)	(16.04)	(16.06)	(9.77)
Head is highschool graduate	-1.55	-5.95	-6.10	51.23	63.13	63.53	43.65***
	(6.75)	(7.63)	(7.63)	(47.59)	(61.32)	(61.24)	(9.78)
Head is college graduate or post-graduate	7.39	0.19	-0.30	124.13*	109.90	112.29	47.03***
	(10.87)	(12.23)	(12.23)	(65.47)	(84.42)	(84.44)	(14.39)
Household lives in urban area[e]	-26.34***	-29.06***	-33.19***	-27.13	-41.85	-53.29	-33.12***
	(5.92)	(6.70)	(6.97)	(25.60)	(35.00)	(35.19)	(8.20)
Observations	36477	29510	29510	36477	29510	29510	36477
R-squared[f]	0.5198	0.5308	0.5309	0.4534	0.4168	0.4172	0.0611

[a] *All regressions include a constant and year fixed-effects.*
[b] *Robust standard errors are in parentheses.*
[c] *The left-out group is owner-occupiers.*
[d] *Low D/p ratio (large D-p gap) indicates that the household resides in region where the region's average D/p ratio in year t is smaller than the entire sample's median D/p ratio in year t.*
[e] *Urban areas include 7 large cities (Seoul, Busan, Daegu, Daejeon, Incheon, Gwangju, Ulsan) and Gyeonggi Province.*
[f] *Overall R-squared is presented for the fixed-effect models. Pseudo R-squared is presented for the Tobit model.*
****Significant at the 1 percent level*
***Significant at the 5 percent level*
**Significant at the 10 percent level*

Table 4: Household consumption as a function of housing tenure choice

Empirical model:	OLS	OLS	OLS	FE	FE	FE
Dependent variable: Household annual consumption						
	(1)	(2)	(3)	(4)	(5)	(6)
Tenure decisions[c]						
Chonsei	**-89.97*** **	**-72.48*** **	**-73.55*** **	**-90.96*** **	**-79.46*** **	**-70.62*** **
	(8.56)	(8.99)	(11.13)	(15.34)	(16.94)	(20.38)
Monthly rent	**-50.86*** **	**-31.05** **	**-31.04** **	**-46.15** **	**-34.93**	**-34.37**
	(12.50)	(13.59)	(13.60)	(23.58)	(27.46)	(27.20)
Interaction terms of chonsei and low D/p ratio indicator						
Chonsei $*$ Low D/p ratio indicator[d]			**1.90**			**-15.70**
			(13.25)			(25.22)
Lag of consumption						
Consumption in t-1	0.4852***	0.3943***	0.3943***	0.1910***	0.1551***	0.1550***
	(0.0177)	(0.0221)	(0.0221)	(0.0186)	(0.0192)	(0.0192)
Consumption in t-2		0.2105***	0.2105***		0.0461***	0.0461***
		(0.0173)	(0.0173)		(0.0145)	(0.0145)
Household characteristics						
Labor income	0.1889***	0.1657***	0.1657***	0.1774***	0.1657***	0.1657***
	(0.0082)	(0.0079)	(0.0078)	(0.0110)	(0.0114)	(0.0114)
Non-labor income	0.0562***	0.0502***	0.0502***	0.0380***	0.0347***	0.0347***
	(0.0055)	(0.0054)	(0.0055)	(0.0050)	(0.0050)	(0.0050)
Number of household members	129.08***	102.48***	102.48***	176.38***	176.57***	176.60***
	(7.26)	(7.08)	(7.08)	(11.02)	(12.79)	(12.79)
Number of kids (under 17)	-17.50***	9.49	9.49	-69.19***	-89.50***	-89.49***
	(6.38)	(6.80)	(6.80)	(8.78)	(13.63)	(13.63)
Single-family household	23.62**	22.29*	22.28*	-61.80*	-96.77**	-96.33**
	(11.21)	(11.91)	(11.92)	(33.15)	(38.40)	(38.44)
Head's age	0.94***	0.47	0.47	-4.39	-5.35	-5.38
	(0.34)	(0.37)	(0.37)	(3.15)	(4.58)	(4.58)
Number of workers	-14.10*	0.10	0.11	72.15***	84.90***	84.92***
	(7.81)	(8.41)	(8.41)	(9.38)	(10.39)	(10.40)
Head is temporary worker	1.21	-7.48	-7.51	-3.20	-9.95	-10.06
	(10.07)	(10.89)	(10.91)	(15.22)	(16.91)	(16.91)
Head is doing family's own business	53.41***	32.85***	32.82***	33.16*	26.03	25.89
	(9.68)	(10.46)	(10.47)	(18.79)	(21.22)	(21.22)
Head is highschool graduate	124.48***	100.52***	100.51***	30.54	52.79	52.47
	(14.45)	(14.48)	(14.47)	(71.80)	(86.22)	(86.22)
Head is college graduate or post-graduate	287.26***	246.26***	246.22***	108.70	42.60	41.91
	(14.48)	(15.838)	(15.81)	(86.22)	(94.57)	(94.59)
Household lives in urban area[e]	74.35***	63.46***	63.20***	63.80	71.26	74.04
	(8.44)	(8.99)	(9.23)	(45.71)	(54.45)	(54.40)
Observations	39668	33900	33900	39668	33900	33900
R-squared[f]	0.7238	0.7382	0.7382	0.6705	0.6631	0.6629

[a] *All regressions include a constant and year fixed-effects.*
[b] *Robust standard errors are in parentheses.*
[c] *The left-out group is owner-occupiers.*
[d] *Low D/p ratio (large D-p gap) indicates that the household resides in region where the region's average D/p ratio in year t is smaller than the entire sample's median D/p ratio in year t.*
[e] *Urban areas include 7 large cities (Seoul, Busan, Daegu, Daejeon, Incheon, Gwangju, Ulsan) and Gyeonggi Province.*
[f] *Overall R-squared is presented for the fixed-effect models. Pseudo R-squared is presented for the Tobit model.*
****Significant at the 1 percent level*
***Significant at the 5 percent level*
**Significant at the 10 percent level*

Table 5: Tenure choice (own vs. chonsei) as a function of household characteristics (first-stage regression)

Dependent variable: Chonsei dummy (1 if chonsei, 0 if own)[c]					
	(1)	(2)	(3)	(4)	(5)
Labor income	-0.0000116***	-0.0000169***	-0.0000170 ***	-0.0000108***	-0.0000137***
	(-7.18)	(-7.88)	(-7.93)	(-6.64)	(-8.26)
Non-labor income	-0.0000051***	-0.0000043**	-0.0000044**	-0.0000047***	-0.0000061***
	(-3.66)	(-2.39)	(-2.45)	(-3.39)	(-4.34)
Number of household members	-0.0459***	-0.0440***	-0.0441***	-0.0459***	-0.0470***
	(-15.30)	(-9.38)	(-9.41)	(-15.29)	(-15.55)
Number of kids (under 17)	0.0395***	0.0338***	0.0338***	0.0378***	0.0385***
	(10.29)	(6.69)	(6.69)	(9.82)	(9.96)
Single-family household	0.1121***	0.1572***	0.1569***	0.1124***	0.1102***
	(9.20)	(9.62)	(9.60)	(9.12)	(9.02)
Head's age	-0.0104***	-0.0099***	-0.0099***	-0.0102***	-0.0111***
	(-38.10)	(-26.66)	(-26.59)	(-37.41)	(-40.66)
Number of workers	-0.0063*	-0.0066	-0.0063	-0.0071*	-0.0037
	(-1.69)	(-1.28)	(-1.23)	(-1.91)	(-0.98)
Head is temporary worker	0.0348***	0.0489***	0.0485***	0.0391***	0.0365***
	(3.53)	(4.01)	(3.97)	(3.94)	(3.72)
Head is doing family's own business	-0.0217***	0.0035	0.0030	-0.0213***	-0.0190***
	(-3.67)	(0.46)	(0.39)	(-3.60)	(-3.18)
Head is highschool graduate	-0.0186***	-0.0703***	-0.0706***	-0.0158**	-0.0201***
	(-2.85)	(-7.68)	(-7.72)	(-2.40)	(-3.06)
Head is college graduate or post-graduate	-0.0300***	-0.0949***	-0.0952***	-0.0220***	-0.0491***
	(-3.79)	(-9.10)	(-9.14)	(-2.79)	(-6.24)
Saving in t-1	0.0000006	0.0000004	0.0000006	0.0000018	0.0000003
	(0.15)	(0.90)	(0.13)	(0.41)	(0.07)
Saving in t-2	-0.0000122***	-0.0000158***	-0.0000156***	-0.0000106**	-0.0000140***
	(-2.79)	(-3.06)	(-3.03)	(-2.44)	(-3.21)
Household lives in urban area[d]	0.0393***	0.0002	-0.0054	0.0663***	0.0554***
	(6.77)	(0.03)	(-0.62)	(11.89)	(9.53)
Housing consumption (h_c)[e]		-0.0010***	-0.0010***		
		(-4.56)	(-4.54)		
Yearly average D/p ratio in region where the household resides			-0.0013***		
			(-2.60)		
Household lives in Seoul	**0.0990*** **	**0.1152*** **	**0.1034*** **		**0.1242*** **
	(14.27)	(14.36)	(11.06)		(18.19)
Household lives in row/townhouse	**0.1483*** **	**0.0608*** **	**0.0602*** **	**0.1646*** **	
	(21.37)	(8.05)	(7.98)	(24.04)	
Observations	26392	19723	19723	26392	26691
R-squared	0.1617	0.1232	0.1235	0.1543	0.1437
Robust F-statistic for weak IV	402.81***	164.06***	110.05***	577.90***	330.92***

[a] *All regressions include a constant and year fixed-effects.*
[b] *Robust t-statistics are in parentheses.*
[c] *Monthly-renters are dropped in the estimation sample. The empirical model is a linear probability model.*
[d] *Urban areas include 7 large cities (Seoul, Busan, Daegu, Daejeon, Incheon, Gwangju, Ulsan) and Gyeonggi Province.*
[e] *The unit of housing consumption is pyong (1 pyong = 3.3m^2 = 35.6 sq. feet).*
****Significant at the 1 percent level*
***Significant at the 5 percent level*
**Significant at the 10 percent level*

Table 6: Household saving as a function of housing tenure choice (second-stage instrumental-variable regression)

Instrumental variable used:	$SEOUL$, $ROWH$	$SEOUL$, $ROWH$	$SEOUL$, $ROWH$	$ROWH$	$SEOUL$
Dependent variable: household annual saving					
	(1)	(2)	(3)	(4)	(5)
Tenure decisions[c]					
Chonsei	**140.77*** **	**262.01*** **	**381.76*** **	**97.04** **	**215.03*** **
	(45.87)	(76.89)	(93.09)	(48.96)	(79.01)
Lag of saving					
Saving in t-1	0.3372***	0.3397***	0.3394***	0.3373***	0.3377***
	(0.0212)	(0.0246)	(0.0247)	(0.0212)	(0.0211)
Saving in t-2	0.1585***	0.1626***	0.1644***	0.1580***	0.1589***
	(0.0192)	(0.0225)	(0.0226)	(0.0192)	(0.0191)
Household characteristics					
Labor income	0.1403***	0.1481***	0.1504***	0.1397***	0.1414***
	(0.0075)	(0.0091)	(0.0093)	(0.0075)	(0.0075)
Non-labor income	0.0283***	0.0283***	0.0290***	0.0280***	0.0286***
	(0.0057)	(0.0067)	(0.0067)	(0.0057)	(0.0057)
Number of household members	-43.70***	-43.57***	-38.13***	-45.72***	-39.51***
	(5.58)	(7.75)	(8.18)	(5.54)	(6.50)
Number of kids (under 17)	3.93	-0.10	-4.03	5.51	0.99
	(6.03)	(7.70)	(8.00)	(5.95)	(6.67)
Single-family household	-17.20	-47.71**	-66.25***	-12.12	-24.89*
	(12.30)	(19.62)	(21.62)	(12.46)	(14.12)
Head's age	0.19	0.55	1.72	-0.28	1.07
	(0.65)	(0.91)	(1.05)	(0.68)	(0.95)
Number of workers	33.85***	26.33***	26.45***	33.63***	33.62***
	(7.53)	(9.52)	(9.66)	(7.51)	(7.54)
Head is temporary worker	-49.21***	-52.65***	-57.85***	-47.28***	-51.05***
	(10.29)	(12.85)	(13.51)	(10.23)	(10.77)
Head is doing family's own business	-48.11***	-55.14***	-54.86***	-49.05***	-46.12***
	(9.75)	(11.69)	(11.86)	(9.74)	(9.76)
Head is highschool graduate	-1.83	13.59	22.92*	-2.52	-0.32
	(8.57)	(11.85)	(12.78)	(8.52)	(8.69)
Head is college graduate or post-graduate	9.42	18.77	32.12*	7.63	14.07
	(12.68)	(16.86)	(17.94)	(2.52)	(13.27)
Household lives in urban area[d]	-37.09***	-37.44***	-28.24***	-33.00	-45.58***
	(8.45)	(10.15)	(10.42)	(8.83)	(9.91)
Housing consumption (h_c)[e]		0.19	0.32**		
		(0.14)	(0.16)		
Yearly average D/p ratio in region where the household resides			1.94***		
			(0.70)		
Observations	26392	19273	19723	26392	26691
R-squared	0.5250	0.5152	0.4961	0.5271	0.5195
Robust score χ^2 for endogeneity test[f]	6.67***	9.49***	15.18***	2.31	5.95**
χ^2 for over-identification test	2.53	0.77	0.01		
(p-values in parentheses)[g]	(0.1116)	(0.3804)	(0.9173)		

[a] *All regressions include a constant and year fixed-effects.*
[b] *Robust standard errors are in parentheses.*
[c] *The left-out group is owner-occupiers. Monthly-renters are dropped in the estimation sample.*
[d] *Urban areas include 7 large cities (Seoul, Busan, Daegu, Daejeon, Incheon, Gwangju, Ulsan) and Gyeonggi Province.*
[e] *The unit of housing consumption is pyong (1 pyong = 3.3m^2 = 35.6 sq. feet).*
[f] *The null hypothesis is that the $CHONSEI$ variable is exogenous.*
[g] *The models in columns (4) and (5) are exactly identified.*
*** *Significant at the 1 percent level*
** *Significant at the 5 percent level*
* *Significant at the 10 percent level*

Figure 1: Pure chonsei equilibrium