B. Online Appendix

Model of macroprudential policy and household wealth

To examine the possible effects of macroprudential policies on wealth inequality, we introduce a two-period model in which investors with different initial wealth decide housing investment and labor inputs. The constraints on their investment include the available loans subject to a loan-to-value ratio (LTV) ceiling, the house price in each period, and the financial costs of borrowing. These constraints over the two periods determine the impact on wealth inequality.

There are two types of investors with large and small amounts of initial wealth b_h and b_l. They maximize their utilities over two periods by choosing their consumption, leisure, and stocks of housing. The utility of an investor is:

$$U_{t,i} = \ln c_t + j_t \ln H_t - l_t^{\eta}/\eta + \beta_i \left(\ln c_{t+1} + j_{t+1} \ln H_t - l_{t+1}^{\eta}/\eta \right), \quad i \in \{h, l\} \tag{B.1}$$

where c_t denotes consumption in period *t*, j_t is the parameter representing the marginal utility from holding housing stock H_t in period *t*, and l_t is the labor input in period *t*. Therefore, the term $-l_t^{\eta}/\eta$ represents the utility of leisure. The constant β_i is investor *i*'s discount factor, for which $\beta_h > \beta_l$.

The budget constraint in each period is given as follows[17]:

$$\text{Period-1 constraint: } b_i + H_t p_t \theta + w_t l_t = c_t + p_t H_t, \tag{B.2}$$

$$\text{Period-2 constraint: } H_t p_{t+1} + w_{t+1} l_{t+1} = c_{t+1} + (1 + r_t) H_t p_t \theta, \tag{B.3}$$

where b_i is the initial wealth of investor *i*, H_t is the housing stock in period *t*, p_t is the unit house price in period *t*, θ is the loan-to-value (LTV) ratio set by the macroprudential authority, and $H_t p_t \theta$ is the amount of the mortgage loan. The

[17] A la Foley (1975), an investor's discrete decision at the end of each period is constrained by both the initial stock of wealth and the labor income flow.

variable w_t is the wage in period *t*, and l_t is the labor input in period *t*. Therefore, investors in the first period consume and invest in houses with their initial wealth, mortgage loans, and labor income. Then, in the second period, the investors pay back their mortgage with their house and labor income and consume the rest.[18]

Investors' speculation affects the growth rate $\pi(\theta)$ of the unit house price as a function of the loan-to-value ratio (LTV) ceiling θ where $p_{t+1}(\theta)/p_t = 1+\pi(\theta)$. The wage is assumed to grow at the same rate as inflation, as $w_{t+1}(\phi)/w_t = 1+\phi(\theta)$ where $\phi(\theta)$ is the inflation rate.[19]

Analysis

Governments can implement ceilings for loan-to-value ratios (LTV) in two fashions: as a fraction of (a) the current house value ($L_t = H_t p_t \theta$) or (b) the expected (or forecasted) future house value ($L_t = H_t p_{t+1} \theta$). As in most developed countries, we restrict mortgage borrowing relative to the current instead of the future house value to avoid the possibly complicated issue of forecasting. Investors take the maximum available mortgage under the ceiling; hence, the loan amount taken is not a strategic variable. Also, investors do not save through other means besides purchasing houses in the first period. Therefore, they spend all of their remaining resources on consumption after purchasing houses in the first period. After repaying their mortgages in the second period, they spend the rest on consumption.

Then the strategic variables are the house investment (H_t) and labor input in each period (l_t and l_{t+1}). The rest—such as the LTV ceiling (θ), the discount factor

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[18] Houses in this model play two roles: (i) providing housing services and (ii) enabling the intertemporal substitution of consumption. Similarly, in Mian et al. (2021), houses serve a critical dual role of providing direct utility (through what they call "warm-glow bequest motive") as well as constituting a pledgeable real asset. Likewise, Piazzesi et al. (2007) models houses both as a source of housing services and claims to future services streams. In contrast, Mitkov and Schwer (2020) model houses solely as the collateral for mortgage loans.

[19] Our earlier manuscript included an assumption that house prices react more sensitively than the inflation rate to changes in macroprudential policy ($\pi'(\theta) > \phi'(\theta)$). However, this assumption is not essential and is not included. In addition, the empirical evidence is weak; for example, Arena et al. (2020) find a mixed impact of macroprudential policies on house prices.

(β_i), and the initial wealth (b_i)—are exogenous. The first-order conditions for the investors' utility maximization are:

$$\frac{\partial L}{\partial H_t} = F^1(H_t, l_t, l_{t+1}; \theta, b_i, \beta_i) = \frac{P_t(\theta - 1)}{c_t} + \frac{j_t}{H_t} + \beta\left(\frac{(1+\pi-(1+r)\theta)P_t}{c_{t+1}} + \frac{j_{t+1}}{H_t}\right) = 0 \qquad \text{(B.4)}$$

$$\frac{\partial L}{\partial l_t} = F^2(H_t, l_t, l_{t+1}; \theta, b_i, \beta_i) = \frac{w_t}{c_t} - l_t^{\eta-1} = 0 \qquad \text{(B.5)}$$

$$\frac{\partial L}{\partial l_{t+1}} = F^3(H_t, l_t, l_{t+1}; \theta, b_i, \beta_i) = \beta\left(\frac{(1+\phi_t)w_t}{c_{t+1}} - l_{t+1}^{\eta-1}\right) = 0 \qquad \text{(B.6)}$$

We linearize the above first-order conditions for the three strategic variables by taking total derivatives:

$$\frac{\partial F^1}{\partial H_t}dH_t + \frac{\partial F^1}{\partial l_t}dl_t + \frac{\partial F^1}{\partial l_{t+1}}dl_{t+1} + \frac{\partial F^1}{\partial \theta}d\theta + \frac{\partial F^1}{\partial \beta_i}d\beta_i = 0, \qquad \text{(B.7)}$$

$$\frac{\partial F^2}{\partial H_t}dH_t + \frac{\partial F^2}{\partial l_t}dl_t + \frac{\partial F^2}{\partial l_{t+1}}dl_{t+1} + \frac{\partial F^2}{\partial \theta}d\theta + \frac{\partial F^2}{\partial \beta_i}d\beta_i = 0, \qquad \text{(B.8)}$$

$$\frac{\partial F^3}{\partial H_t}dH_t + \frac{\partial F^3}{\partial l_t}dl_t + \frac{\partial F^3}{\partial l_{t+1}}dl_{t+1} + \frac{\partial F^3}{\partial \theta}d\theta + \frac{\partial F^3}{\partial \beta_i}d\beta_i = 0. \qquad \text{(B.9)}$$

We can rewrite the linearized first-order conditions as

$$\begin{bmatrix} \frac{\partial F^1}{\partial H_t} & \frac{\partial F^1}{\partial l_t} & \frac{\partial F^1}{\partial l_{t+1}} \\ \frac{\partial F^2}{\partial H_t} & \frac{\partial F^2}{\partial l_t} & \frac{\partial F^2}{\partial l_{t+1}} \\ \frac{\partial F^3}{\partial H_t} & \frac{\partial F^3}{\partial l_t} & \frac{\partial F^3}{\partial l_{t+1}} \end{bmatrix} \begin{bmatrix} dH_t \\ dl_t \\ dl_{t+1} \end{bmatrix} = -\begin{bmatrix} \frac{\partial F^1}{\partial \theta}d\theta + \frac{\partial F^1}{\partial \beta_i}d\beta_i \\ \frac{\partial F^2}{\partial \theta}d\theta + \frac{\partial F^2}{\partial \beta_i}d\beta_i \\ \frac{\partial F^3}{\partial \theta}d\theta + \frac{\partial F^3}{\partial \beta_i}d\beta_i \end{bmatrix}.$$

(B.10)

Let us simplify the above matrix by substituting the values of the FOC's partial derivatives with respect to the endogenous variables as follows:

$$\begin{bmatrix} -\frac{(1+\beta)j_t}{H_t^2} & 0 & 0 \\ 0 & -(\eta-1)l_t^{\eta-2} & 0 \\ 0 & 0 & -\beta_i(\eta-1)l_{t+1}^{\eta-2} \end{bmatrix} \begin{bmatrix} dH_t \\ dl_t \\ dl_{t+1} \end{bmatrix} = -\begin{bmatrix} \frac{\partial F^1}{\partial \theta}d\theta + \frac{\partial F^1}{\partial \beta_i}d\beta_i \\ \frac{\partial F^2}{\partial \theta}d\theta + \frac{\partial F^2}{\partial \beta_i}d\beta_i \\ \frac{\partial F^3}{\partial \theta}d\theta + \frac{\partial F^3}{\partial \beta_i}d\beta_i \end{bmatrix}. \qquad \text{(B.11)}$$

Then the impact of the LTV ceiling on the equilibrium amount of house investment is determined to be positive:

$$\frac{dH_t}{d\theta} = -\frac{\begin{vmatrix} \frac{\partial F^1}{\partial \theta} & 0 & 0 \\ \frac{\partial F^2}{\partial \theta} & -(\eta-1)l_t^{\eta-2} & 0 \\ \frac{\partial F^3}{\partial \theta} & 0 & -\beta_i(\eta-1)l_{t+1}^{\eta-2} \end{vmatrix}}{\begin{vmatrix} -\frac{(1+\beta)j_t}{H_t^2} & 0 & 0 \\ 0 & -(\eta-1)l_t^{\eta-2} & 0 \\ 0 & 0 & -\beta_i(\eta-1)l_{t+1}^{\eta-2} \end{vmatrix}} = -\frac{\begin{vmatrix} \frac{P_t}{c_t} - \frac{\beta_i(1+r)P_t}{c_{t+1}} & 0 & 0 \\ 0 & -(\eta-1)l_t^{\eta-2} & 0 \\ \frac{\beta_i\phi' w_t}{c_{t+1}} & 0 & -\beta_i(\eta-1)l_{t+1}^{\eta-2} \end{vmatrix}}{-\frac{j_t\beta_i(1+\beta_i)(\eta-1)^2 l_t^{\eta-2}l_{t+1}^{\eta-2}}{H_t^2}}$$

$$= \frac{\left(c_{t+1} - c_t(1+r)\beta_i\right)P_t H_t^2}{c_t c_{t+1} j_t(1+\beta_i)} > 0 \qquad if\ r < (c_{t+1} - c_t\beta_i)/c_t\beta_i.$$

(B.12)

The above result shows that a looser (higher) loan-to-value ratio (LTV) ceiling increases the equilibrium housing investment as long as the mortgage rate is lower than a critical level. The impact of the LTV ceiling on the investors' budget constraints is larger when their initial wealth is smaller and vice versa. As a result, the elasticity of housing investment to LTV ceiling changes is lower for (initially) wealthier investors. Likewise, the impact of the LTV policy changes on the budget constraints is larger for poorer investors; consequently, they have a higher elasticity of housing investment to LTV ceiling changes: $\varepsilon_{H_t(b_h)\theta} < \varepsilon_{H_t(b_l)\theta}$.[20] Therefore, a tighter (lower) LTV

[20] The higher elasticity of housing investment to LTV ceiling changes for poor investors can be shown as follows:

ceiling—a stricter macroprudential policy—can widen wealth inequality. Proposition 1 summarizes this result.

Proposition 1. The tightening macroprudential policy of decreasing the loan-to-value ratio (LTV) can worsen wealth inequality further from the initial gap in endowments $b_h - b_l$.

Proof. The equilibrium wealth inequality in the second period is defined as follows:

Wealth Inequality (WI): $WI = P_{t+1}(\theta)H^*_{b_h}(\theta) - P_{t+1}(\theta)H^*_{b_l}(\theta)$

Then the impact of the LTV ceiling change on wealth inequality is determined as follows:

$$\begin{aligned}
\frac{\partial WI}{\partial \theta} &= \frac{\partial P_{t+1}(\theta)}{\partial \theta}\left(H^*_{b_h}(\theta) - H^*_{b_l}(\theta)\right) + P_{t+1}(\theta)\left(\frac{\partial H^*_{b_h}(\theta)}{\partial \theta} - \frac{\partial H^*_{b_l}(\theta)}{\partial \theta}\right) \\
&= \left(\frac{\partial P_{t+1}(\theta)}{\partial \theta}\frac{\theta}{P_{t+1}}\left(H^*_{b_h}(\theta) - H^*_{b_l}(\theta)\right) + P_{t+1}(\theta)\frac{\theta}{P_{t+1}}\left(\frac{\partial H^*_{b_h}(\theta)}{\partial \theta} - \frac{\partial H^*_{b_l}(\theta)}{\partial \theta}\right)\right)\frac{P_{t+1}}{\theta} \qquad \text{(B.13)} \\
&< \left(\frac{\partial P_{t+1}(\theta)/P_{t+1}}{\partial \theta/\theta} - \left(\frac{\partial H^*_{b_l}(\theta)/H^*_{b_l}(\theta)}{\partial \theta/\theta} - \frac{\partial H^*_{b_h}(\theta)/H^*_{b_h}(\theta)}{\partial \theta/\theta}\right)\right)\frac{P_{t+1}\left(H^*_{b_h}(\theta) - H^*_{b_l}(\theta)\right)}{\theta} < 0
\end{aligned}$$

if $\varepsilon_{H_{b_l}\theta} - \varepsilon_{H_{b_h}\theta} > \varepsilon_{P_{(t+1)}\theta}$.

The impact of the LTV ceiling changes on the budget constraints is larger for poorer investors. As a result, the housing investment for poorer investors is more elastic to the LTV ceiling changes: that is, $\frac{dH_t(b_h)/H_t(b_h)}{d\theta/\theta} < \frac{dH_t(b_l)/H_t(b_l)}{d\theta/\theta}$. Since wealthier investors are less sensitive to LTV ceiling changes and own a larger share of total houses, the change in the house price is limited. Therefore, a stricter (lower)

$$\varepsilon_{H_{b_l}\theta} - \varepsilon_{H_{b_h}\theta} = \frac{\partial H^*_{b_l}(\theta)/H^*_{b_l}(\theta)}{\partial \theta/\theta} - \frac{\partial H^*_{b_h}(\theta)/H^*_{b_h}(\theta)}{\partial \theta/\theta} = \frac{\partial H^*_{b_l}(\theta)}{\partial \theta}\frac{\theta}{H^*_{b_l}(\theta)} - \frac{\partial H^*_{b_h}(\theta)}{\partial \theta}\frac{\theta}{H^*_{b_h}(\theta)}$$

As assumed, the initial asset endowment of the wealthier is higher than the poor as follows: $b_h > b_l$. Then, the budget constraint for the two types of investors to invest in housing show the following asymmetry:

$$H_{b_l} = (b_l + w_t l_t - c_t)/p_t(1-\theta) < H_{b_h} = (b_h + w_t l_t - c_t)/p_t(1-\theta)$$

$$\begin{aligned}
\varepsilon_{H_{b_l}\theta} - \varepsilon_{H_{b_h}\theta} &= \frac{\partial H^*_{b_l}(\theta)/H^*_{b_l}(\theta)}{\partial \theta/\theta} - \frac{\partial H^*_{b_h}(\theta)/H^*_{b_h}(\theta)}{\partial \theta/\theta} = \frac{\partial H^*_{b_l}(\theta)}{\partial \theta}\frac{\theta}{H^*_{b_l}(\theta)} - \frac{\partial H^*_{b_h}(\theta)}{\partial \theta}\frac{\theta}{H^*_{b_h}(\theta)} \\
&= \left(\frac{\theta}{1-\theta}\right)\left(\frac{1}{b_l + w_t l_t - c_t} - \frac{1}{b_h + w_t l_t - c_t}\right) > 0 \quad \text{since } b_l < b_h.
\end{aligned}$$

LTV ratio worsens the existing wealth inequality when the elasticity $\varepsilon_{P_{(t+1)}\theta}$ of house price to LTV ceiling changes is lower than the difference $\varepsilon_{H_{b_l}\theta} - \varepsilon_{H_{b_h}\theta}$ between the poor and wealthy households' elasticities of housing investment to LTV ceiling changes. □

Given the initial inequality in endowments, stricter macroprudential policies such as a lower LTV ceiling have a more significant impact on poorer households, thus aggravating wealth inequality.

Wealthier investors have higher flexibility in the intertemporal decision of consumption and investment. That is, they have a higher discount factor $\beta_h > \beta_l$. Consequently, wealthier investors increase their housing investment in the first period, widening the wealth inequality in the following period since their relative weight of period-2 utility is higher than that of the poor. Corollary 1 summarizes this result.

Corollary 1. Since the discount factor is greater for the wealthy than the poor ($\beta_h > \beta_l$), the wealthy increase housing investment in response to a stricter LTV ceiling, resulting in increased wealth inequality.

References for Online Appendix

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Table B.1. Summary Statistics of Household Finances in Year 0

Variable	Mean	SD	Percentile				
			0%	25%	50%	75%	100%
Panel A: Full sample							
Assets	361.1	574.2	0.0	69.2	207.5	435.8	16054.8
Financial	89.6	179.4	0.0	11.3	41.7	103.9	8080.0
Real estate	254.0	472.3	0.0	0.0	130.0	310.0	14600.0
Other real assets	17.5	50.3	0.0	0.0	5.0	17.9	1613.0
Liabilities	60.2	174.6	0.0	0.0	5.0	57.0	7400.0
Unsecured credit debt	5.4	23.6	0.0	0.0	0.0	0.0	610.0
Mortgage debt	31.9	126.2	0.0	0.0	0.0	13.0	6900.0
Other debt	22.8	84.4	0.0	0.0	0.0	7.1	2700.0
Net worth	300.9	480.3	-280.1	54.0	170.4	368.0	9594.0
Annual Income	50.1	48.6	0.0	17.8	38.1	66.8	821.1
Loan-to-value ratio (%)	8.3	17.4	0.0	0.0	0.0	5.8	100.0
Panel B: Subsample							
Assets	465.1	426.8	2.9	212.7	347.0	563.5	3978.8
Financial	115.1	131.0	0.1	35.5	75.5	146.2	1501.8
Real estate	325.3	376.5	0.0	119.5	230.0	400.0	3400.0
Other real assets	24.7	47.7	0.0	5.2	13.0	26.0	715.0
Liabilities	85.3	153.7	0.0	0.0	30.0	104.5	2120.0
Unsecured credit debt	7.6	24.5	0.0	0.0	0.0	0.0	380.0
Mortgage debt	47.7	104.4	0.0	0.0	0.0	60.0	2000.0
Other debt	30.0	83.9	0.0	0.0	0.0	15.0	1300.0
Net worth	379.8	372.3	-270.8	164.0	280.6	464.8	3956.8
Annual Income	69.1	10.6	52.0	60.3	68.1	78.2	97.9
Loan-to-value ratio (%)	13.3	20.3	0.0	0.0	0.0	22.9	100.0

Note: This table shows the summary statistics of South Korean households' balance sheets and annual income reported in 2017 in the *Survey of Household Finances and Living Conditions*. The unit is a million South Korean won (KRW). A *loan-to-value ratio* is the size of a household's mortgage debt relative to the value of its real estate assets. Panel A is for the full sample of 10,251 households. Panel B is for the subsample of 2,025 households. Both the full sample and the subsample include households with non-positive net worth. The subsample consists of (a) households whose annual income is between 52 and 88 million South Korean won (KRW) and have nonzero real estate assets, and (b) households whose annual income is between 62 and 98 million KRW and have zero real estate assets.

Table B.2. Household Income, Wealth, and Mortgages in Year 0

Statistic	Net worth quintile in Year 0					All
	Bottom (poorest)	Second	Middle	Fourth	Top (wealthiest)	
Panel A: Full sample						
Observations	2,222	2,207	2,043	1,904	1,875	10,251
Mean annual income	22.0	33.6	45.9	60.9	96.6	50.1
Mean net worth	10.9	84.9	189.3	346.1	974.8	300.9
% with net worth > 0	87.9	100.0	100.0	100.0	100.0	97.4
Mean real estate assets	8.1	66.9	155.0	290.0	837.0	254.0
% with real estate assets > 0	14.6	63.4	87.3	95.6	98.0	69.9
Mean mortgage debt	4.6	17.7	28.1	35.0	82.1	31.9
% with mortgage debt > 0	4.4	25.0	36.6	37.2	36.2	27.1
Mean loan-to-value ratio (LTV) among those with positive mortgage	66.0	41.7	32.5	24.3	20.9	30.6
% with LTV						
≥ 40%	81.4	52.3	34.4	16.8	14.2	30.2
≥ 50%	76.3	38.3	19.9	8.3	6.9	19.4
≥ 60%	60.8	22.3	7.0	3.2	3.2	10.0
≥ 70%	44.3	8.3	1.7	1.0	1.2	4.2
≥ 80%	36.1	4.5	1.2	0.6	0.7	2.8
≥ 90%	25.8	1.3	0.7	0.3	0.4	1.5
Panel B: Subsample						
Observations	92	278	540	626	489	2,025
Mean annual income	71.7	68.1	67.9	69.5	70.2	69.1
Mean net worth	6.6	93.4	193.7	349.0	857.7	379.8
% with net worth > 0	79.3	100.0	100.0	100.0	100.0	99.1
Mean real estate assets	53.6	94.9	158.8	291.4	734.5	325.3
% with real estate assets > 0	23.9	69.1	87.2	95.5	97.3	86.9
Mean mortgage debt	47.1	40.7	40.0	43.5	65.8	47.7
% with mortgage debt > 0	16.3	43.5	50.7	45.2	35.6	42.8
Mean loan-to-value ratio (LTV) among those with positive mortgage	74.6	50.1	33.0	25.2	20.9	31.1
% with LTV						
≥ 40%	100.0	69.4	35.0	17.3	12.1	30.6
≥ 50%	93.3	52.1	19.3	7.8	7.5	19.0
≥ 60%	80.0	34.7	5.8	3.2	2.3	9.6
≥ 70%	66.7	13.2	0.7	0.4	1.1	3.6
≥ 80%	46.7	9.1	0.7	0.4	0.0	2.4
≥ 90%	26.7	4.1	0.4	0.4	0.0	1.3

Note: This table shows the summary statistics of South Korean households' income, wealth, and mortgages in 2017 in the *Survey of Household Finances and Living Conditions*. The unit for mean values is a million South Korean won (KRW). A *loan-to-value ratio* is the size of a household's mortgage debt relative to the value of its real estate assets. Panel A is for the full sample of 10,251 households. Panel B is for the subsample of 2,025 households. Both the full sample and the subsample include households with non-positive net worth. The subsample consists of (a) households whose annual income is between 52 and 88 million South Korean won (KRW) and have nonzero real estate assets, and (b) households whose annual income is between 62 and 98 million KRW and have zero real estate assets.

Table B.3. Absolute Changes in Household Net Worth

Cumulative change in net worth from Year 0	Net worth quintile in Year 0					All
	Bottom (poorest)	Second	Middle	Fourth	Top (wealthi-est)	
Panel A. Full Sample						
Year 1	9.3	14.6	14.9	17.2	42.9	19.2
	(38.5)	(97.8)	(83.9)	(100.1)	(278.1)	(141.1)
	[2,222]	[2,207]	[2,043]	[1,904]	[1,875]	[10,251]
Year 2	19.2	25.4	27.8	38.2	94.5	39.5
	(69.7)	(101.1)	(107.4)	(147.9)	(476.5)	(227.7)
	[2,222]	[2,207]	[2,043]	[1,904]	[1,875]	[10,251]
Panel B. Subsample						
Year 1	30.7	31.2	18.6	16.5	40.8	25.6
	(77.5)	(95.1)	(77.0)	(90.5)	(209.4)	(127.6)
	[92]	[278]	[540]	[626]	[489]	[2,025]
Year 2	56.4	53.3	38.2	43.0	88.4	54.7
	(142.6)	(125.1)	(110.6)	(134.5)	(497.7)	(268.3)
	[92]	[278]	[540]	[626]	[489]	[2,025]

Note: This table shows the changes in households' net worth from Year 0 (2017) to Year 1 (2018) and Year 2 (2019). The unit is a million South Korean won (KRW). Net worth quintiles are from the whole population of households in Year 0. Numbers without brackets are mean values. The numbers in parentheses are standard deviations. Numbers in square brackets are the numbers of observations. Panel A is for the full sample of 10,251 households. Panel B is for the subsample of 2,025 households. Both the full sample and the subsample include households with non-positive net worth. The subsample consists of (a) households whose annual income is between 52 and 88 million South Korean won (KRW) and have nonzero real estate assets, and (b) households whose annual income is between 62 and 98 million KRW and have zero real estate assets.

Table B.4. Share of Households by Demographic Groups: Subsample

Demographic Group	Net worth quintile in Year 0					All
	Bottom (poorest)	Second	Middle	Fourth	Top (wealthiest)	
Age						
18-29	6.5	4.3	1.1	0.8	0.0	1.4
30s	17.4	18.3	22.6	16.8	10.2	17.0
40s	28.3	29.1	30.4	34.7	22.1	29.4
50s	29.3	34.2	31.5	27.6	30.9	30.4
60 or above	18.5	14.0	14.4	20.1	36.8	21.7
Sex						
Male	82.6	87.4	89.3	93.5	90.2	90.2
Female	17.4	12.6	10.7	6.5	9.8	9.8
Education						
Elementary school	7.6	6.8	6.5	6.2	3.7	5.8
Middle school	13.0	12.2	7.8	5.8	6.7	7.8
High school	46.7	41.4	38.0	35.0	31.3	36.3
College or further	32.6	39.6	47.8	53.0	58.3	50.1
Household size						
1	6.5	2.9	2.6	2.1	3.7	2.9
2	15.2	18.3	19.1	16.3	27.2	19.9
3-4	62.0	67.3	67.2	69.5	60.3	66.0
5-6	16.3	11.5	10.9	11.7	8.2	10.8
7+	0.0	0.0	0.2	0.5	0.6	0.3
Housing type						
Own housing	18.5	59.7	75.0	86.6	88.1	77.1
Lump-sum deposit rent (*Jeonse*)	23.9	19.8	18.9	10.5	10.2	14.6
Monthly rent	42.4	13.3	3.9	1.6	0.6	5.4
Free housing	15.2	7.2	2.2	1.3	1.0	2.9
Location						
Seoul Metropolitan Area	45.7	33.8	28.0	34.3	42.7	35.1
Other	54.3	66.2	72.0	65.7	57.3	64.9
Employment type						
Regular	51.1	54.7	61.9	58.8	44.2	55.2
Temporary	21.7	15.5	6.9	6.2	4.1	7.9
Self-employed	20.7	25.2	25.4	27.3	36.0	28.3
Unemployed *etc*.	6.5	4.7	5.9	7.7	15.7	8.7
Annual income quintile in Year 0						
Bottom (0-20%)	0.0	0.0	0.0	0.0	0.0	0.0
Second (20-40%)	0.0	0.0	0.0	0.0	0.0	0.0
Middle (40-60%)	3.3	3.6	3.7	2.1	1.4	2.6
Fourth (60-80%)	78.3	85.3	81.3	83.2	81.0	82.2
Top (80-100%)	18.5	11.2	15.0	14.7	17.6	15.2
Observations	92	278	540	626	489	2,025

Note: This table shows the share of households by demographic groups. *Sex* refers to the sex of the householder for the subsample of 2,025 households. Both the subsample include households with non-positive net worth. The subsample consists of (a) households whose annual income is between 52 and 88 million South Korean won (KRW) and have nonzero real estate assets, and (b) households whose annual income is between 62 and 98 million KRW and have zero real estate assets. *Lump-sum deposit rent* (or, *Jeonse*) refers to a housing arrangement unique to Korea of having the tenant pay a large one-time deposit returned at the end of the lease. *Free housing* refers to free housing such as that provided by employers.

Table B.5. Effects of Stricter LTV Ceiling on Household Log Net Worth by Initial Net Worth Quintile: Placebo exercise

	Dependent Variable:					
	Cumulative Change in Log Net Worth					
Initial Net Worth Quintile and Stricter LTV Ceiling (*D*)	(1) Year 1	(2) Year 2	(3) Year 1	(4) Year 2	(5) Year 1	(6) Year 2
Bottom (poorest) × *D*	0.123	0.003	0.108	0.010	0.100	-0.006
	(0.410)	(0.540)	(0.409)	(0.537)	(0.409)	(0.539)
Second × *D*	-0.087	-0.124	-0.066	-0.082	-0.063	-0.082
	(0.152)	(0.185)	(0.152)	(0.184)	(0.150)	(0.180)
Middle × *D*	0.017	-0.054	0.028	-0.032	0.018	-0.047
	(0.051)	(0.102)	(0.050)	(0.102)	(0.051)	(0.103)
Fourth × *D*	0.002	-0.013	-0.008	-0.030	-0.006	-0.027
	(0.061)	(0.094)	(0.062)	(0.092)	(0.061)	(0.091)
Top (wealthiest) × *D*	-0.001	-0.029	-0.008	-0.043	-0.007	-0.039
	(0.040)	(0.053)	(0.042)	(0.055)	(0.042)	(0.054)
Bottom (poorest)	0.513	1.038**	0.582*	1.099**	0.576*	1.074**
	(0.327)	(0.466)	(0.338)	(0.486)	(0.336)	(0.483)
Second	0.322***	0.459***	0.353***	0.491***	0.309***	0.414***
	(0.102)	(0.118)	(0.106)	(0.121)	(0.104)	(0.121)
Middle	0.082**	0.163***	0.108***	0.185***	0.055	0.099
	(0.036)	(0.054)	(0.041)	(0.063)	(0.050)	(0.076)
Fourth	0.035	0.047	0.068	0.087	0.000	-0.020
	(0.042)	(0.065)	(0.050)	(0.070)	(0.059)	(0.083)
Top (wealthiest)	0.019	0.078**	0.043	0.107**	-0.027	-0.008
	(0.028)	(0.038)	(0.034)	(0.046)	(0.050)	(0.067)
Controls						
Age, sex, & education			✓	✓	✓	✓
Residence in Seoul					✓	✓
Observations	1,814	1,807	1,814	1,807	1,814	1,807
Adjusted R-squared	0.061	0.076	0.063	0.088	0.065	0.091

Note: This table shows the results of a placebo exercise of using hypothetical income cutoffs of 80 and 70 million KRW instead of 70 and 80. Numbers without parentheses represent estimates of regression coefficients on the selected independent variables in Equation (3). Stricter LTV ceiling (*D*) is a dummy variable that equals one if the household faces the LTV ceiling of 40% and 0 if it faces 50%. The controls age, sex, and education refer to those of the householder. Residence in Seoul equals one if the household lives in Seoul Metropolitan Area and equals zero otherwise. Numbers in parentheses are heteroskedasticity-robust standard errors. Stars *, **, and *** indicate that the estimates differ significantly from zero with 90%, 95%, and 99% confidence.