

Demand for Home Pension and Reverse Mortgage: An Information Provision Survey Experiment*

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Abstract

Elderly poverty remains a critical issue in South Korea, despite widespread homeownership among older adults. Although the home pension program allows retirees to unlock housing wealth, uptake remains below 2% as of 2024. Using a large-scale survey of adults aged 55–79, we conduct an information provision experiment to assess how policy reforms and belief corrections affect demand. We find that enrollment intention rises by 6 percentage points when monthly pension payments are adjusted with house price changes, and by 5 percentage points when bequest conditions are made more flexible. Notably, merely informing that the fixed monthly payments—often perceived as disadvantageous during housing price increases—do not result in a loss when house prices rise because the amount bequeathed to their children increases accordingly, led to a 7%p increase in enrollment intention. Our results suggest that addressing informational barriers may be as effective as structural reforms in increasing program uptake.

JEL Classification: D14, C93, H55

Keywords: Home Pension, Reverse Mortgage, Survey Experiment

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1 Introduction

South Korea is one of the fastest aging countries in the world. This country became a so-called super-aged society in December 2024, whereby the proportion of people aged over 65 will reach 20% of the total population. By 2050, this proportion of the elderly population is anticipated to be more than double.¹ Among several issues associated with the changes in the population structure, elderly poverty is distinctive. According to the OECD report,² the income poverty rate of older people (aged over 65) ranks South Korea first out of all OECD countries at 40.4%. A noticeable point of elderly poverty in South Korea is that many elderly who suffer from the lack of flow income possess an illiquid asset; a residential house. Recent studies (Choi et al., 2023b; Lee, 2023) estimate that the elderly poverty rate would decrease by 13%p to 16%p if they liquidate their assets by adopting the existing schemes such as home pension, farmland pension, and reverse mortgages.³ Since these studies claim that elderly poverty can be resolved to a large extent if the elderly liquidate their assets, the problem seems easy to tackle: allowing them to liquidate their wealth via home pension. Strikingly, only 1.89% of eligible elderly had enrolled in the home pension program as of 2024. Although two major commercial banks provide a reverse mortgage plan that is comparable to home pension, almost no one uses it. Since both the home pension and the reverse mortgage plans can be stopped at any point of request, the commitment problem is not the major issue. The primary goal of this paper is to investigate why the uptake of home pension is so low, compared to what the "wealthy hand-to-mouth" (Kaplan et al., 2014) are supposed to demand.

What would facilitate elderly demand for liquidizing their homes more? Should some features of the home pension scheme be improved? Should the elderly be more positively informed about the home pension, that is, should the government agency (Korea Housing Finance Corporation) emphasize the positive aspects of the home pension to the eligible elderly more? Or, should the reverse mortgage plans offered by commercial financial institutions such as banks and insurance companies be promoted more?

To answer these questions, we design an information provision survey experiment (Haa-

¹[Aging population in South Korea - statistics & facts](#). Last access: Oct 24, 2024

²[OECD Income Distribution Database](#), Last access: Oct 24, 2024

³A reverse mortgage is a loan that provides the opposite cash flows to the mortgages: receiving a monthly payment (income) while living in the house, and the loan and interest are repaid only when the loaner sells their home, permanently moves away, or dies. Considering that reverse mortgages are offered by commercial financial institutions, we call a similar product offered by a government enterprise a home pension. See Section 3 to check the differences in more detail.

land et al., 2023), providing a different set of information to survey participants and examining the difference (the treatment effect) among their responses. We believe this information provision survey is appropriate, especially when there have been no policy changes to observe changes in enrollment as a response to the policy changes. Since the reform plan for the home pension has not been finalized, various virtual conditions can be presented to survey participants, without raising a concern about the different information processing due to the participants' prior beliefs about the home pension reforms.

We conduct the survey experiment in the following way: A total of 3,820 participants were recruited as a representative sample of South Korean adults aged 55–79 who own a residential property and have not enrolled in the home pension scheme, selected using proportional stratified sampling stratified by gender, age, residential area (16 regions), and type of property owned (apartments vs. others). All participants first answer whether they are aware of the home pension scheme and how much they are interested in signing up for the home pension. After that, they are randomly divided into four groups, and each group is presented with information about the home pension, either in the form of the amendment or in the form of re-appreciation of the current home pension. The changes in the intention to sign up due to the information provision will be compared by treatments so that we can estimate the treatment effects. Afterwards, we ask whether similar structural modifications on the reverse mortgage plan offered by commercial financial institutions would raise its demand. The details follow in Section 4.

As found in the previous studies, the major reasons for not enrolling in the home pension were (1) the concern about being paid less than the home value, (2) the constant (inflation-adjusted) payment that does not reflect on the, mostly positive, changes in the housing price, and (3) the possible difficulty of inheriting the house to their children. We found that the intention of enrollment increased by 6%p when the home pension scheme is reformed to periodically redetermine the monthly payment based on the changes of the housing price, and by 5%p when it is reformed so that the remaining housing value can be bequeathed to their children more easily. A more interesting finding is that merely informing participants that the two major concerns—the constant pension payment not responding to later changes in housing prices and the issue of bequeathing the remaining housing value—contrast with each other also increased the intention to enroll by 7%p. That is, when informed that the fixed monthly payments, which do not adjust to later rises in house prices, do not result in a loss when house prices rise, because the amount bequeathed to their children increases accordingly, participants showed the most significant changes. Our findings suggest that

reconciling some of the concerns about the uptake of the home pension produces an effect of comparable magnitude to the policy reforms that could be considered most effective.

Furthermore, we find that although people in general prefer the home pension provided by the government enterprise over the reverse mortgage provided by commercial banks, the preference change is significant if the reverse mortgages are designed in more attractive ways. Thus, we envision a potential for burgeoning private markets for the liquidation of residential houses.

This paper is related to the literature on behavioral impediments of uptake of welfare enhancing reverse mortgages (Davidoff et al., 2017; Hanewald et al., 2020; Han et al., 2024; Han and Zhang, 2024; Fong et al., 2023) and annuities (Brown et al., 2008, 2021). To our knowledge, this paper is the first to conduct an information provision experiment (Haaland et al., 2023) with a randomized controlled trial setup on the uptake of reverse mortgages. From a methodological perspective, the most closely related study is Han and Zhang (2024), which investigates the likelihood of changing the "demand willingness" for house reverse mortgages through an information provision experiment. Unlike Han and Zhang (2024), which focuses on "within variation" with a small sample size ($n=342$) from China, this study utilizes a large sample of Koreans ($n=3,820$) divided into four groups, employing a randomized controlled trial design. This design allows for the examination of both "between variation" and "within variation," providing a more robust framework for causal inference. This study thereby provides firm causal evidence that information provision addressing loss framing can have a similar or greater impact than offering differently designed reverse mortgage options. Furthermore, the incorporation of a placebo treatment to detect experimenter demand effects adds a unique dimension to the study's methodology.

It is worth noting that while stated intentions may not perfectly predict or lead to subsequent behavior, they provide a necessary first step toward understanding behavioral change. According to the theory of planned behavior (Ajzen, 1985), intention represents the most immediate determinant of action, reflecting an individual's evaluation of potential outcomes and perceived control. Our experimental results should therefore be interpreted as evidence on how information affects the formation of such intentions. Although actual enrollment decisions depend on additional factors, such as financial constraints, institutional barriers, and time delays, the observed shifts in intention identify whether informational interventions can move individuals closer to considering home pensions as a viable retirement option.

The remainder of the paper is organized as follows. After a brief introduction of the home pension and the reverse mortgage considered in South Korea in Section 3, Section

4 describes how we designed the experimental survey and how we conducted it. Section 5 presents the survey results and estimates the average treatment effects on demand for home pension. Section 6 concludes.

2 Literature

This study contributes to the literature on behavioral impediments of adopting welfare-enhancing reverse mortgages and annuities. [Davidoff et al. \(2017\)](#) provide evidence that the low uptake of reverse mortgage plans might be due to the limited understanding about the products. Our finding that changing perceptions regarding the home pension produces an effect of comparable magnitude to direct policy changes is consistent with the findings of [Brown et al. \(2008\)](#), which provide evidence that survey respondents' preferences are reversed when the same annuity plan is introduced in the consumption frame and in the investment frame. [Brown et al. \(2021\)](#) find that the complexity of the annuity choice reduces respondents' ability to value the annuity, and narrow choice bracketing can help their ability to value an annuity.

The literature on the take-up of insurance is also closely related to this paper, because Korea's home pension provides lifelong "annuity insurance" through the scheme of housing reverse mortgage. [Hwang \(2021\)](#) and [Hwang \(2024\)](#) find that loss-averse individuals show significantly lower ownership rates of insurance products, indicating that consumers may perceive insurance as a risky financial product that could result in a loss. Consequently, loss-averse consumers tend to be reluctant to purchase insurance. Our findings reveal that elderly Koreans with strong loss aversion are hesitant to adopt home pensions as well, suggesting that many view these pensions as uncertain financial instruments potentially leading to losses.

[Ha et al. \(2019\)](#) demonstrate that providing highly relevant and more accurate information about retirement pensions can alter the investment behavior of Korean consumers. This finding is consistent with the strong treatment effects observed in Group 4 of this study, where accurate information about products was provided. In particular, Group 4 showed significant effects when the loss frame was corrected through information provision. This finding is consistent with [Kwon et al. \(2021\)](#), which demonstrated that the choices of many households in Korea are influenced by framing effects. The finding from Group 3, which shows that the intention to enroll increases when inheritance of home pensions is made easier, aligns with the results of [Nakajima and Telyukova \(2017\)](#), which demonstrated that

bequest motives have a significantly negative impact on the adoption of reverse mortgages in the United States.

This paper contributes to the literature on Korea’s home pension system (Choi et al., 2023a, 2020) by presenting the first information provision experiment focused on this topic. It provides rigorous quantitative evidence on the potential increase in uptake under real-world conditions. In doing so, it offers crucial insights into how reforms to the Korean home pension system can enhance elderly income and addresses the pressing issue of severe elderly poverty in Korea (Hwang et al., 2023; Choi et al., 2022).

Our study also contributes to the broader literature on pension design and behavioral response, where institutional features interact with household decision-making. Atalay et al. (2019) report that policy design in pension incentives and joint retirement has strong behavioral effects among older couples. While that study focused on structural incentives, our findings show that non-incentive-based interventions, such as changing misperceptions and clarification, can produce similarly strong responses. These findings suggest that behavioral and institutional levers are complementary in promoting pension participation.

3 Background: Home pension and reverse mortgages

This section serves as a brief introduction to two specific forms of house loans: the home pension and the reverse mortgage. The denominations might be different by country, so we focus on the two long-term payment schemes associated with the value of a residential house, offered in South Korea. Both share a common feature of generating an income flow to the homeowner by liquidating the residential house, but their operations somewhat differ.

	Home Pension	Reverse Mortgage
Eligibility	Aged over 55 House value* \leq 1,200M KRW	Aged over 40 no restrictions
Maturity	When both spouses die	up to 30 years
Payment stability	Guaranteed by the government	Stopped when the bank goes bankruptcy
Recourse	No recourse	When the sum of payments exceeds the market value

*Official land value appraised by the government. The official value of 1,200M KRW is priced around 1,700M KRW in the market.

Table 1: Comparison between the home pension and reverse mortgage

A reverse mortgage is a loan provided by commercial financial institutions. As the name suggests, the reverse mortgage generates income flows in the opposite direction of a typical mortgage. By collateralizing the house, the borrower receives monthly loan payments from a bank over a contract period (up to 30 years), and the repayment is made at the end of the contract. Either when the lender declares bankruptcy or when the sum of payments exceeds the market value of the house, the payments are stopped during the contract period.

A home pension can be regarded as a government-backed reverse mortgage for life. Even if the sum of the pension payments exceeds the market value of the house, the Korea Housing-Finance Corporation (KHFC) continues to pay the pensioner until both spouses die. This lifetime annuity effectively functions as insurance against longevity risk—the risk of living too long. Since the home pension has such a feature of social insurance, only those who possess a house with a value less than 1.2 billion KRW in terms of the official land value, or less than 1.7 billion KRW in market value, are eligible to enroll in the home pension. A reverse mortgage doesn't have such an upper limit of the value of an eligible house.

According to KHFC's data as of September 2024,⁴ the average home pensioner is 72 years old and receives a monthly pension payment of 1.22 million KRW (about 870 USD), living in a house worth 388 million KRW.

There are several subtle issues worth mentioning about the home pension and reverse mortgages, especially regarding the payment schemes and the bequest taxes. KHFC also provides other types of home pensions, for example, paying a larger amount for the first five years of enrollment or after some years of enrollment. Obtaining a reverse mortgage loan or a home pension payment lowers the remaining value of the house that children wish to inherit, effectively reducing the inheritance tax. Addressing these subtle issues are beyond of the scope of this study.

4 Experimental Design

Our primary research questions are (1) whether changes of the current home pension scheme would facilitate demand for it, (2) whether demand for the home pension would increase if information pointing out that the two major reasons for reluctance to the home pension may counteract each other is presented, and (3) whether reverse mortgage plans offered by commercial financial institutions could be more effectively promoted. To address these questions, we designed an information provision survey experiment that provides different

⁴Source: [Korea Housing-Finance Corporation webpage](#). Last access: December 5, 2024

sets of information about the home pension to survey participants. This approach allows us to examine the difference (the treatment effect) driven by the information provided.⁵ We believe an information provision survey is an appropriate method, especially given the lack of policy changes to observe how enrollment might respond to such changes. Since no reform of the home pension has been considered, various hypothetical conditions can be presented to survey participants without being influenced by their prior beliefs. Since some of the survey questions ask respondents' unobservable beliefs and valuations, some may consider advanced methods with strategy-proof monetary incentives, such as a binarized scoring rule (Hossain and Okui, 2013). However, we decided against using complicated incentive-compatible payment methods because the elicitation of beliefs might not be behaviorally incentive compatible (Danz et al., 2022).⁶

The survey experiment was conducted as follows: All participants (aged 55 or older, owning a residential house, and not enrolled in the home pension scheme⁷) were initially informed about the home pension (See Figure 1) in section A of the survey. This section assesses their awareness and intention to enroll in the home pension.

In section B, participants were randomly divided into four groups, each presented with information about the home pension, either as potential amendments or reinterpretations of the current scheme. All treatment arms are summarized in Table 2. Participants were then asked again their intention to enroll in the home pension after receiving the information.

The G1 (Placebo) group was informed about a negligible change: See Figure 2. The participants were told that under the current home pension, an enrollment fee of 1.5% of the home value is due on the first day of receiving pension payments. Under the hypothetical new scheme,⁸ a small amount (10,000 KRW) would be refunded from the enrollment fee.

⁵See Online Appendix for the complete survey questions in Korean. The survey questions translated into English are available upon request.

⁶Two additional reasons guided our decision not to use incentive-compatible payment methods. First, given our budget constraints, the scale of payments under incentive-compatible methods would have been drastically smaller. While this might work in a laboratory setting, it seems irrelevant to the context of the home pension information we provide during the survey. Second, many questions ask for personal beliefs or private information, making it challenging to determine which questions should be incentivized. Given the respondents' ages (55 or older), we believe that adopting strategy-proof incentive schemes for many questions would be unproductive.

⁷Although including participants who are not eligible for the home pension but qualify for reverse mortgages could be insightful, we excluded participants under 55 because our primary focus is on why the most eligible elderly have not enrolled. We also exclude participants already enrolled in the home pension for two reasons: First, including them would require tailoring the first set of survey questions, complicating comparisons. Second, since only a small fraction (1.16% in 2022) of eligible elderly have enrolled, excluding them does not significantly affect the sample's representativeness.

⁸We emphasized the suggested changes introduced during the survey might not be implemented.

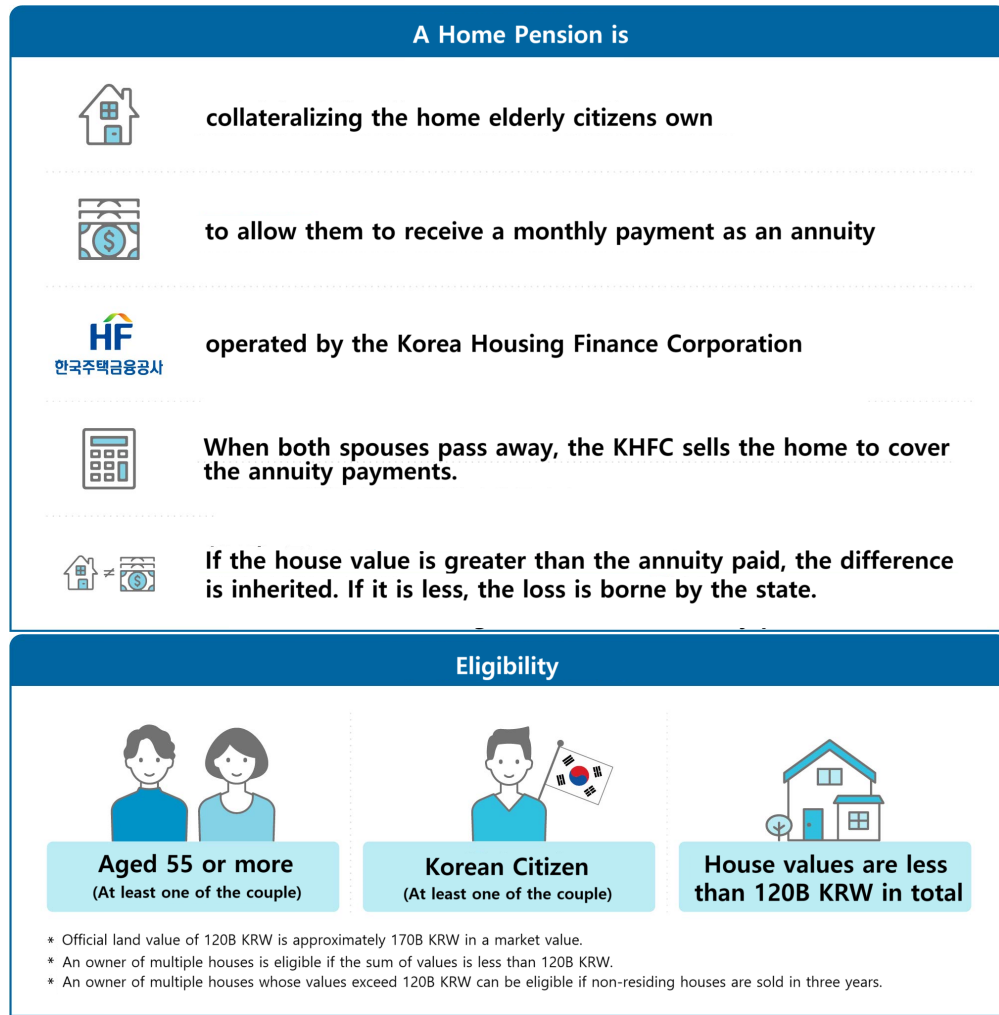


Figure 1: Commonly provided information (translated in English)

Group	Treatment	Information provided
G1	Placebo	A negligible partial refund of the initial enrollment fee
G2	Varying Payments	Pension payments varying with the house value changes
G3	Easing Bequests	Longer repayment periods for the house being bequeathed
G4	Changing Perceptions	Benefits of stable pension payments

Table 2: Experimental Design

Considering the average home value of 386 million KRW and an average enrollment fee of approximately 5,790,000 KRW, this refund is negligible.

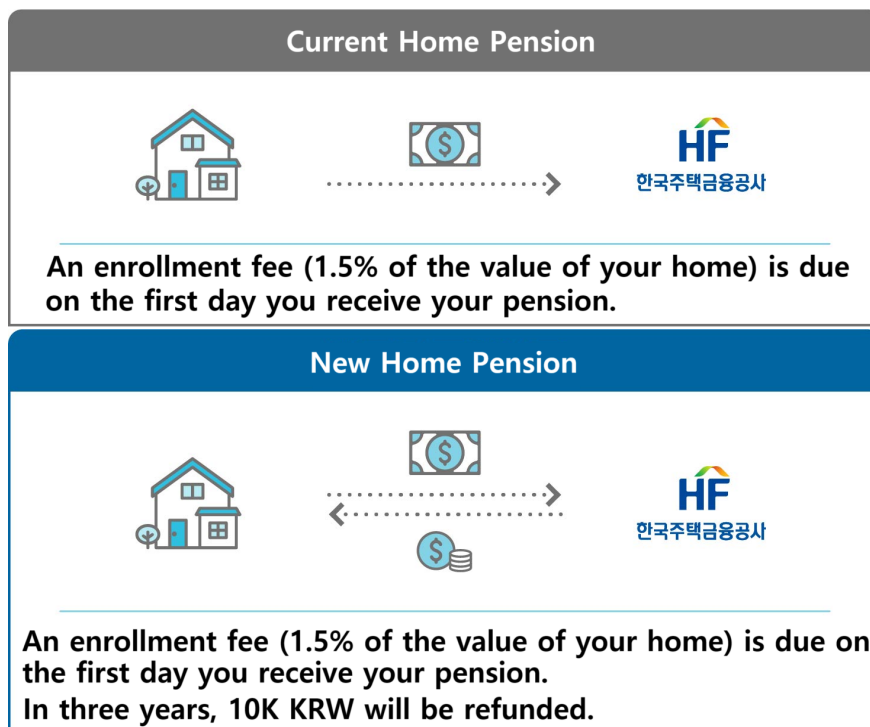


Figure 2: Information provided to G1 (translated in English)

G1 serves as the control group, instead of introducing a separate treatment arm without providing additional information, to account for potential experimenter demand effects—participants' tendency to respond to perceived implicit demands. By structuring the survey to elicit intentions before and after providing seemingly favorable information, changes in responses could arise from perceived demand rather than actual treatment effects. Although the experimenter demand effects were not severe in the laboratory (de Quidt et al., 2018), we want to ensure that the changes in their reported intention are not driven by the mere fact that we have provided something in the middle. The monetary benefit suggested in G1 is negligible, so would be the changes in intention to enrollment. Making the survey structure and length identical to the treatment conditions is another benefit of the placebo treatment.

To further reduce experimenter demand effects, we carefully worded the information to avoid framing it as inherently positive. For example, we avoided calling the new schemes in G1–G3 "improvements." Instead, we explicitly stated, "the new home pension discussed in this survey might be better, worse, or indifferent compared to the current home pension."

The G2 (Varying Payments) group was informed about potential changes to monthly

payments in later years: See Figure 3. Participants were told that the current home pension pays fixed monthly amounts regardless of changes in the market value of the collateralized house. If some regard the home pension enrollment as an investment, they may mistakenly believe that delaying enrollment until house prices peak maximizes income streams. This belief, influenced by sharp historical increases in South Korean house prices, is a significant behavioral impediment to enrollment, as noted by previous surveys conducted by KHFC.⁹

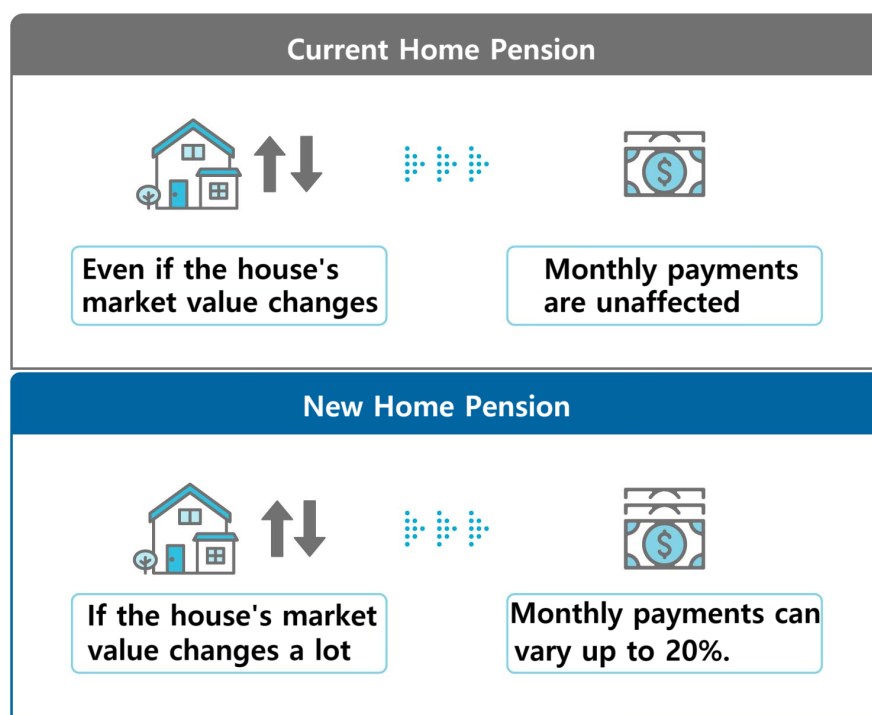


Figure 3: Information provided to G2 (translated in English)

However, waiting for higher monthly payments may not align with the home pension's purpose of providing stable income for asset-rich, income-poor elderly. Beneficiaries gain from stable income streams now rather than enduring current financial struggles while speculating on future house prices. Even if house prices increase significantly, they could still profit by selling the house and terminating the pension without penalties. This concern about higher payments contrasts with another major reluctance regarding home pensions: bequest motives.

According to the previous survey conducted by KHFC, the eligible elderly citizens' second and most common reason for not enrolling is that bequeathing a collateralized house seems

⁹Our survey differs from KHFC's annual surveys by focusing on the effects of information provision, rather than describing current conditions.

difficult.¹⁰ G3 (Easing Bequests) treatment addresses this concern: The G3 group is informed that the process of getting bequeathed is easier under the new home pension: See Figure 4. Participants were told that under the new scheme, the repayment period for inheritors would be extended from six months to three years, with more accessible loans for repayment.

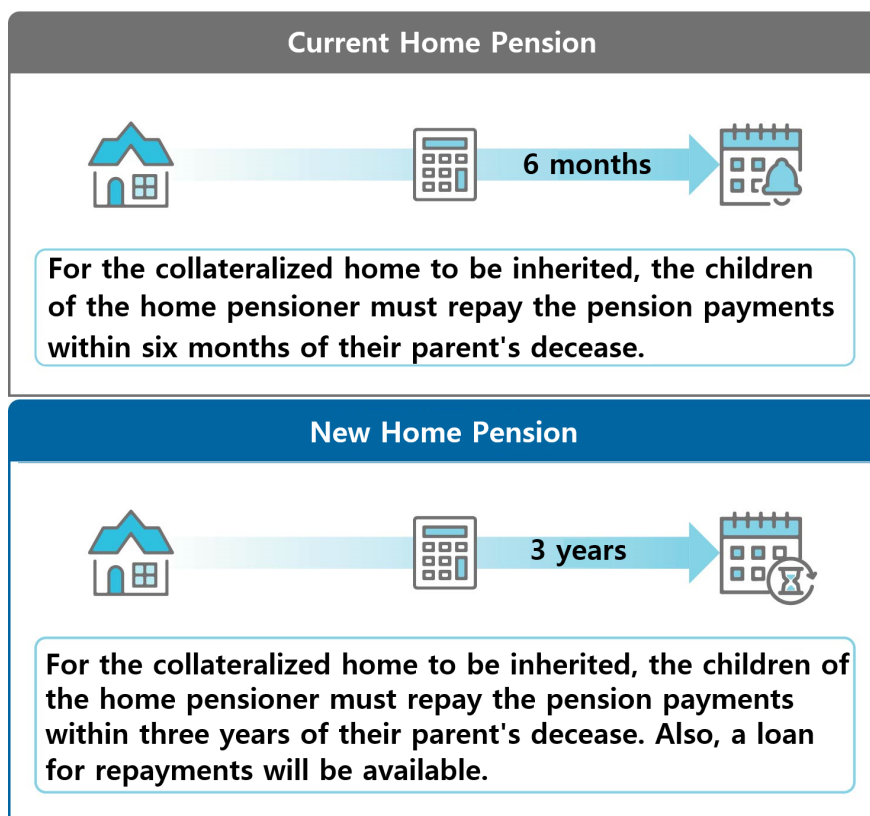


Figure 4: Information provided to G3 (translated in English)

Note that the two information treatment conditions in G2 and G3 address somewhat contrasting concerns about the home pension. Suppose that an eligible elderly citizen changes her intention to enroll in the home pension in G2 and G3. It means that she wants to receive (possibly increasing) pension payments that reflect the (possibly increasing) house price, and at the same time, she is concerned about her children's repayment, which will be larger when her monthly payments are associated with the increased house price. In G4 (Changing Perceptions) treatment, the survey participants were informed that the two main concerns may seem to counteract each other, without suggesting an change in the

¹⁰A recent study (De Nardi et al., 2025) also shows that bequest motives are a key determinant of aggregate retirement wealth.

home pension scheme: See [Figure 5](#).

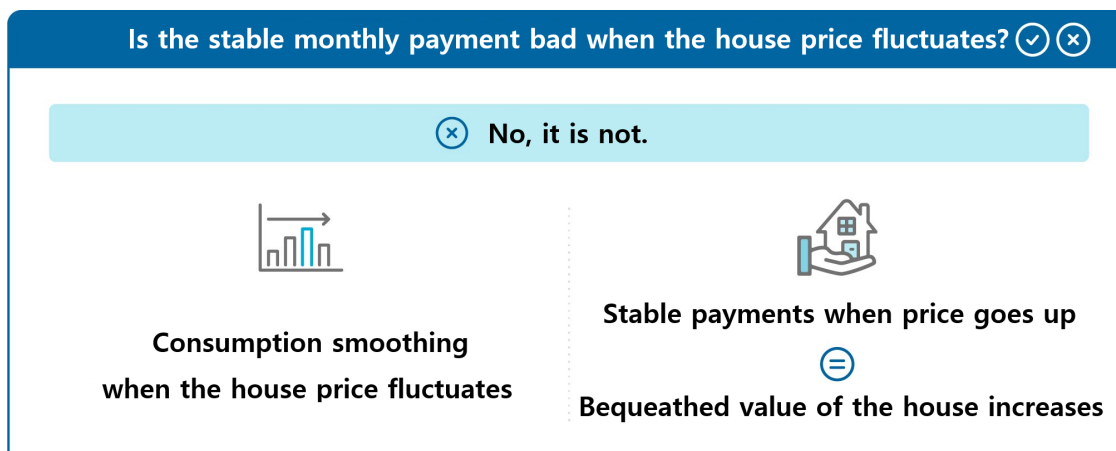


Figure 5: Information provided to G4 (translated in English)

G4 group is told that the perception about the stable monthly payment that does not reflect ex-post changes in house price may not necessarily be negative. Stable monthly payments help the pensioner to appreciate smoothed consumption for life, which is the essentially desirable feature of the lifetime utility maximization given that people prefer a convex combination of two extreme consumption bundles across periods. Also, it reiterates a simple point that getting stable monthly payments when the house price increases means that the remaining value of the house, which will be bequeathed, increases. Even if the children want to inherit the house, the sum of their parents' pension payments compared to the value of the house is less burdensome. Note that the 'information' provided in G4 is not an introduction of a new feature, but a reiteration of what they can rationally infer.

Although the G4 treatment adopts a more directive tone, it does not present any new or persuasive content. Rather, it reorganizes existing factual information about the home pension scheme to make key mechanisms, such as consumption smoothing and bequest retention, more salient. In this sense, G4 represents an informational reframing intervention, comparable in policy relevance to G2 and G3, which model potential structural reforms. The content of G4 may influence respondents through several overlapping mechanisms—framing effects, salience, perceived credibility, or cognitive clarification—and we do not claim to isolate a single channel. Instead, our primary aim is to assess the effectiveness of this type of intervention as a policy-relevant communication strategy. While the G2–G4 treatments engage different mechanisms, structural change versus informational reframing, they represent distinct but relevant policy options. Our comparison therefore focuses on

relative policy effectiveness rather than strict experimental equivalence.

Two upfront sections A (the intention to enroll in the current home pension) and B (the intention to enroll after being informed) are of our main interest. Sections C to H of the survey collected respondent characteristics for control variables. Section C asked how they prospect the housing prices in 20 years and how long they anticipate to live in a healthy shape. In section D, we introduced the reverse mortgage plans that are currently provided by commercial banks and asked whether they are aware of these plans and whether they would prefer the reverse mortgage over the home pension. We also asked their general tendency of appreciating services and products provided by the government versus the private sector. Section E assessed the respondent’s risk and time preferences, by adopting similar questions from World Values Survey and [Gächter et al. \(2022\)](#), and their time inconsistency and willingness to pay for insurances. Sections F and G included demographic and economic status questions. Section H measured financial literacy using OECD international survey items.

4.1 Experimental Procedure

The survey was conducted by Hankook Research, a professional survey agency, using a nationally representative sample of 3,820 participants, from August 26 to October 2, 2024.¹¹ Upon completing the survey, online respondents received the participation fee of 1,500 KRW (about 1.06 USD as of December 5, 2024) and in-person respondents received a small gift whose value is greater than 1,500 KRW. Since the standard web-based survey may lose its representativeness for the elderly, especially for those aged 70 or over, the agency collected the responses in person: the trained survey agents asked survey questions to the participants aged 70 or over and recorded their answers on-site. Because random assignment occurred only after screening and consent, survey completion rates were similar across treatment groups, ranging 89–91% by treatment. Combined with the balance of observable characteristics at baseline, these patterns suggest that potential attrition bias is unlikely to meaningfully affect our results.

[Table A.1](#) shows that our samples are representative of the South Korean population aged 55 or over. Since the survey participants were randomly assigned to one of the four

¹¹We also had pilot data from 205 respondents. The pilot survey was conducted online in June 2024. Whether to merge the pilot data does not change the results in any qualitatively meaningful ways, but we decided to exclude the pilot data for two reasons. First, the pilot data was collected online, so the responses from those aged 70 or over would be more deviating from the representative sample responses. Second, we changed the wording and images used in the survey slightly.

treatment conditions with an equal probability, the sample characteristics of each treatment group should share those of the population distribution. χ^2 homogeneity test results of some un-targeted variables (Table A.2) show that there are no significant differences among groups, implying that survey samples are randomly split into the four treatment groups as designed.

5 Results

5.1 Treatment Effects on Demand for Home Pension

Since each survey respondent reports their intentions to enroll in the home pension both before and after the information provision, we use the individual change in intention to enroll as a key dependent variable to test how each treatment arm affects changes in intention. Because we randomly assigned the survey participants to four treatment conditions, other control variables capturing individual characteristics are, at least by design, orthogonal to the treatment condition.¹² Table 3 presents the main results without controlling for other explanatory variables, where positive response is defined as fraction of the responses indicating "likely to enroll" and "surely likely to enroll" combined.

	N	Positive Response (%)		Δ (p -value)	Between group
		Before Informed	After Informed		
Total	3,820	35.29	40.21	+4.92 (0.000)	-
G1 (Placebo)	946	35.86	36.60	+0.74 (0.419)	base
G2 (Varying Payments)	967	33.02	39.23	+6.21 (0.000)	+5.47 (0.000)
G3 (Easing Bequests)	956	36.69	41.93	+5.24 (0.000)	+4.50 (0.001)
G4 (Changing Perceptions)	951	35.61	43.07	+7.46 (0.000)	+6.72 (0.000)

Table 3: Changes in the intention to enroll, by treatment

Notes: The respondents answered their intention to enroll in the home pension in a five-point Likert scale. Positive response is defined as fraction of the responses indicating "likely to enroll" and "surely likely to enroll" combined.

As expected, the intention changes in G1 were the smallest, with a 0.74 percentage point change that is statistically insignificant ($p = 0.419$)¹³. The treatment effects for G2–G4 are

¹²In a similar vein, inaccurate responses—such as overstatement or understatement of their willingness to enroll in the pension—do not bias the treatment effect estimates as long as such noise is not systematically related to the treatment conditions. However, inaccurate responses may reduce the statistical significance of the estimates by increasing their standard errors. Accordingly, we report statistical results in a conservative manner.

¹³Unless otherwise stated, we report the p -value of the two-sided test about the null hypothesis of zero esti-

statistically significant at the 1% level of significance, and those are significantly larger than the treatment effect for G1 at the same level of significance, as indicated in the last column of [Table 3](#). Specifically, the intention to enroll increases by 6.21 percentage points if the home pension scheme is reformed to periodically redetermine the monthly pension payment based on changes in house prices and by 5.24 percentage points if it is reformed so that the remaining house value can be bequeathed to children in a less burdensome way.

A particularly interesting finding is that merely informing participants that the two major concerns regarding the home pension are contrasting each other also increases the intention to enroll by 7.46 percentage points. Although the treatment effect in G4 is not statistically different from those in G2 and G3, the G4 result is particularly noteworthy as it does not involve any structural policy change, highlighting the powerful role of framing and perception correction. These findings suggest that reconciling some of the concerns about the uptake of the home pension can produce an effect of comparable magnitude to the direct policy reforms that have been considered most effective.¹⁴

These findings do not appear to be driven by eligible elderly respondents being unaware of the home pension and discovering it for the first time during the survey. In fact, 96% of respondents reported that they were already familiar with the home pension before it was introduced in the survey. Additionally, the responses align with their self-reported reasons for why people are reluctant to enroll in the home pension. [Figure 6](#) summarizes the top reasons respondents believe people are hesitant to enroll in the home pension.¹⁵

Consistent with previous findings from the survey conducted by the KHFC, the survey participants identified the following as the most crucial reasons for reluctance to enroll in the home pension: (1) pension payments are too small compared to the (potentially increasing) future house value, (2) a desire for children to inherit the home without dealing with the clearance of collateralization, and (3) concerns about stable payments when house prices rise. Considering that reasons (1) and (3) both stem from the lack of responsiveness to house price changes, the main reluctance arises from dissatisfaction with stable pension payments

mated coefficients. [Table 3](#), for example, report the two-sided t test results of zero differences in mean. Because the hypotheses were defined ex ante and correspond to direct pairwise comparisons, multiple-testing correction is not strictly required, but adjusted p-values computed using the Bonferroni and Benjamini–Hochberg (FDR) procedures are reported in [Table A.4](#). Results remain statistically significant.

¹⁴Although the KHFC does make efforts to correct common misconceptions by, for example, offering brief informational videos, these outreach activities remain limited in reach and depth, and thus have not effectively penetrated the broader public despite high overall awareness of the home pension program.

¹⁵The exact survey question was, "Researchers consider the following (randomly ordered) list as potential reasons why people are reluctant to enroll in the home pension. Please indicate the most crucial reasons, up to three." Combining the top three reasons does not lead to meaningful analytical changes.

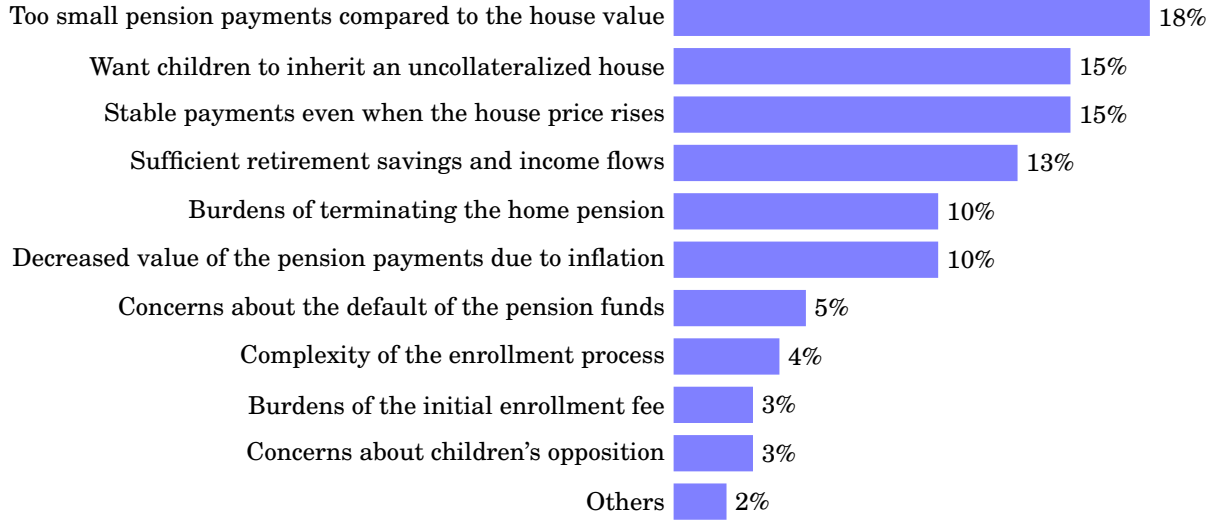


Figure 6: Reasons about the reluctance of the home pension

and concerns about bequests. G2 and G3 effectively address these concerns. Result 1 summarizes the first findings.

Result 1. *The intention to enroll in the home pension increases by 6 percentage points if the home pension is reformed to periodically redetermine the monthly pension payment based on house market prices and by 5 percentage points if it is reformed enable easier bequeathal of the remaining house value to children. Additionally, emphasizing the benefits of stable pension payments increases the intention to enroll by 7 percentage points.*

5.2 Treatment Effects on Demand for Reverse Mortgage

Next, we examine whether similar products offered by private lenders, such as banks and insurance companies, can serve as suitable substitutes for the home pension. This question is of interest because the current market for collateralized retirement plans in Korea is predominantly concentrated in the public sector.

In section D, we introduced the reverse mortgage (Figure 7) and asked whether the survey participants were aware of it. We then inquired which they would prefer—the home pension or the reverse mortgage—if the terms and conditions of the reverse mortgage were identical to those of the current home pension.

After that, we asked participants to choose between the current home pension and a reverse mortgage with additional features corresponding to the treatment conditions. Specifically, in G1, participants were asked to choose between the current home pension and a

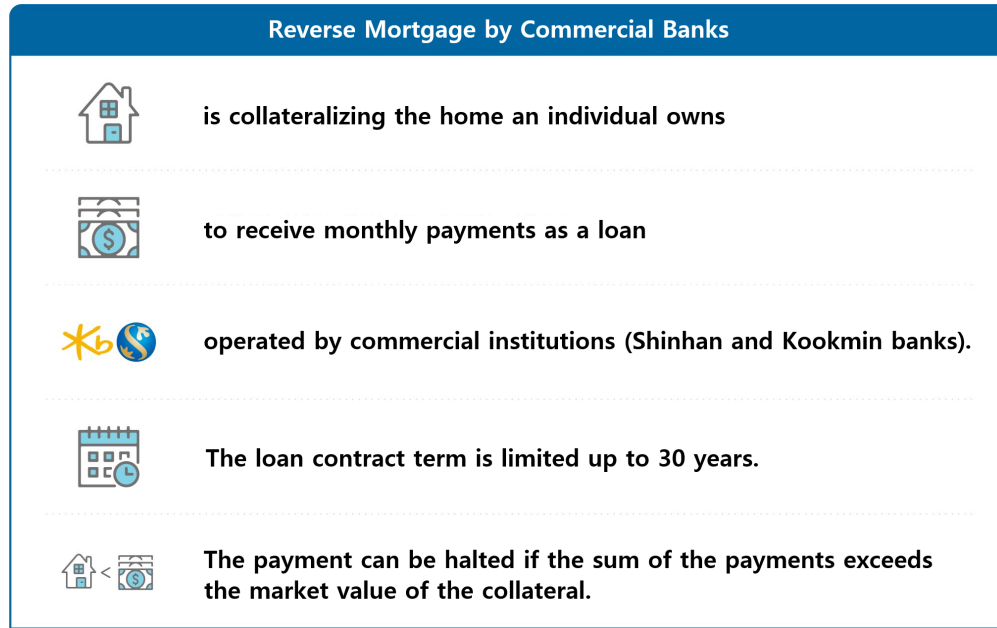


Figure 7: Provided information about the Reverse Mortgage (translated in English)

reverse mortgage with a small refund of the initial enrollment fee. In G2 (G3), they were asked to choose between the current home pension and a reverse mortgage whose monthly payments reflect house price changes (a reverse mortgage with an easier repayment process and simplified access to new loans for repayment). In G4, since no new information about the home pension was provided, we reminded participants of one feature of the reverse mortgage: there is no upper limit on house price for eligibility.

It turns out that respondents were less familiar with the reverse mortgage. While 96% stated that they had heard about the home pension before it was introduced in the survey, only 54% reported that they had heard about the reverse mortgage. Given identical conditions, the majority (67%) of respondents indicated a preference for the home pension over the reverse mortgage, while only 4% preferred the reverse mortgage over the home pension. Among those who preferred the home pension, 63% chose ‘trust in government agencies’ as the primary reason for their preference, which aligns with the fact that the current market for collateralized retirement plans is exclusively concentrated in the public sector.

However, we find some evidence suggesting that the private sector could play a role. When the current home pension is compared to the reverse mortgage with the treatment condition, preferences for the reverse mortgage significantly increase under all treatments; See [Table 4](#). Notably, in G2 and G3, preference for the reverse mortgage with the treatment condition increases by 14 percentage points. Although the changes in preference for the

reverse mortgage in G1 and G4 are smaller, they remain significantly positive, implying that people may respond to positive incentives, no matter how minor. The treatment effects in G2 and G3 are significantly larger than that of G1 at the 1% level of significance, while the treatment effect in G4 is not statistically different ($p=0.716$).

	Prefer Mortgage over Pension (%)		$\Delta(p\text{-value})$
	Under the same condition	Reverse mortgage with the treatment condition	
G1	4.75	9.70	4.96 (0.000)
G2	4.76	18.84	14.08 (0.000)
G3	3.25	17.19	13.94 (0.000)
G4	3.68	9.14	5.46 (0.000)

Table 4: Changes in preferences for the reverse mortgage

The survey participants selected the features they would most like to see added to reverse mortgage loans. [Figure 8](#) summarizes the features they found most favorable. Extending the loan contract for life essentially makes the reverse mortgage identical to the home pension, reflecting the majority response of preferring the home pension over the reverse mortgage. The other three most frequently chosen features were incentives related to medical care expenses and taxes, flexible options including emergency withdrawals, and mortgage loans tied to medical care expenses. These findings suggest that reverse mortgages could become more attractive not by merely mimicking the home pension (which is not feasible, as the commercial financial institutions are not obligated to bear the potential loss associated with longevity risk) but by offering diverse service features. [Result 2](#) summarizes these observations.

Result 2. *While most respondents prefer the home pension over reverse mortgages offered by private lenders, reverse mortgages have potential for growth if they provide competitive advantages such as house price-responsive payments, simplified inheritance processes, and additional incentives.*

5.3 Individual Heterogeneities to Treatment Effects

Although we claim that the random assignment to each treatment condition eliminates concerns about sample selection bias by design, this does not mean that we disregard heterogeneous individual characteristics, as these could influence changes in the intention to enroll

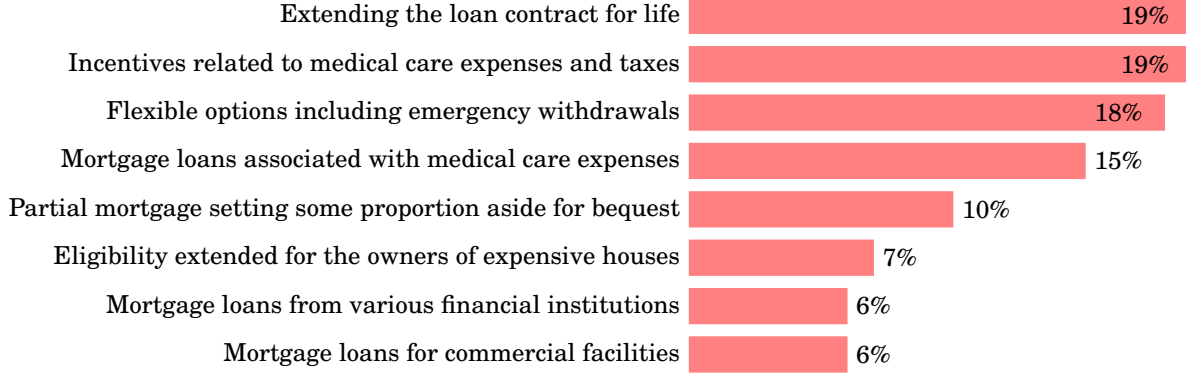


Figure 8: Desirable improvements of the reverse mortgage

within each treatment condition. To illustrate how individual characteristics may affect the responses to the treatment conditions, Figure 9 presents how survey respondents perceive future house prices at both the national and local levels. While the majority expect house prices to rise over the next 20 years, a non-negligible proportion (24.66% for national prices and 27.09% for local prices) of respondents anticipate that the house prices will decrease. If concerns about the house value depreciation outweigh expectations of the house value appreciation—possibly due to loss aversion—then people may view G2 treatment (varying payments based on the market price of the collateralized house) negatively, as it implies that their payments might decrease. Similarly, the G4 treatment (highlighting the benefits of stable payments) could have an adverse effect by reminding respondents that bequeathed value of the house would diminish. This illustration underscores the importance of examining the effects of individual heterogeneities.

To examine the effects of individual heterogeneities, we first regress the initial intention to enroll in the home pension on explanatory variables of interest, as follows:

$$y_i^* = \beta_0 + \sum_{k=1}^K \beta_k x_{ik} + \varepsilon_i, \quad (1)$$

where y_i^* is individual i 's underlying initial intention to enroll in the home pension, and x_{ik} represents i 's explanatory variable k , which includes individual socioeconomic characteristics such as gender, age, education level, and preparedness for retirement. The explanatory variables also include their expectations about future house prices, life expectancy, risk and time preferences, and financial literacy. Since survey participants' initial intentions were asked before the information treatment, this regression does not include a binary indicator for the treatment group. Given that the observed dependent variable—intention to enroll

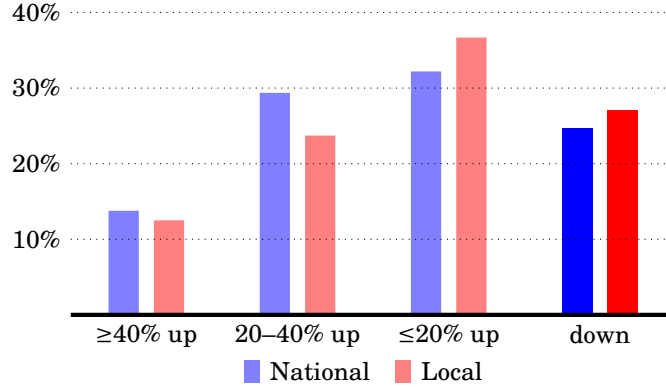


Figure 9: House price expectations in the next 20 years

Notes: The x-axis labels refer to the expected house price appreciation rates over the the next 20 years. For example, "≥40% up" is the proportion of respondents who report that the house price will be 40% or higher than the current price in the next 20 years.

in the home pension—is a discrete ordinal variable, we adopted ordered logit model. [Figure 10](#) presents the results of our preferred model specification. For each horizontal line, a dot represents a point estimate, and the line indicates the 95% confidence interval. If the line does not intersect with the vertical axis, the point estimate is statistically significant at the 5% significance level. Some additional model specification results are available in [Table A.3](#) in the Appendix. The results align with [Figure 10](#). Additional variables, such as monthly income, income sufficiency, and home value, were not statistically significant.¹⁶

The results show that their intention to enroll in the home pension is weaker for relatively older respondents; weaker for single-family homeowners (as opposed to the residents of the apartment unit); stronger for the more educated; stronger for the more patient; weaker for the more loss averse; weaker for those who are prepared for retirement; stronger for those who live in greater Seoul area, including Seoul, Incheon, and Gyeonggi-do; and stronger for those who have demand for insurance. These are all aligned with commonsensical narratives. For example, people with a higher education attainment level are more

¹⁶The descriptive statistics show that the intention to enroll in the current or reformed pension schemes is relatively lower among the low-income group compared to the overall average. For households with a monthly income of less than 2 million KRW (n=696), the intention to enroll in the current pension scheme is 25.1%, lower than the overall average (N=3,820) of 35.3%, and for the reformed pension scheme (G1-G4), it is 27.7%, lower than the overall average of 40.2%. One thing to note is that the low-income group includes many older adults and individuals with lower education levels, who tend to show less responsiveness to the home pension. Therefore, while the descriptive statistics indicate that the low-income group shows less response to the home pension, after controlling for factors such as age and education level ([Table A.3](#)), the direct effect of monthly income appears to be small.

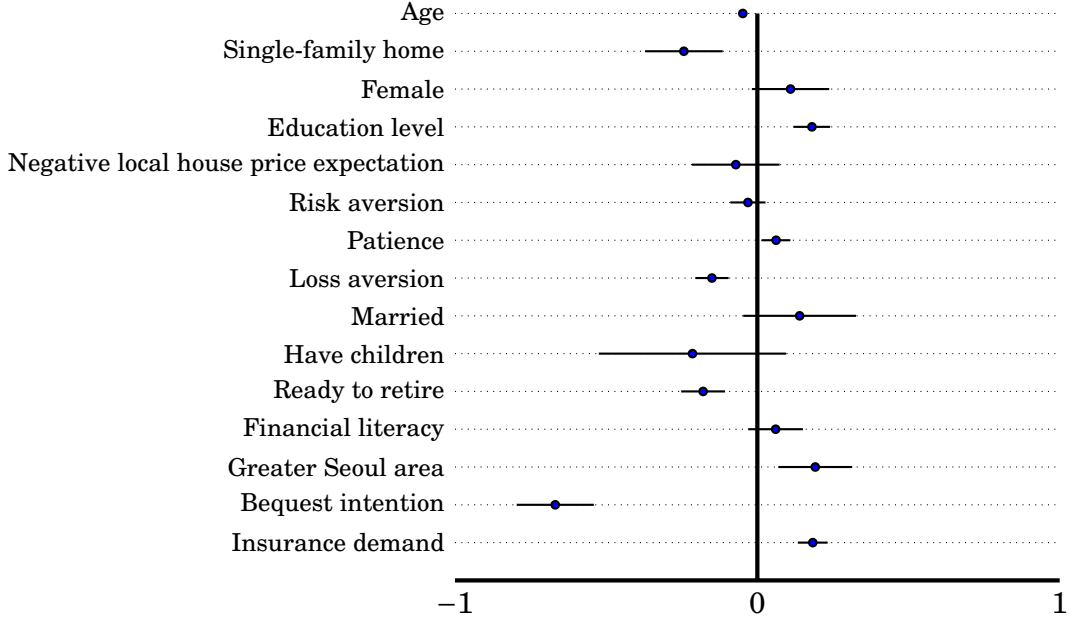


Figure 10: Effects of individual characteristics on the intention to enroll

likely to intend to enroll in the home pension as they would appreciate the insurance values of the home pension, and people who intend to bequest their house to children are less likely to intend to enroll.¹⁷ It is worth noting that merely having children does not necessarily imply that they are less likely to enroll in the home pension: Only the parents who intend to bequest their home to children matter. The effects of gender, negative housing price expectations, risk aversion, marital status, and the financial literacy measure are statistically insignificant.

With having in mind such heterogeneous intentions to enroll, we further examine how these heterogeneities influence the treatment effects—the changes in positive intention before and after information provision. We adopted the following regression model:

$$y_i^t = \beta_0^t + \sum_{k=1}^K \beta_k^t x_{ik}^t + \varepsilon_i, \quad \text{for } t \in \{1, 2, 3, 4\}, \quad (2)$$

where y_i^t is individual i 's change in positive intention in treatment t , and x_{ik}^t is i 's explanatory variable k in treatment t . There was a small fraction of respondents (2.7%) whose

¹⁷Our findings corroborate with the findings in a previous study (Lee et al., 2015) comparing the characteristics of those who enrolled in the home pension and others. They reported that people with higher real estate holdings, lower financial assets, and higher education levels, who live in an apartment in the metropolitan area are more likely to enroll in the home pension. This suggests that our data are consistent with empirical demand for the home pension.

changes were in the negative direction, so y_i^t takes values +1, 0, or -1. To visualize¹⁸ the results in a more straightforward manner, we binarized the explanatory variables. For example, instead of ages ranging from 55 to 79, we consider two age categories, aged 69 or under and aged 70 or over. This way, we can examine whether relatively younger participants responded more to the treatment conditions. Similarly, "high education level" is a binary variable indicating a college degree or more; "negative price expectation" indicates whether the respondent expects local house prices to decline in the future; "high risk aversion" indicates those who prefer to surely receive the current salary over to receive 200% or 80% of the current salary with an equal probability; "high patience" indicates those who prefer to receive 17,000 KRW a year later over to receive 10,000 KRW immediately; "high loss aversion" indicates those who prefer not to participate in the gamble gaining 6,000 KRW or losing 3,000 KRW with an equal probability; "prepared for retirement" indicates those who self-report that their preparation for retirement is sufficient; "high financial literacy" indicates those who answered both financial literacy questions correctly; and "demand for insurance" indicates those who prefer to buy an insurance that fully covers a loss of 100 million KRW with a 5% chance for 7 million KRW. Other variables such as "single-family home," "female," "married," and "have children" are binary variables to begin with. Figure 11 shows linear¹⁹ regression results with using the subsample of each treatment. Similar to Figure 10, for each horizontal line, four dots represent point estimates in each treatment, and lines present the 95% confidence interval of each estimate. If the line does not intersect the vertical axis, then the point estimate is statistically significant at the 5% significance level.

The first observation from Figure 11 is a near zero effect on the G1 (Placebo) treatment, as expected. This finding is in line with our claim that the treatment effects we have observed are not due to the experimenter demand effect. The effects of the explanatory variables in the other treatments, although they are aligned to the conventional wisdom to some degree, are not statistically significant at the 5% level of significance. Result 3 summarizes our findings.

Result 3. *Some of individual heterogeneities, such as age, type of the house, education level,*

¹⁸Although Figure 11 shows the estimates and confidence intervals in the aggregate, we can present two bar graphs per treatment condition for each control variable so that the heterogeneity in treatment effects can be demonstrated easily. Such figures are available upon request.

¹⁹Since the dependent variable is the difference of two binary variables, it has three discrete values, -1, 0, and 1. Although ordered logit model would be more appropriate in this case, we considered linear regression as the interpretation of the estimated coefficients is more intuitive. Results from different model specifications are not noticeably different, and they are available upon request.

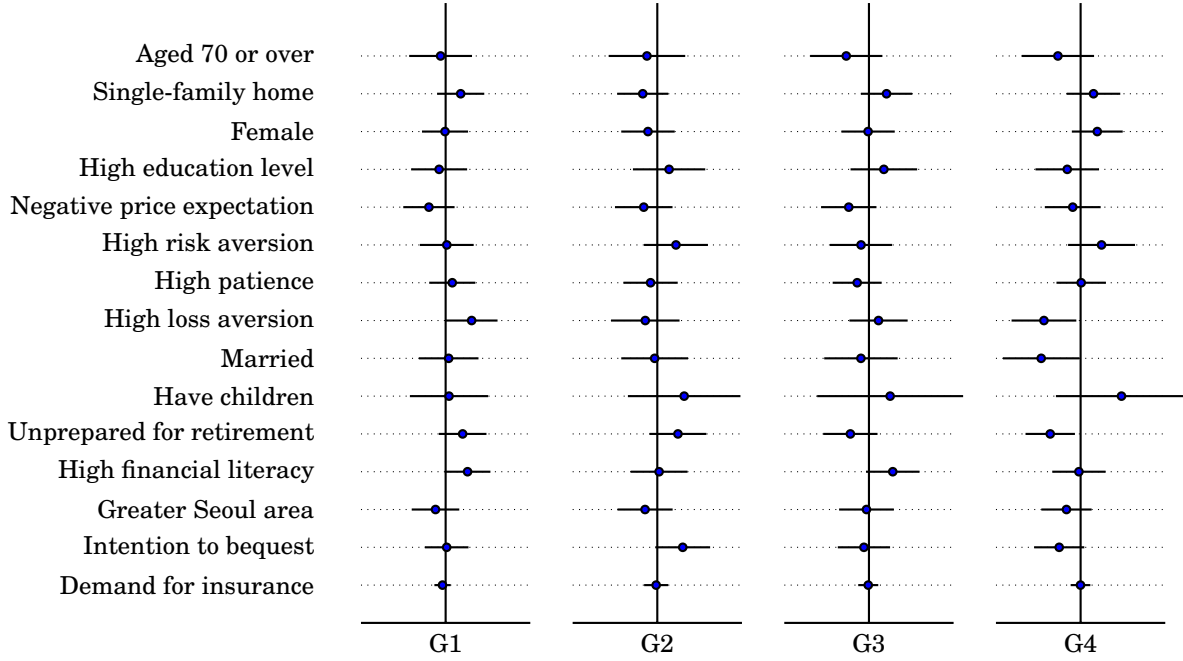


Figure 11: Effects of individual characteristics to the changes in intention, by treatment

loss aversion, preparedness for retirement, intention to bequest, and demand for insurance help to explain their untreated intention to enroll in the home pension. However, most of them do not affect the positive change in intention as a response to the provided information in each treatment.

One caveat is that our power to detect heterogeneous effects is limited because subgroup analyses substantially reduce sample size within each treatment arm. The absence of statistically significant differences should therefore not be interpreted as evidence of complete effect homogeneity; rather, it may reflect insufficient statistical power (Type II error). Future work with larger samples or pooled data could test these differences more precisely.

6 Concluding Remarks

Elderly poverty is one of the issues that need to be addressed immediately in the fastest aging country, South Korea. Our study is motivated by the fact that although there is a room for significant welfare enhancement among those who possess an illiquid asset—house—while whose income level is meager, surprisingly little proportion of eligible elderly enrolled in the home pension. In this study's sample, 32.8% of households headed by individuals aged

65 and older were found to be living in poverty (defined as having an equivalized disposable income below the poverty line).

We conduct an information provision survey experiment to examine how additional features or the change of the stereotypical beliefs about the home pension scheme would affect the intention to demand it. We report three sets of results. First, we found that the intention of enrollment increases by 6 percentage points when the home pension scheme is reformed to periodically redetermine the monthly pension payment based on the changes of the housing price and by 5 percentage points when it is reformed so that the remaining housing value can be bequeathed to their children more easily. A more interesting finding is that merely informing that the two major concerns—constant pension payment not responding to the recent changes in housing prices and bequeathing the remaining housing value—are contrasting each other also increases the intention of enrollment by 7 percentage points. These are not due to the experimenter demand effect of providing something (information) in the middle of the survey, as our placebo treatment does not lead to any significant changes. Our findings suggest that reconciling some concerns about the uptake of the home pension produces an effect of comparable magnitude to the policy reforms that could have been considered most effective. Given the rapidly aging populations in many OECD and East Asian countries, these findings would offer scalable lessons for encouraging retirement security through communication-based interventions.

We also find that while most respondents prefer the home pension over the reverse mortgages offered by private lenders, the reverse mortgages also have potential for growth if they offer competitive advantages such as house price-responsive payments, ease of inheritance, and additional incentives associated with medical care expenses and emergency withdrawals.

Lastly, we find that some individual heterogeneities, such as age, education level, loss aversion, and the level of financial literacy can help to explain their intention to enroll in the home pension, as well as the positive change in intention as a response to the provided information.

One of the two important limitations of our study is that it measures stated intentions to enroll, rather than actual enrollment behavior. While this is a standard approach in survey experiments, we acknowledge that intention does not always translate directly into action, particularly in the domain of complex financial decisions. Still, intentions provide meaningful evidence of behavioral receptivity to interventions and offer insights into the mechanisms by which policy communication may influence decision-making. The large, random-

ized design and causal identification of treatment effects support the internal validity of our results. Nonetheless, future work could enhance external validity by complementing survey-based measures with behavioral outcomes such as real enrollment decisions or administrative take-up data following similar interventions.

Another limitation is that the G4 intervention may affect respondents through multiple, potentially overlapping mechanisms. It could correct misperceptions about the fixed-payment structure, increase the salience of benefits, or shift evaluative framing from a perceived ‘loss’ of house appreciation to a ‘gain’ in smoothed consumption and bequest value. Our experiment was not designed to isolate these channels, and we therefore interpret G4 as capturing the overall impact of improved informational framing rather than any single mechanism. Future research could disentangle these channels to inform more targeted policy communication.

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A Appendices

A.1 Additional Tables and Figures

Population Info.	Home Ownership Statistics (2022) by Statistics Korea						
Sampling Method	Proportional stratified sampling by gender, age, region (16 regions), and housing type (apartment, non-apartment)						
Target Population	i) Adults aged 55 to 79 in South Korea ii) Homeowners or spouses of homeowner iii) Not currently enrolled in the home pension scheme (as of 2022 home pension enrollment rate was only 1.16)						
		Population		Targeted		Sampled	
		N	%	N	\$	N	%
Total		7,106,756	100%	3,800	100%	3,820	100%
Age	55–59	1,925,760	27%	1,030	27%	1,049	27%
	60–69	3,386,411	48%	1,811	48%	1,808	47%
	70–79	1,794,585	25%	959	25%	963	25%
Gender	Male	3,704,815	52%	1,982	52%	1,996	52%
	Female	3,401,942	48%	1,818	48%	1,824	48%
Residence	Apartment	4,407,975	62%	2,357	62%	2,411	63%
	Others	2,698,781	38%	1,443	38%	1,409	37%
Region	Seoul	1,242,011	17%	662	17%	673	18%
	Busan	526,310	7%	283	7%	285	7%
	Daegu	345,045	5%	185	5%	189	5%
	Incheon	386,157	5%	207	5%	213	6%
	Gwangju	193,435	3%	103	3%	103	3%
	Daejeon	197,338	3%	104	3%	103	3%
	Ulsan	166,247	2%	89	2%	87	2%
	Gyeonggi-do	1,651,634	23%	883	23%	893	23%
	Gangwon-do	247,012	3%	130	3%	130	3%
	Chungchukbuk-do	238,958	3%	128	3%	127	3%
	Chungchungnam-do	334,790	5%	179	5%	171	4%
	Jeollabuk-do	270,142	4%	144	4%	145	4%
	Jeollanam-do	285,164	4%	153	4%	154	4%
	Gyeongsangbuk-do	429,161	6%	230	6%	228	6%
	Gyeongsangnam-do	505,291	7%	273	7%	274	7%
	Jeju	88,065	1%	47	1%	45	1%

Table A.1: Representativeness of the surveyed sample

Notes: This table juxtaposes statistics for the South Korean population aged 55 or over and the targeted samples with those of the actual samples.

Variable	Responses	G1	G2	G3	G4
Education level	High school or GED	420 (44%)	395 (41%)	406 (43%)	407 (43%)
	College	85 (9%)	115 (12%)	92 (10%)	94 (10%)
	Bachelor	323 (34%)	352 (36%)	363 (38%)	348 (37%)
	Postgraduate	120 (13%)	104 (11%)	93 (10%)	103 (11%)
	χ^2 -test statistic for homogeneity: 1.2318, p -value=0.9987				
Intention to enroll	Very unlikely	43 (5%)	41 (4%)	41 (4%)	37 (4%)
	Unlikely	259 (27%)	276 (29%)	275 (29%)	251 (26%)
	Neutral	306 (32%)	330 (34%)	288 (30%)	325 (34%)
	Likely	325 (34%)	304 (31%)	337 (35%)	326 (34%)
	Highly likely	15 (2%)	15 (2%)	13 (1%)	13 (1%)
	χ^2 -test statistic for homogeneity: 0.3931, p -value=0.9417				
Have spouse	Yes	787 (83%)	817 (85%)	793 (83%)	803 (84%)
	No	161 (17%)	149 (15%)	161 (17%)	149 (16%)
	χ^2 -test statistic for homogeneity: 0.2021, p -value=0.9773				

Table A.2: Group homogeneity test results

Notes: This table shows some results of the χ^2 test for homogeneity of three un-targeted variables—education level, intention to enroll in the home pension, and whether to have a spouse. We do not reject null hypotheses that the groups are homogeneous.

Dependent variable: Intention to enroll in the home pension (before treatment)				
	(1)	(2)	(3)	(4)
Age	-0.071*** (0.0054)	-0.0708*** (0.0055)	-0.0481*** (0.0059)	-0.046*** (0.0063)
Single-family house	-0.2204*** (0.0643)	-0.2183*** (0.0644)	-0.2431*** (0.0655)	-0.2442*** (0.0658)
Female	0.0337 (0.0622)	0.0357 (0.0623)	0.1098 (0.0653)	0.1167 (0.0659)
Education level	0.1878*** (0.029)	0.1854*** (0.029)	0.1805 (0.0307)	0.1739*** (0.0316)
Negative national housing price expectation	-0.0182 (0.072)			
Negative local housing price expectation		-0.126 (0.0713)	-0.0712 (0.0739)	-0.0648 (0.0743)
Risk aversion			-0.0312 (0.0296)	-0.0302 (0.0298)
Patience			0.062** (0.0241)	0.0627** (0.0241)
Loss aversion			-0.1502*** (0.0281)	-0.1475*** (0.0281)
Married			0.1399 (0.0952)	0.1242 (0.0964)
Have children			-0.2146 (0.1581)	-0.2373 (0.1593)
Retire ready			-0.1794*** (0.037)	-0.1791*** (0.0503)
Financial literacy			0.0605 (0.0461)	0.0627 (0.0463)
Greater Seoul area			0.1915** (0.0623)	0.1872** (0.0648)
Bequest intention			-0.6684*** (0.0651)	-0.6683*** (0.0658)
Insurance demand			0.1833*** (0.0251)	0.183*** (0.0252)
Self-evaluated health level				-0.0547 (0.0382)
Economic activities				-0.0553 (0.0793)
Monthly income				0.0000 (0.0000)
Income sufficiency				0.0326 (0.0482)
High house value				0.0182 (0.1246)
Net asset value				0.0000 (0.0000)
N	3820	3820	3820	3820
Pseudo R2	0.0484	0.0487	0.0777	0.0782

Table A.3: Effects of individual characteristics on the intention to enroll

Notes: The numbers in parentheses are robust standard errors. *, **, and *** imply $p < 0.05$, $p < 0.01$, and $p < 0.001$. Ordered logit models are used. Control variables include age (55–79), dummy variables for single-family house and female, education level (1–5), a dummy for negative national/local housing price expectation, levels of risk aversion, patience, and loss aversion (1–4, respectively), dummies for marital status and children, readiness for retirement (0–4), level of financial literacy (0–2), dummies for residing in the greater Seoul area and intention of bequest, demand for insurance (1–4), health condition (1–5), a dummy for economic activity, average income (0–30,000), level of income sufficiency (1–5), a dummy for high house value, and net assets (–350,000–1,330,000).

Comparison	Unadjusted		Bonferroni Adjusted		Benjamini–Hochberg (FDR)	
	Effect (pp)	p -value	Adjusted p	Sig.	Adjusted p	Sig.
G2 vs. G1	5.47	0.000	0.001	***	0.000	***
G3 vs. G1	4.50	0.002	0.012	**	0.004	***
G4 vs. G1	6.72	0.000	0.000	***	0.000	***
Three treatments (G2, G3, and G4) versus control (G1)						

Table A.4: Adjusted Significance Levels for Pairwise Treatment Comparisons

Notes: This table reports unadjusted and adjusted p -values for the three pre-specified pairwise comparisons between each treatment group (G2–G4) and the control group (G1). Adjusted p -values are computed using the Bonferroni and Benjamini–Hochberg (FDR) procedures. Because the hypotheses were defined *ex ante* and correspond to distinct policy treatments, multiple-testing correction is not strictly required. Results remain statistically significant at the 5% level under both methods. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.