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**Ph.D. Dissertation of Social Welfare**

**Effect of Public Pension and  
Homeownership on  
Individual Pension Purchase**

공적연금과 주택소유가 개인연금에 미치는  
영향에 관한 연구

**February 2022**

**Department of Social Welfare  
The Graduate School  
Seoul National University**

**Soyeon Kim**



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관한 연구

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이 논문을 사회복지학박사 학위논문으로 제출함

2021년 11월

서울대학교 대학원

사회복지학과

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2021년 12월

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# **Effect of Public Pension and Homeownership on Individual Pension Purchase**

**SOYEON KIM**

**A DISSERTATION PRESENTED TO THE  
DEPARTMENT OF SOCIAL WELFARE AND THE  
COMMITTEE ON THE GRADUATE SCHOOL IN  
PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY  
IN SOCIAL WELFARE**

**SEOUL NATIONAL UNIVERSITY**

**FEBRUARY 2022**



# **Abstract**

## **Effect of Public Pension and Homeownership on Individual Pension Purchase**

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Department of Social Welfare

The Graduate School

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This study attempts to analyze the factors affecting individual pensions, especially homeownership and public pension that can function as income sources in one's later life. Old age poverty is always a serious issue in Korea. About half of retired Koreans consider their main problem in old age is economic difficulties and furthermore, approximately 44% of Korean senior citizens are living under poverty as of 2019. Among several ways to address the financial difficulty, the pension system is one of the more stable and effective ways, which is designed to prevent the entire loss of income after retirement. Typically, it is considered a rule-of-thumb that a replacement rate of roughly 70% of gross income from a variety of pension sources, is adequate for retirement. However, the benefit level of the public pension system in Korea is far from satisfying level to support the stable old age life, as the replacement rate of public pension in Korea is only about 40 percent. There is a growing expectation that the gap between the ideal replacement rate and actual coverage should be filled by the individual. In such environment, it is natural that the role of the private sector in the

pension system becomes increasingly important.

As one of the main purposes of purchasing an individual pension is to secure future income, the purchase level of individual pension is largely affected by the other types of retirement preparations. And because the public pension is a major source of future income for many individuals, it can have a considerable effect on an individual pension. There are two theories asserting the relationship between public pension and individual pension: life cycle theory and extended life cycle theory. According to life-cycle theory, public pension and individual pension have a substitutive relationship; public pension tends to crowd out individual pension purchases. However, these two also can have a complementary relationship, or a positive relationship, in regard to extended life cycle theory. Previous studies that explored the relationship between public pension and savings, showed both positive and negative outcomes.

Besides individual and public pension, homeownership also has a similar role in old age; it can provide income in old age and protects individuals from poverty. Homeownership can offer a financial benefit to older people as an 'income in cash' and 'income in kind.' House can provide direct cash to the owners, as one can realize the housing asset in the form of cash. It also can provide an array of non-cash benefits, as expenditure regarding residence can be dramatically reduced compared to that of the rent. In a later year when individuals have no consistent income, owning a house will be a great benefit for retirees. The pension and homeownership also are known to have two contradictory relationships; Kemeny's trade-off theory explains the negative relationship between the two, while extended life cycle theory assumes a positive relationship.

The individual pension, public pension and homeownership not only just shares

role as a ‘future income’; They all occur during one's working time, within the boundary of a limited budget. Which means, in other words, they have parallel growth over ones’ working years and eventually have a competing relation. Among other things, mandatory public pension contributions and home purchases are two cases of considerable and steady expenditure across one’s life that need to be paid concurrently for a long time. The status of pension participation and housing can change one’s level of budget constraint and thus can impact the level of individual pensions, which also requires a sizable and constant contribution.

Considering their parallel growth during the work period and functional similarity in later life, it will be rational to assume that individual pension participation can be altered by public pension and home purchases. Based on these discussions, the following three principal research questions was be investigated in this dissertation. 1) What is the effect of public pension on individual pension? Does the effect differ depending on one’s pension status (uninsured, NPS, SOP) and pension contribution? 2) What is the effect of homeownership on individual pension? What is the effect of house prices on individual pensions? 3) What does the interaction of the two - public pension and housing – say?

To answer the research question, this study used the National Survey of Tax and Benefit (NaSTaB) wave 2 to 12; the target data was the head of the household between 20 and 60, and the final sample contained 3,461 individuals. The dependent variables were individual pension participation status and individual pension purchase level, and independent variables were public pension participation status, public pension contribution level, homeownership, house price, and interaction terms of public pension and housing. To address the censored data problem, double hurdle analysis

was applied, with a control function approach to deal with the endogeneity issue.

The result shows that public pension participation status and public pension participation level both had a significantly positive impact on individual pension purchase. Compared to the non-public pension participation group, NPS and SOP participants had a better chance and amount of individual pension purchase. The contribution amount also had a similar result, as it had a significant effect on both the participation and purchase amount model. This result indicates that the two pension systems in Korea are in a complementary relationship. One of the major reasons for this relationship would be precautionary motives; low and decreasing public pension replacement rate, and unstable financial future of public pension might trigger precautionary motives.

Homeownership and house price had a positive effect on individual pension participation, which indicates that the relationship between the two is complementary, rather than substitutional. However, homeownership had a significant negative effect on individual pension purchase amount — this showed some possibility of a trade-off between pension and housing; the owner might purchase a smaller amount of individual pension than non-owners, because they can utilize the house as a pension at a later age, or because they might face greater financial constraint (such as housing mortgage) than non-owners.

The result of interaction effect analysis showed that there was a positive interaction effect between homeownership and public pension (both status and contribution) on individual pension participation, while there was no interaction effect between homeownership and public pension on the individual pension purchase amount. On the other hand, there was no interaction effect between house price and

public pension contribution or status on individual pension participation. Meanwhile, there was a significant interaction effect between house price and public pension on the individual pension purchase amount. The result of the interaction effect generally indicates there is a tendency for a complementary relationship among public pension, housing and individual pension.

The results have a few primary theoretical implications: First, this study emphasized the importance of housing in individuals' old age and old age preparation, which have been somewhat excluded from the academic field. Although the importance of housing and homeownership in old age is widely accepted, study on housing in pension or old age preparation was largely understudied in the academic field compared to its importance. This study shed light on under-recognized 'housing' in the pension field and reviewed the role of housing in individual pension purchases in Korea to overcome the limitation of previous literatures. Second, this study has its meaning in that it surveyed the relationship of housing and pension at the micro level using Kemeny's trade-off theory. Although original Kemeny's theory explains the trade-off between pension and homeownership on the national level, its mechanism (need-induced or constraint-induced trade-off) can be applied to micro level as well. However, there were few attempts explaining the pension-homeownership relationship using Kemeny's theory except for a handful of recent movements. This study can find its significance in that it seeks to convert macro-level discourse into micro-view. Third, this study has a contribution to the academic field that this is one of the very first studies that investigated the interaction effect of public pension and housing on individual pension purchase. This study assumed that the result of individual pension purchase will be altered by how public pension and housing are arranged, and the findings showed the meaningful interaction effect between public

pension and housing on individual pension purchase.

The results have a few primary political implications and suggestions as well: First, this study provides some significant information on individual pension purchases that could be important political preliminary data. For proper policy intervention, understanding the accurate situation on related features is of paramount importance; However, in terms of individual pension, comprehensive evidence of the actual situation was insufficient to this point. This study can be important baseline information that could be used in political settings. Second, there are needs to aid people in vulnerable groups to participate in individual pensions if they want to. The result found a complementary relationship among public pension, individual pension and housing which indicates that those with a better household economy tends to have a better outcome in an individual pension. This also indicates that less economically viable ones might have the risk to be excluded or not actively involved in the individual pension system. There is a need for policy-level intervention to those economically vulnerable ones, but those who has the will to participate in individual pension. Finally, the expanding role of the public sector will be also necessary. Expanding coverages of public pension and the increasing role of basic pension probably can work as solutions to narrow the gap between the groups. Extending the pension credit policy to various other areas can be a way to expand coverages in more effective ways. Moreover, it will be also necessary to consider ways to partially strengthen the role of the Basic Pension for the socially disadvantaged, or vulnerable groups.

**Keyword :** Public pension, homeownership, individual pension, old age preparation, double hurdle model, control function

## LIST OF ABBREVIATIONS

OECD	Organization for Economic Cooperation and Development
NPS	National Pension System
SOP	Special Occupational Pension
BLSP	Basic Livelihood Security Program
DB	Defined Benefit
DC	Defined Contribution
IRA	Individual Retirement Accounts
DTI	Debt To Income
LTV	Loan To Value
HTP	House-to-Total Population
KLIPS	Korean Labor and Income Panel Study
KReIS	Korean Retirement and Income Study
NaSTaB	National Survey of Tax and Benefit

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# I. Introduction

Many old age people suffer from financial difficulty. This often leads to serious individual and social problems, as financial distress in old age can easily make them slide into poverty. Also, because this experience is usually caused by losing income after retirement, it can occur commonly to all retirees. This universal problem of old age appears across time and country, but it is particularly painful for senior citizens in South Korea (hereafter Korea), as about half of retired Koreans consider their main problem in old age are economic difficulties and furthermore, approximately 44% of Korean senior citizens are living under poverty as of 2019 (Statistics Korea, 2020).

Among several ways to address the financial difficulty, the pension system probably will be one of the more stable and effective ways. The pension, either public or private, are designed to prevent the entire loss of income after retirement and alleviate the burden of old age financial danger. It can be solid support and a key preventer for old age income and poverty. The importance of proper preparation of old age through adequate pension, cannot be stressed enough. Then, do people in Korea prepare for retirement through adequate pension? Does a pension scheme in our society property guarantee the passable old age life? The answers to both questions are, unfortunately, but very clearly a 'NO'.

Typically, it is considered a rule-of-thumb that a replacement rate of roughly 70%

of gross income is adequate for retirement from a variety of pension sources, while there is an argument that this rate should be higher as life expectancy is extending (Gale et al, 2004). However, the benefit level of the public pension system in Korea is far from satisfying level to support the stable old age life, as the replacement rate in Korea dropped down to 40 percent (Kang & Choi, 2010) after public pension reform in 2007<sup>1</sup>. Public pensions in Korea alone are not only insufficient to provide retired persons with an adequate quality of life but are ineffectual to prevent poverty in old age.

There is a growing expectation that the gap between the ideal replacement rate and actual coverage should be filled by the individual (Orenstein, 2013; Joo, 2009). In such an environment, it is natural that the role of the private sector in the pension system becomes increasingly important. Many OECD countries have introduced (and some mandated) a range of policies to encourage more people to purchase individual pensions, to help future retirees to arrange better old age. However, the role played by the private sector in Korea is quite limited, as only a small proportion of the population is insured through the private sector. Although there was subtle growth in individual pension systems, the participation rate was barely around 24% as of 2018. Moreover, the replacement rate for individual pensions of the participants is only ranging at 10–12% (Kim, 2018). Thus, an expanded role of private pensions is essential for Korea, in

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<sup>1</sup> Applies to National Pension Scheme only; the other type of public pension (called special occupational pension) has better situation. This will be described in detail, in Chapter 2.

terms of both quantity (coverage) and quality (replacement rate), as private investment in pension directly will lead to the quality of life in later years. If the current situation is not remedied, it may be not possible to avoid long-term consequences involving severe and prolonged old-age poverty in Korea. Should the government be unable to provide a sufficient level of public pensions, they have a responsibility to educate and encourage workers to prepare for old age through the use of individual pensions.

As described above, one of the main purposes of purchasing an individual pension, now, is to cope with the low replacement rate of public pension and to secure future income. Therefore, the purchase level of private savings is largely affected by the other types of retirement preparations (Muller, 2018). And because the public pension is a major source of future income for many individuals, it can have a considerable effect on an individual pension. Thus, in order to provide an effective strategy to guide people to individual pensions, careful consideration of the studies on the relation of the two pensions will be essential<sup>2</sup>. Fortunately, there are numerous studies related to this

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<sup>2</sup> There are many studies related to individual pension purchase, and of course, the public pension is not the only factor. Many other factors exist that are known to have effects on an individual pension. Those are personal, household characteristics (e.g. Foster, 2012; Johannison, 2008; Ku & Cha, 2015; Jun et al., 2006; Baek, 2012; Cha, 2015, among many) —such as gender, age, marriage status, employment, number of family or children, housing, savings, various source of wealth, etc—regulations and tax benefits (Crowford et al., 2012; Dickson, 2010; Jung & Moon, 2016; Lim, 2009), financial education (Maki, 2004), macro-economic environment (Munnell, 1979) and more. This dissertation chose to focus especially on possible other ‘future incomes.’

topic.

Many studies examined the effect of public pension on private savings since the early 60s. To this day, scholars found that public pensions are known to have two opposing effects on personal saving: they crowd out personal savings as public pension substitute for household assets (Feldstein, 1974; Kotlikoff, 1979; Gale, 1998; Attanasio & Rohwedder, 2003; Lachowska & Myck, 2015; Diamond & Hausman, 1984; Pfau, 2005), but they also crowd in saving (Dicks-Mireaus & King, 1982; David & Menchik, 1985; Jeon et al., 2006). Both crowding-out and crowding-in effects are found in the results of empirical studies as the net effect of the pension is known to relies upon the relative strength of these two forces (Feldstein, 1974). However, compared to the extensive research on public pensions and personal savings in general, relatively limited number of studies have focused specifically on individual pensions. As individual pensions represent a special form of saving, its relationship with public pensions used to be presumed to be similar to that of general savings (Rejda & Schimidt, 1984; Deviney, 1995; Na & Choi 2014).

However, the result of studies that investigated the relationship between public pension and individual pension in Korea, has a somewhat different face. Most of those studies in Korea did not find the crowd-out effect; it was either crowd-in or non-significant (Jeon & Im, 2008; Im & Kang, 2005; Kim et al., 2015; Moon, 2012; Kim, 2017; Yoo, 2020 and more). Interestingly, however, studies on public pension-savings relations in Korea show both sides of directions, which is quite distinct compared to

public-individual pension relations. Yet, it is hard to accept this contrasting result without doubt, because of number of limitations of the previous literature.

First of all, many of the previous studies failed to consider different aspects of public pensions—such as contribution level, participation types and/or status. Which means, the studies might overlook the possibility that the different aspect of public pension might affect the purchase of individual pension differently. Moreover, there is a methodological problem: the majority of these studies in Korea used Tobit analysis to estimate the topic. Although Tobit analysis is widely known to be an effective way to address censored data, this might not be the best way to access the problem. Also, many literature examined the relation between public- individual pension used cross-sectional data or short panel data, the prolonged impact of public pensions on individual pensions using longer panel data in Korea is still quite under-investigated. There will be an effort to reaffirm the effect of public pension on individual pension in this dissertation, addressing the limitations mentioned above. It would be worthwhile to visit the accurate relationship between the two types of pensions as the importance of individual pensions is growing, and much research on public pensions is needed to understand the accurate relationship between the two.

Another important feature that can affect individual pension participation is housing, more specifically, homeownership, as this can be another important potential ‘future income’. Purchasing a house is not just buying a place to live, but it also is forced savings and asset accumulation. Hence, in addition to individual and public pension,

homeownership also has a similar role in old age; it can provide income in old age and protects individuals from poverty (Torricelli et al. 2016; Doling & Elginsa, 2012; Doling & Ronald, 2010; Ronald & Doling, 2012). However, the role of homeownership in old age and related studies, are often time neglected.

Public pension and individual pension benefits become a direct income source for the retiree. They buffer household financial vulnerability by strengthening livelihood strategies and may help reduce the intensity of poverty. While, homeownership can be helpful in later life in more indirect ways. When a mortgage is paid off and the house becomes debt-free, expenditure regarding residence can be dramatically reduced compared to that of the rent, as spending for housing often time takes up a large part of the household budget (Johnson, 2015). In a later year when there is no consistent income, this will be a great benefit for retirees, as they would be able to get by on a smaller budget. Also, the owner always can be capitalized the dwelling in case of need. Through selling the property and moving into a smaller dwelling, or a rental house, retirees can realize the house into cash. Although not all retirees sell houses due to different reasons in reality, such as will for a bequest, aging in place, etc., but they always can use the 'last bastion' in an emergency. Finally, retirees can participate in reverse mortgage programs, a way to use housing as an annuity form.

Although housing is one of the key features of individuals' well-being, there is a great lack of academic concerns regarding its role and effect on welfare. This is because housing and homeownership is not entirely service, but is, at the same time, a

consumption, investment, and asset that is heavily market-oriented. However, there is a growing interest in housing and homeownership areas these days, as homeownership becomes widely available to a majority of people, and it bears the possibility to serve as welfare. In the same context in which the role of individuals in welfare provision became increasingly stressed, the importance of homeownership also risen; homeownership fitted well with the overall welfare trend of emphasized-individual roles. Moreover, it interplays with other welfare areas because its equity can adjust one's need for other social services (Boelhouwer, et al.,2005; OECD, 2013).

Investigating the effect of homeownership in individual pension is particularly important in Korea, as a house is exceptionally valued in Korean society. Korea has more family-oriented characteristics compared to western countries. In a context where individual and family responsibility in welfare is widely understood as a 'normal and standard', it is natural that homeownership to be mutually perceived as a cornerstone and fundamental basis to care for family members. Therefore, owning a house is more than just having a shelter or investment on an asset in Korea, but is securing the core value of kinship welfare (Ronald, 2007; Doling & Elsinga, 2012).

While there has been much academic interest in the relationship between the public and individual pension sphere, relatively little attention is paid to homeownership and its effect on an individual pension. Generally, previous research defined the relationship between homeownership and pensions as a trade-off or a negative. There are two mechanisms behind this: constraint-induced and need-

induced reasons (Kemeny, 1981; Castle, 1998; Doling & Horsewood, 2011). A constraint-induced relationship explains that the more one pays for a home mortgage, the less one can afford to contribute to a pension, and vice versa. Therefore, the purchase of the home will affect the pension in a negative direction. A need-induced relationship is one in which a person owns a home and can live rent-free in retired years, he/she can make do with a smaller pension. Eventually, the need for a pension diminishes and might lead to an actual decrease in a purchase. Understandably, house price also plays an important part in this game, as higher price house is expected to have stronger restraint in budget and give more support in case of need, hence crowds out the more private savings.

Despite these theoretical arguments, there is not much empirical support, due to the short history and unpopularity of ownership-welfare studies. Furthermore, the outcome of those small number of studies presents a mixed result; some supported the theory by finding a negative relationship between homeownership and pensions (Castle, 1998; Stams, 2010; Doling & Horsewood, 2011; Delfani et al, 2014; Torricelli et al, 2016; Muller, 2019), while others did not find any relationship (Castle & Ferrera, 1996; Fahey, 2003; Doling & Omar, 2012). The analysis specifically on individual pensions and home purchases has further limitations (Torricelli et al, 2016; Kim, 2019), as existing literature focuses more on the offset of macro-level pension/homeownership. Likewise, the study on house prices and pensions is also extremely limited.

The individual pension, public pension and homeownership not only just shares role as a 'future income' as previously stated. Yet, there is another similarity among them; they all occur during one's working time, within the boundary of a limited budget—usually an income. Which means, in other words, they have parallel growth over ones' working years and eventually have a competing relation. The majority of people accumulate their wealth and save money during the work periods in preparation for a time when there is no salary (Feldstein, 1976; Ando & Modigliani, 1957). Various savings and accumulation activities usually occur within the wage boundary, throughout an individual's working period. Among other things, mandatory public pension contributions and home purchases are two cases of considerable and steady expenditure across one's life that need to be paid concurrently for a long time. The status of pension participation and housing can change one's level of budget constraint and thus can impact the level of individual pensions, which also requires a sizable and constant contribution (Cristini & Sevilla, 2014).

Considering their parallel growth during the work period and functional similarity in later life, it will be rational to assume that individual pension participation can be altered by public pension and home purchases. However, a previous study was insufficient to elucidate the influence of public pension and house purchases on individual pension, neither separately nor together. Especially, there is no study on the effect of the interaction between house purchase and public pension, on individual pension to the best of my knowledge. An individual pension can be altered by how the

two factors are arranged. For instance, an individual pension purchase between the ones with pension and house and ones with a pension but without a house; ones with low pension contribution without a house and ones with high pension contribution without a house, etc., will vary in terms of capability or need. That is, different coordination of public pension and house purchases will affect one's financial limitation as well as his/her need for old age preparation. Investigating the effect of a public pension, house purchase on individual pension, respectively as well as combined, will be very valuable in understanding individual pension participation in one's life. And furthermore, this can help to develop a useful strategy for better old age preparation.

With these statements of the problems, this study attempts to examine the empirical effect of public pension and house purchase on individual pension, with addressing limitations of previous studies. The following three principal research questions will be investigated.

1. What is the effect of public pension on individual pension? Does the effect differ depending on one's pension status and pension contribution?
2. What is the effect of homeownership on individual pension? What is the effect of house prices on individual pensions?
3. What does the interaction of the two - public pension and housing — says?

## **II. Background and Literature Review**

This section will be providing the background and theoretical framework of the study, addressing four core elements: First, there will be a detailed investigation on the background of public/private pension (role and definition, types, systems in Korea, etc). and homeownership (trend, role, and effect, etc.). The second section will review the related theories explaining the connection between the public and individual pension, as well as pension and housing, followed by a survey of the preceding works of literature. The section then summarizes the common role and competing relation of pension and homeownership in individuals' life, emphasizing the significance to investigate the interaction effect of the two. The third section explains the supplementary factors that can affect individual pension participation, and finally, the section finishes with a summary and conclusion. This background and literature review section will provide an overall understanding of the 'future income' that this study handles.

### **1. Pension Background**

#### **1.1. Definition and Role of pension**

A pension is a long-term saving plan to support one's after-retirement life. Bodie (1989) defined pension as "a lifetime income security in retirement for however long the

retiree lives.” A regular contribution is usually paid out of one’s salary to the pension fund during one’s working life, and regular benefits start after retirement and continue until death, acting as a consistent and reliable future income in old age (Diamond, 1996). The pension system is one of the very basic but widespread services in the welfare state.

Pension is known to have several different roles. Among many, consumption smoothing, insurance, and poverty reduction/alleviation<sup>3</sup> will be discussed in this section, as they are commonly considered as particularly important (Blake, 2006; Kwon & Ryu, 2018). First, pension plays the role of consumption smoothing; through saving one’s income during the working period and exchange the contribution as income after retirement, pension helps individual to maintain a relatively smooth pattern of consumption over the lifetime. Without a pension, an individual may experience a sharp decline in consumption after retirement as the income will dramatically reduce, if not cease.

Second, it works as useful insurance against longevity risks (Willmore & Bertucci, 1999; Blake, 2006), which is uncertainty attached to one’s unknown

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<sup>3</sup> The three roles of pension are universal for all pension regardless of their type. Public pensions are known for a few more purposes that other pension types do not have: two important ones are redistribution and inflation risk management. A redistributive effect from rich to poor— low-income group receives a relatively higher benefit with lower contributions, while high- income group gets lower benefit with a higher rate of contributions. Also, public pension policy is designed to reflect inflation; the benefit level increments to be adjusted with inflation. The public pension also can efficiently address other issues such as individuals’ myopic behaviors, market failure, etc.

remaining lifetime. The retirees will be exposed to major risks if they survive longer than expected age and outlive their resources. A pension scheme can effectively manage this risk and offers protection by pooling the risks—gathering all individuals' risks of outliving their savings together and reducing variability in risk collection (Blake et al., 2014).

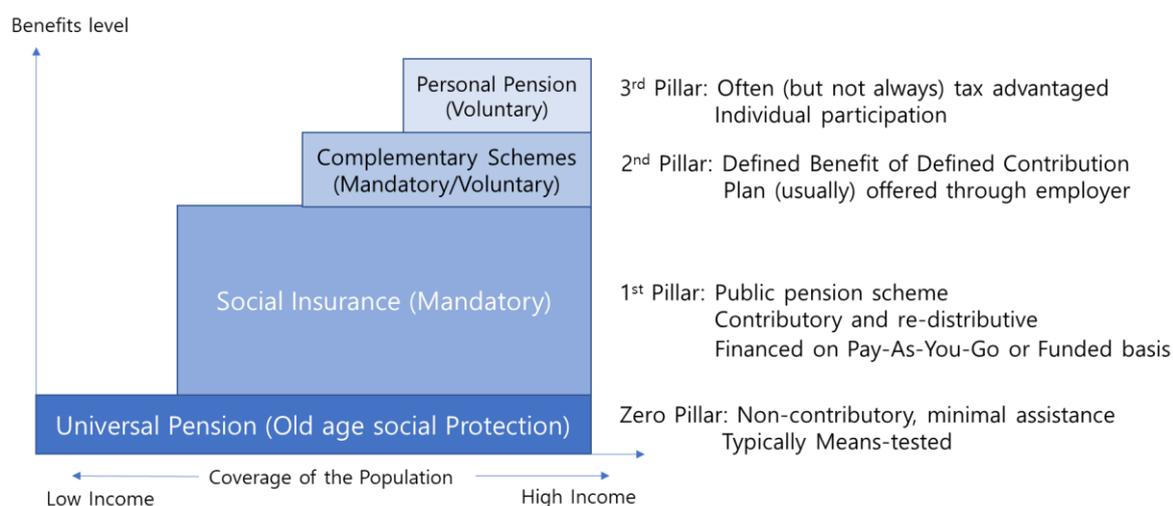
Third, it prevents/alleviates old age poverty (Seok, 2010(a); Kim & Kwon, 2007; Grech, 2013). Retirees have a risk of, and vulnerability to poverty, as they normally have a constraint level of income. This is not limited to people who live under the poverty line but applies to many people from other social-economic groups. A pension can protect retirees from poverty at a considerable level. With a well-designed pension plan, retirees will have less incidence of poverty, as well as its intensity will be reduced.

Today, most countries provide pension services to their citizens, including Korea, and work as one of the most important sources of income at retirement. However, the performance level of pension in terms of consumption smoothing, insurance and poverty prevention in each country will vary depending largely on its designs and structures.

## 1.2. Types of pensions and the multi-pillar system

There are different types of pensions that people can participate in; Generally, they are classified into three types, according to the provider of a pension plan: government,

employer, and individual. Public pension is ‘social security’ provided by the government; typically, every working adult is mandated to participate. These days, almost every industrialized country has a public pension system (Börsch-Supan, 2001). Meanwhile, occupational pension is organized by employer/sponsor. Usually, it is offered to workers as compensation for their service in an altruism view; and/or as an entitlement in a deferred payment perspective (Logue, 1979). An individual (or personal) pension is an additional saving that one can prepare for retirement, other than a public or occupational pension. Individual pension assets are made through financial contracts between individual and financial organizations (e.g. insurance companies, banks), and are usually stocked in a deposit account or in mutual funds.



Source: International Labour Office (ILO); World Economic Forum, (2013); Edited by Author

[Figure 1] Multi-pillar Pension System

These days, individuals are recommended to prepare for their retirement by piling up different types of pensions. Many global organizations, such as the World Bank, the International Labor Organization (ILO), and the Organization for Economic Cooperation and Development (OECD), emphasizes the importance of this 'multi-pillar' pension plan [Figure 1], and encourages the public to make rational choices (OECD, 2013; World Bank, 1994; Stanic, 2012). The central concept of a multi-pillar pension system is to combine a set of pension instruments—public and private sector—to provide social protection that will ensure the financial well-being of retired people. Multi-pillar pension systems are generally known to improve social safety nets than single-pillar systems (Ortiz et al., 2018). This permits a better buffer from a diversity of risk and offers superior individual protection from poverty, as individuals can be more susceptible to unexpected economic distress. Nowadays, multi-pillar pension systems have become a winning paradigm in pension design, and they are considered an ideal way to prepare for old age (Sorsa, 2016; Kim & Kim, 2007; Jeon & Im, 2011)<sup>4</sup>.

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<sup>4</sup> Lee & Jung (2008) categorized four types of public-private pension mix, according to the relative relationship between public and private (individual and occupational) pension of different countries; public pension dominant, public pension advantaged, private pension advantaged, and private pension dominant. Public pension dominant countries have a public pension replacement rate of 50% or more, thus the development status of private pension (occupational pension and individual pension) is not remarkable. Southern European countries such as Greece, Spain, Turkey are categorized into this type. Public pension advantaged groups have a public pension replacement rate of 35%~50%, which includes the U.S., Belgium, Czech, Canada, Japan, Korea, etc. In these countries, the role of private pension is greater than public pension dominant group. Private pension advantaged countries include Australia, Denmark, Switzerland, Netherland, the U.K. etc. This type has a public pension replacement of 20~35%; a great proportion of old age

Encouraging multi-pillar pension schemes was further accelerated with the retrenchment of public pensions which started in the mid-90s (Woo, 2016). The rapid growth of the aging population, changes in demographic structure, a crisis in global economies, changes in labor market structure, etc. all put a great threat on the pension economy. To address this challenge, most of the countries with public pensions underwent pension modifications that were intended to reduce the financial pressure and strengthen the sustainability of the pension systems. The efforts for pension reforms could be sorted into two main types; parameter reforms (such as reduction of a pension benefit, increase in pensionable ages and/or retirement ages) or paradigm reforms (change of the pension system itself). One of the most common methods in parameter reform included the reduction of public pension benefits. In fact, this type of reform was implemented in most of the OECD member states (OECD, 2013), and consequently, generosity of public pensions benefit was fell in numerous countries. In this environment, it was natural that the role of the private sector in multi-pillar pensions becomes very important in later life (Orenstein, 2013; Kim, 2011). As average lifespan increases alongside a decrease in public pension sizes and time span of provision, the gap was expected or even forced to be filled by the individual's effort.

Traditionally, individual pension was considered optional, and the

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preparation is covered by the private sector. Lastly, the private pension dominant type has a public pension replacement rate of 20% or less, which means the private pension scheme takes more part of old age preparation, rather than a public pension. These countries usually have mandatory private pension programs. Chile, Mexico, Peru is included in this type.

participation was on a voluntary basis. But today, many countries are expanding the role of the individual pension. Countries such as Germany encourage individual pension participation through various supports and benefits<sup>5</sup> (Kim & Ryu, 2015), while Sweden mandates the participation and extending the official role of individual in overall pension provision (Chung & Kang, 2017). In other words, many countries chose individual pension to compensate for public pension decline and to raise the overall replacement rate.

### 1.3. Pension System in Korea

Korean pension scheme has a multi-pillar structure composed of four different pillars – Zero pillar (National Basic Livelihood Security and Basic Pension System), the first pillar (National Pension and Special Occupational Pension), the second pillar (Retirement Pension/ Occupational Pension), and the third pillar (Individual Pension). The zero and first pillars are managed by the government, while the second and third pillars are prepared by private sectors and individuals. Typically, zero and first pillars are expected to protect retirees from absolute poverty, and upper pillars are designed to supplement the lower pillars, protect them from relative poverty, and provide better

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<sup>5</sup> Germany introduced 'Riester Pension' in 2002, which is individual pension but heavily state-subsidized scheme to encourage public participation.

later life (Willmore, 2000). Table 1 shows the overall old age pension structure in Korea.

[Table 1] Multi-pillar pension system in Korea

Third pillar	Individual pensions			
Second pillar	Retirement allowance	Retirement pension/allowance		
First Pillar	Special occupational pension			
Zero Pillar	Basic Pension			
	National Basic Livelihood Security System			
Target Group	Public sector employees	Private sector employees	Self-employed	Economically non-active population

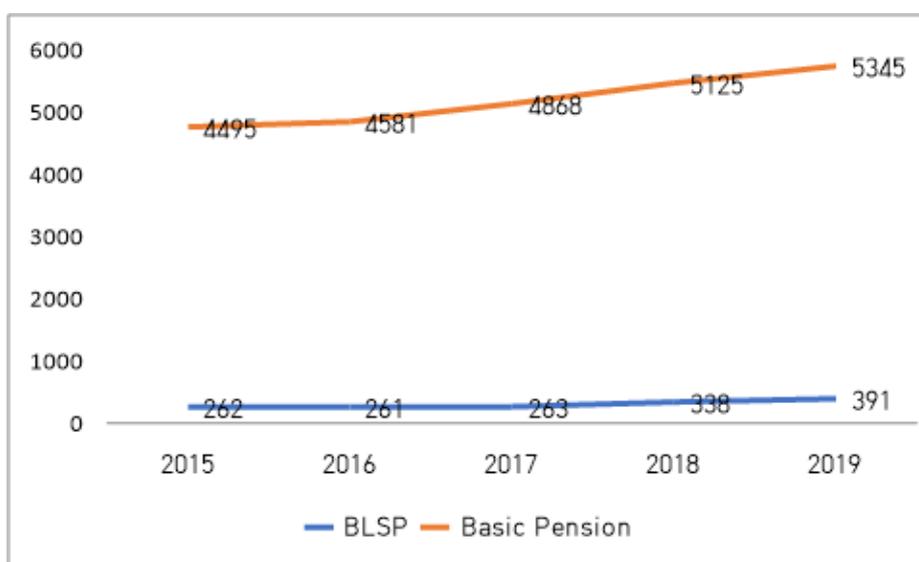
(Source: NPS, edited by author)

### 1.3.1 Zero Pillar: Basic Livelihood Security and Basic Pension

The zero pillar comprises the Basic Livelihood Security Program (BLSP) and Basic Pension. These programs are non-contributory, residual income security, mostly funded through tax and covers any Korean citizen who is eligible. The BLSP is purposed to aid low-income individuals and families, by providing various benefits including cash, housing, education etc. Among 1,744 thousand people who are participated in the program, 23 percent of them are older citizens, as of 2018 (Statistics Korea, [www.index.go.kr](http://www.index.go.kr)). Basic Pension, introduced in 2008, covers seniors aged 65

or older in the bottom 70 percent of income and assets. It provides a monthly allowance of up to 240,000KRW as of 2019;<sup>6</sup>. Figure 2 shows the recent trend of BLSP recipients (65+) and Basic Pension recipients.

[Figure 2] Recent trend of BLSP and Basic Pension recipients



(Source: Statistics Korea, [www.index.go.kr](http://www.index.go.kr))

unit: thousand in person

### 1.3.2 First Pillar: National Pension and Special Occupational Pension

The First pillar is consisted of National Pension and Special Occupational Pension scheme, both contribution-based and earning-related. The National Pension System (NPS) is the largest system in Korea that is designed to covers the total labor force, age

<sup>6</sup> Up to 300,000KRW for low income seniors; 80% for couple compare to single rate.

from 18 to 59. It has four types: workplace insures, individual insures, voluntary insures, and voluntary & continuous insures; each type covers different targets of people [Table 2].

[Table 2] Four types of NPS

<b>Type of NPS</b>	<b>Targets</b>	<b>Contribution</b>
<b>Workplace</b>	Employees with private sectors	4.5% individual, 4.5% employer
<b>Individual</b>	Private sectors, but not eligible for workplace scheme; mainly self-employees	9% individual
<b>Voluntary</b>	Not subject for mandatory participation, such as students or housewives	9% individual
<b>Voluntary and Continuous</b>	Covers population over 60, but choose to pay for additional contribution to qualify better amount of benefits	9% individual

*(Source: NPS, edited by author)*

As of 2020, 222 million people participated in NPS, which is 72.9% of the age group between 18 and 59. Workplace insurers take up 64.47% of among all NPS participants, individual insurers are 31.55%, voluntary insurers and voluntary & continuous participants are 1.57% and 2.41% respectively (NPS statistics, <http://nps.or.kr>).

The pensionable age is 61 years old, and the benefit is available for individuals who made a contribution of ten years or more. With 40 years of full contribution, the

participants can receive 44 percent of their gross income as of 2020. Originally, the replacement rate of NPS was designed to reach 70% of the income in 1988, however, this is decreasing continuously after the NPS went through two major reforms in 1998 and 2007 (Park, 2007). The replacement rate was dropped from 70% to 60% in 1999, and 50% in 2008. Additionally, there is an ongoing decrease of 0.5 percent every year, started from 2009 until it reaches 40 percent in 2028. The pensionable age also is increasing from 60 to 65, every five years by 2028.

Special Occupational Pension (SOP) refers to Military Personnel Pension, Government Employees Pension, and Private School Teacher Pension systems combined. In 2019, SOP covers 17.1 million citizens in Korea: Among them, 11.1% are Military, 70.2% are Government Employees, and 18.7% are Private School Teachers. SOP has very distinct characteristics compared to the NPS. Both NPS and SOP are major pension schemes in Korea, but the contribution rate, replacement rate, operating department etc. are very different; these variances between the pension benefits of NPS and SOP are not ignorable. Both NPS and SOP are tied under the title 'public pension,' but these pensions, de facto, are two distinct schemes (Yun, 2015; Kim, 2016). The contribution rate of SOP is 17% total, 8.5% each from participants and the government. Generally, the pension benefit of SOP is far more generous than NPS; the replacement rate is up to 76 percent of their gross income. The average amount that participants received from NPS is around 386 thousand KRW in 2017, while there that of SOP (government employee pension) is 2,400 thousand KRW. Furthermore, over 85% of total SOP pensioners are known to receive more than

1,500,000 KRW. Also, the pensionable age is 61 for NPS, while it is lower for SOP participants. The accrual rate between the two public pensions is also substantial: the rate for NPS is 1.86-2.20, while that of SOP ranges from 3.63-4.29<sup>7</sup> (Kim, 2007). Because of this difference in the accrual rate (along with a higher contribution rate), SOP is generally perceived as a more generous pension scheme compared to NPS. SOP is facing its mature stage, as it was introduced relatively early compared to NPS; thus, it is possible to provide better benefits to the recipients. Compared to SOP, pensioners of NPS faces big difference between theoretical and actual replacement rate. As of 2019, a total of 72 thousand retirees receives benefits from SOP.

Although about 239 million people in Korea participated in the public pension scheme (either NPS or SOP as of 2019), there is a large number of uninsured people (Kang, 2011). According to statistics, about 30 percent of individuals between the age of 18 and 59, which is almost 136 million people, is not covered by public pension for different reasons. This is spotted as one of the major problems of public pensions in Korea.

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<sup>7</sup> There are ongoing arguments on fairness between SOP and NPS, along with recent debates on reducing the gap between the two pension systems.

[Table 3] First pillar pension system in Korea

Total Population between 18-59 (324,560,000 person)				
Economically Non-Active Population	Working Population			
	NPS participants		SOP participants	
	Exempted	Income Earner		
		(Long-term) Delinquent		Regular Payers
Non- public pension Participants		Public Pension Participants		

(source: [www.nps.or.kr](http://www.nps.or.kr))

### 1.3.3. Second Pillar: Occupational Pension with DB, DC and IRA

The second pillar is a pension scheme arranged by an employer, therefore only employees of the private and public sectors can benefit from the program. For a long time, the retirement benefit from the company was paid out only as lump sums but based on Employee Retirement Security Act (2004), the corporate pension system started operating on a voluntary basis (Jeon & Son, 2015). Employer or employee can

choose between Defined Benefit (DB) or Defined Contribution (DC) plans<sup>8</sup>. DB guarantees a specific benefit amount in the retirement for each participant, while DC pays the amount depends on the results from the contribution (and investment that was made with the contribution) the worker made during his/her working time. More specifically in Korea, the DB plan provides benefits equivalent to a minimum of one month's salary every year, to a retired employee. The employees who participated in DC, on the other hand, make a contribution of a minimum of 1/12 of the total annual salary as a retirement plan. Compared to public pension, the pensionable age for occupational pension is much lower, starting from 55.

In 2005, Individual Retirement Accounts (IRA) was introduced, which is a very convenient retirement plan for those who experience frequent resignation and re-employment. Employers with less than 30 employees can provide IRA instead of providing DB or DB directly. Employees receive a retirement allowance at their resignation and accumulate it in the IRA plan. Other features, such as payment form or pensionable age of IRA, are similar to the other occupational pensions.

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<sup>8</sup> In the DB scheme, the amount of benefit that retiree can receive is defined; it offers fixed pension benefits at the retirement, any surplus or deficit is responsible for sponsors. In the DC scheme, on the other hand, only contribution is defined, and benefit levels are determined by pension assets investment results. No specific level of pension benefit is guaranteed; low contribution or poor investment result leads to a lower pension benefit, while higher contribution or profitable investment result can provide higher pension benefits to retirees. Unlike the DB scheme, there is no surplus or deficit that burdens sponsors. In recent days, more and more employers are replacing DB schemes with DC schemes.

The occupational pension was implemented in 2005, but because this system is not mandatory in Korea, the actual participation rate is only about half of the total working population (Statistics Korea); as of 2018 about 52.2% of male, and 49.9% of female workers, which is about 6.1 million people. Table 4 presents the numbers of workplace with different occupational pension schemes. As of 2019, about 40 thousand companies sponsor occupational pensions of any kind.

[Table 4] Occupational Pension in Korea

	2015	2016	2017	2018	2019
<b>DB</b>	89,817	105,471	102,967	102,985	98,705
<b>DC</b>	175,479	179,694	201,093	222,851	244,376
<b>DB &amp; DC</b>	7,894	23,979	24,446	26,935	27,676
<b>IRP</b>	32,475	25,676	25,512	25,659	25,782
<b>TOTAL</b>	305,665	334,820	354,018	378,430	396,539

(source: Statistics Korea [index.go.kr](http://index.go.kr))

unit: cases

However, it is questionable to refer this scheme as a proper ‘pension’ at this point, as still many workers choose to receive their retirement allowance as a lump-sum over annuity; moreover, many workers choose to withdraw it before retirement. About 98% of occupational pension was received as lump-up in 2017, and only about 2% was annuity form (Financial Supervisory Service, <https://www.fss.or.kr/>).

#### 1.3.4. Third Pillar: Individual Pension

The individual pension was introduced in 1994, with the purpose to supplement the shortage of the lower pillar coverage. Anyone can join the individual pension scheme, regardless of age or income. There are, roughly two types of individual pensions in Korea, individual pension savings and individual pension insurance. Pension saving and pension insurance are managed by different organizations, such as a bank, fund managers, insurance companies, etc. The major benefit between the two is the way the tax is levied<sup>9</sup>.

The policies purposed to encourage the participation of individual pension, was enhanced several times since 2002. The tax-relief limit of individual pension increased continuously; 2.4 million KRW in 2002, 3.0 million KRW in 2006, and finally 4.0 million KRW in 2011. In 2014, the tax relief was revised to the tax credit, and this was increased to 15% as of 2015. Despite the policy effort, the role played by the private sector in the multi-pillar system is limited, as only a small proportion of the population is insured through the private sector. The participation rate was barely around 24% as of 2018, and the replacement rate for individual pensions of the participants is only ranging from 10–12% (Yeo, 2016). Table 5 shows the recent trend

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<sup>9</sup> Pension saving participants are qualified for tax relief—up to 4 million KRW tax deduction per year— but pension income tax is levied, upon the receipt of their benefits. On the other hand, pension insurance is not for tax relief, but it is tax-free upon receipt. Pension Saving also can be divided into pension saving trust, pension saving fund, and pension saving insurance, depending on the provider/manager of the services (Ku & Cha, 2015).

of a total individual pension wealth from 2015 to 2020. As of 2020, total of 151.7 trillion won is accumulated through various individual pension savings plans.

[Table 5] Recent trend of total individual pension wealth

	2015	2016	2017	2018	2019	2020
<b>Pension Insurance</b>	81.1	88.2	94.9	100.5	105.6	109.7
<b>Pension Trust</b>	15.3	16.1	16.8	17.2	17.4	17.6
<b>Pension Mutual Fund</b>	8.8	9.7	12.2	12.1	14.5	18.9
<b>Others</b>	3.5	4.5	4.9	5.4	5.9	5.5
<b>Total</b>	109.7	118.5	128.8	135.2	143.4	151.7

(source: Korean Insurance Research Institute, [kiri.or.kr](http://kiri.or.kr))

unit: trillion won

### 1.3.5. Multi-pillar system in Korea under question

Although Korea seems to have a plausible multi-pillar pension structure, the function of each pillar as income protection is highly doubtful. A basic pension system offers universal coverage for 70% of the aged population, but the amount is very limited. The NPS and SOP are the primary mandatory pension schemes, but there is an unignorable rate of uninsured citizens, while the replacement rate is insufficient to meet the requirements of retired persons. Typically, it is considered a rule-of-thumb that a replacement rate of roughly 70% of gross income is adequate for retirement income from a variety of pension sources. However, following public pension reform in 2007, the replacement rate of public pensions in Korea dropped as low as 40 percent. It

appears obvious that public pensions are insufficient to provide retired persons with an adequate quality of life in their retirement years and are, moreover, inadequate to prevent poverty in old age. Furthermore, it is highly likely that this problem will become worse over time because the state pension fund in Korea is rapidly dwindling and is predicted to be exhausted by 2060 (Kang & Ryu, 2014). The replacement rate may experience even more reductions in the near future.

Thus, like other OECD countries, Korea also faces a great necessity for individual pensions. In spite of this situation, the part played by the private sector in this multi-pillar system is significantly limited, as only a small proportion of the population is insured through the private sector. Although there was steady growth in voluntary pension systems, the participation rate was only around 24% as of 2018. The replacement rate for corporate pensions is approximately 10–12%, and is similar for individual pensions, as mentioned. Like the other OECD countries, an expanded role for individual pensions is essential for Korea, both in quantity (coverage) and quality (replacement rate).

## 2. Housing, Homeownership and welfare

Although there is an ongoing debate on its size of provision, there is no disagreement that pension has important economic meaning in later life. However, homeownership, which is also one of the key fiscal features in old age (OECD, 2013) is often overlooked

in retirement studies, and in the general welfare area. As stressed earlier, homeownership has a possibility to become a valuable source of future income, along with various pensions. This section will focus on homeownership as a means for welfare, especially for old age.

## 2.1. Growing importance of housing in welfare

Housing is considered as one of four key pillars of welfare, along with pension, education, and health (Torgersen, 1987) and is perceived as universal and fundamental rights in most societies (Kemeny, 1995). Whilst the services or benefits regarding the other three pillars—pension, education, and health—are widely organized by the government, housing is scarcely a broad public provision (Doling & Ronald, 2010). This is because housing services lie in a zone between private and public. It is not fully market based, nor a public service. Housing is largely apparent as a consumption affected by market principle, thus it does not perceive as ‘public’ as other pillars, although there is an agreement on housing as an important welfare component.

Most of the housing related policies before the 1990s were limited to social housing provision or rent controls (Conley & Gifford, 2006). It is often treated as a ‘least successful domain in welfare (Stamsso, 2010) in terms of its generosity or universality, while other social services such as pension or health care reached a far more advanced level. For this reason, housing is seen as ‘the wobbly pillar of the welfare state’ (Torgersen, 1987), and evaluated as a fragment that ‘hovers awkwardly

on the threshold of the status of social services (Townsend, 1976)'. Furthermore, housing studies were also neglected by the welfare academia for a prolonged period.

In recent years, there was a new trend in housing: The rate of homeownership began to rise quite remarkably since the mid-20th century in all OECD countries, and nowadays, it has become a major housing type across the world, compared to the other forms of dwelling (Ronald & Elsinga, 2012; Kurz, 2004). Unlike public or rental houses, owning a house not only provides housing securities but also brings tangible financial securities, as a house is a major asset for most households that can work as major protection against emergencies (Ryznar, 2018; Doling & Ronald, 2010). House also offers various individual and social benefits at the micro, and macro levels. As homeownership now became available for the vast majority of the people, it began to be widely recognized as a means for welfare. Moreover, homeownership is claimed as 'the most effective form of tenure' that complies with modern society, especially for those times where individual role and responsibility on welfare is enhancing (Groves, Murie & Watson 2007, Malpass 2008).

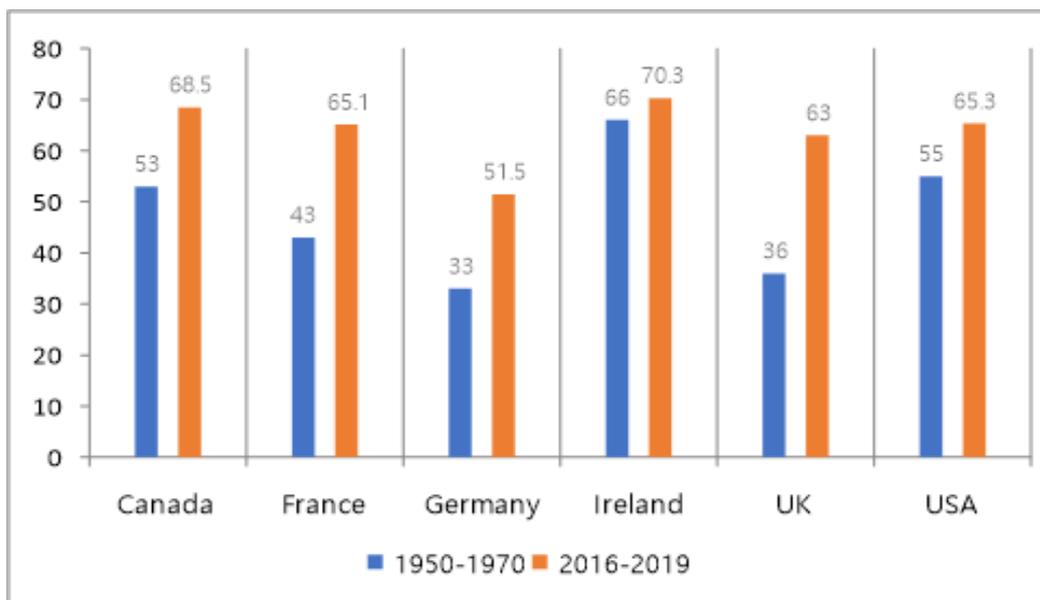
As there is growing recognition of the importance of homeownership, it is promoted and subsidized by many government policies. Also, as the role of housing and homeownership is becoming increasingly essential to welfare structures, the academic efforts on homeownership and welfare are also growing in different countries (Kemeny, 2001; Fahey & Norris, 2011). However, still more research on housing and homeownership in relation to different parts of the welfare area is

necessary. Korea, too, needs a better understanding of housing and homeownership in welfare, as the academic environment in this topic is gravely understudied.

## 2.2 Trend in Homeownership

Homeownership was relatively a minor tenure in 1950, but it grew into a major occupancy type by the beginning of the millennium in most parts of the world (Doling & Elsinga, 2012). Figure 3 shows the change of aggregated homeownership rate of selected OECD countries between the 1970s and 2018<sup>1011</sup>.

[Figure 3] Homeownership rate of mid-20<sup>th</sup> century and today of selected countries



(source:www.oecd.org)

unit: percentage

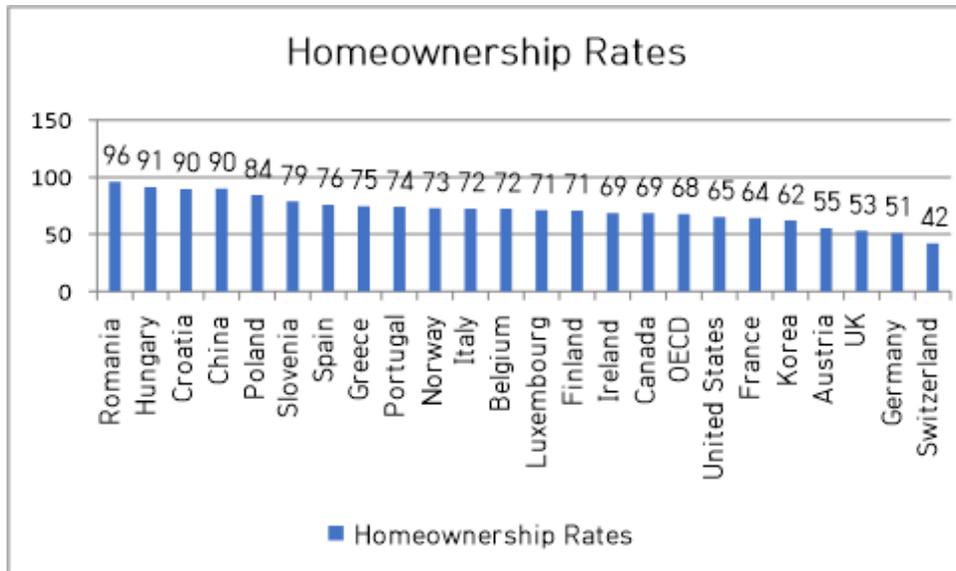
<sup>10</sup> Only limited number of countries' information is available, due to lack of data from 50-70s.

<sup>11</sup> Homeownership rate of Ireland reached over 80 percent early in the 2000s, but it is now in decreasing phase marked 70.3 percent in 2018, which tends to show a lower increase compared to the other countries.

This trend in the rapid growth of homeownership is in fact not a coincidence; Rather it was a very natural phenomenon that concurred with the world-wide trend of welfare retrenchment started in the mid-70s (Boelhouwer & Heijden, 2005). In the era of retrenchment, the generous public provision of welfare has widely come under pressure due to severe economic crises from oil shocks and demographic changes. Many countries re-evaluated the role of government in welfare provision and decided on a major reduction of the key welfare policies (Ku, Sohn & Ahn, 2010).

Instead, and to fill the gap caused by the cutback, governments expanded the role and responsibilities of individuals in welfare provision, through the efforts to encourage private savings, investments, and asset accumulations. Expansion of individual pension, which was discussed in the previous section was in the same line of ideas. Homeownership too, was considered an appropriate vehicle that flows well with the movement. Many countries, except for a few such as Germany, promoted the positive sides of homeownership, idealized homeownership as a 'better' type of tenure, and expanded public support to encourage the individual to buy a property (Sellon, 1990; Ronald, 2008). These policies include subsidizing grants, discount mortgage interest rates and property tax rates, higher tax deductibility and more (Atterhög, 2005).

[Figure 4] Homeownership rate of OECD countries (2019)



(source:www.oecd.org)

unit: percentage

As a result, the average homeownership rate of OECD countries experienced growth, and became a major type of dwelling. In 2018 more than half of the member countries has a homeownership rate of 70 percent or higher (OECD statistics, 2019), while the average rate marked 68 percent, as of 2018 (Figure 4). Some countries have a homeownership rate as high as 90 percent.

### 2.3 Role and effects of homeownership: in welfare perspective

As a house is both a service and a capital, purchasing a house also has twofold; it is a consumption that secures people's housing for current and future living, and also an

asset that provides a certain level of return as an investment (Doling, 2012; Muller, 2019). These two aspects of homeownership offer several benefits at both individual levels as well as societal levels. This section will introduce some of the major roles and effects.

### 2.3.1 Role and advantages homeownership

First of all, homeownership provides protection against housing (or living) security (McCarthy et al., 2001; Doling & Elsinga, 2012). The owners of the house can enjoy more stable and secure dwelling types than renters. Renters have risks of being displaced from their residence if the contract is over, or the property is sold/converted to non-rental. Homeowners do not have to move unless they choose to, so they tend to move less frequently compared to the other types of dwellings. They also have better control over the house than renters, in terms of renovations or customization.

Another important role of homeownership is providing financial security to owners (Zehnder, 1998; Naumanen, et al., 2012). Buying a house is forming wealth, as homeowners are mandated to save through paying off the mortgage debts. Typically, at the end of the mortgage payment, it becomes a single largest asset in the household budget (Ronald & Elsinga, 2012; Dietz & Haurin, 2003). The financial security from increased wealth is the major benefit of owning a house, as the owners can encash house by selling it whenever they need it.

Homeowners are also likely to be advantaged from their house prices. Normally, the value of other types of large consumptions, such as cars or large

electronic devices, diminishes as the moment it is purchased. The value of a house, on the other hand, does not decrease dramatically as other durable goods; rather it has a chance of increases over time and benefits the homeowners. This makes a house a relatively fine investment instrument for many households. Also, owning a home offers better access to capital than renters; the owners can use of loan secured on their house in case of emergency (Bradbury, 2010).

Also, purchasing a house usually requires long-term mortgages. The financial load at the beginning of purchase may be greater for owners than non-owners, but as mortgage repayment amount remains relatively constant in nominal terms (fall in real terms) and income rises, the burden might decrease over time (Doling, 2012). In contrast, rent generally rises as time passes; the financial burden might rise as well. Because rent is only consumption, thus no financial security is offered with a rental house.

### 2.3.2 Effect of homeownership

With help of house ensuring living and financial securities, homeowners are known to have better protection, security, and/or a sense of control over non-owners (Hiscock et al., 2001; Kleinhand & Elsinga, 2010). Also, they can feel more autonomy, less pressure, and better privacy in terms of housing (Despres, 1991). These positive features of homeownership may impact the owners' well-being, possibly in both physical and psychological paths. Although it is inconclusive, research on the housing effect found a tendency that owners have increased life satisfaction, higher self-esteem

and better social connectedness than non-owners (Rohe et al., 2002; Rotolo et al., 2010). Korean literature also evident the effect of a house on life-satisfaction (Park & Choi, 2019; Ryu & Han, 2018); subjective well-being was much higher for people with a house. To an extent, some researchers found its relation to physical health on owners (Austin & Baba, 1990; Saunders, 1990; Park & Choi, 2019)<sup>12</sup>.

Owning a home is also known to have a macro level effect: homeownership foster greater and consistent contribution to communities—such as school, nonprofits and voluntary organization, charities etc (Cox, 1982; Blum & Kingston, 1984; Rohe & Stewart 1996; Rossi and Weber, 1996). Also, owners are more active in political issues as well, in terms of higher participation in political activities and/or better rates of voting (Kingston et al. 1984). Owners are motivated to participate in these various social and political activities because they have strong motives to improve community environments. The active participation in society among homeowners is observed because a better community often leads to adding value to their homes (Dipasquale & Glaeser, 1999). For example, a good school district often is very closely related to house

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<sup>12</sup> Another widely known positive outcome is related to children of the house. They tended to have better educational attainment, such as better school performance, and lower school dropouts. Also, the children experienced reduced behavior problems, i.e., lower rates of pregnancy. The possible reason for this is that homeowners relatively have more stable life than non-owners, therefore having more time to spend with children or the possibility to monitor children's lives. Also, the owners might reside longer in the community, therefore easier to get resources from neighbors that can be additional supervision. Although there is wide research on homeownership and child outcomes in western countries, there is no solid evidence this is also applicable in Korean case.

price (Rohe & Stewart, 1996); this stimulates community members to actively participate in school volunteers/activities or raise funds, in order to improve or maintain the quality and environment of their educational district.

### 2.3.3 Using house in old-age

As mentioned, purchasing a house eventually becomes a major private asset for most of the owners, and provides strong financial security to the household. As an asset, housing equity is often viewed as an individual social insurance vehicle, working as a safety net that may help individuals/households during a tough period such as unemployment or various financial crisis. Although homeownership is a useful means to an individual at any time of their lives, it is considered particularly important for elderly men and women (Conley & Gifford, 2006; Doling & Elsinga, 2012; Elsinga & Mandic, 2010). Where old age people generally cannot anticipate regular income or revenue increase, the financial benefit of owning a home becomes much greater than other age groups. This section will discuss the two mechanisms of how homeownership financially benefits old age households.

Previous literature showed that homeownership can offer a financial benefit to older people, directly and indirectly—as an ‘income in cash’ and ‘income in kind.’ (Doling & Elsinga, 2012; Zehnder, 1998; Elsinga, et al., 2010): First, a house can provide direct cash to the owners, as one can realize the housing asset in the form of cash. This is commonly known as ‘income in cash,’ and the size of the benefit is generally equal to the value of the dwelling. Because monetizing a house is much harder than other forms of assets such as savings or bonds, income in cash from a

house is often expressed as ‘embedded in housing (Ronald & Elsinga, 2012).’ The easiest way to capitalize house in old age is, clearly, by selling the property and moving into other dwellings of lower price or rental accommodation. The owner can release house equity completely or partially (Reifner et al. 2009; French et al. 2017). A house can provide cash income to the older owners in lump-sum form, but the amount of income in cash gained from selling a house is not definitive. It can differ from time to time depending on the market value of the house, which can be affected by various internal and external conditions.

Early release scheme, which is usually represented with ‘reverse mortgage program’, is another solution to realize cash from the house. This is a useful way to use a house especially for those who are in need of cash, but do not want to move from their own house. Homeowners may borrow cash against the house equity and receive fixed, regular payments or lines of credit from the lenders (McCarthy, et al., 2001). In return, the lender gets the inheritance right of the house after the decease of the owner. With participating reverse mortgage scheme, the owners can get cash in annuity form; older homeowners not only may realize housing assets to maintain their life and consumptions, but also may age-in-place in their own house.

Nowadays, a reverse mortgage is considered as a fine substitute for an unsatisfactory safety net (Naumanen, et al., 2012). However, the use of a reverse mortgage is not sufficient enough to be considered as an alternative to existing welfare policies, because transforming housing assets into income in cash is often time not a comfortable process for elderly homeowners. They tend to hesitate to liquidate house

assets due to several psychological barriers, such as bequest and/or precautions motives, emotional attachment to their homes and neighbors (Doling & Elsinga, 2012; Doling & Elsinga, 2013). However, it is clear that the interest in reverse mortgages is growing as time passes (Watson & Webb, 2009; Hong, 2019).

The second method is using a house as a form of ‘income-in-kind’. It is an array of non-cash benefits that one can obtain by owning a house, often considered as a hidden source of income (Doling & Elsinga, 2012; Muller, 2019; Koppe, 2015; Elsinga & Mandic, 2010). It is also named ‘imputed rent’, because the size of the benefit is usually computed as the amount the owner would pay when he/she rent out the owned house at market rates. In different words, income-in-kind is an indirect income that one earns by saving housing fees. It prevents a household from paying rent, typically the largest single item of consumption that takes up a large part of household income if older household does not own a house. This is critical in income-less old age. By owning a house, one can live with reduced housing costs in old age, and the amount of rent can be saved and consumed in other areas. In other words, house helps older homeowners to maintain living at a lower cost than non-owners. The advantage gets from imputed income persists as long as the owner keeps the house.

Table 6 shows the six different strategies one can use for housing assets in old age (Doling & Elsinga, 2012). Not-dissaving housing asset provides an income in kind to older owners, meanwhile, dissaving housing asset offers an income in cash to older workers. Owners get the full benefit of income in-cash and in-kind if they continue to

live in outright housing and get a full reverse mortgage. If they choose to live in a house without or with a partial reverse mortgage, they will get full income in kind benefit, with zero or reduced income in cash. In contrast, if the owners choose to sell and move into other types of dwelling, they can get more income in cash, and reduced income in kind. If they sell the house and move to a rental house, they will get the full benefit from income in cash by dissaving, but no further benefit from income in kind will be available. Also, if they move down to a smaller dwelling, they will get reduced income in cash, but also get reduced income in kind. Owners decide which benefit they would receive between income in cash or in kind; either way, they would enjoy the benefit from house equity as a return for owners' investment of prior working period. Whichever strategy one decides to take, a house is helpful for one's later financial life.

[Table 6] Strategies of using house as income in-kind and in-cash

		Income In-kind	
		Full	Reduced/Zero
Income In-cash	Zero	Continue to live in home	Continue to live in home But let out part to a tenant
	Reduced	Reverse mortgage product against a part of the total equity	Move down market to a smaller/cheaper house
	Full	Reverse mortgage product against all of the total equity	Sell home and move into rental tenure

(Source: Doling & Elsinga, 2012)

## 2.4 Homeownership in Korea

### 2.4.1 Value of homeownership in Korea

Compared to western society, Korea (and also other East Asian countries) has more family-oriented characteristics (Ronald, 2007; Hirayama, 2012;). Being economic growth as a predominant national priority, public welfare was developed heavily relying on this unique environment, which means individuals and kinships are expected to be a major welfare provider and caregiver in case of need, and the role of government in welfare is focused on filling in the shortage (Ronald, 2007; Ronald & Doling, 2010). These two traits of the welfare system in Korea - family-oriented, state-residual provision- made homeownership particularly important to Korean people.

As mentioned in previous sections, homeownership is not only a shelter for a family, but also an income-in-kind and asset that can hold up a household in case of crisis or retirement. In a context where individual and family responsibility in welfare is widely understood as a standard, it is natural that homeownership to be mutually perceived as a cornerstone and fundamental basis to care for family members (Doling & Elsinga, 2012). In Korea, owning a house is not just having a shelter, but is securing core features to household and family welfare. In other words, homeownership is more than dwelling, but a 'must-have item', in individual welfare perspective. This phenomenon was especially prominent in 70-80s. Although this phenomenon is somewhat diminished nowadays, house owning is nonetheless very important in

Korean society.

Recent survey still clearly reflects this trend; according to Korean Housing Survey 2019, about 85 percent of all respondents answered that purchasing a house is a ‘must’, which is the highest count since the survey started in 2005 (Ministry of Land, Infrastructure and Transport, <http://stat.molit.go.kr>). This consciousness on homeownership is even more widespread among younger, newly-wed generations (87.8 percent). As it is a mutual perception that housing is necessary and a ‘must’ to provide well-being of the household members, including welfares in old age, it is not difficult to conclude that housing positioned especially important part Korea, and has a powerful effect on most of the people’s life and well-being<sup>13</sup>.

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<sup>13</sup> Another reason that makes homeownership valuable in Korea is the high rate of self-employment rate. Self-employed tend to have lower level of total pension than workplace employees (Shin, 2012; Park & Kim, 2020). They mainly rely on the zero and the first pillars of the pension system, as the self-employed are barely included in the second pillar pension scheme, and the burden for the first pillar public pension contribution makes a higher hurdle for them to participate in the third pillar pension system. As most of the time, they must shoulder all the pension contributions themselves, while workplace employees share their load with their employers. (NPS as an example, while workplace worker pays for half (4.5 percent) of their contribution, self-employed must pay for the full contribution of 9 percent.) These barriers often fail to lead self-employed to successfully participate in the multi-pillar pension schemes, but rather might opt for homeownership and landlordism (Wind, DeWilde & Doling, 2019). Korea has a self-employment rate of 25 percent approximately, which is 5<sup>th</sup> among OECD countries (OECD statistics). These population would have a higher probability to be opt out from the multi-pillar pension system but rely on retirement income from the housing.

#### 2.4.2 Homeownership and related policy in Korea

Despite the universal recognition of the importance of homeownership in Korea, the actual rate does not reach 60 percent as of 2019. This difference between the need and the reality of homeownership has a close relation to the fluctuation of the housing market, and the high price of dwellings (Woo, 2019; Kim, 2019).

Until the 1970s, Korea experienced a major shortfall of the house, therefore focused on supplying housing units to citizens. The government led the construction, prioritizing the increase of the absolute quantity of dwelling. After that, the Korean government has implemented different strategic policies in order to stabilize, sometimes to stimulate the housing market. Typically, the government chooses to reinforce or relax the housing market through controlling four types of area: tax system (house acquisition tax, housing possession tax), finance regulation (Debt To Income (DTI), Loan To Value (LTV), mortgage interest rate), transaction regulation (transaction reporting system, management of overheated speculation), and development regulation (redevelopment, price cap). When the housing market experience a rapid increase in housing price, the government address the issue with stabilizing policies such as transaction control, tax increase, tightening DTI and/or LTV, more supply on housing, etc. On the other hand, when housing prices decrease, the government used transaction vitalization, various financial support for buyers, deregulation on housing supply, the permission of new development, etc. to stimulate the depressed housing market (Choi et al., 2002; Woo, 2019).

Administrations before the 90s mainly focused to provide more dwellings to the people in Korea, as the house-to-total population (HTP) rate only was about 80 percent in 1990 (Statistics Korea). Most of the housing policies were centered on supplying homes. Housing was expanded consistently through construction and HTP finally reached 100% around 2002, and today, there is over-supply in dwelling, as HTP reached 118% of the total population. Then, starting from the late 90s, the Korean housing market experienced a very frequent transition between regulation and deregulation in a very short history to control house prices. Renowned economist Milton Friedman even referred to the Korean housing policy as “a fool in the shower room (Woo, 2019).”

In 1997, the economic crisis hit Korea critically (known as the IMF era); the housing market also experienced a great depression; thus government (Kim Dae-Jung administration) enacted every possible policy that can stimulate the housing market, which includes repealing apartment prices control, expanding tax exemptions, cutting transaction costs. In Rho Moo-Hyun administration (2003-2008), on the other hand, experienced a rapid increase in house price; the government implemented strong regulations to control housing price, such as strong regulation on constructions, imposing total real estate tax, decrease DTI and LTV, etc. However, Lee Myung-Bak and Park Geun-Hye administration chose to deregulate the housing policy at the same time providing more dwellings to the public. Finally, Moon Jae-In administration, chose the same path as the Noh administration, and tightened the various housing policy regulations. Homeownership policy was always a major issue for South Korean

administrations; most of the housing policies, are concentrated in homeownership related ones, which shows the position of the homeownership in the policy area.

### 3. Literature Review

#### 3.1 Theories on Public pension and individual pension

##### 3.1.2 Life Cycle Model

Modigliani's Life-Cycle model is a major theory in the economic field that explains individuals' behavior on saving, wealth accumulations and consumption. According to the Life-Cycle model, individuals seek to maximize their lifetime utility by saving and evenly distributing consumption in the best possible way, as individuals plan their financial behavior over his/her lifetimes. Individuals are expected to choose the level of consumption and savings in consideration of their present level of wealth and their current and expected future income. He/she is motivated to save during the time when one's income is higher compared to their consumption and dis-save in the times when the income decreases. In other words, by saving and building up an asset while individuals have income, he/she maintains the consumption at the habitual standard during his/her retired period. Thus, savings and stock of wealth are 'hump-shaped' – accumulated saving and asset rises with age, peaked by the time of retirement, and decreases after that (Blake, 2006; Yang, 2010).

On the other hand, some scholars insist that although the patterns for saving and asset accumulation do form a hump-shaped but dis-saving or asset decumulation may happen much slower than the Life-Cycle model predicted. In some cases, there is even additional accumulation after retirement (Poterba, 2001). Much academic effort was poured to extend the original Life-Cycle model to explain the unfitted phenomenon, which developed as to ideas of bequest motives, precautionary motives, liquidity constraints and more<sup>14</sup>. The life-Cycle model, both original and extended, is evaluated as a fundamental idea in modern theory and a major reference framework for analyzing the way of saving. The life-Cycle model is utilized for “making important economic inferences about the private and public provision of social security, implications of the stock market on the economy, the impact of demographic changes on national saving and in economic growth, and the determinants of national wealth (Ruiz-Menjivar, 2013).”

### 3.1.2 Life-Cycle model and pension

The life-Cycle model is also widely used to explain pension and its relation to private savings, which also often extended to individual pensions (Poterba et al., 1996; Kim, 2017). According to the original Life-Cycle model, the public pension is in the substitutive (or crowd-out) relationship with personal savings and pension. That is, participation in a public pension can decrease private savings or individual pension

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<sup>14</sup> This affects the saving progress as well, which will be discussed in the next section.

purchases, or vice versa. Individuals would discourage to save with the presence of a public pension, because they can anticipate a certain degree of public income after retirement—usually a greater level of benefit than the original contributed amount—they may result in saving less. This will be especially true for those who are less affordable for generous savings; they would have a higher chance to substitute public pension for private savings. However, even for those individuals who can manage for generous saving, the importance for personal preparation of the later life may relatively decrease. For these reasons, under the original Life-Cycle model, it is natural that the public pension and personal savings are in a substitutive relationship.

However, the public pension also can have a complementary relationship with personal savings, according to the extended Life Cycle Model. Scholars who claimed the 'crowd-in' effect between the public pension and personal savings, explain the relationship of the two, by retirement effect, bequest motives, precautionary motives, among others. As the public pension system helps the livelihood in the aged life, it may motivate workers to retire earlier. Thus, to be prepared for spending a longer aged life after retirement, the individuals would feel greater needs for saving during the labor period, which can lead to better saving outcomes. This has been first suggested by Feldstein (1974); he claimed that both substitution effect and retirement effect may appear on the relationship with the public pension and private savings and that the net effect is determined depending on the relative size of the two effects.

On the other hand, Barro (1974) and a number of other scholars claimed that

private savings would be increased by the bequest motives, a wish to leave bequests to descendants. Parents generally hope for their children's best and well-being, and furthermore, the utility of parents can be affected by their children's utility at certain levels (Laferrere & Wolff, 2006). These reasons can arise motives on the bequest, which can lead individuals to increase savings. Recognition effect (or education effect) is also widely used as an idea to explain the complementary relationship. Scholars including Cagan et al. (1965), described how the public pension raise and educate people about their retirement, naturally heads to increase the savings.

Also, there is a precautionary motive (Kimball, 1990); it is highly related to the uncertainty that individuals do not have accurate information on their remaining lives, on top of their fear over the health in old age. Due to the uncertainty they face, individuals may become very cautious about their consumptions. This makes individuals to save more, while motives them to decrease or postponed consumption as much as possible. Compared to other countries with more generous public pension or solid multi-pillar pension systems, the cautious motives may be more influential in Korea as the public pension policy has limitations securing old people's well-being. Liquidity constraints attached to pension also can stimulate savings behaviors. According to Bailliu and Reisen (1998), liquidity constraints can make individuals become more cautious to uncertainty over future income. The higher the liquidity constraints are, the more individuals become cautious, which can lead to greater saving outcomes.

In short, according to the original Life-Cycle model, the public pension may crowd-out private savings or individual pensions. However, as the effect of public pension is also influenced by the complementary force including retirement induced effect, bequest motive, precautionary motive, and recognition effect, the relationship between the pension and saving is determined depending on the extent of their influences. The empirical evidence also showed both directions of relationship, which will be discussed in the following section.

### 3.1.3 Evidence: relationship between pension and savings

There is much empirical evidence regarding the relationship between public pension and savings; the results of long listed literature, both cross-sectional and longitudinal studies are quite complicated, showing different directions of relationships<sup>15</sup>. First of all, Feldstein(1974)'s study analyzed the impact of social security on one's savings and retirements from 1929-1971. His pioneering work showed that social security tended to decrease personal savings by about 30 to 50 percent. Kotlikoff (1979) also analyzed the relationship between social security wealth and individual savings using males between the age of 45 and 59 of 1966 US Census data. His result concurred with

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<sup>15</sup> Private savings or pension are also known to have negative/substitutive relationship with other financial products, such as insurance, stock, etc. (Mitchall et al, 1999; Milevsky & Young, 2003; Kim & Kim, 2014), as these can also be other means of savings, which grows during one's working period. However, this study does not include these products into consideration because these financial products are not widely seen as a 'future income.' In the retired era.

Feldstein's (1974), finding substitutive effect around 66 percent. Gale (1998) made critics on measurement errors of previous studies and used Least Absolute Deviation Regression to analyze the effect of pension. Using Survey of Consumer Finance data, he found the negative effect of social security wealth on non-pension savings was averaged 0.770, which was much higher than existing results. Attansio and Rohwedder (2003) asserted the effect of public pension on savings behaviors by comparing the difference of personal savings outcomes before and after the public pension reforms; they assumed that savings would react to the change of public pension wealth. Using difference-in-difference estimations, they found diminished public pension generosity had a positive effect on saving rates, ranging from 0.65 to 0.75, depending on the age groups. Lachowska & Myck (2015) used a similar technique to Attansio and Rohwedder (2003), using the Poland case. They also used difference-in-difference estimations and compared personal saving rates before and after public pension reforms in Poland. Likewise, they found substituting effect, as 1 Poland złoty decrease in public pension generosity led to 0.24 złoty increase in personal savings. Other studies, such as Feldstein & Pellechio (1979), Diamond & Hausman (1984), Pfau (2005), and Alessie, Angelini & Santen (2013) also explored the effect of pension on savings, and found a substitutive effect of 0.5, 0.25~0.4, 0.5, and 0.47~0.61, respectively. These studies generally found the generous pension is, the less saving the individual made, or vice versa.

On the other hand, there is also a number of studies that did not observe the

crowd-out effect of pension on private savings. Barro & MacDonald (1979)'s result on their analysis of 16 countries' data implied that public pension did not depress or promote private savings. Meanwhile, Hurst & Ziliak (2006) performed longitudinal analysis using Panel Study of Income Dynamics (1994-2001) to find out the public pension effect on savings; but the result also did not find any significant relationships. Gustman & Steinmeier (1998), on the other hand, criticized previous studies having a limited address on heterogeneity. Using data from Health and Retirement Study, they showed that the regression result without addressing heterogeneity predicted the substitutional effect of pension on personal wealth, while the relation turned out to be very limited or no replacement at all, after proper consideration of heterogeneity. Other similar studies, such as Datta & Shome (1981), Gullason et al (1993), Hubbard (1986), and Leimer & Lesnoy (1982) found no effect of public pension on private savings or wealth.

Dicks-Mireaus and King (1982), on the other hand, found a positive effect of public pension on savings. They used data of 8,000+ Canadian households to estimate the effect of pension wealth on private savings, and the result suggests that there is a small but significant positive relationship between the two. David & Menchik (1985) took bequest motive into consideration. The result also showed pension wealth, in fact, has a positive effect on savings, up to 13 percent points.

Similar studies also have been actively conducted in Korea, and the results were alike those from other countries. Both crowd-in and crowd-out relations between

the pension and savings were witnessed. Ahn and Lee (2016), Gil (2005), Hong (2012), Kang & Im (2005), Cha & Kim (2013); Kang & Hong (2009); Im and Moon (2003) and more, using different strategies (including regression, DID, Generalized Method Moments, simulations, etc), with various sources of data, in order to examine the effect of public pension on savings. The results do find negative relations between them, and the substitution rate was ranged between 0.1 and 0.4. These studies supported Feldstein's original argument on substitutive effect, although the overall crowd-out effect of public pension on private saving tended to be weaker in Korea, compared to the evidence from other countries. By contrast, number of literatures in Korea also presented results that did not support the substitutive effects. Kim & Kim (2014), Jeon (2010), Jeon and Im (2008), Jeon and Im (2011), Jang and Song (2016) did not find a significant relationship between pension and savings, while Yoo & Yoo (2015) and Kwon (2013) rather found a crowd-in effect, suggesting the relationship might be mutually complementary, rather than substitutional.

A few studies (but not many) also investigated the outcome of saving according to the public pension type that individual participated in; the results, too, were found to be contradictory in this case either. Im and Moon (2003) found a stronger crowd-out effect on savings among SOP participants, while they did not find a relationship among NPS participants. In contrast, Kang and Im (2005) found the crowd-out effect on saving was statistically smaller in SOP households (more specifically, government employee households) than non-SOP households. While, a recent study by Jang and

Song (2016) did not find any crowd in or out effect neither for SOP nor for NPS.

The described studies above investigated the relationship between public pension and private savings. As mentioned, the empirical evidence concurred with theoretical arguments, showing both directions of results. There are number of studies in Korea that examined the relationship specifically between public pension and individual pension. The result can be expected to be similar to the public pension-saving relationship, as individual pensions can be considered as one special type of private savings (Kim, 2017). However, the empirical results in Korea show a somewhat different pattern.

Few scholars observe the crowd-out effect of public pension on individual pension through their studies. Kim (2013) used simulation to explore factors associated with individual pension purchase; with Korean Labor and Income Panel Study (KLIPS) wave 4 to 11 and dynamic random effects probit model, he found substitutive effect between individual pension and public pension participations.

In contrast, most of the related studies found opposite, or non-significant effects. Jeon, Im & Kang (2006) used a binary panel logit model on KLIPS 4~7 waves to investigate the effect of NPS on individual pension participations. Their result found public pension helped people to participate and maintain the individual pension purchase. Also, Kim et al. (2015) claimed that public pension participation raises the probability to participate in individual pension, and higher public pension contribution also tended to associate with a higher amount of individual pension

contribution. They used the Public finance panel (wave 1 through 6) with Panel Logit and Panel Tobit analysis.

On the other hand, Jeon & Im (2008) estimated how the wealth affected individual pension participation and its amount, with 2005 KReIS data. They found that the NPS did not affect individual pension in either direction; it did not have stimulating or diminishing effects. Similarly, the study of Moon (2012) used fixed effect panel logistic regression to explore individual pension participation. His analysis result of KReIS data shows that public pension participation did not have any significant effect. Yoo (2020) also did not find any significant relationship between public pension and individual pension, either participation or contribution amount. She used KLIPS waves 4 through 20, using panel data of 5,000 households, with panel Tobit, fixed effect and random effect analysis.

[Table 7] Summary of previous literature on public and-private savings and pension

<b>Public pension saving/wealth and private saving</b>	Negative	Feldstein (1974), Kotlikoff (1979), Gale (1998), Attansio & Rohwedder (2003), Lachowska & Myck (2015), Feldstein & Pellechio (1979), Diamond & Hausman (1984), Pfau (2005), Alessie, Angelini & Santen (2013)
		Ahn & Lee (2016), Gil (2005), Hong (2012), Kang & Im (2005), Cha & Kim (2013), Kang & Hong (2009), Im & Moon (2003)
	Nonsignificant	Barro & MacDonald (1979), Hurst & Ziliak (2006), Gustman & Steinmeier (1998), Datta & Shome (1981), Gullason et al (1993), Hubbard (1986), Leimer & Lesnoy (1982)
		Kim & Kim (2014), Jeon (2010), Jeon & Im (2008), Jeon & Im (2011), Jang & Song (2016)

	Positive	Dicks-Mireaus and King (1982), David & Menchik (1985)
		Yoo & Yoo (2017), Kwon (2013)
<b>Public pension saving/wealth and individual pension</b>	Negative	Kim (2013)
	Nonsignificant	Jeon & Im (2008), Moon (2012), Yoo (2020)
	Positive	Jeon, Im & Kang (2006), Kim et al. (2015)

In sum, previous studies on public pensions and savings showed both directions outcomes, showing both crowding in and out effect between the two factors. However, when it narrows down to the relationship between public pension and individual pension in Korea, the direction becomes more like ‘one-way’; the results only present complementary or non-significant ones. This needs careful attention in terms of generalization, due to several limitations: First, only a few studies focus on individual pensions purchase amount; there are not many studies investigating the effect of public pension on individual pension purchase itself, but existing studies tend to focus on individual pensions’ participation, and only handful study examines the relationship between public pension and individual pension purchase amount. Decisions on individual pension participation and decisions on purchase level might have different mechanisms and might be affected by different factors. Detailed and separate investigations might lead to different results; more academic attention is needed for this area.

Second, many of the previous studies failed to consider different aspects of

public pensions: the types (NPS or SOP) or contribution level. Although there is some evidence that generosity level might affect the saving outcome differently, existing studies often time overlook this difference in individual pensions. Consideration on these differences also might show distinct results. Finally, there is a methodological problem: the majority of studies regarding individual pension purchase in Korea used Probit (participation) or Tobit (purchase amount) analysis to estimate the topic. Although this analysis is widely known to be an effective way to address censored data, there might be a better way to answer the question. This will be further discussed in Chapter 4.

## 3.2 Theories on Homeownership and pension relationship

### 3.2.1 Life Cycle Model & “Trade-off” Theory

This section will introduce two major theories that conjecture the relationship between homeownership and pension; Modigliani’s Life-cycle model and Kemeny’s ‘trade-off’ theory. As housing composes the largest part of the asset that plays a key mechanism of individuals’ saving and dis-saving, it certainly correlated to the life-cycle model. According to the original life cycle model, a person smooths the consumption through the following process of purchase and selling of housing: individuals purchase a house and save through mortgage repayment, and retirees liquidate housing by selling and down-sizing the dwelling (or switching to rental) and consume the asset (Feinstein &

McFadden, 1989)<sup>16</sup>. Similar to public pension, purchasing housing generally constitutes a negative correlation with private savings or individual pensions; many scholars showed the evidence that constitutes this relationship, including Jones (1997), Choi (2011), Krumm & Kelly (1989), and more. However, it is also a known fact that the crowd-in effect of homeownership on savings (or individual pension) may also exist, with a similar reason explaining the positive relationship between pension and savings in the previous section.

Kemeny's 'trade-off' theory is another important theoretical framework to understand the relationship between pension and homeownership. Kemeny is one of the renowned scholars who provided insight on the link between housing and welfare in his well-known publications (1980, 2001, 2005, 2006). In his study, he developed a theory on the inverse relation between homeownership and pension. He focused on the tendency of pension spending and homeownership rates at the country level, in order to investigate the relationship between the welfare state and the housing market.

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<sup>16</sup> However, previous research argues that the saving and dissaving process through housing also does not occur as predicted through the life-cycle model. Artle & Varaiya (1978) showed how households lowered consumption and increase saving from prior to house purchase (until they have enough budget to pay for a minimum down payment). While, Jones (1997), Skinner (1996), Sheiner & Weil (1992) found that housing slowly dis-saved than other forms of savings or assets. People are inclined to use the house as a 'last resort' and do not actively include house prices in old-age spending. Thus, Housing assets were likely to be liquidated after consumption of their non-housing savings. Although these arguments show that housing can affect the savings of individuals' lives differently compared to the prediction of the life cycle model, this model still is a strong theory to explain the relationship of the two.

He asserted that the countries with generous welfare provision tended to have a lower level of homeownership with the stronger rental markets, while the societies with higher levels of homeownership had relatively restrained welfare services.

Although Kemeny did not provide empirical proof to the theory, and his theory was limited on macro level concepts, his idea became extensively discussed both in macro and micro levels and empirically tested by other scholars. Latter research developed a detailed mechanism on the trade-off relationship between homeownership and pension. More specially, this can be divided into personal and societal level trade-offs (Doling & Elsinga, 2012; Kim, 2019, Muller 2019 and more).

First, the personal level trade-off emphasized the ideas on budget-constraints and economic-incentive. Housing is a high-priced good that requires considerable wealth to acquire, and accounts for most of the household's assets. Also, as mentioned, homeownership usually comes with mortgage debt, which performs as a role of allocating one's housing expenses throughout one's life. This, in fact, is similar progress to redistributing one's resources over the life cycle. As buying housing requires a consistent and prolonged expense payment, if individuals choose to buy a house, it is likely that they would experience financial pressure throughout given periods. And this can work as a substantial burden for them to make other types of consumption, especially a (generous) pension, which also requires a consistent and prolonged contribution. These budget-constraints can cause the inverse relationship between pension and house—known as 'constraint-induced trade-offs'.

On the other hand, homeowners would have less pressure on the future housing expenses, especially in their retired era, as they do not need to fret about rent payment. They will get by with a smaller budget compared to non-owners, because housing expenses will be greatly reduced. Moreover, homeowners can secure capital by selling their houses if they face financial shock in old age life. Which means, theoretically, the owners will be less in need of generous pension or welfare provision; and again, this becomes a reason for the inverse relationship. It is called economic-incentive or need-induced trade-offs; the budget-constraint and need-induced trade-off mechanism may affect homeowners not to prefer large old-age pension, less in need for generous individual pension and moreover, lead individuals to become resistant to generous mandatory public pensions (Ronald, 2008; Doling 1997).

The mechanism for the societal level trade-off process is also similar (constraint-induced and need-induced). If the state takes policies to promote homeownership, (for example, through tax benefits or allowances to assist house purchase) the budget availability for welfare spending including public and individual pension systems might be a constraint. In other words, generous policies for homeownership often, can be translated into limited expenditure on social welfare, and vice versa. Also, as stated above, housing can be used as retirement savings, so individuals' need for pensions can be reduced. This leads to the decline of active political pressure on the governmental income support in old age, such as the generous public pension system or subsidies for the individual pension purchase. Furthermore,

individual budget-constraints may cause public resistance to the development of pension systems, which makes it harder for government to receive public understating to fund budget or tax for generous pension provision (Kemeny, 2005; Ronald & Doling, 2011).

### 3.2.2 Empirical evidence: relationship between homeownership and pension

As original Kemeny's argument on the relationship between homeownership and pension is on a macro level, there are many empirical studies regarding country or societal level of trade-offs. Castle (1998) is one of the first scholars who examined the correlation between homeownership and pension expenditure of OECD countries, with the years 1960, 1970, 1980 and 1990. He confirmed Kemeny's inverse relationship between the two factors, finding a strong negative correlation with all four time points, although it becomes weaker as time passed. Stamso (2010) compared the relationship of homeownership and pension spending of 1980 and 2001 to examine whether the relationship has changed among selected OECD countries. She found there is a negative relationship between the two, for both time points, showing Kemeny's trade-off persisted for the years. However, the trade-off slope between homeownership and pension was steeper in the year 1980, and more gradual in the year 2001. This indicates that although a trade-off exists, the intensity between the two got reduced. Van Gunten & Kohl (2019) examined the relationship between homeownership and pension including more recent years, using the Comparative Welfare Entitlement Dataset. They analyzed the relationship of 19 countries in 1970,

1980, 1990, 2000 and 2010 time points; their result showed that there was a strong trade-off between homeownership and pension in earlier years (1970 and 1980), but the relationship became neutral in 1990; in 2000 and 2010 the relationship finally got inversed. They showed that the relationship between homeownership and pension is now more of a complementary or positive relationship, rather than a trade-off. This result is opposite to Stams (2010)'s investigation, which insisted that there is still a trade-off relationship between homeownership and pension (in the year 2000) although there is a tendency for weaker intensity. The overall trends illustrate that the macro trade-off existed in the past, but it is gradually weakening.

There were several more studies on a macro level trade-off between homeownership and pension. These includes Conley & Gifford (2006), Fahey (2003), Delfani De Deken & Dewilde (2014; 2015), Dewilde & Raeymaeckers (2008), Doling (2013) Doling & Ronald (2010), Morris (2016). They examined the trade-offs of countries or certain regions, and the result generally endorsed Kemeny's argument. Yet there also were several studies that found macro level inverse, or non-significant relationships between the two factors. <sup>17</sup>.

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<sup>17</sup> There are case studies as well; the followings are a few studies that investigate the housing-pension relationship within or between countries. According to Castle & Ferrera (1996), Australia, Canada, Finland, Ireland, New Zealand, Norway, Spain, and the USA tended to have a high homeownership rate with low pension provision. Meanwhile, Austria, Belgium, Denmark, Germany, Luxembourg, Netherlands, and Sweden had high pension provisions with a low homeownership rate. In general, most of the countries fit into the categories of trade-off, but there were exceptions as well. Portugal had a low pension with low homeownership, and Greece, Italy, the UK

On the other hand, there are some efforts to clarify the causal relationship between homeownership and pension. In Kemeny's explanation of the relationship, homeownership can be the causal factor of the trade-off. Homeowner's society strengthens the need for the house that can lead to low pension contribution, as owners will resist tax payment for generous welfare systems. However, Castle explains the trade-off the other way around. His argument insists that the low welfare system and poor pension provision motivated the purchase of housing to prepare for old age; In Castle's argument, the low pension scheme can be a causal factor for the trade-off relationship. This argument has been issued among scholars, and a few research was conducted to seek some answers: Doling and Horsewood (2011) examined the possible causality between the two, using the Granger causality test. They analyzed the

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and France had a high ownership rate with a high pension. Castle & Ferrera tried to provide some rationale (policy mix, demographic problems, family-oriented society) to explain the exception made by 'Southern Europe' — Greece and Italy. Doling & Omar (2012) investigated East Asia, especially the case of Malaysia, and they found pension-homeownership relationships in Malaysia were different from western countries. Whereas western countries have a 'trade-off' in general, which is not only between sectors but also between markets and states. This means, according to Doling & Omar, the low-income people tend to get benefits from 'pension' or state, while the high-income group receives benefits from homeownership or market sectors. However, in Malaysia, the relationship between pension and homeownership, is not a trade-off or substitution but can be complementing and reinforce relationship due to several reasons including a family-oriented society. However, Yuan et al. (2017) tried to investigate the relationship between homeownership and pension in China with quantitative analysis. They tested 35 city panel data in the years of 1998-2012; They found there was a negative correlation between homeownership and house price with government spending for social security, which is the result that supports the trade-off theory of Kemeny.

'direction' of causality between a house price change and total spending for old age assistance among OECD countries between 1980 and 2003. The result showed that an increase in housing price was followed by a reduction of government spending on old age, while a decrease in price was chased by an increase in state expenditure. This was noticeably significant, especially in liberal and Conservative-corporatist countries. This result indicates the house is the causal factor in the housing-pension relationship. Yuan et al. (2017) also found some causality in their study: They tested the relationship of homeownership rates/house price with social security spending of 35 cities in China. They conducted panel data in the years of 1998-2012, used a two-way fixed effects framework as an analytic strategy. They found an increase in housing price and homeownership had a significant negative effect on public social security provision. More specifically, 1 percent of the increase in house price caused 1.15 Yuan decrease in social security expenditure per capita. This result also indicates housing as a causal factor. Although there are not many studies regarding the causality of the two factors, these concurred results showed the possible direction of causality relationship between the two.

While, research regarding trade-off at the individual level based on Kemeny's theory, is even scarcer. Muller (2019) is one of few studies that examined the effect of the housing-public pension relationship at a micro level. He used a European data set (SHARE) and proved the trade-off effects within a household portfolio. He found a substitutive effect between housing and pension wealth, ranging from about 16 to 22

percent. Torricelli et al. (2016) also examined the trade-off relationship at the household level, using the Italy Survey of Household Income and Wealth data from 1995-2012. They analyzed the effect of homeownership and housing wealth on individual pension purchases. The result found the offset between the two factors, showing consistent outcomes parallel to macro level analysis. Similarly, Kim (2019) explored the empirical link between homeownership, house price and individual pension. The study used a Two-Part analysis with Public Finance 8th wave data in Korea, and the result indicates that homeownership and house price increase the probability of individual pension purchase itself. However, the study also found evidence on trade-off, as housing was found to have a negative effect on individual pension amount. These studies generally confirm the negative relationship between homeownership and pension at the micro level.

Eckardt et al. (2018) focused on personal pension and homeownership in European society. They argued that personal pension and homeownership are two main investments that one makes over their life cycle, and the investment decisions are interdependent. They categorized Ireland, Netherland, the UK as a society with high individual pension and high homeownership, Italy, Hungary as a country with low individual pension and high homeownership, and Germany as low degree of individual pension and homeownership, and gave a detailed description of each country's social and political settings (Jiyawala et al., 2018; Haffner, 2018; Sharma, et al., 2018; Murro & Palmisano, 2018; Dotsch et al., 2018; and Clerc-Renaud, et al.

2018). They majorly argued that the relationship can vary greatly by the countries' political settings and fiscal situations. Meanwhile, Ho and Zhou (2016) presented a simulation analysis using the Survey of Consumer Finances, to illustrate the relationship between personal pension and individual homeownership decisions in the U.S. They found homeownership promotes individual pension, which illustrates the complementary relationship between the two. Their finding showed homeowners purchase individual pensions by making smaller down payments<sup>18</sup>.

Although there is only a small number of studies specifically on housing and pension at the micro level, a few more empirical studies exist if the relationship extends to housing and general savings. Housing and saving are also inclined to have mixed results. For example, Krumm and Kelly (1989) found a positive relationship between homeownership and savings with a 1976 survey on consumer credit data. Analyzed with OLS and Heckman two-stage, they investigated the difference of savings between homeowners and renters. The result implies that homeowners tended to save better than non-owners, and consumption of higher housing assets led to a substantial increase in savings. De et al. (2007) examined the link between homeownership and household savings, and the result was similar to previously mentioned studies. They used longitudinal analysis using PSID from 1989-2001, and found that the house price

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<sup>18</sup> Some of the studies included the housing variables as a control variable in investigating the determinant of individual pension purchase. The results were controversial; while Cha(2003) and Joo (2010) reported the negative relationship, Kim et al (2011), Kim (2013), and Jeon (2016) did not find any significant correlation. Baek (2012) on the other hand, found a positive relationship.

did have a positive and significant effect on household savings, Meanwhile, Amoateng (2002) used Granger’s causality test to investigate the effect of homeownership on personal savings, using 1980-2000 data. However, he did not find any significant relationship between the two. In the same token, Lan (2017) used the 2011 urban household survey data set in China to measure the relationship between house prices and saving rates. Their cross-sectional analysis found that higher housing price was closely associated with lower saving rates. Similarly, Li et al. (2013) measured the effect of house price on household savings using 2002 and 2007 data of the Chinese Household Income Project. Their finding indicates that it has negative effects among the owners in all periods.

[Table 8] Summary of previous literature on housing and pension/savings

<b>Housing-pension relationships</b>	Macro level	Castle (1998), Stams (2010), Van Gunten & Kohl (2019), Conley & Gifford (2006), Fahey (2003), Delfani De Deken & Dewilde (2014; 2015), Dewilde & Raeymaeckers (2008), Doling (2013) Doling & Ronald (2010), Morris (2016)
	Micro level	Muller (2019), Torricelli et al. (2016), Kim (2019), Eckardt et al. (2018), Ho and Zhou (2016)
	Case study	Castle & Ferrera (1996), Doling & Omar (2012), Yuan et al. (2017)
	Causality Study	Doling and Horsewood (2011), Yuan et al. (2017)
<b>Housing-saving relationships</b>	Positive result	Krumm and Kelly (1989), De et al. (2007)
	Non-significant	Amoateng (2002)
	Negative result	Lan (2017), Li et al. (2013)

The section will close the discussion by mentioning several limitations of previous studies: First, the greatest limitation of all, is the lack of studies focusing on housing and individual pension purchase; also in other countries, but especially in Korea. This deficiency of academic concern makes it hard to make any generalizations regarding this matter. More research in this area is necessary without a doubt, especially housing area is gaining importance in welfare studies. In addition, previous studies failed to consider the interaction effect of public pension and housing, on an individual pension; To the best of my knowledge, there is no study concerning this matter. As will be discussed in the next section, the effect of housing on individual pensions might differ according to the people's public pension level. Similarly, the effect of public pension on an individual pension can be altered by the status of homeownership or house price. For example, if individuals cannot expect a generous public pension, they would purchase more individual pension; but if they own a house, their actual purchase might not be large, theoretically. On the other hand, if individuals own generous public pension, they should have less individual pension purchase; but if they do not own a house, they might buy a higher level of individual pension. If both pension types are assumed to have a complementary relationship, they might have a higher probability to purchase individual pension, when the individuals have a higher public pension. However, this relationship also might be affected by housing; a person with a higher public pension and housing might not need an additional pension. In this sense, there is a great possibility that the two factors might have an interaction effect on individual pension purchases. However, no study

so far has explored the interaction effect of housing and public pension, which can be a huge research gap in academia.

Another limitation is on methodology; There are studies that considered both a public pension and/or housing on individual pension (Torricelli, 2016; Kim, 2019); but failed to address the endogeneity issue. The purchase level of individual pension will be greatly influenced by housing as well as a public pension; the two factors are assumed to have a trade-off relationship according to previous studies. This implies that public pension, and housing are highly likely to have an endogenous relationship, which needs to be modified before the analysis. However, Torricelli (2016) and Kim (2019), both did not consider the possibility of endogeneity issue, and this might cause the result to be under or overestimated. Endogeneity is not an easy problem to be solved completely, but this study will deal with the problem with effective methods, which will be further discussed in Chapter IV.

## 4. Pension and Homeownership: role and relation

### 4.1 Shared role in later life

As seen from the previous sections, public and individual pension and homeownership have similar aspects. They have conformity as a consumption smoothing device over one's life cycle. People save their income through public and individual pensions during working time and receive the accumulated savings as an old age income.

Homeownership also has a similar pathway, as people buy a house and pay off mortgage loans during the labor period and enjoy the financial benefit after retirement in the forms of income-in-cash or income-in-kind. Both become a major income source in later life.

As they together provide a key financial benefit, they mutually buffer the poverty of older people. In fact, OECD favors not only public and individual pension, but also homeownership as one of the key factors that can prevent elderly poverty (OECD, 2013). The absence of either factor makes old age very difficult to get by; needless to mention, lack of a pension in one's old age would make his/her life increasingly hard. For instance, those who do own houses, but do not have a regular income, would eventually slide into poverty unless they dis-save the house (De Decker & Dewilde, 2010). Often called 'asset-rich, house-poor', many Korean old age people fall into this status (Heo, Ahn & Hong, 2016). In contrast, the absence of homeownership in old age poses a heavy financial burden to the income-limited older households. Non-homeowner retirees will have a higher possibility to be exposed to old age poverty as housing costs usually is the biggest source of expenditure of the household, even if they prepare for multi-layered pension. For these reasons, both homeownership and pension are critical for old age retirees.

Because the pension system was originally designed to prevent old age poverty, many literatures attempted to measure its effect on poverty alleviation. Although its power lessening the risk and vulnerability to poverty may vary across the countries,

pension type, policy setting, maturity and/or structure, there is consensus, in general, that pension benefit is an important factor behind the decline of poverty in old age. Englehardt and Gruber (2004), Engelhardt et al (2005), Korpi and Palme (1998), Smeeding (2001), Williamson and Smeeding (2004), Zaidi et al. (2006), Hauser(1997), Kim et al. (2018), among many, found evidence in individual, society, and country levels that social security is effective in improving elderly living arrangements and reducing poverty incidence among the elderly population. There are also similar efforts in Korea that measure the poverty alleviation effect of pensions (Kwon, 2000; Hong, 2005; Kim and Kwon, 2007; Kang 2011; Kand and Im, 2009; Seok, 2010a; Seok, 2010b)<sup>19</sup>. These studies commonly found that expanded coverage and greater pension generosity found as important factor that affects the outcome of poverty alleviation (Vos et al., 2008). Without pension benefits, the rate and intensity of poverty among older people will be much greater.

There are also several studies on the impact of housing on old age poverty

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<sup>19</sup> Related studies in Korea were conducted largely through simulating or calculating poverty rates and/or gaps before and after pension benefits. Most of the previous literature found the poverty alleviation effect of the public pension. For example, the effect was found 9.2 percent in 2004 (Kim, 2004), but as the system gets mature, the alleviation rate increased consistently, up to 34 percent in the 2010s. Although individual pension does not have a significant effect on reducing poverty at this point due to low coverage and participation, but it is expected to have increasingly larger benefits, synergy with a public pension. There are critics among scholars that the anti-poverty effect of public pension in Korea is not significant compared to other countries, the beneficiaries of pension do have better-off financially compared to non-beneficiaries, for most cases.

alleviation. As housing costs usually are the biggest source of expenditure of the household, the absence of homeownership in old age poses a heavy financial burden to the income-limited older households. Which is, in other words, those with homeownership can be quite free from the housing costs, because related expenses become limited to utilities and maintenance. This could work as a great financial relief to old age groups with constrained income. Morris (2016) found in his study that the elderly with his/her own house was able to maintain a certain level of living with public pension benefit alone, while those without homeownership tended to suffer serious financial distress. In the same vein, Delfani et al. (2014) also revealed that a high proportion of housing costs in later life (usually caused by not having one's own house) might expose individuals to the risk of poverty, even if the retirees own public pension income (or more). Yates & Bradbury (2010) also emphasized the importance of housing by showing significantly higher poverty rates among non-homeowners with higher housing costs, compared to the owners. OECD (2013) analyzed the benefit of homeownership as income-in-kind of 22 OECD member states and stressed the importance of housing wealth in old age poverty: it showed the imputed rent decrease the level of poverty in most countries, and the rate was as high as 7 percent. In a similar token, Choi (2011) showed that the more housing costs one spends, the higher possibility he/she will expose to poverty in later life. Which means, even if the older retirees have generous retirement income, the risk of poverty will likely increase if housing costs are high. These research commonly indicates that, pension and homeownership are all critically important in old age, especially protecting poverty.

## 4.2 Parallel Growth and competing relationship

In order to play the 'shared role' at a later age, public pension, individual pension and homeownership have to undergo parallel growth during the working period. Both pension contribution and housing mortgage repayment periods require a considerable length of time, and these payments usually overlap through one's life span. Normally, individuals join the public pension scheme at the time he/she starts economic activity, which starts in one's 20s on average. Since public pension is mandatory for all working individuals, those who work and earn income are required to contribute the benefit throughout the labor period. Meanwhile, a house is purchased at different points in individuals' life, which can greatly vary from person to person. But since a house usually is a high-priced good, people generally get mortgages and repay the loan for extensive periods. In Korea, the average age of purchasing a house is the late- 30s (Korean Housing Survey, <http://stat.molit.go.kr>); the installment payments period is around 10-20 years, while it can be extended. Thus, the mortgage repayment term also is expected to take up a significant proportion in individuals' labor period.

Furthermore, both housing payment and pension contribution involve a substantial amount of capital to be paid. Individuals are required to pay 9% of their income (and up to 17% for SOP) as a public pension contribution. According to the recent Korean Housing Affordability Index (K-HAI), which shows the proportion of

housing mortgage amount in overall income, housing mortgage takes up about 15% of individual income in average households as of 2016 (Kim, 2016). The average monthly income of Korean workers is 3,290,000 KRW as of 2017; this means 246,750 KRW is deducted as a public pension contribution, and about 493,500 KRW is paid as homeownership mortgage. The persistent and substantial contribution to public pension and housing naturally and inevitably impacts the household budget, savings and consumption.

Similar to public pension and housing, individual pension also requires people to pay a given amount of contribution for a substantial period, on regular basis. Although the purchase amount or period can differ among people, the individual pension has parallel growth to public pension and homeownership. Furthermore, individual pension grows within the limited resources along with public pension and housing purchase; it needs to compete with other factors. In other words, all three contributions occur within the boundary of an individual's income during one's life cycle, which makes individual pensions inevitably be influenced by the other two<sup>20</sup>.

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<sup>20</sup> Individual pension is regarded as a matter of choice while public pension is mandatory, and housing is a 'norm'. Thus, individual pension is rather influenced by public pension and housing, than affecting the two.

### 4.3 Interaction effects

Taken together with previous arguments, this study expects public pension, and homeownership (and house price) to have an interaction effect on an individual pension. It is assumed that the effect of housing on individual pensions might differ according to the people's public pension level, vice versa.

Although Kemeny's theory initiated from trade-off at a macroscopic level on state public pension spending and homeownership rate, the mechanism behind the trade-off is also valid at the individual or household level (Muller, 2019); the trade-off on pension (public and/or individual) and housing within households is highly likely to occur. As described above, when an individual purchases a house, one can live with smaller living expenses in later years and thus needs for (additional) pension arrangements decrease. However, when an individual fails to purchase a house, she/he would need generous income in retirement to make ends meet, and this may encourage additional pension purchase. Also, when individuals purchase a house, they need to pay off a house mortgage which becomes a financial burden that makes them harder to contribute to the pension. If individuals do not buy a house, there is a relatively surplus budget which makes one would feel less burdens on a pension contribution. In the opposite perspective, smaller pensions indicate an increased need for a house, as individuals might sense a greater need for a financial cushion to prepare

risk at their retired time.<sup>21</sup>

Similar logic can be applied, if the relationship is extended with an individual pension, but the level of individual pension purchase can largely be determined by housing status (homeownership and house price) and public pension, and how the two factors interact. When an individual purchases a house (or have high-valued property) and have a relatively generous public pension, one needs to go through the phases of house mortgage repayment along with heavier pension contribution. Also, the need for additional pension purchase might be diminished, as the homeowner with a generous pension might less be concerned about the retirement period. Thus, they may have less chance of participating in individual pensions at all or participated with a limited amount.

On the other hand, for an individual who purchased a (high-valued) house but does not have (a generous) public pension, or for those who did not purchase a house (or with low-valued house) but have a relatively generous public pension, the need for

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<sup>21</sup> On the other hand, generous pension benefits may not necessarily decrease the need for purchasing a house in Korea. In our society, the house has more purpose than preparing the old age. Instead, it holds the various markets, welfare, and personal meaning. However, in countries with solid public pension schemes and stable rent markets, such as Germany, more generous pensions may decrease the need for a house. If the pension benefit is large enough to guarantees stable older years and rent expense does not take up a significant proportion of old age income, there will be less needs to buy a house. In fact, Germany shows a significantly low homeownership ratio. However, this does not apply to Korea; pension has a low chance to decrease the need for a house.

individual pension may be higher than a prior group. Also, as these individuals have relatively more room in the budget and higher need on additional old age income, compared to the groups with both (high-valued) house and generous public pension, they are more likely to join individual pension or make a higher pension contribution. Thus, the relationship between individual pension purchase and homeownership can be altered by public pension status, while the relationship between individual pension and public pension can be altered by housing status.

## 5. Other factors associate with individual pension purchase

There are many other factors that are known to have an effect on individual pension purchases. This section will introduce demographic and financial factors that can alter ones' individual pension participation: Most of the existing literatures showed that demographic features need to be co-considered when investigating individual pension purchases. Those features include gender, education, age, number of children, marital status, and job positions. As many previous literatures asserted the importance of these aspects on individual pension purchase; missing or overlooking these factors might not correctly represent the actual mechanism of individual pension purchase.

First, individual pension purchases might differ according to one's gender.

More specifically, male is known to have a better participation rate than female in general. This tendency is often explained by sexual inequality in wage, or occupational sex segregation in the workplace. Females are more likely to have a lower wage, or a higher possibility to participated in part-time work. Females also are exposed to extra family work demands, as they normally have higher obligations to childbearing and childrearing. This often disturbs women to have continuous and successful careers compared to men, resulting in repeated withdrawal and re-entry into labor markets. These features in the labor market that female face, often has a very close relationship with individual pension participation, as they might become a barrier to a stable and sufficient purchase of an individual pension. Empirical studies also point out similar results, generally showing a higher probability of man to have individual pension participation than women (Graiet & Jilani, 2019; Ciriotto et al., 2020; Baek,2012; Cha, 2015; Na & Choi, 2014; Kim et al., 2015).

The second important factor is education: Becker(1975)'s Human capital model explains that individuals' investment in education can cause better income, which also can lead to a better outcome in old age preparation. Longer years in education tend to have a stronger correlation with investment in an individual pension. Also, the recognition effect led by higher education also can raise individual pension purchases. Number of previous literatures presents evidence on individual pension and education (Kim, 2013; Na & Choi, 2014; Ciriotto et al., 2020; Jeon et al., 2006, Cha, 2015; Kim et al., 2015).

Third, job position, too, is closely associated with an individual pension. The dual economy theory (Beck, Horan, & Tolbert, 1978) explains that there are two separate markets around industries: the core sector with large scale, higher productivity, and greater profit, and the peripheral one with lower profit and poorer job security. It is natural that retirement preparation through pension purchase differs among workers of the two sectors; regular workers and solid self-employers have better individual pension purchases. On the other hand, part-time workers and small business self-employers might have a hard time preparing individual pensions. These are well-reflected in previous studies (Graiet & Jilani, 2019; Ciriotta et al., 2020; Stinghamber et al., 2007, Joo, 2011, Na & Choi, 2014).

Fourth, marital status is also one of the important predictors. Interestingly, literatures from other countries have a tendency to show that individuals without spouses have better rates of individual pension purchase compared to those with spouses (Graiet & Jilani, 2019; Ciriotta et al., 2020; Stinghamber et al., 2007). While, in contrast, those in Korea tended to show the opposite result: individuals with a spouse were more likely to participate in the individual pension system (Baek, 2012; Choi, 2015; Joo, 2011, Moon, 2012; Cha, 2015). As Korea has a family-based welfare system, having a spouse (in other words, having someone to take care of beside him/herself in old age) perhaps makes people become precautious in old age, and moreover to become a better investor for the future (Lee, 2012). Meanwhile, individuals in other countries, rather may perceive 'not-having-a-spouse status' as a

negative in ones' old age. Thus, people without a spouse in old age were more likely to purchase individual pension (Stinglhamber et al., 2007)

Age is also an important factor according to previous studies, but the results are somewhat contradictory. Some studies see that people tend to purchase more individual pension as they gets older, because income generally rises with age; therefore, the people get more affordable of additional pension purchase as ages (Baek, 2012; Ciriotto et al., 2020; Moon, 2012; Kim et al., 2015). In contrast to these arguments, there is evidence that is opposite to this—the younger the more purchase they made on individual pension (Jeon et al, 2006; Moon, 2012; Na & Choi, 2014; Joo, 2011). These studies rationalize the result that people eventually shoulder heavier financial burdens (such as child education or house purchase) as they age, along with income increase. Thus, younger time is rather better for people to purchase individual pensions. Either way, these findings make age an important factor to consider as an important covariate.

The number of Children also is a critical aspect. The enthusiasm of Korean education is famous world-widely; Korea has the highest proportion of tertiary students, which is about 80 percent, the first place among the OECD countries and far greater than OECD average rate of 27 percent (OECD statistics). Differently phrased, the educational cost that is spent on the child is very high and widely competitive in Korea. The more children one has, the more educational expenses the parents ought to spend, which naturally affects the personal budgets, including individual pensions.

In opposite words, if there is no child, there will be more room for better investment for one's later life. Also, those with children might have the bequest motive, which might have similar priority compared to one's old age preparation, which might have a close relationship to individual pension purchase. Again, the empirical studies back up the arguments (Lee, 2012; Choi, 2015; Foster, 2012; Kim, 2013; Na & Choi, 2014); thus, the number of children should be considered, because it can be very important, another constraint to the household budget.

Another important group of factors that need to be considered, is other financial features: non-cash assets (secondary housing and others), cash assets, and debts. An individual pension is a financial factor, and other key elements— housing and public pension— are also fiscal ones. Thus, these have a high possibility that can be affected by other financial factors, and in fact, previous studies show the actual possibilities. It is proven by many literatures that more assets (Joo, 2011; Na & Choi, 2014, Moon, 2012; Jeon et al., 2006; Baek, 2012) also tended to raise the probability of individual pension participation. A debt is also important as this can be a factor that represents the 'constraint' of the household budget. However, the previous results tend to have either a positive or negative relationship (Jappell & Pagano, 1994; Shin, 2018; Yoo & Yoo, 2017; Li, 2001; Baek & Jung, 2005), as debt can work as 'constraints' to the household, but also can work as a unique type of asset that can help the household economy. Also, secondary housing is closely related to the housing assets that can affect constraint- and need-induced mechanisms of housing-pension relationships

(Kim, 2019). Thus, these financial factors also need to be co-considered along with key variables.

## 6. Summary and Conclusion

This study is purposed to investigate the effect of public pension and homeownership on individual pension purchases. In earlier sections, the background and previous literature on pension and homeownership were explored. A few main ideas can be summarized into the followings:

First of all, although public pension in Korea does have an important role in old age as a major income, the pension benefit and the replacement rate are very low to prevent poverty in retired age. Thus, preparations for additional old age income through an individual pension are becoming increasingly important. This is especially important in Korea, as our society has an exceptionally high rate of old age poverty. However, the individual pension purchase is extremely limited in Korea both in quality and quantity, which demands immediate attention. Various political methods are necessary in order to properly guide people to prepare for their retirement period.

Second, homeownership and house price are gaining significant meaning these days, as another important means to prepare one's old age. This is because housing can provide economic benefits to retirees as income-in-cash and income-in-kind. The significance of housing in welfare used to be neglected, but as homeownership became

the dominant tenure type and widely available to the majority of people, its meaning and role in individuals' well-being have rapidly grown. However, compared to its increased importance, research related to homeownership from a welfare perspective is very constrained, especially in Korea.

Third, according to life-cycle theory, public pension and individual pension have a substitutive relationship; public pension tends to crowd out individual pension purchases. However, these two also can have a complementary relationship, or a positive relationship, in regard to bequest and precautionary motives, liquidity constraints, recognition effects. Previous studies that explored the relationship between public pension and savings, showed both positive and negative outcomes. Interestingly however, the studies confined the subject to public pension and individual pension, more studies presented the crowd-in effects. This confusing outcome makes it harder to confirm the accurate relationship between the public and individual pension, which requires reaffirmation regarding the two factors.

Fourth, homeownership (and house price) and pension are also expected to have a negative relationship according to the life-cycle model and Kemeny's trade-off theory. In previous studies on the housing-saving relationship, there is a mixed result of both positive and negative correlations. Nonetheless, the research specifically focused on the relationship between housing and pension, mostly confirming crowd-out effects, which needs further investigation. Furthermore, although it is critical to study the relationship of the two factors at the individual or household level, most of

the studies focused on macro level analysis. There are only a handful of studies regarding housing and pension at the micro level; especially in Korea, there is an almost complete lack of research on this area. As housing is only considered as a control variable in pension studies, more academic attention is needed in order to find an accurate relationship.

Fifth, public pension, individual pension and homeownership shares role as a major income in old age and protect retirees from poverty. They also share parallel growth during one's working period; as they all require prolonged, regular and sizable contribution, it is natural to have a competing relationship. More specifically, because the public pension is mandated to participate during the labour period, and homeownership is widely perceived as a 'standard' to purchase during one's working time, the two factors inevitably impact individual pension that shares a similar purpose and similar growth. Nevertheless, there is a shortage of studies using these two factors to explain individual pension purchase, and furthermore, there is no study regarding the interaction effect of the public pension and homeownership, on an individual pension.

Considering these limitations of the previous studies, this research purpose to fill the academic gap. More specifically, this study focuses to address on the followings:

First, this study will investigate the relationship between public pension and individual pension. More specifically, the effect of pension type (uninsured, NPS, SOP) and pension contribution level on individual pension purchase (participation and purchase

level) will be analyzed. As previous literatures asserted the outcome that individual pension purchase can be differ depending on the generosity of public pension; the type and contribution level of public pension will be considered in the analysis<sup>22</sup>.

Second, the relationship between housing and individual pension will be explored. Homeownership and housing price will be used as housing variables. These variables will be effective measures to examine the trade-off relationship between housing and individual pension; the homeowners would have less need on additional pension purchase, compared to non-owners, as they can utilize the house as a pension in later years, whenever they need. Also, homeowners would experience economic constraints as they eventually must pay off the housing debt. House price is more related to the need-induced mechanism. The higher the house price is, the more resources the owners can get when they sell the property. Thus, the owners of higher value property are expected to have less need for additional pension. The owners of lower value property, on the other hand, might have the need for extra retirement

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<sup>22</sup> This study could not incorporate the occupational pension system into the analysis. The occupational pension system would also play an important 'future income' and is expected to have a significant impact on individual pensions. Although the occupational pension variable was offered in the dataset, there was not sufficient number of cases was available to perform the analysis. This study considered various alternatives (such as using worker's compensation insurance as a proxy variable, controlling company size etc.) to control the occupational pension system, but it was not possible with the current dataset. This is one of the main disappointments of this study, and is addressed in the limitation section.

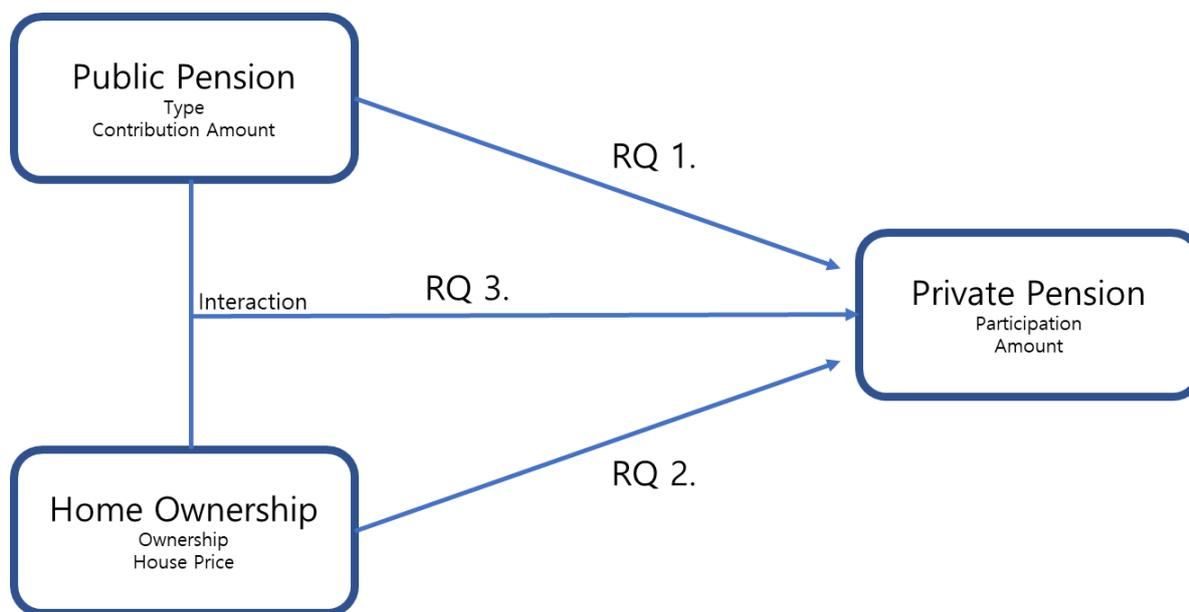
income<sup>23</sup>. Individual pension purchases of homeowners and non-owners will be examined first, then the effect of house price on individual pension among homeowners will be analyzed.

Third, this study will examine the interaction effect of public pension and housing on individual pension purchase. This is one of the very different and unique aspects of this study. The 1) interaction between homeownership and public pension type, 2) interaction of homeownership and public pension contribution will be explored, and then the 3) interaction of house price and public pension type, and finally 4) the interaction between house price and public pension contribution amount among homeowners will be analyzed. This study will have its contribution to the academic field as this is one of the very first studies that investigated the interaction effect of public pension and housing on individual pension purchase.

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<sup>23</sup> The mechanism of constraint-induced trade-off can be partly applied to the house price, as generally higher-valued house requires a higher mortgage. But this is not always true, and the constraint level could be heavily influenced by one's income. If variables such as 'housing mortgage' or 'percentage of housing mortgage payment in income' could be used as additional housing variables, this could be more useful to examine constraint-induced mechanisms. However, housing mortgage payment was not available in the dataset that was used in this study, so this analysis was not possible.

### III. Research Question and Analytical Framework



[Figure 5] Research Question and Framework

**Research Question 1.** How does public pension (public pension type, public pension contribution level) affect individual pension (individual pension participation, individual pension purchase level)?

According to the life-cycle hypothesis, this study expects individual pensions will be crowded out by the public pension. Although, as discussed in the previous section, there is a possibility that the two factors might have a positive relationship, since bequest and precautionary motives, recognition effect etc. can influence one's decisions, this study expects that public pension and individual pension to have a

negative relationship. This is because this study assumes the public pension and individual pension (and housing) has a competitive relationship due to shared role and similar growth. The more public pension contribution and the better expected pension benefit will lower the individual pension purchase.

1-1. Individuals with the more generous public pension type will have a lower probability of individual pension participation.

1-2. Individuals with the more generous public pension type will have a lower level of individual pension contribution.

1-3. Individuals with higher public pension contributions will have a lower probability of individual pension participation.

1-4. Individuals with higher public pension contributions will a lower level of individual pension contributions.

**Research Question 2.** How does housing (homeownership, house price) affect individual pension (individual pension participation, individual pension purchase level)?

This study assumes that housing and individual pension has negative effects, following the life-cycle hypothesis and Kemeny's trade-off theory. People who own houses will have lower individual pension purchases, as they can use housing as a direct or indirect income in later life. House price, in the same vein, is also an important aspect of this relationship because it can determine the size of the (direct/indirect) income level in later life. Therefore, the relationship between 1) homeownership and individual pension, and 2) house price and individual pension

will analyze in separate stages.

2-1. Individuals with homeownership will have a lower probability of individual pension participation.

2-2. Individuals with homeownership will have a lower level of individual pension contribution.

2-3. Individuals with higher priced housing will have a lower probability of individual pension participation.

2-4. Individuals with higher priced housing will have a lower level of individual pension contribution.

**Research Question 3.** What does the interaction of the two - public pension and homeownership — say? Does the effect of one feature alter by the other?

This study assumes the interaction of public pension and housing on individual pension purchases. It is expected that the effect of housing on individual pensions might differ according to the people's public pension level. Similarly, the effect of public pension on an individual pension can be altered by the status of homeownership or house price.

3-1. There will be an interaction between public pension status and homeownership.

3-2. There will be an interaction between public pension contribution and homeownership.

3-3. There will be an interaction between public pension status and house price.

3-4. There will be an interaction between public pension contribution and house price.

## IV. Methodology

This chapter contains a discussion of the methodological approach and research design best suited to examine the research questions set out in the previous Chapter. An overview of data used in this study is addressed first, then the description of the key variables is followed. Then the section informs the statistical strategy employed to answer the research questions, namely the double hurdle estimation and control function approach.

### 1. Data and Sample

This study used the National Survey of Tax and Benefit (NaSTaB) wave 2 to 12 (2009-2019), provided by the Korea Institute of Public Finance<sup>24</sup>. It is a massive longitudinal data, which is collected on a yearly basis since 2008. It surveys approximately 5,600 households (7,500 family members of 15+ years old with income) throughout the country (except Jeju) on various socio-economic background information; including subjects of income, expenditure, assets, real estate, transfers, welfare, debts, tax credit, and more.

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<sup>24</sup> Wave 1 was excluded from the analysis, because it did not contain all the key variables.

Other possible datasets that could consider using for this study, are the Korean Welfare Panel Study (from Korean Institute for Health and Social Affairs), the Korean Labor and Income Panel Study (from Korea Labor Institute) and the Korean Retirement and Income Study (KReIS; from National Pension Service). However, not every dataset contains the key variables<sup>25</sup> that this study requires: only NaSTaB and KReIS have all the variables on pension and housing. Between the two, this study chose NaSTaB over KReIS, because of several reasons. First, the total number of individual pension incidents (dependent variables) was only 4% in the total sample in KReIS, while it was 20% in NaSTaB. Considering the actual purchase rate of individual pension, it can say the sample of NaSTaB tends to be better at representing the population. Also, unlike other panel datasets, NaSTaB directly investigates tax return information on survey participants<sup>26</sup>; thus, the data contains accurate and objective information. Furthermore, it has a relatively low sample attrition rate compared to other datasets. A panel data survey the same individual and household repeatedly, which allows scholars to examine both static and dynamic research. This escalates the importance of sample maintenance rate; and as of the 10th panel survey point, the

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<sup>25</sup> Individual pension related variables (participation status, purchase amount), public pension related variables (participation status, contribution amount), and housing (homeownership status, housing price) are other control variables (demographic and financial related variables) considered as key variables in this study.

<sup>26</sup> 61% of total workers consent to provide the information on the actual tax return.

original sample maintenance rate was up to 72.6 percent<sup>27</sup>. All these advantages of NaSTaB make the dataset an attractive choice over the others.

NaSTaB initiated its first survey in 2008, and the 12th data is released up to date and is unbalanced panel data. The target data is the head of the household<sup>28</sup> between 20 and 60, the active working age groups before pensionable age, and the final sample contains 3,461 individuals<sup>29</sup>. NaSTaB data is consists of two separate datasets—household and individual—and the analysis was performed with merged data of the two. Information on gender, age, education, public and individual pension status were used from the individual dataset, and finance, asset, and housing related variables were extracted from the household dataset.

## 2. Definition of Variables

In order to test the effect of public pension and housing on individual pension purchase, two dependent variables are used reliant on the research question:

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<sup>27</sup> Korean Welfare Panel 64.48%; Korean Labor and Income Panel Study 65.3%; KReIS 67.1%, as of latest datasets

<sup>28</sup> Only head of the household was selected, and information on spouse or other house member was not included; as house and individual pension purchase are often time purchased by head of the household, analyzing head of the household only were assumed to show the overall relationship more clearly.

<sup>29</sup> Number based on 2nd wave.

individual pension participation and average monthly individual pension purchase amount. NaSTaB gathers information on individual pension insurance and individual pension savings (Pension trust/mutual fund/mutual insurance) separately, but because all shares similar purpose as privately preparing for old age, and the case does not have sufficient number separately, this study combined all cases and used as a single variable. Individual pension participation was coded as 0 (non-participant) and 1 (participant); for the monthly purchase amount, the actual value was used while non-participant and participant with no contribution were coded as 0.

Independent variables are categorized into two groups: public pension related, and housing related variables. For the public pension variable, participation type (non-participant, NPS participants, SOP participant) and participation amount (continuous) were used, and for housing variables, housing status (homeownership, non-ownership) and housing price (continuous variable) was employed<sup>30</sup>. The analysis with housing status variable was performed with the entire sample, while analysis with housing price was limited to those who own the house. First, the effect of public pension and housing variables on individual pension purchase (participation and amount) will be examined, and then the interaction of the two factors (type\*status, type\*price, amount\*status and amount\*price) will also be analyzed.

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<sup>30</sup> If data contain information on down-payment or housing mortgage in addition to homeownership and house price, it would be a proper variable to measure the constraint effect in the relationship. However, NaSTaB does not have the information in their data.

Finally, the other factors (besides housing and public pension) that can affect the individual pension purchase, especially based on the previous literatures and theories that were illustrated in the previous section, were selected as control variables. Those factors include demographic features—gender (male/female), education (below high school, high school graduates, college or above), age (continuous), job position (full-time, part-time, self-employed), marital status (spouse/without a spouse), number of children (0,1,2,3+)— were controlled in the model, as well as financial factors (all continuous variables)—secondary housing, other non-cash assets, and cash assets<sup>31</sup>. The definition of dependent, independent and control variables are presented in Table 9.

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<sup>31</sup> Income is also a critical factor that can affect the relationship of public pension, housing and individual pension. This study also considered adding income as a control variable; however, the key independent variables—public pension participation status and public pension contribution level— are directly related to income. Especially, the public pension contribution level is determined by the percentage of income. If income is added to the control variable, there is a possibility that the result might not accurately reflect the reality due to the multicollinearity problem. Thus, income was excluded from the main analysis.

[Table 9] Definition of Variables

<b>Variable</b>	<b>Definition</b>		
<b>Dependent Variables</b>	Individual Pension Participation	Participation status of individual pension insurance or individual pension savings (trust/mutual fund/mutual insurance)	Participant (1) Non-participant (0)
	Individual Pension Purchase Level	Natural Log of Sum of individual pension insurance and individual pension saving (trust/mutual fund/mutual insurance)	continuous
<b>Independent Variables</b>	Public Pension Participation Status	Non- pension participant (0) NPS participant (1) SOP participant (2)	Dummy
	Public Pension Contribution Level	Natural Log of public pension contribution amount	Continuous
	Homeownership	Homeownership Status	Dummy
	House Price	Natural Log of house price	Continuous
<b>Control Variables</b>	Gender	Male (1) Female (0)	Dummy
	Education	Below high school (0) High school Graduate (1) College or above (2)	Dummy
	Age	Current Age	Continuous
	Job Position	Full-time worker (1) Part-time worker (2) Self-employee (0)	Dummy
	Marital Status	With spouse (1) Without spouse (0)	Dummy
	Number of Children	Number of children in the household (0,1,2,3+)	Dummy
	Secondary Housing	With secondary house (1) No Secondary house (0)	Dummy
	Non-cash Asset	Natural Log of Sum of Non cash asset (Building, Land, Jewel, etc.)	Continuous
	Cash Asset	Natural Log of Sum of Cash Asset (Savings, Stock)	Continuous
	Debt	Natural Log of total Debt of the household	Continuous

### 3. Analytical Method

#### 3.1 Double Hurdle Panel Model

As a great number of people chose not to purchase any type of individual pension in reality, the participation status or the value of purchase level of individual pension might have a large proportion of zeros. This indicates that the data have a problem of left censored dependent variable at zero, which means ordinary least square regression (OLS) is not appropriate for the analysis, as basic assumptions are violated. In previous studies, typically Probit Model (for participation) and/or Tobit model (for purchase level) were widely applied in similar settings. Usually, these two analytical strategies were applied independently.

Tobit model (Tobin, 1958) was considered as one of the effective ways to address censored and truncated dependent variable problems. However, the Tobit model can be somewhat restrictive in dealing with the excessive zero-problems, as the model considers all zeros as identical while does not distinguish the different zeros (Wang, 2016; Yang, 2010; Huh & Lee, 2019). In fact, not all zeros are the same, but there are two distinct types of zeros: zeros which result from non-participating, and zeros which result from choosing corner solutions from circumstantial reasons. For example, there can be zeros, coming from not purchasing individual pension at all, and zeros from not contributing to an individual pension due to different reasons at the time; the Tobit model fails to embrace the difference but treat them as the same.

Another important limitation of the Tobit model is that the model imposes the restriction that both probabilities of participation and level of contribution of individual pension purchase are determined by the same variables and parameters. This means, the Tobit model does not separate the decision of participation and purchase level but presumes both are all affected by the same variables in the same direction, which can be quite a strong assumption (Yen & Huang, 1996). In fact, a previous study illustrates that individual pension participation and individual pension purchase amount are affected by different parameters, possibly in different directions even (Cha, 2015). According to the results of existing literatures, the consideration of the same factors have the same effect on participation as they do on the consumption level, is an excessive assumption to be made. These restrictions may cause limitations on the Tobit model.

The Double-hurdle panel model can be an alternative to the Tobit model; it has several advantages that can compensate for the limitation of the Tobit model (Cragg, 1971; Suarez-Varela & Dinar, 2017; Yen & Huang, 1996; Bettin, Lucchetti & Pignini, 2008; Shin & Ryu, 2018). First, the Double Hurdle model is superior in dealing with zero problems to the Tobit models, as it can differentiate two types of zero. The Double Hurdle model assumes individuals must pass two hurdles before being observed with a positive level of contribution of individual pension: First, they decide to participate in individual pension purchase, and second, they need to decide more than zero to contribute. If they decide not to purchase individual pensions at all, in other words,

fail to pass the first hurdle, they will have zero, which belongs to the first type. If they decide to participate or become potential consumers of individual pensions but choose not to contribute at the given year for some reason and fail to pass the second hurdle, they will have zero of the second type. While the Tobit model treats the two types of zero the same, the Double hurdle tolerates the possibilities of different zeros.

Also, the Double Hurdle model allows a distinct stochastic process for participation and purchase level decisions, unlike the Tobit model; it assumes that individuals make two separate decisions whether to participate in individual pension purchase, and how much they would pay for the individual pension. Naturally, the Double hurdle model assumes different factors influence the participation and contribution possibly in different directions, as two decisions are not related but separately made. Thus, the Double hurdle model is especially valuable when investigating participation and consumption (contribution in our case) in a separate manner is meaningful. The estimation process follows a subsequent procedure: First, uses the Probit model to estimate the probability of an individual would make a decision to participate in an individual pension. Then second, with the truncated regression model, it examines the level of contribution (Solomon et al., 2014).

The double hurdle model has a participation equation:

$$d_t^* = z_t \alpha + v_t, \quad v_t \sim N(0,1)$$

And a purchase level equation:

$$y_t^* = x_t\beta + \epsilon_t, \quad \epsilon_t \sim N(0, \sigma_t)$$

$$\text{Where } y_t \begin{cases} y_t^* = y_t^* > 0 \text{ and } d_t^* > 0 \\ 0 \text{ if } (y_t^* \leq 0 \text{ and } d_t^* > 0), \text{ or } d_t^* \leq 0 \end{cases}$$

$d_t^*$  is a latent participation indicator  $y_t^*$  is a latent contribution,  $z_t$  and  $x_t$  are vectors of explanatory variables, and  $\alpha$  and  $\beta$  are conformable vectors of parameters. Errors are independent and normally distributed, while the error term  $\epsilon_t$  is truncated.

As the Double hurdle model differentiates participation and contribution into combined two-stage estimations, it provides a better understanding of individual pension purchase than separate Probit and Tobit estimations (Oh & Song, 2015). Considering the advantages, this study takes the Double Hurdle model as a major analytical strategy.

### 3.2 Dealing with Endogeneity

Another important issue that needs to be addressed in the analysis is the problem of endogeneity. There are a few different reasons that cause endogeneity, such as simultaneous causality, omitted variable, measurement errors, (un)observed heterogeneity, sample selection, etc (Wooldridge, 2010). This study assumes that the purchase level of individual pension will be greatly influenced by housing (homeownership and house price) as well as public pension (type and contribution level); but as illustrated in previous sections, housing and pension might have close

(more specifically, a trade-off) relationship according to previous studies. This implies that pension and housing are highly likely to have an endogenous relationship, which needs to be modified before performing the double hurdle analysis. It is important to properly handle this problem, because endogeneity can lead to biased outcomes by under or overestimating the actual values (Wooldridge, 2009).

Among a few pathways to deal with endogeneity in econometric modeling, this study chose the control function approach above other instrumental variable methods (such as two stage least square, Generalized Method Moments, ivprobit) because in non-linear corner solutions setting, the control function is known to yield better efficiency and precision (Wooldridge 2010); also, it shows better outcomes with weak instruments according to previous literatures (Tadesse and Bahiigwa, 2015; Wooldridge, 2007). Control function also is increasingly applied in other similar settings as well, such as Suarez-Varela & Dinar (2017), Garbero & Marion (2018), Yu et al. (2013), Ricker-Gilbert, Jayne & Chirwa (2011) and more.

The control function approach for the Double hurdle model proposed by Wooldridge (2010) follows subsequent steps: first, endogenous variables are regressed on exogenous regressors, instruments, and control variables, which is often referred to reduced form function, and the generalized residuals are retrieved. Second, the estimated residual is included in the original function as a covariate(s) in the model. The significance of the coefficient of the residuals represents the controls for endogeneity. However, the standard error associated with the estimated residuals in

the original function is no longer valid, so this needs to be addressed through bootstrapping.

Another important issue is the introduction of relevant instruments to housing and pension variables. An ideal Instrument variable should be correlated with endogenous variables, but not relevant to dependent variable (Kennedy, 2008) or error term of the regression equation (Angrist and Krueger, 2001); in reality, however, it is hard to find a good instrument that satisfies both independent assumption and the exclusion restriction. As a result, in many settings, there was an effort to ‘exogenize’  $x$  using lagged variables as an instrument, although it is a less-ideal way. There are some known limitations<sup>32</sup>, but using lagged variables as an instrument is still widely used (Wang & Bellemare, 2019). This study also, had a hard time finding a valid instrument variable, and decided to use lagged variable as an instrument.

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<sup>32</sup> For example, whether it is truly unrelated with the variable of interest.

# V. Research Results

## 1. Description of data

### 1.1 Basic Statistic

Table 10 presents the socio-demographic characteristics of the sample. Among the total of 3,461 participants, about 21.1 percent were participated in the individual pension programs, while 78.9 percent were not. The average individual pension contribution was about 69,610 KRW (SD=214.21). A majority of participants were NPS participants (67.8 percent), followed by non-participants (24.9 percent) and SOP participants (21.1 percent); the average monthly public pension contribution was 102,250 KRW (SD=92.60). In terms of homeownership, 55.1 percent were known to have a house, while 44.9 percent were not owners. House price averaged 22,402.19 with SD of 25,056.83. Most of the participants were male (87.6 percent) as this sample targets the head of the households, and the average age was 43.93 (SD=8.51). A majority of participants had education level higher than high school (49.7 percent), followed by high school graduates (38.2 percent) and below high school (12.1 percent). Also, many were regular employees (59.3 percent), followed by self-employees (29.5 percent) and temporary or daily employees (8.2 percent). Most of the participants have a spouse (91.4 percent), only 8.6 were in the status of single, bereavement, divorce, separation or others. Participants have an average number of 1.04 children,

with 40 percent no child, 22 percent one child, 32.6 percent two children, 5.3 percent three or more children. The debt was averaged 4576.03 (SD=10483.65), while cash asset was 2698.80 (SD=5375.11), and non-cash asset 5928.70 (SD=18085.71). Lastly, about 16.9 percent owned secondary property, while the majority (83.1) did not.

[Table 10] Socio-demographic Characteristics (2009)

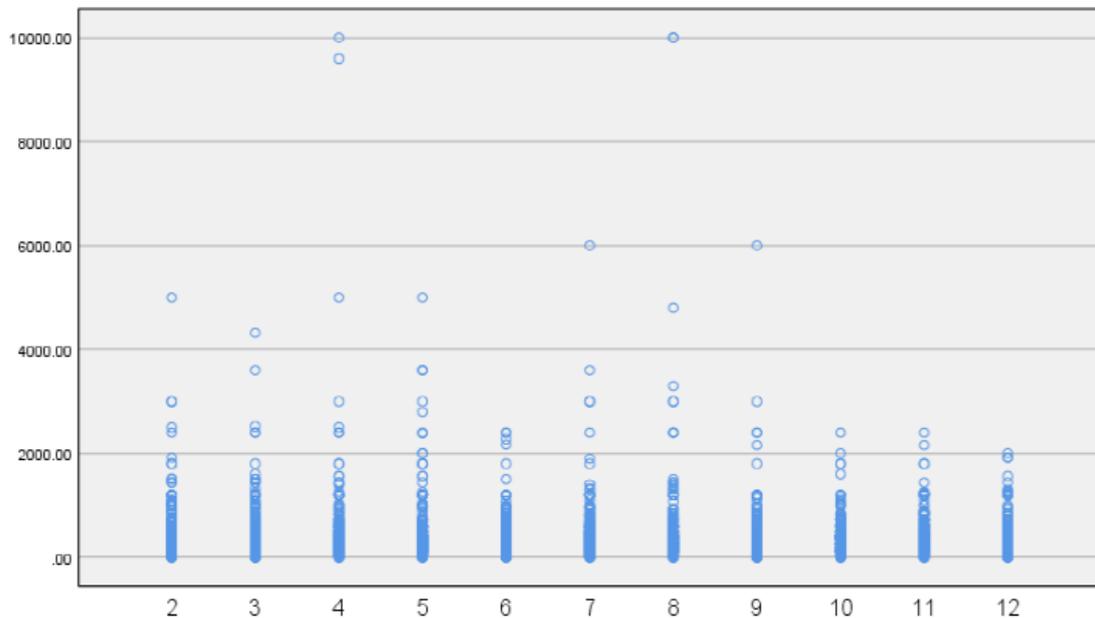
<b>Variables (n=3,461)</b>	<b>Categories</b>	<b>Frequency (%)</b>	<b>Mean (SD)</b>
<b>Individual Pension Participation</b>	Yes	731 (21.1)	
	No	2730 (78.9)	
<b>Individual Pension Purchase Amount (unit: 1,000 KRW)</b>			69.61 (214.21)
<b>Public Pension Participation</b>	Non-Participation	863 (24.9)	
	NPS	2,348 (67.8)	
	SOP	731 (21.1)	
<b>Public Pension Contribution (unit: 1,000 KRW)</b>			102.25 (92.60)
<b>Homeownership</b>	Yes	1,555 (44.9)	
	No	1,906 (55.1)	
<b>House Price (unit: 10,000 KRW)</b>			22402.19 (25056.83)
<b>Gender</b>	Male	3,033 (87.6)	
	Female	428 (12.4)	
<b>Age</b>			43.93 (8.51)
<b>Education</b>	Below High School	419 (12.1)	
	HS Graduate	1,321 (38.2)	
	Higher than HS	1,721 (49.7)	
<b>Employment</b>	Regular Employee	2,053 (59.3)	
	Temp Employee	281 (8.2)	
	Self-Employee	1,022 (29.5)	
<b>Presence of Spouse</b>	Yes	3,163 (91.4)	
	No	298 (8.6)	

<b>Number of children under 18</b>	<b>0</b>	1,385 (40)	1.04 (0.980)
	<b>1</b>	7,63 (22)	
	<b>2</b>	1,128 (32.6)	
	<b>3 or more</b>	185 (5.3)	
<b>Debt (unit: 10,000 KRW)</b>			4576.03 (10483.65)
<b>Cash Asset (unit: 10,000 KRW)</b>			2698.80 (5375.11)
<b>Non-Cash Asset (unit: 10,000 KRW)</b>			5928.70 (18085.71)
<b>Secondary Housing</b>	Yes	585 (16.9)	
	No	2,876 (83.1)	

## 1.2 Information regarding Dependent Variable

Figure 6 shows the distribution of individual pension purchase amounts on a yearly basis (wave 2- wave 12). Except for a few outliers, most of the purchasing amount is concentrated between 0 and 400,000 KRW.

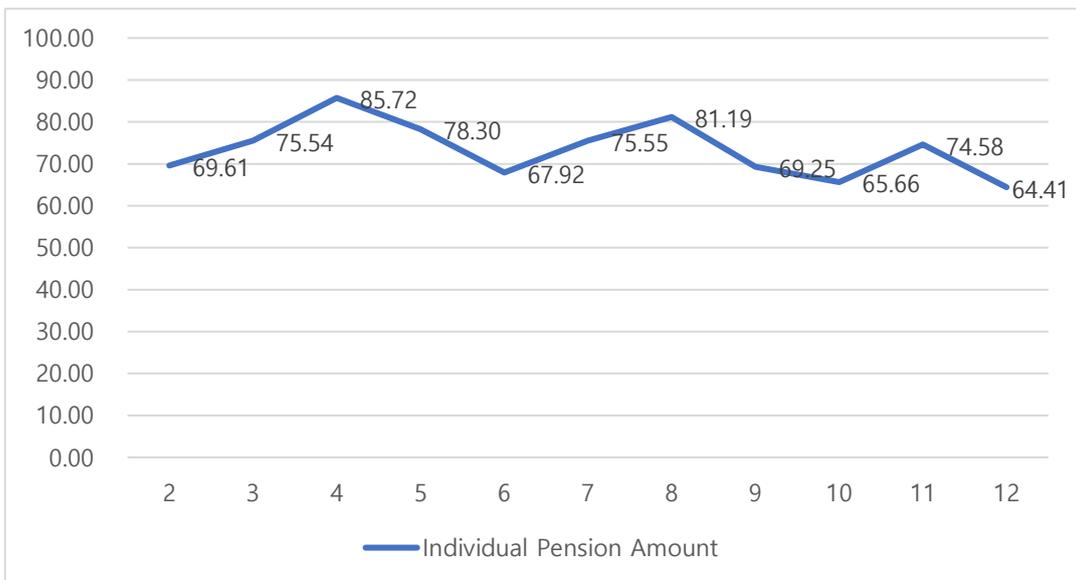
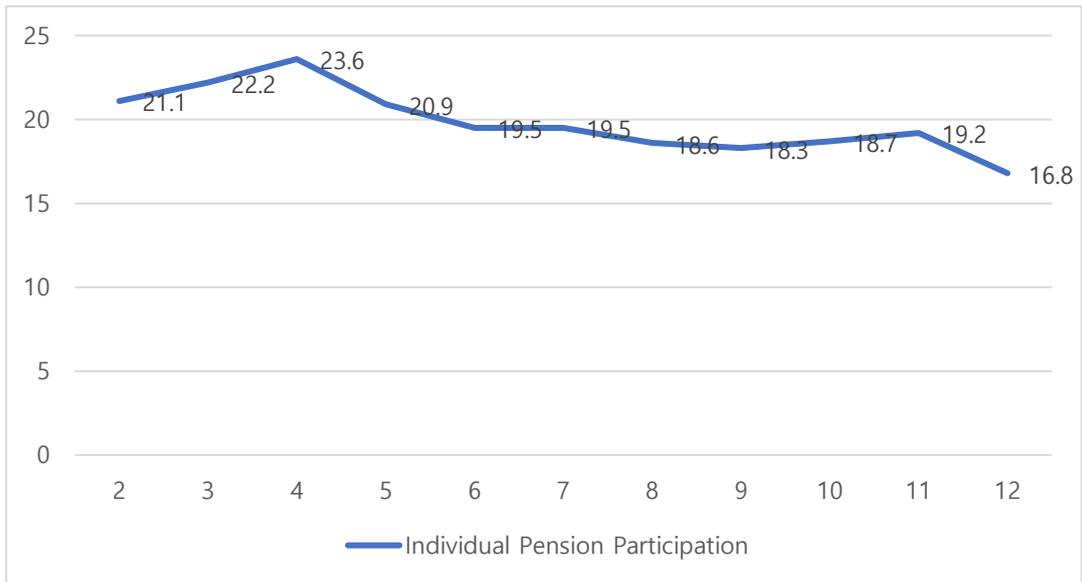
[Figure 6] Distribution of individual pension purchase



*(unit:hundred won)*

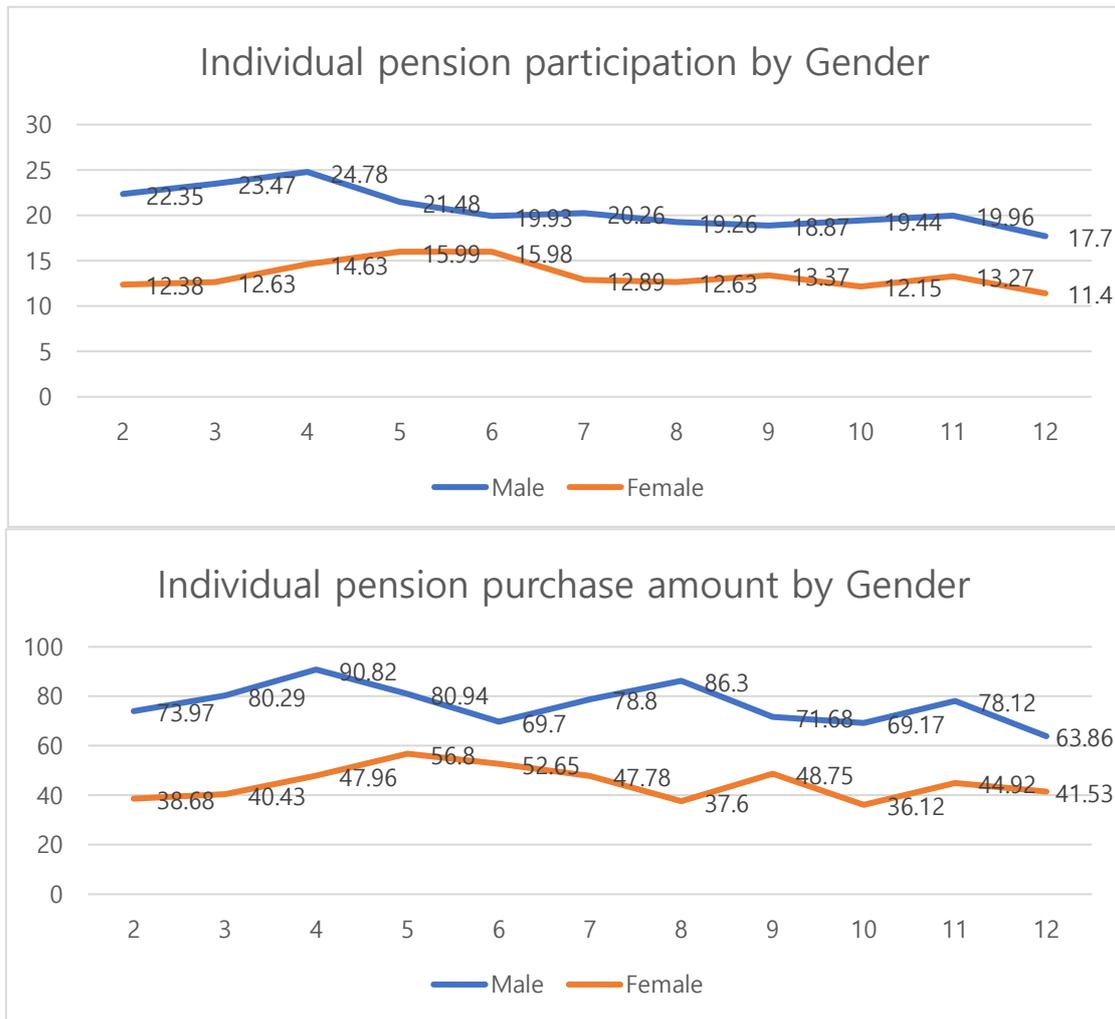
Meanwhile, Figure 7 shows the yearly trend of individual pension participation rate and individual pension participation amount. As presented in the graph, the individual pension participation rate was peaked in the 4<sup>th</sup> wave (2011), 23.6 percent, and decreased since; The average participation rate over 11 waves is 20.1 percent. The individual pension participation amount, on the other hand, experienced a rise and fall repeatedly for the past decade; the average amount is 73.56.

[Figure 7] Yearly trend of individual pension



(unit: percent, thousand won)

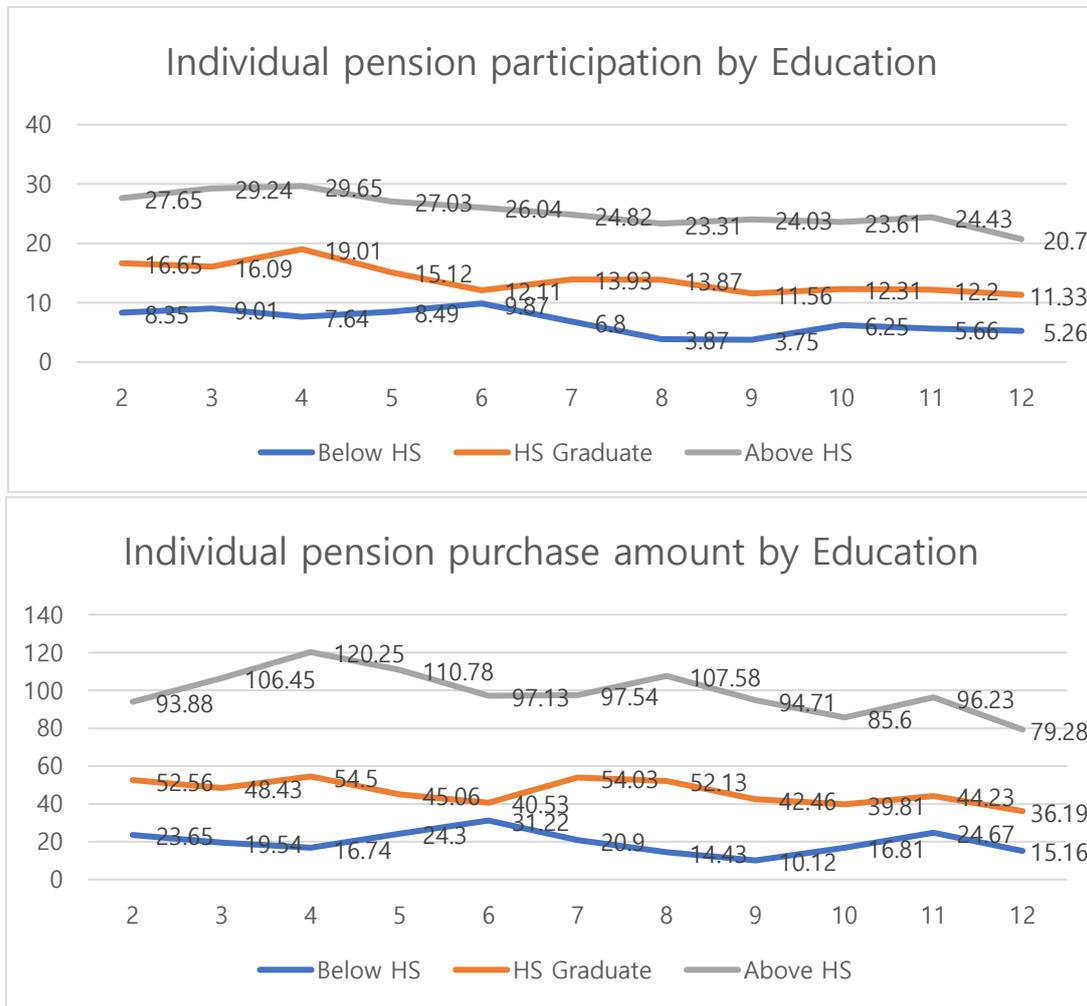
[Figure 8] Individual pension purchase by Gender



(unit: percent, thousand won)

Figure 8 shows the individual pension participation and purchase amount by gender. Overall, the male showed a better participation rate and purchase amount compared to females in all periods. The average participation rate for males is 20.89 percent, while it was 13.44 percent for females. The average purchase amount was 77.16 for males and 44.8 for females.

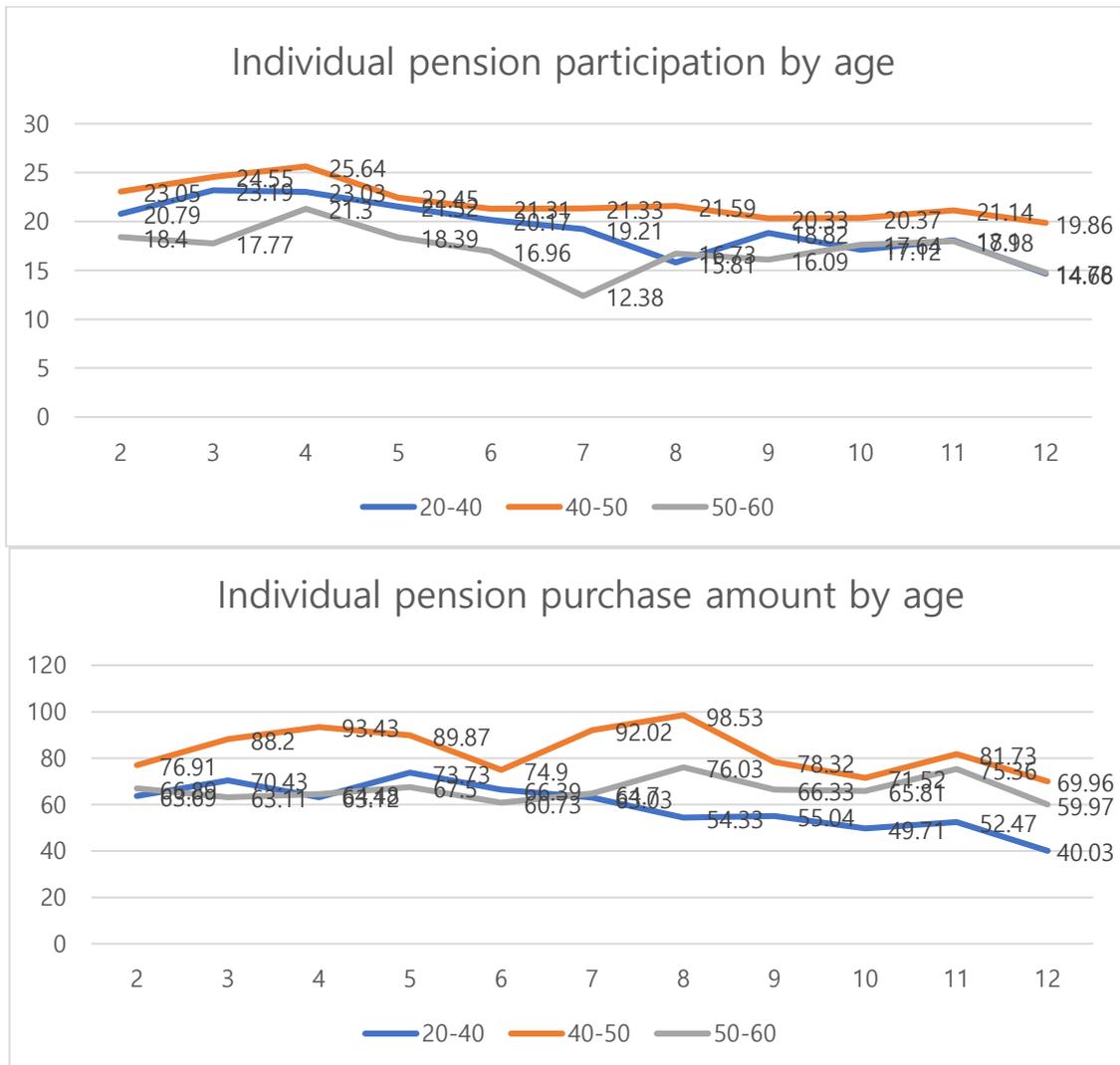
[Figure 9] Individual pension purchase by Education level



(unit: percent, thousand won)

Individual pension purchase was closely related to educational level (Figure 9). Those with lower education levels (below high school) tended to have low participation rates and purchase amounts, followed by high school graduate groups and above high school groups. The average participation rate was 7.10 percent for a below high school group, 14.35 percent for the high school graduate group, and 25.68 percent for the above high school group. The average purchase amount was 20.15, 46.70, 99.12 respectively.

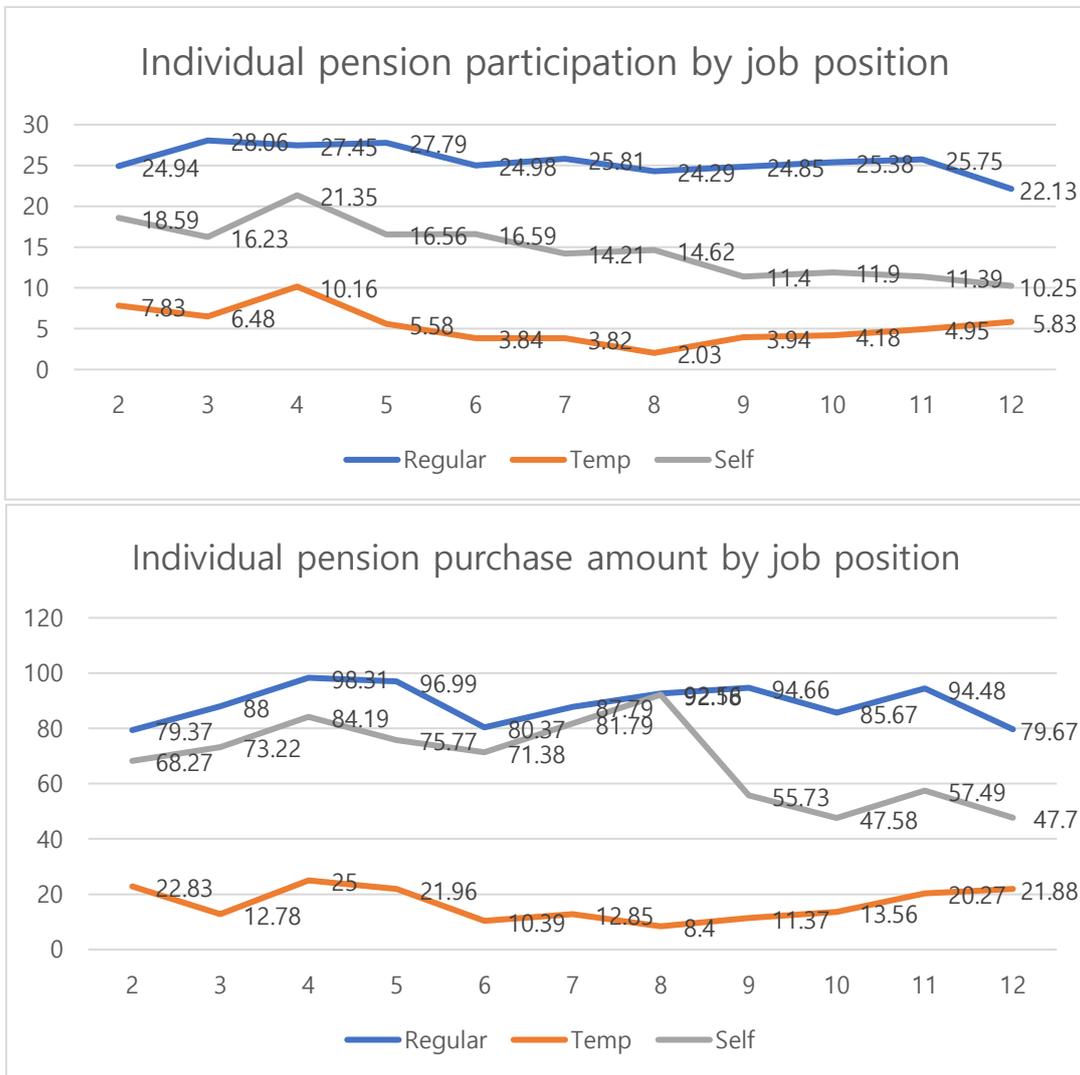
[Figure 10] Individual pension purchase by Age



(unit: percent, thousand won)

Figure 10 shows individual pension purchases by age. The average participation rate was highest among people in 41-50 (22.14 percent), followed by 20-40 (20.33 percent) and 51-60 (17.54 percent). The average purchase amount, on the other hand, was highest among people in 41-50 (83,772), followed by 51-60 (69,390). It was lowest among people in 20-40 (62,590).

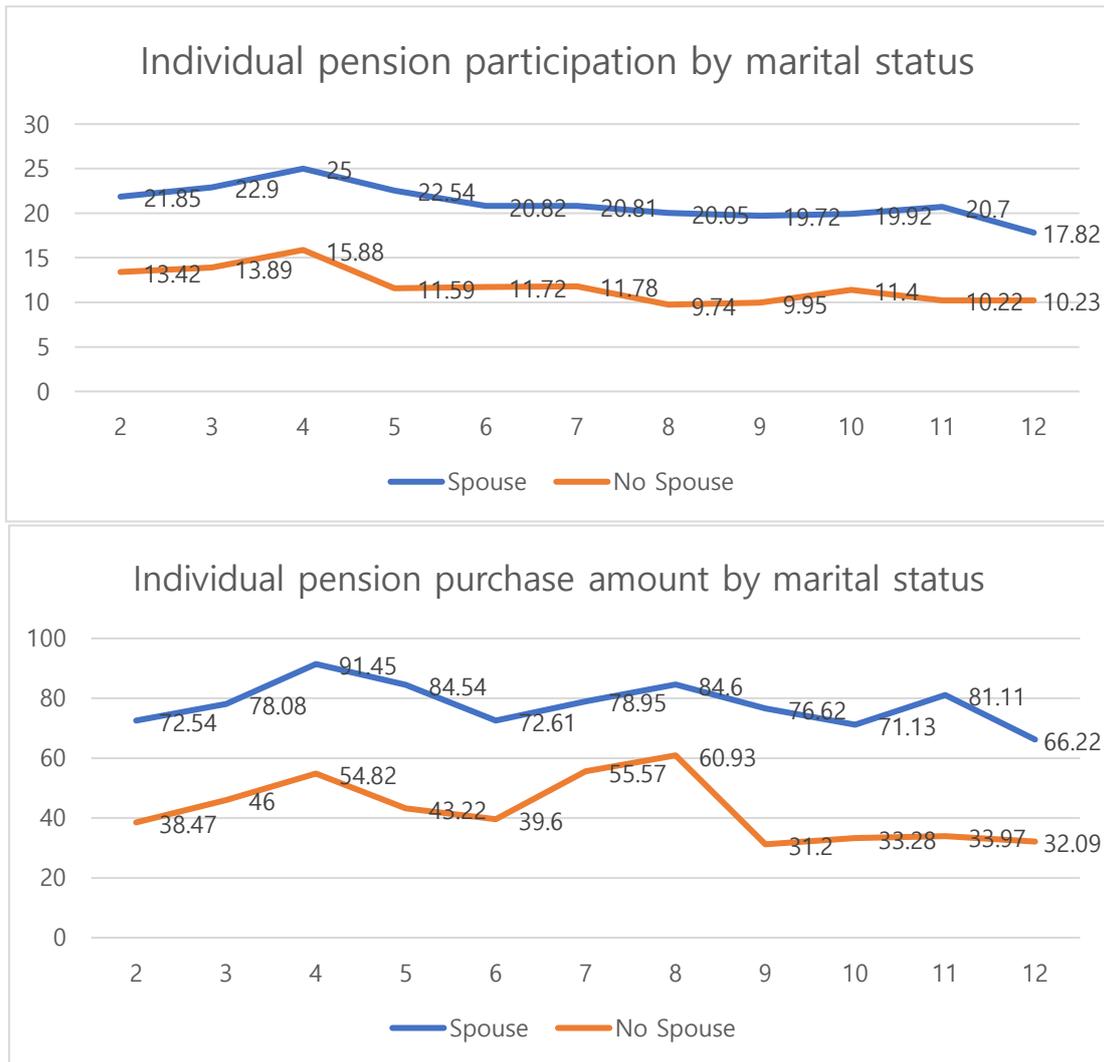
[Figure 11] Individual pension purchase by job status



(unit: percent, thousand won)

Individual pension purchase was closely related to job status. Regular employees tended to have the highest participation and purchase amount, followed by self-employed and temporary employees. The average participation rate was 25.72 percent for regular employees, 15.29 percent for self-employed, and 5.32 percent for temporary employees. The average purchase amount was 88.86 regular employees, 68.50 for self-employee. The temporary employee had purchase amount of 15.82.

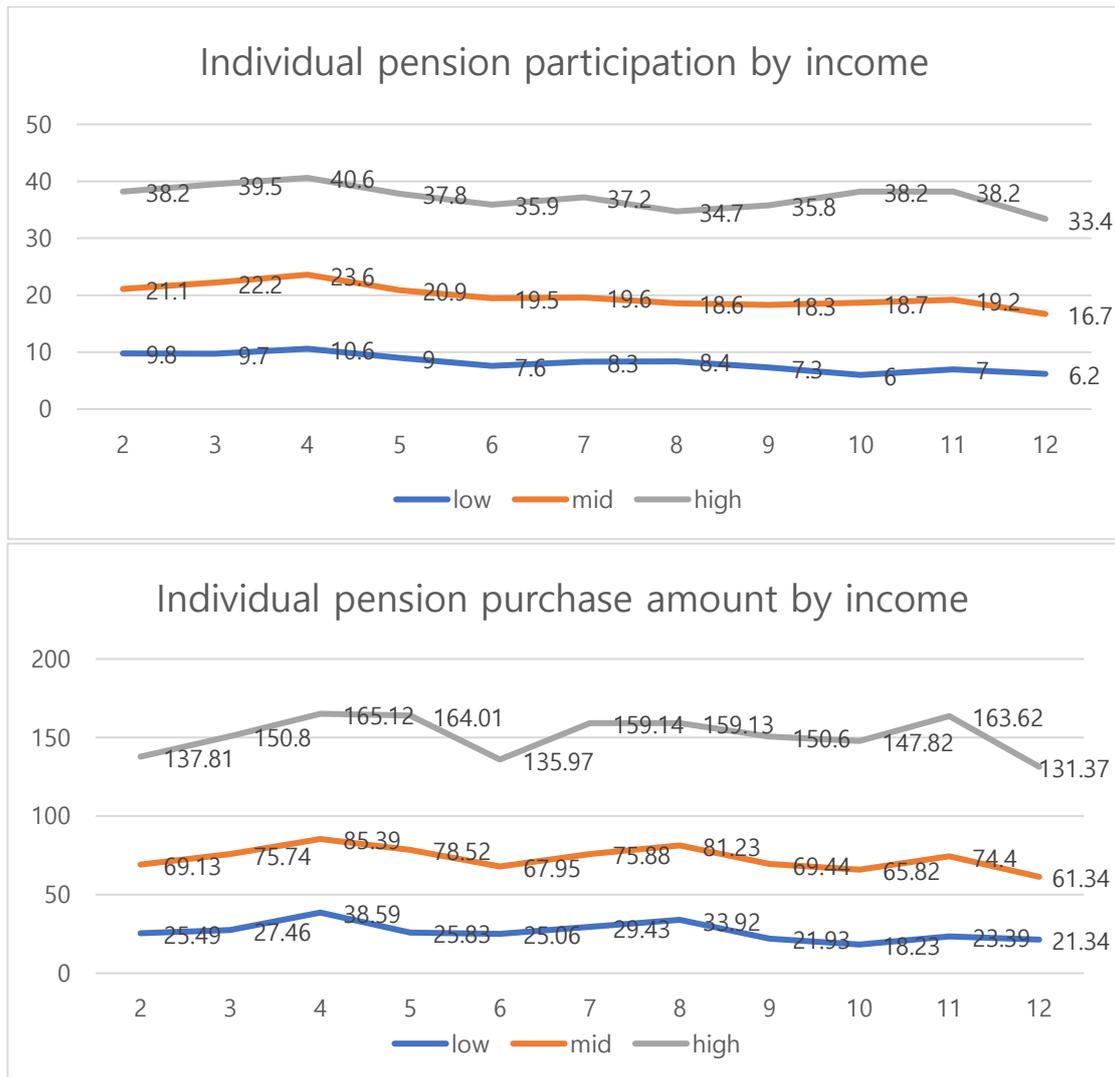
[Figure 12] Individual pension purchase by Marital Status



(unit: percent, thousand won)

Figure 12 shows individual pension purchases by marital status. Overall, the group with a spouse tended to have a better participation rate and purchase amount than the group without a spouse. The average participation rate was 21.31 percent for the group with a spouse, and 11.85 percent for the group without a spouse. The average purchase amount was 78.22 and 43.00 respectively.

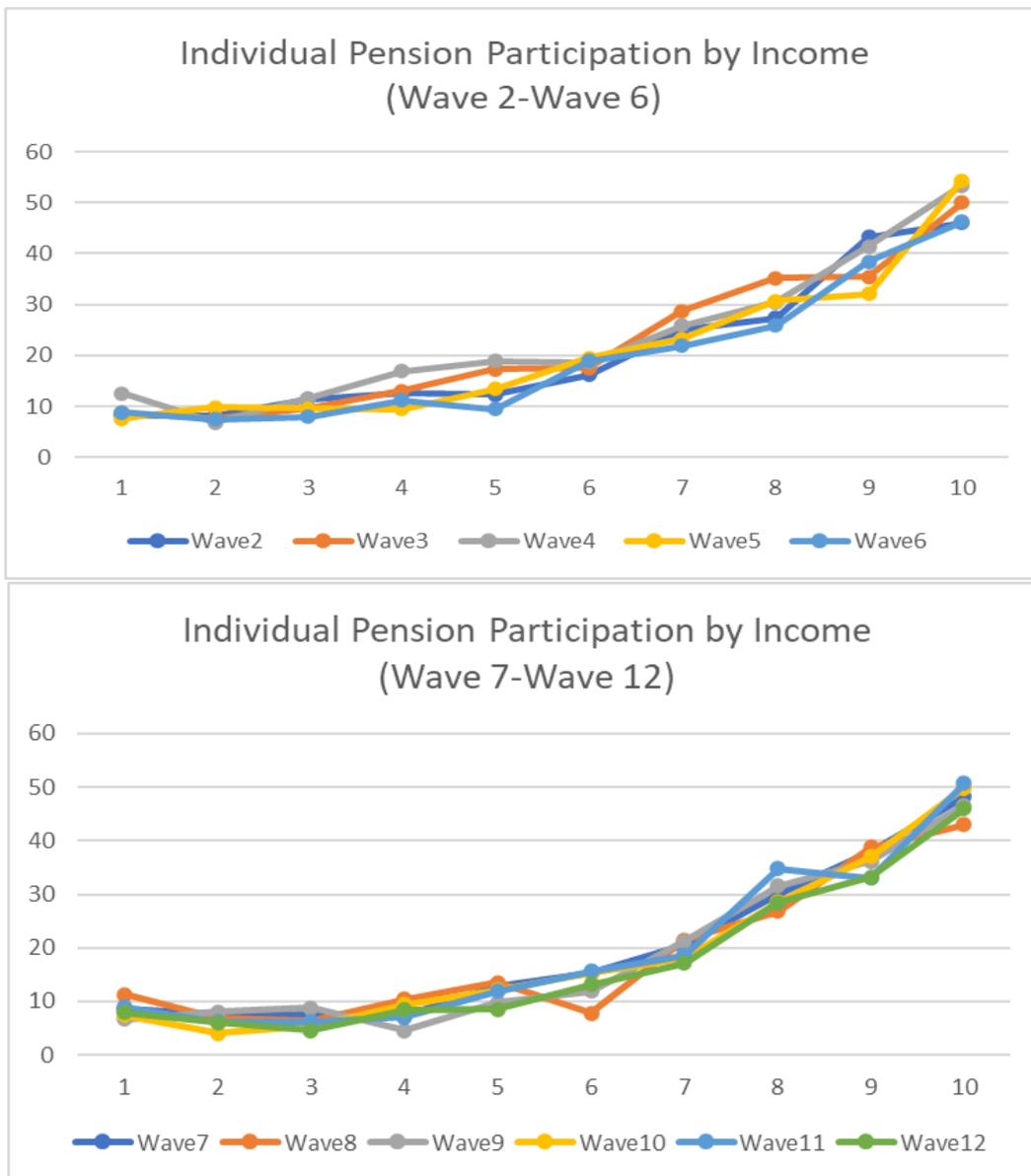
[Figure 13] Individual pension purchase by Income level (3 groups)



(unit: percent, thousand won)

Individual pension purchases had a close relationship with income status. It was clear that the participation rate and purchase amount depend highly on income status. The higher income group had a participation rate of 37.38 with a purchase amount of 151.48. And the mid-income group had a participation rate of 20.07 and the purchase amount was 73.56. The lowest income group only had a participation rate of 8.37 with 26.80 as a purchase amount.

[Figure 14] Individual pension participation by income (10 groups)



(unit: percentage)

Figure 14 shows individual pension participation by income decile. Only about ten percent of people in the lowest decile participated in individual pension, while above half of people in the highest decile have an individual pension. Although there are some disparities among waves, there is a tendency that participation rate was similar in 1-5 decile, and experience a rapid increase in participation among the 6-10 decile.

[Figure 15] Individual pension purchase amount by income (10 groups)



Figure 15 shows the individual pension purchase amounts by income decile. The purchase amount of the lower half decile was mostly under 50,000 KRW, while people in the highest decile had a purchase amount over 200,000 KRW. Also, there was a tendency that the slope of purchase amount was almost flat in 1-6 decile, while the purchase amount of 7-10 decile experienced rapid growth.

### 1.3 Information regarding Major Independent Variables

Table 11 shows the trend of public pension participation within the dataset. NPS took the largest proportion of the sample, about 70.3% of the total. NPS participant rate was highest in the 11<sup>th</sup> wave (77.04 percent), and lowest in the 4<sup>th</sup> wave (64.57 percent). There is also an unignorable share of non-participants; about 22.1 percent of the total sample neither participate NPS nor SOP. This rate was highest in the 4<sup>th</sup> wave (28.22 percent) and lowest in the 11<sup>th</sup> wave (15.58 percent). SOP, on the other hand, showed a stable rate of around 7 percent. The number of non-participants, NPS and SOP participants tends to decrease due to the overall sample attrition.

[Table 11] Trend of public pension participation

	Non-part(%)	NPS(%)	SOP(%)	Total
2	863 (24.96)	2348 (67.90)	247 (7.14)	3458
3	877 (27.52)	2078 (65.20)	232 (7.28)	3187
4	865 (28.22)	1979 (64.57)	221 (7.21)	3065
5	603 (20.71)	2083 (71.56)	225 (7.73)	2911
6	671 (23.78)	1934 (68.53)	217 (7.69)	2822
7	621 (22.67)	1906 (69.59)	212 (7.74)	2739
8	545 (20.65)	1887 (71.50)	207 (7.84)	2639
9	501 (19.75)	1842 (72.61)	194 (7.65)	2537
10	439 (18.29)	1777 (74.04)	184 (7.67)	2400
11	352 (15.58)	1741 (77.04)	167 (7.39)	2260
12	343 (15.96)	1654 (76.97)	152 (7.07)	2149
<b>Total</b>	6,680 (22.1)	21,229 (70.3)	2,258 (7.50)	-

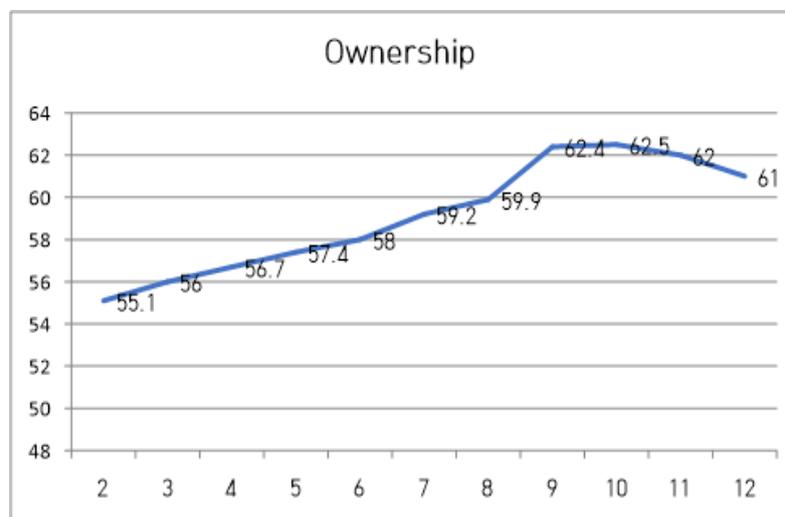
*(unit: cases, percent)*

Table 12 shows the trend of homeownership in the panel data. Through the whole years, homeowners outnumbered the non-owners. The proportion of homeowners incremented gradually, peaked at wave 9 and somewhat decreased after that. However, the overall number of samples decreased over time again due to sample attrition.

[Table 12] Trend of homeownership

Non-owner	Owner
1555	1906
1403	1784
1340	1757
1241	1670
1186	1636
1117	1622
1057	1582
954	1583
900	1500
858	1402
839	1310

(unit: cases)



(unit: percentage)

Table 13 shows the percentage of individual pension purchases and the amount of individual pension savings according to public pension participation status. In general, the SOP group had the highest participation rates, ranging from 28.95-39.22 percent, followed by the NPS group (18.20-25.89). Non- public pension participants had the lowest participation rates (3.83-10.50). Individual pension saving amounts also had a similar trend; the SOP group had the highest purchasing amount among all

groups (ranging 98.16-163.49). NPS group ranged 67.45-98.34, and the non-participant group, again, was the lowest (11.71-33.29).

[Table 13] Percentage of individual pension purchase according to public pension status

Wave	Non-participnat		NPS		SOP	
	%	Amount	%	amount	%	amount
2	10.50	33.29	24.11	78.81	33.20	108.82
3	9.76	24.93	25.89	91.14	39.22	127.19
4	3.83	40.14	20.79	98.34	35.93	163.49
5	5.79	15.82	23.76	92.58	35.09	113.58
6	8.05	31.58	22.18	76.34	33.18	105.32
7	8.38	26.81	21.14	84.39	39.15	138.85
8	6.45	24.15	20.56	93.79	33.33	116.55
9	4.78	11.71	20.41	78.04	35.05	134.37
10	5.02	18.01	20.60	72.82	33.15	110.20
11	3.83	12.29	20.79	81.77	35.93	130.92
12	4.57	16.01	18.20	67.45	28.95	98.16

*(unit: percent, thousand won)*

On the other hand, table 14 shows the percentage of individual pension purchases and the amount of individual pension savings according to homeownership status. Overall, owners tended to show higher figures in both participation rates and purchasing amount. The individual pension participation rate among homeowners was around 19.69-26.75 percent of the total sample, and the amount ranged from 69.44-100.99. Meanwhile, the non-owners showed relatively lower rates (12.16-19.40) with lower average amounts of purchase (48.87-67.71).

[Table 14] Percentage of individual pension purchase according to homeownership status

Wave	Homeowners		Non-owners	
	%	Amount	%	Amount
2	24.50	84.16	16.98	51.78
3	24.66	85.47	19.03	62.92
4	26.75	100.99	19.40	65.70
5	23.47	86.17	17.41	67.71
6	21.33	72.44	17.03	61.69
7	23.37	88.84	13.88	56.26
8	21.68	90.20	13.91	67.71
9	20.85	79.10	14.05	52.91
10	21.53	71.92	13.89	55.22
11	21.54	82.32	15.50	61.93
12	19.69	69.44	12.16	48.87

(unit: percent, thousand won)

## 2. Double Hurdle Analysis

### 2.1 Effect of public pension on individual pension purchase

#### Result

From Model 1-1 to Model 1-4 are analyzed to investigate the effect of public pension (public pension participation status and participation amount) on individual pension purchase. Model 1-1 compared the individual pension participation among non-public pension participants, NPS participants and SOP participants. Non-participants as a reference group, the coefficient of the NPS group was  $\beta=0.2493$ , and that of SOP was  $\beta=0.4344$ , and both were statistically significant ( $p<0.001$ ). The analysis outcome of the individual pension purchase amount (Model 1-3) was also similar to that of Model 1-1. Non-participant group as a reference, NPS group had coefficient of  $\beta=0.0532$  ( $p<0.1$ ), while SOP had  $\beta=0.0841$  ( $p<0.05$ ).

Meanwhile, Model 1-2 and Model 1-4 were purposed to investigate the effect of public pension contribution amount on individual pension purchase. In model 1-2, the contribution amount had positive effect ( $\beta =0.1158$ ,  $p<0.001$ ) on individual pension participation. It also had a significant positive effect ( $\beta=0.0216$ ,  $p<0.01$ ) on individual pension purchase amounts, in model 1-4.

[Table 15] Effect of public pension on individual pension purchase

	Individual pension participation		Individual pension purchase amount	
	Model1-1 (n=29,481)	Model1-2 (n=29,480)	Model1-3 (n=29,481)	Model1-4 (n=29,480)
<b>nps</b>	0.2493*** (0.0337)		0.0532* (0.0336)	
<b>sop</b>	0.4344*** (0.0352)		0.0841** (0.0329)	
<b>Cont</b>		0.1158*** (0.0346)		0.0216* (0.0254)
<b>age</b>	-0.0038*** (0.0010)	-0.0030** (0.0017)	0.0122*** (0.0016)	0.0123*** (0.0017)
<b>gen</b>	-0.0731** (0.0339)	-0.1017** (0.0363)	0.0328 (0.0270)	0.0282 (0.0280)
<b>marD1</b>	0.0255 (0.0259)	0.0000 (0.0237)	-0.0129 (0.0533)	-0.0191 (0.0535)
<b>eduD2</b>	0.1272** (0.0646)	0.1312** (0.0638)	0.2002*** (0.0459)	0.2004*** (0.0464)
<b>eduD3</b>	0.2581*** (0.0550)	0.2597*** (0.0531)	0.3383*** (0.0376)	0.3394*** (0.0380)
<b>jpoD1</b>	0.2033*** (0.0479)	0.1991*** (0.0409)	-0.1527*** (0.0222)	-0.1528*** (0.0280)
<b>jpoD2</b>	-0.2471*** (0.0539)	-0.2147*** (0.0551)	-0.1182** (0.0518)	-0.1153** (0.0465)
<b>cnum1</b>	0.1207*** (0.0203)	0.1177*** (0.0216)	0.0262 (0.0252)	0.0253 (0.0262)
<b>cnum2</b>	0.0934*** (0.0244)	0.0872*** (0.0285)	0.0234 (0.0253)	0.0212 (0.0247)
<b>cnum3</b>	0.0686* (0.0476)	0.0692* (0.0506)	-0.0289 (0.0528)	-0.0292 (0.0535)
<b>Indebt</b>	0.0214*** (0.0028)	0.0199*** (0.0031)	0.0030 (0.0027)	0.0027 (0.0026)
<b>Incashasset</b>	0.1877*** (0.0133)	0.11838*** (0.0140)	0.0926*** (0.0136)	0.0920*** (0.0136)
<b>Innoncash</b>	-0.0054 (0.0016)	-0.0047 (0.0016)	0.0049*** (0.0013)	0.0051*** (0.0012)
<b>second</b>	0.1902*** (0.0294)	0.1856*** (0.0295)	0.0358 (0.0291)	0.0356 (0.0288)
<b>cons</b>	-2.6400*** (0.0841)	-2.6396*** (0.1035)	4.0031*** (0.1247)	4.0064 (0.1230)
<b>sigma</b>			0.7296*** (0.0128)	0.7294*** (0.0124)
<b>log-likelihood</b>			-19441.41	-19371.342

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

## Summary & Discussion

In the previous section, this study asserted that public pension and individual pension can have two contradictory relationships and explained the link between the two pensions based on original life-cycle theory and extended life-cycle theory. The original life-cycle model anticipates a 'crowd-out' or negative relationship between the two, while extended life cycle theory expected a 'crowd-in' or positive relationship. It was tested and argued by many scholars including Feldstien (1974), Kotlikoff(1979), Barro & MacDonald (1979), Gullason et al. (1993), and more. Both crowding out and crowding in results can be found in empirical studies, as the net effect is known to rely upon the relative strength of the two forces (Feldstein, 1974). In Korea, the relationship between public pension and general savings tended to have mixed results (both negative and positive) but the most evidence on the link between public pension and individual pension turned out to be positive, or complimentary. This study tried to re-examine the relationship between the two using the double hurdle model, and hypothesized that the two will have a negative, or crowd-out relationship (Research Question 1), focusing on the fact that the two pensions share similar roles and grow through parallel relationships. However, the result of models 1-1 through 1-4 does not follow the assumptions in the research question.

The result of model 1-1 showed that NPS participants had a better chance to participate in public pension than non-participants, while SOP participants had the highest chance of being part of an individual pension program. The result of individual

pension purchase amount was similar; the non-participant group had the lowest amount of individual pension, followed by NPS and SOP. In sum, the non-participant group had the lowest participation rate as well as the lowest participation amount, and the SOP group showed the highest participation rate and participation amount. NPS was in between two groups in both analyses.

This result indicates that public pension in Korea tends to crowd-in individual pension participation, rather than crowd-out. In other words, the two pension systems in Korea are in a complementary relationship. Thus, the arguments by extended life cycle theory —and mechanisms induced by bequest motives, precautionary motives etc. —might explain the phenomenon in Korea better than life cycle theory. Also, this result reaffirms the related previous studies (such as Jeon, Im & Kang, 2006; Kim et al., 2015) from Korea, which illustrates the greater possibilities of a crowd-in relationship between public and individual pension.

Meanwhile, Model 1-2 and Model 1-4 were purposed to investigate the effect of public pension contribution amount on individual pension purchase. Greater contribution indicates the greater expected benefits in general, which also can affect one's purchase in individual pension. However, the result showed that the contribution both had a significant positive effect on an individual pension purchase, in participation and amount in Model 1-2 and Model 1-4. This means the more public pension one pays, the greater chance (and amount) they will pay for an individual pension. This result is also opposite to the assumption made in the research question,

which, again, suggests that public pension and individual pension are in complementary, or crowd-in relationship.

One of the major reasons for this complementary relationship between public pension and individual pension in Korea, among many potential justifications explained by extended life cycle theory, would be precautionary motives (Yoo & Yoo, 2017). This would possibly be because of two reasons: first, the weak generosity of the public pension, and second, the uncertainty of the future and sustainability of the public pension system. As mentioned in the previous section, the public pension system in Korea is not in very generous shape. Although it was started with a replacement rate of 70 percent in 1988, but this decreased continuously after the NPS went through two major reforms in 1998 and 2007. The replacement rate was dropped from 70% to 60% in 1999, and 50% in 2008. Additionally, there is an ongoing decrease of 0.5 percent every year, starting from 2009 until it reaches 40 percent in 2028. This can be further less if one cannot contribute to public pension in fullest. Public pension obviously is not high enough to be relied as a sole income source of old age, which is rather perceived as an aspect that needed to be supplemented by other means, such as an individual pension.

Another important reason is the uncertain future of public pension. As stated above, there were some efforts to maintain the stable sustainability of public pension through multiple reforms. Nevertheless, the financial problem and sustainability of the public pension system have been continuously an issue in Korea. According to NPS

Fund Management Committee (2018), there will be a deficit in funds starting from 2042, while the fund is expected to be exhausted by 2057. News on pension fund exhaustion and experience of several downsizing on public pension might triggered the precautionary motive of Korean people. In fact, according to the public survey, only 21.2% of workers between 15-59 answered that they have trust in the public pension system (Ahn, 2019). Furthermore, 37.6 percent of respondents answered that they do not think they will be able to receive public pension benefits, while only 34.5 percent thought they will receive the benefit. Uncertain future of public pension added on weak generosity might stimulate the precautionary motive which might have led Korean people to prepare for additional individual pension purchase, which can partially explain the complementary relationship of the public - individual pension system in this study.

## 2.2 Effect of homeownership and house price on individual pension purchase

### Result

The effect of housing (homeownership and house price) on individual pension purchase (participation and purchase amount) was analyzed with a double hurdle model, and the result is presented in Table 16. Model 2-1 and Model 2-2 represent the result of the effect of homeownership and house price on individual pension participation. Homeownership in Model 2-1 turned out to have a significant positive effect ( $\beta=0.1727$ ,  $p<0.001$ ) on individual pension participation, and house price in Model 2-2 also were significant ( $\beta=0.1214$ ,  $p<0.001$ ) in a positive direction. Model 2-3 and Model 2-4 are regarding the second hurdle – the relationship of housing variables and individual pension purchase amount. The Homeownership variable in Model 2-3 was  $\beta=-0.0433$  and it was statistically significant ( $p<0.05$ ). Lastly, house price in Model 2-4 was  $\beta=0.1587$  and it was significant ( $p<0.001$ ).

[Table 16] Effect of housing on individual pension purchase

	Individual pension participation		Individual pension purchase amount	
	Model 2-1 (n=25,367)	Model 2-2 (n=14,282)	Model 2-3 (n=25,367)	Model 2-4 (n=14,282)
<b>HO</b>	0.1727*** (0.0345)		-0.0433** (0.0217)	
<b>Inprice</b>		0.1214*** (0.0195)		0.1588*** (0.0199)
<b>age</b>	-0.0053*** (0.0015)	-0.0118*** (0.0026)	0.0132*** (0.0022)	0.0109*** (0.0026)
<b>gen</b>	-0.0730** (0.0361)	-0.0720* (0.0532)	0.0388 (0.0365)	-0.0495 (0.0408)
<b>marD1</b>	0.0121 (0.0298)	0.0409 (0.0649)	0.0221 (0.0739)	-0.0096 (0.0695)
<b>eduD2</b>	0.1588** (0.0713)	0.0845 (0.0766)	0.1931*** (0.0598)	0.1512** (0.0652)
<b>eduD3</b>	0.3300*** (0.0592)	0.2142*** (0.0583)	0.3383*** (0.0546)	0.2232*** (0.0624)
<b>jpoD1</b>	0.3117*** (0.0527)	0.4036*** (0.0553)	0.1475*** (0.0258)	-0.0925*** (0.0339)
<b>jpoD2</b>	-0.3171*** (0.0667)	-0.3326*** (0.0806)	-0.1605*** (0.0488)	-0.0627* (0.0403)
<b>cnum1</b>	0.1272*** (0.0241)	0.0855** (0.0335)	0.0200 (0.0297)	0.0732*** (0.0261)
<b>cnum2</b>	0.0820*** (0.0257)	0.0193** (0.0427)	0.0304 (0.0314)	0.0327 (0.0446)
<b>cnum3</b>	0.0687* (0.0533)	0.0059* (0.0696)	0.0408 (0.0603)	-0.0031 (0.0612)
<b>Indebt</b>	0.0191*** (0.0026)	0.0119*** (0.0022)	0.0044* (0.0031)	-0.0007 (0.0034)
<b>Incashasset</b>	0.1831*** (0.0155)	0.1644** (0.0179)	0.0922*** (0.0155)	0.0749*** (0.0166)
<b>Innoncash</b>	0.0044* (0.0032)	0.0066*** (0.0034)	0.0016* (0.0012)	0.0048** (0.0024)
<b>second</b>	0.2202*** (0.0326)	0.1928* (0.0053)	0.0250 (0.0326)	0.0109 (0.0557)
<b>cons</b>	-2.5704*** (0.1241)	-3.0864 (0.1868)	4.0675*** (0.1534)	2.7871*** (0.2492)
<b>Sigma</b>			0.7227*** (0.0122)	0.7069*** (0.0192)
<b>Log-likelihood</b>			-16757.85	-10366.3200

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

## Summary & Discussion

In the literature review section, this study introduced two major theories that conjecture the relationship between housing and pension, which were Modigliani's Life-cycle theory and Kemeny's 'trade-off' theory. According to the original life-cycle model and trade-off theory, housing and pension should have a negative relationship. In fact, many scholars including Jones (1997), Choi (2011), Muller (2019), Kim (2019) and more found a negative correlation between housing and pension. In contrast, extended life cycle theory argues that housing and pension can have a complementary relationship, due to retirement effects, bequest motive, liquidity constraint, precautionary motive, and other reasons (Krumm & Kelly, 1989; De et al, 2007). Both negative and positive effects can be found theoretically, so the net effect can be decided upon the relative strength of the two forces. This study assumes that housing and individual pension would have a negative correlation (Research Question 2), as housing and individual pension has a relationship as the shared role in later life and competing relationship in working period. Also, people with the higher valued houses are assumed to have a lower individual pension, vice versa. However, most of the results do not exactly follow the assumption in research questions, except for the homeownership- individual pension purchase amount model (model 2-3).

Model 2-1 and 2-2 showed that people with a house, and those homeowners with a higher value of the property have a better chance to participate in individual pension programs than non- owners or homeowners with a lower value property. This

result is quite in opposite direction to (need- or constraint-induced) trade-off theories from the previous studies, or the assumptions of this study. Which means, in Korea, the relationship between the two is rather complementary.

However, the result of the relationship between homeownership and individual pension purchase amount was not the same as Model 2-1, which was significantly negative; this showed the possibility of a trade-off between pension and housing. In real life, homeowners might be people who are economically better than non-owners; thus, they might be able to afford to participate in an individual pension program. Or they might find various tax-incentive policies from the government attractive. These reasons might drive owners to participate more in an individual pension. However, the significant negative coefficient of homeownership in Model 2-3, reflects that the purchase of the amount of individual pension among owners might be lower than non-owners, although the participation rate might be higher. This shows the possibility of the trade-off; that the owner might purchase a smaller amount of individual pension than non-owners. This might be because they can utilize the house as a pension in later age and thus less in need of generous pension (need-induced); or they might face greater financial constraint (such as housing mortgage) compared to the non-owners (constraint-induced). On the other hand, the non-homeowner individual pension purchasers—the reference group— probably would be more in need for ‘future income,’ as they do not own the house, and expects higher living expenses in the retired time. Also, they do not have financial constraints caused by house

purchases, thus more capable of purchasing a higher level of individual pension amount. Combined natures of homeowners, who might be less in need for the generous purchase of individual pension amount, and the reference group, who might be in need of a substantial level of individual pension amount, may cause the result of the model 2-3.

On the other hand, Model 2-4 showed that the people with higher valued houses tended to have a better amount of individual pension purchases. This means the people with higher valued property among the homeowners, had a tendency of purchasing a higher amount of individual pension than lower-valued property owners. This result does not agree with Model 2-3, and does not support the result of previous studies of trade-offs, but rather strengthens the complementary relationship of the two. This contradictory result can be partially explained by liquidity constraint and precautionary motive from extended life cycle theory. As mentioned earlier, liquidity constraints can work as a motive for better saving and individual pension purchase outcomes. According to Bailliu and Reisen (1998), liquidity constraints can make individuals become more cautious to uncertainty over future income. The higher the liquidity constraints are, the more individuals become cautious, which can lead to greater individual pension outcomes. In contrast, the lower liquidity constraint generally is known to cause a gradual decrease in individual pension purchases. Agreeing to previous studies, housing wealth is one of the major factors of liquidity constraint in the household economy. (Yoo & Byun, 2012 ; Boar, Gorea & Midgrigan,

2021). Higher price in a house<sup>33</sup> leads to higher liquidity constraints, which can cause greater uncertainty; and this process may affect the increase of individual pension purchase amount. This can be one of the reasons why the result of higher house prices on individual pension purchase amounts turned out to be positive.

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<sup>33</sup> In fact, the result of subgroup analysis based on house price (page 157) indicates that the effect of house price on the individual pension purchase amount of lower house value group was not significant. While the effect of house price on the individual pension purchase amount of higher house value group was statistically significant in a positive direction. This result can be evidence that supports the explanation of liquidity constraints at some level.

## 2.3 Interaction Effects of housing and public pension status

### Result

The next models examine the interaction effect of housing (homeownership and house price) and public pension participation status (non-participants, NPS, SOP) on individual pension purchase, and the result is presented in Table 17. In Model 3-1, the interaction term (interaction 1) of homeownership and NPS had a significant positive effect on individual pension participation ( $\beta=0.1919$ ,  $p<0.001$ ). In the same token, the interaction term (interaction 2) of homeownership and SOP also had a significant positive effect on individual pension participation ( $\beta=0.2122$ ,  $p<0.01$ ).

Meanwhile, the interaction effect of house price and public pension status on individual pension participation (Model 3-3) did not show statistical significance. The interaction between price and NPS (interaction 1,  $\beta=-0.0200$ ) and interaction between price and SOP (interaction 2,  $\beta=-0.001$ ) were not significant ( $p>0.1$ ).

Model 3-2 and 3-4 examined the interaction effect of house price and public pension on individual pension purchase. In model 3-2 interaction 3 was statistically significant ( $\beta=0.0788$ ,  $p<0.05$ ), while interaction 4 was not ( $\beta=0.0418$ ,  $p>0.1$ ). The result of model 3-4 was slightly different from model 3-2. The interaction of NPS and house price was  $\beta =0.1371$  and significant at  $p<0.05$  (interaction 3), and the interaction of SOP and house price was  $\beta=0.1852$  and also statistically significant at  $p<0.05$  (interaction 4).

[Table 17] Interaction Effects of housing and public pension on individual pension

	Individual pension participation		Individual pension purchase amount	
	Model 3-1 (n=25,367)	Model3-2 (n=14,282)	Model 3-3 (n=25,367)	Model 3-4 (n=14,282)
HO	-0.0131 (0.0722)		-0.0311 (0.0766)	
lnprice		0.0483* (0.0352)		0.0269 (0.0558)
nps	0.1370*** (0.0306)	-0.5054** (0.2626)	0.0822** (0.0495)	-1.3211** (0.6299)
sop	0.3018*** (0.0369)	0.0419 (0.0397)	0.0893** (0.0423)	-1.7609** (0.7002)
HO*nps (interaction1)	0.1919** (0.0832)		-0.0200 (0.0778)	
HO*sop (interaction2)	0.2122** (0.0909)		-0.0001 (0.0682)	
lnprice*nps (interaction3)		0.0788** (0.0272)		0.1371** (0.0600)
lnprice*sop (interaction4)		0.0418 (0.0418)		0.1852** (0.0681)
age	-0.0060*** (0.0015)	-0.0124*** (0.0026)	0.0130*** (0.0021)	0.0108*** (0.0026)
gen	-0.0862*** (0.0368)	-0.0808* (0.0524)	0.0339 (0.0377)	-0.0460 (0.0419)
marD1	0.0081 (0.0332)	0.0362 (0.0654)	-0.0250 (0.0738)	-0.0068 (0.0715)
eduD2	0.1303** (0.0750)	0.0732 (0.0792)	0.1876** (0.0613)	0.1511** (0.0667)
eduD3	0.2798*** (0.0630)	0.1830** (0.0605)	0.3278*** (0.0545)	0.2186*** (0.0644)
jpoD1	0.2426*** (0.0500)	0.3385*** (0.0495)	-0.1603*** (0.0249)	-0.1012*** (0.0295)
jpoD2	-0.2478*** (0.0686)	-0.2493*** (0.0773)	-0.1368** (0.0560)	-0.0747* (0.0472)
cnum1	0.1243*** (0.0244)	0.0841** (0.0349)	0.0192 (0.0296)	0.0748** (0.0267)
cnum2	0.0776** (0.0265)	0.0116 (0.0438)	0.0291 (0.0307)	0.0343 (0.0444)
cnum3	0.0638 (0.0538)	0.0028 (0.0691)	-0.0421 (0.0592)	0.0044 (0.0590)
lndebt	0.0187*** (0.0025)	0.0119*** (0.0022)	0.0043* (0.0030)	-0.0006 (0.0033)
lncashasset	0.1808*** (0.0153)	0.1628*** (0.0178)	0.0920*** (0.0155)	0.0754*** (0.0166)
lnnoncash	0.0039 (0.0030)	0.0057** (0.0032)	0.0014 (0.0012)	0.0045** (0.0024)
second	0.2167*** (0.0325)	0.1891*** (0.0528)	0.0239 (0.0332)	0.0102 (0.0550)

cons	-2.5428*** (0.1305)	-2.5075*** (0.2432)	4.0311*** (0.1444)	4.0554*** (0.6806)
Sigma			0.7224*** (0.0121)	0.7062*** (0.0190)
Log-likelihood			-16707.67	-10335.50

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

## Summary & Discussion

This study assumed that there will be interaction effect of public pension and homeownership on individual pension purchase; it is expected that the level of individual pension purchase would be determined by housing status (homeownership and house price) and public pension status (non-participant, NPS, SOP), and how the two factors interact. More specifically, this study assumed the negative relationship among public pension, housing and individual pension, and the relationship will be altered by housing or public pension status. However, as seen in the result of the previous analysis, the relationship of housing and individual pension purchase, and the relationship between public pension and individual pension purchase turned out to be positive, rather than negative (except for homeownership and individual pension purchase amount). The effect of interaction also was positive throughout the analysis.

The result of Model 3-1 indicates that the homeowners with NPS or SOP tended to have significantly better chances to participate in individual pension, compared to the non-owners, or non-participants. For non-public participants, having a house may decrease the individual pension purchase probability (HO:-0.0131), but having a

public pension (of any kind) and housing increased the probability of purchasing an individual pension. According to trade-off theory, generous pension and homeownership should have a negative relationship, but the result is in opposite direction. The owners and the people in generous pension schemes are in better shape with individual pension participation; thus, they are in a complementary relationship. However, model 3-3 showed that both interactions (HO\*NPS, HO\*SOP) did not have a specific effect on individual pension purchase amount; the homeowners with NPS or SOP did not have significantly better individual pension purchase amount compared to the non-owners, non-participants groups.

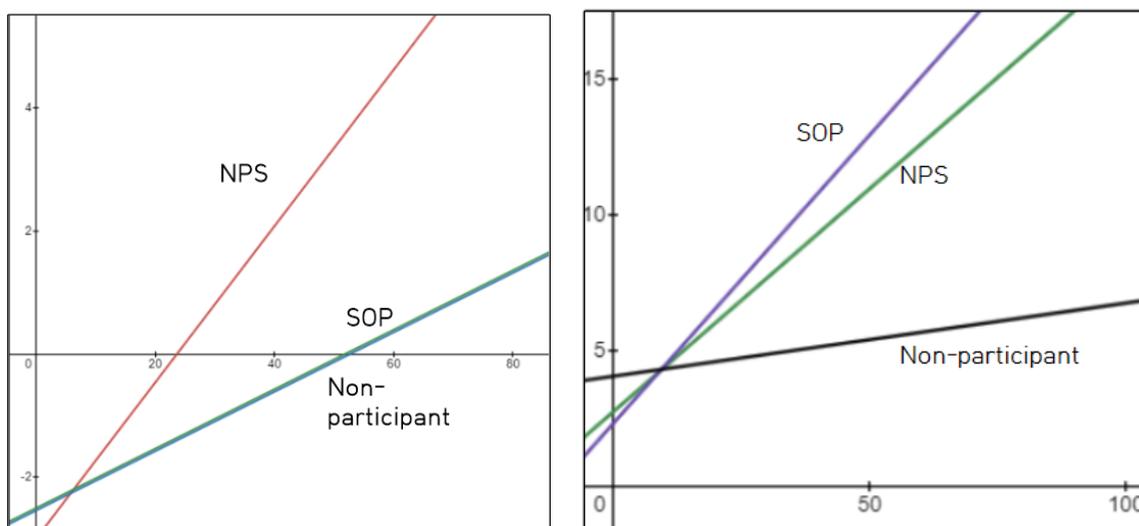
There are two possible reasons why the interaction of homeownership and public pension status is not significant on the individual pension purchase amount. First is the nature of the reference group of model 3-3; The reference group of model 3-3 was the group with an individual pension, but without public pension and homeownership. The reference group of model 3-3 probably will not be the lower income group, as the lower income group might not participate in individual pension in the first place. Thus, there is a possibility that the reference group of model 3-3 might participated in an individual pension with a certain level to prepare for old age in real terms. The second possibility is some level of trade-offs within NPS and SOP groups; if public pension participants own houses, there will be less in need for future income, while there will be a possible financial constraint, which could lead to a diminished level of individual pension purchase level at some degree. The reference

group with a significant level of individual pension purchase combined with diminished individual pension purchase within the NPS and SOP group, might be led to the result of the non-significant difference in purchase amount among the groups.

In Model 3-2, the interaction of SOP and house price is not significant, while the interaction of NPS and house price were significant. SOP and non-public pension participants (reference group) both experience the same increase in probability according to a price change, as they share the same slope [Figure 16, Left]. However, as interaction 3 was significant; the NPS group has a difference in slope compared to the other two groups. Which means, the people in the NPS group with higher house prices tended to have a greater chance of individual pension participation than other groups. This result makes sense if it is looked at through the lens of trade-off theory. SOP participants with higher valued housing would expect higher future income in retired time because SOP generally expect higher public pension than other groups, and higher valued housing indicates higher income in cash or income in kind; while NPS participants would expect lower future income compared to SOP although they have higher valued house, because NPS generally have lower pension amount compared to SOP. Thus, SOP are people who probably will be less in need of additional pension, compared to the NPS participants, while NPS would need further individual pension. This can partially explain the result.

In Model 3-4, people in the NPS group with higher house value tended to have a greater purchase amount of individual pension. Similarly, people in the SOP group

with higher house values also showed a higher level of individual pension purchase. Both groups have different slopes compared to the non-participant group, SOP showing steeper slope compared to NPS [Figure 16, Right]; this result indicates that compared to the non-participant group, NPS and SOP participants may experience a greater increase in individual pension purchase amount according to house price. Interaction of SOP and house price was not significant in the individual pension participation model, but it was significant in the purchase amount model. Although this group might be less in need of additional pension, which caused non-significant on individual pension participation model (model 3-2), this group ironically can afford a better amount of individual pension once they choose to purchase. SOP with higher house prices can represent a relatively stable household economy, and thus can purchase a higher amount of individual pension. This fact possibly could be reflected in Model 3-4.



[Figure 16] House price \* public pension status interaction on individual pension participation (left) and purchase amount (right)

The result, in general, is in opposite direction to the assumption made in this study. Generous pension and housing are expected to have a trade-off relationship, but homeowners, and especially high valued price homeowners, with a more generous pension scheme, are more towards individual pension purchase. Again, this result also supports the complementary relationship among public pension, housing and individual pension. This study provided the possible reasons for the complementary relationship between public pension and individual pension (precautionary motive) and housing and individual pension (liquidity constraint) in the previous section. The complementary relationship that appeared in the interaction effect can be the result of the mixed and combined effects of the two.

## 2.4 Interaction Effects of housing and public pension contributions

### Result

The next models examine the interaction effect of housing (homeownership and house price) and public pension contribution on individual pension purchase, and the result is presented in Table 18. Model 4-1 and 4-3 examined the interaction effect of public pension contribution and homeownership on individual pension purchase. The result shows the interaction term of contribution and homeownership (interaction 5 in Model 4-1) has a positive effect on individual pension participation ( $\beta=0.0682$ ,  $p<0.001$ ). Model 4-3, on the other hand, showed a different outcome: the interaction effect of contribution and homeownership on individual pension amount turned out to be non-statistically significant ( $\beta=-0.0144$ ,  $p>0.1$ ).

The analysis regarding the interaction effect of public pension contribution and house price on individual pension purchase amount was Model 4-2 and 4-4. The interaction 6 in model 4-2 (interaction of contribution and house price on individual pension participation) was not significant in statistical level ( $\beta=0.0024$ ,  $p>0.1$ ), while interaction 6 in model 4-4 (interaction of contribution and house price on individual pension purchase amount) was significant in conventional level ( $\beta=0.0542$ ,  $p<0.05$ )

[Table 18] Interaction Effects of housing and public pension on individual pension

	Individual pension participation		Individual pension purchase amount	
	Model 4-1 (n=25,366)	Model 4-2 (n=14,281)	Model 4-3 (n=25,366)	Model 4-4 (n=14,281)
cont	0.1224*** (0.0127)	0.1451 (0.1825)	0.0770*** (0.0180)	-0.5019*** (0.2495)
HO	-0.0160 (0.0538)		-0.0216 (0.0537)	
Inprice		0.0713* (0.0446)		0.017 (0.0680)
Cont*HO (interaction5)	0.0682** (0.0223)		-0.0144 (0.0205)	
Cont*Inprice (interaction6)		0.0024 (0.0180)		0.0542** (0.0247)
age	-0.0073*** (0.01659)	-0.0125*** (0.0027)	0.0120*** (0.0020)	0.0107*** (0.0026)
gen	-0.1257*** (0.03712)	-0.1186** (0.0545)	0.0158 (0.0371)	-0.0468 (0.0398)
marD1	-0.0054 (0.0330)	0.0295 (0.0637)	-0.0356 (0.0739)	-0.0065 (0.0731)
eduD2	0.0964 (0.0760)	0.0518 (0.0818)	0.1737** (0.0623)	0.1497** (0.0658)
eduD3	0.2219*** (0.0644)	0.1600** (0.0634)	0.2987*** (0.0555)	0.2177*** (0.0633)
jpoD1	0.2121*** (0.0503)	0.3134*** (0.0507)	-0.1861*** (0.0238)	-0.1052*** (0.0299)
jpoD2	-0.1890** (0.0684)	-0.1836** (0.0797)	-0.1013** (0.0568)	-0.0545 (0.0486)
cnum 1	0.1109*** (0.0244)	0.0713** (0.0358)	0.0104 (0.0295)	0.0700** (0.0256)
cnum2	0.0615** (0.0262)	0.0012 (0.0442)	0.0190 (0.0293)	0.0306 (0.0433)
cnum3	0.0489 (0.0535)	-0.0124 (0.0688)	-0.0522 (0.0577)	-0.0042 (0.0590)
Indebt	0.0180*** (0.0026)	0.0121*** (0.0023)	0.0039* (0.0030)	-0.0008 (0.0033)
Incashasset	0.1750*** (0.0149)	0.1604*** (0.0175)	0.0903*** (0.0152)	0.0753*** (0.0161)
Innoncash	0.0031 (0.0031)	0.0053* (0.0033)	0.0010 (0.0013)	0.0043** (0.0024)
second	0.2129*** (0.0318)	0.1919*** (0.0526)	0.0221 (0.0326)	0.0123 (0.0539)
cons	-2.4405*** (0.1336)	-2.7555*** (0.3144)	4.0598*** (0.1381)	4.1147*** (0.7730)
Sigma			0.7204*** (0.0121)	0.7052*** (0.0191)
log-likelihood			-16614.686	-10286.095

Note: \*\*\*  $p < 0.001$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

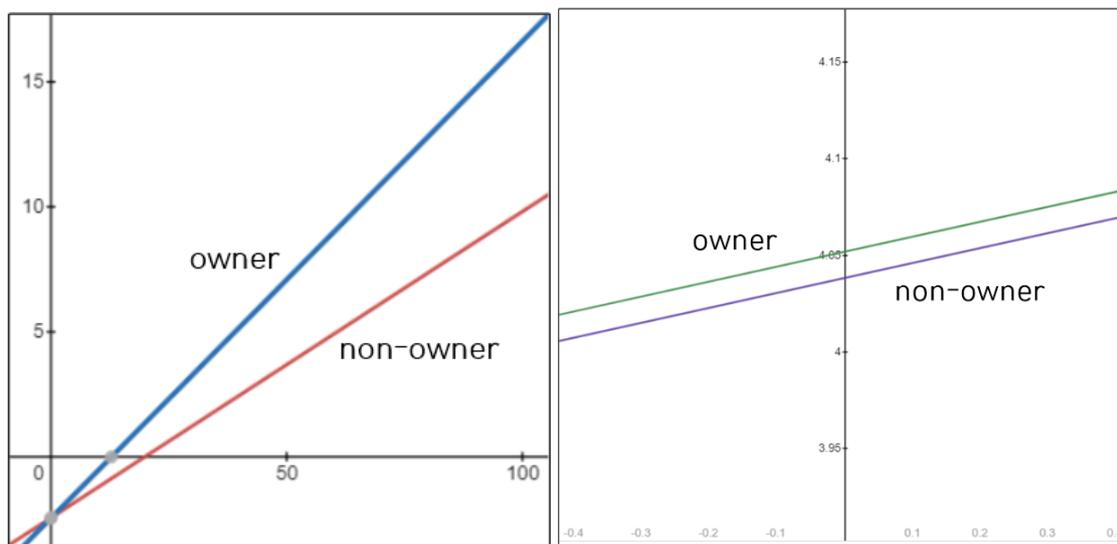
### Summary & Discussion

This study also assumed the interaction effect of housing (homeownership, house price) and public pension contribution amount on individual pension purchase. As mentioned above, the study generally expected a negative relationship among public pension, housing and individual pension, and the relationship will be altered by housing or public pension contribution. However, again, the relationship of housing and individual pension purchase, and the relationship between public pension and individual pension purchase was mostly positive (except for Model 2-3), the effect of interaction also tended to be positive throughout the analysis.

The result of model 4-1 indicates that homeowners with higher contribution amounts tended to have a better chance in individual pension participation. In other words, compared to non-owner groups, the owner group's effect of contribution on individual pension participation is greater; and this difference grows as contribution increases [Figure 17, left]. This, again, is the result that supports the complementary relationship between pension and housing.

Meanwhile, the result of Model 4-3 shows that that higher contribution amount with homeownership did not have a superior amount of individual pension purchase. Both homeowner and non-owner groups experience the same increase in

probability according to a contribution change, as they share the same slope [Figure 17, right]. If one has a higher contribution on public pension and owns a house, he/she would expect better future income with a public pension, while expect more financial constraints with pension and housing mortgage. This can decrease the need for future income while constrains household finances. This may cause the non-significance of contribution\*price interaction of Model 4-3.



[Figure 17] Interaction of homeownership and public pension contribution on individual pension participation (left) and purchase amount (right)

The result of Model 4-2 showed that the interaction of contribution and price did not increase the probability to purchase an individual pension. Those with higher contribution levels with higher valued houses did not have a higher probability of purchasing individual pensions than others. Although interaction 6 (contribution \* price) did not affect the probability of purchasing individual pension, it had a positive

impact on individual pension purchase amount model 4-4. The interaction in model 4-4 had a meaningful increase in individual pension purchase amount. The people with higher contribution amounts and higher valued houses tended to have a better amount at individual pension purchases.

High contribution and higher valued houses denote better preparation for after-retirement time, as well as higher financial constraints compared to other groups. This can weaken the chance to purchase individual pension at first, which may possibly lead to a non-significant result of interaction 6 in model 4-2. However, this group is also one with a better financial situation compared to the others: although the chance to participate in individual pension might be weakened, once they participate, they might participate with a better amount of individual pension. This might be a clue to explain the significant result of interaction 6 in model 4-4.

Again, this result shows an opposite direction to the assumption made in this study. Higher public pension contribution and housing are expected to have a trade-off relationship, but this result supports the complementary relationship among public pension, housing and individual pension. As stated in the previous section, the possible reasons for this complementary relationship might be rooted in the mixed and combined effect of precautionary motive (public pension and individual pension) and liquidity constraint (housing and individual pension).

## 2.5 Control Variables

The effect of control variables — age, gender, marital status, education, job position, number of children, debt, amount, cash asset, non-cash asset secondary housing — throughout the analysis can be summarized as follows.

First of all, the age variable had a pattern. For individual pension participation, age had a negative effect on a consistent level. However, for the individual pension purchase amount, age had a significant positive effect throughout the analysis. Younger people tended to have better participation, while older people tended to have a greater amount of individual pension savings. Previous studies also show both directions of the results: younger the better purchaser (such as Jeon et al., 2006; Moon 2012), older the better purchaser (such as Baek, 2012; Moon 1997). The result of this study reflects the previous studies uniquely.

In terms of gender, females tended to have significantly better individual pension participation than males. However, there was no gender difference in individual pension purchase amount. This result does not follow the outcome of previous findings (Graiet & Jilani, 2019; Ciriotta et al., 2020; Cha, 2015). Marital status, on the other hand, was not significant throughout the analysis, indicating it was not a factor that affects individual pension purchases.

Education level was significant. The more education years showed the better individual pension purchase, both participation and amount. This result concurred

with previous studies (Kim, 2013; Na & Choi, 2014; Cha, 2015). Job position variable had a complicated result. As a self-employed group as a reference, regular employees tended to have a significant positive level of individual pension participation as well as purchase amount, with a few significant negative signs as well, while temporary employees consistently lower level of individual pension purchase than the self-employed group.

The number of children was another variable that did not follow the result of existing studies (Lee, 2012; Choi, 2015; Foster, 2012) as a 'no child' as a reference group, having one child had a significant increase in an individual pension, both in participation and purchase amount. However, having two or three+ children did not have shown any difference compared to the reference group.

Debt amount tended to have a positive effect on individual pension participation, as it turned out to be significantly positive in all analyses. In the case of the individual pension purchase amount, it was either significantly positive or non-significant. If this is reflected to trade-off theory, it should show as negative directions, as debt can be constrained to the household budget; however, some scholars argue (Li, 2001; Baek & Jung, 2005) that debt can help household budget, thus this may possibly lead to a positive effect on an individual pension.

Cash asset was positively significant in all analyses, indicating that more cash assets can help the individual to have better participation and better purchase amount in an individual pension. The non-cash asset had mixed results; More noncash assets

tended to have significantly more individual pension purchases, both in participation and amount, but there were a few non-significances, as well as significant negative. Lastly, secondary housing had a significant effect on individual pension participation in all analyses, while secondary housing did not have a specific effect on individual pension participation amounts.

# VI. Conclusion

## 1. Summary of the study

This study is purposed to investigate the effect of public pension and homeownership on individual pension purchases. This study focused on three research questions: the relationship between public pension and individual pension (Research Question 1), the relationship between housing and individual pension (Research Question 2), and the interaction effect of public pension and housing on individual pension (Research Question 3). Following is a summary of major findings on these research questions.

### RQ1. What is the effect of public pension on individual pension?

Public pension participation status (NPS and SOP) had significant positive effects on individual pension participation and purchase amount; Compared to the non-public pension participation group, NPS had a better chance and amount of individual pension purchase, and SOP had a better chance and purchase amount than NPS group. Contribution amount also had a similar result, as it had a significant effect on both participation and purchase amount model; the more public pension one pays, the greater chance (and amount) they will pay for an individual pension. This result indicates that public pension in Korea tends to have a crowd-in effect on individual pension purchase, rather than crowd-out. In other words, the two pension systems in

Korea are in a complementary relationship.

RQ2. What is the effect of housing on individual pension?

Homeownership had a significant positive effect on individual pension participation, as well as house prices. People with house, and homeowners with higher value property have a better chance to participate in individual pension programs than non-owners or homeowners with lower value property. This result is quite in opposite direction to Kemeny's (need- or constraint-induced) trade-off theory, or the assumptions of this study. This means, in Korea, the relationship between the two is complementary, rather than substitutional.

However, homeownership had a significant negative effect on individual pension purchase amount — this showed some possibility of a trade-off between pension and housing; the owner might purchase a smaller amount of individual pension than non-owners, because they can utilize the house as a pension at a later age (need-induced), or they might face greater financial constraint (such as housing mortgage) than non-owners (constraint-induced). Meanwhile, the people with higher valued property among the homeowners, had a tendency of purchasing a higher amount of individual pension than lower-valued property owners, which again showed a complementary relationship between the two.

RQ3. What does the interaction of the housing and public pension on individual pension?

The interaction effect of housing (homeownership and price) and public pension (status, contribution amount) were investigated, and the summary of the result is presented in table 19.

[Table 19] Summary of Interaction Effect

	Individual pension participation		Individual pension purchase amount	
	HO	price	HO	Price
NPS	O	O	X	O
SOP	O	X	X	O
Contribution	O	X	X	O

The result indicates there were interaction effects between homeownership and public pension (both status and contribution) on individual pension participation, while there was no interaction effect between homeownership and public pension on the individual pension purchase amount. This means homeowner groups with public pension (NPS or SOP) or homeowners with higher public pension contributions tended to have a better chance of participating in an individual pension. On the other hand, there was no interaction effect between house price and public pension contribution or status on individual pension participation, except there was a

significant interaction between NPS and house price. Meanwhile, there was a significant interaction effect between house price and public pension (both status and contribution amount) on the individual pension purchase amount. Homeowners of higher valued houses with the public pension, or higher public pension contributions tended to have better purchase amounts.

## 2. Theoretical Implication

There are several theoretical implications in this study, which can be summarized into four; First, this study emphasized the importance of housing in individuals' old age and old age preparation, which have been somewhat excluded from the academic field. As mentioned in the study, homeownership prevents a household from paying rent, which is typically the largest single item of consumption that takes up a considerable part of household income. This is critical in old age as much as a pension, which prevents the loss of income after retirement. Although the importance of housing and homeownership in old age is widely accepted (OECD, 2012), study on housing in pension or old age preparation was largely understudied in the academic field compared to its importance, as many studies treated housing or homeownership in pension only as one of control variables. This study shed light on under-recognized 'housing' in the pension field and reviewed the role of housing in individual pension purchases in Korea to overcome the limitation of previous

literatures.

Second, this study has its meaning that it surveyed the relationship of housing and pension at the micro level using Kemeny's trade-off theory. Numbers of previous studies investigated the relationship of housing and pension using Kemeny's trade-off theory, but most of them were in macro-level analysis. Although original Kemeny's theory explains the trade-off between pension and homeownership on the national level, its mechanism (need-induced or constraint-induced trade-off) can be applied to the micro level as well (Muller, 2019); In fact, these mechanisms are quite effective tools to explain individual level behavior. However, there were few attempts explaining the pension-homeownership relationship using Kemeny's theory except for a handful of recent movements (Muller, 2019; Torricelli, 2016), which caused an extreme lack of empirical evidence at the micro-level. Consequently, this barred the chance of the policy regarding pension-housing on the micro level to be developed. This study can find its significance in that it seeks to convert macro-level discourse into micro-view.

Third, this study elucidated that the relationship of housing and individual pension and the relationship of public pension and individual pension in Korea is mostly complementary, using double hurdle analysis. Those who participate in generous public pension, those who participate in public pension with higher participation amounts, homeowners, and owners with higher valued property generally showed the better results of individual pension purchase, except for a few

cases. This indicates that the extended life-cycle theory and its mechanism behind it generally explains the situation of Korea better than other theories. Especially, this study argues two mechanisms of extended life cycle theory as the reasons for the complementary relationships: precautionary motive, caused by weak generosity of the public pension and uncertain future of pension policy, and liquidity constraints from owning a house or higher valued house.

Additionally, this study also found out homeownership and individual pension can have some possibility of a trade-off relationship in Korea; as the effect of homeownership on individual pension purchase amount turned out to be substitutive. There has been no attempt to empirically examine Kemeny's trade-off theory in Korea in previous studies; thus, this finding might be a speaking contribution that can foster a chance of future investigations.

Fourth, this study has a contribution to the academic field that this is one of the very first studies that investigated the interaction effect of public pension and housing on individual pension purchase. This study assumed that the result of individual pension purchases will be altered by how public pension and housing are arranged. Although the outcome has not concurred with the direction it was assumed, this study found out the meaningful interaction effect between public pension and housing on individual pension purchase. Thus, this study has particular implications confirming that it was reasonable, and necessary to observe the interaction effect of public pension and housing, along with analyzing each factor in a separate manner.

Furthermore, according to life cycle theory and Kemeny's trade-off theory, it was possible to assume the substitutive or negative relationship or interactions among public pension, housing, and individual pension purchase; however, the result indicates that the interaction of homeownership and public pension had a significant positive effect on individual pension participation. Also, house price and public pension had a significant positive interaction effect on the individual pension purchase amount. In other words, this study confirmed the valid positive relationship among three aspects. This finding also shows that the actual evidence in Korea might not be in line with the (life cycle and Kemeny's trade-off) theoretical framework. This could be another valuable finding as well.

### 3. Political Implication and Suggestions

As noted at beginning of the study, there are multi-problems in Korea regarding the economic problem of old age. And this can be everyone's problem because eventually, all people will grow old. The findings of this study can provide some clues to supplement the situation not only by an individual pension but also by a public effort. A few political implication and suggestions are listed below.

First, this study provides some significant information on individual pension purchases that could be important political preliminary data. For proper policy intervention, understanding the accurate situation on related features is of paramount

importance; based on the precise data, the proper point of intervention can be appropriately guided. However, in terms of individual pensions, accurate and comprehensive information of the actual situation was somewhat insufficient to this point. This study tried to investigate the detailed information on individual pensions in relation to both public pensions and housing. Also, this study provided various basic evidence of the individual pension in terms of gender, education, job position etc. as well as its time sequential changes. This could be important baseline information that could be used in political settings.

Second, there are needs to provide solid information on individual pension to the non-participants in order to encourage individual pension purchase. This study showed the traits of those who tend to have less participation in the individual pension scheme. Those include people who are in the non-public pension participant or NPS participant group, groups with lower public pension contribution, non-homeowners or homeowners with the lower valued property. Furthermore, these group of people has a lower likelihood to have secure older age, as public pension and housing tend to have a complementary relationship with individual pension purchase. The proper education on individual pension, on its necessity, types, benefits, through various organizations—such as government, welfare facilities, non-profit organizations, even bank or financial organization if necessary— would be essential to promote the individual pension purchase for these people. The effort to increase interest and understanding of individual pensions should be made continuously through

counseling or consulting, as this could be one way to help build a stable multi-pillar pension system.

Third, there are also needs to aid people in vulnerable groups to participate in individual pensions if they want to. As mentioned, the result found a complementary relationship among public pension, individual pension and housing, which indicates that those with a better household economy tend to have a better outcome in individual pension. This also indicates that less economically viable ones—those who are in the non-public pension participant or NPS participant group, group with lower public pension contribution, non-homeowners or homeowners with lower valued property from the study— might have the risk to be excluded or not actively involved in the individual pension system. In short, and in general, the complementary relationship found in this study indicates rich people purchase more individual pensions while poor people have limitations. Thus, proper policy-level intervention is necessary to those economically non-viable people with a will to participate in individual pensions. ‘Riester Pension’ from Germany could be a good model to intervene in this problem. The Riester pension was started in 2002 to expand the role of the individual pension to compensate for the reduction in the level of public pension benefits (Ryu, 2012; Moon, 2012). It provides a direct and substantial level of subsidy to the amount of individual pension one purchases. This has been a useful entice and practical method to aid the mid to low-income groups to participate in the individual pension system in Germany. Also, as individuals can get a subsidy from Riester Pension only if they

participate in the public pension system, this contributes naturally to participate in public pension systems, and eliminates blind spot of the public pension. As of 2011, about 50 percent of the total participant of Riester pension are in the mid- to low-income group, with an annual income of fewer than 20,000 euros. This indicates the significant influence of Riester pension on the old-age income security among the vulnerable groups. Adopting this individual pension subsidy program would be an impressive political intervention that could help economically less viable ones to participate in individual pensions. Also, this will be one practical way to overcome the limitation of the complementary relationship.

Finally, expanding role of the public sector will be also necessary. The complementary relationship of public pension, individual pension and housing can lead to polarization of old age preparation between groups, as complementary relationship, again, indicates rich people purchase more individual pension while poor people have limitations. This indicates a clear gap of old age preparation level between two groups, which could not be easily overcome solely through personal effort. Rather it can be possible with public and political attempts. In other words, the complementary relationship evident in this study, paradoxically, emphasized the importance of basic protection characteristics of the public pension schemes, which should be further strengthened.

Expanding coverages of public pension and the increasing role of basic pension probably can work as solutions to narrow the gap between the groups: Simple coverage

expansion of public pension can be one way, however, will not a fitted method, reflecting the rising flexibility of the labor market— there has been a consistent decrease of regular employees, while there are increasing new types of employment such as platform workers etc. Moreover, it does not flow well with the downsizing trend of the public pension. The use of pension credit policy of public pension instead can be considered as one of the other means. The policy is to provide pension credits to an individual at periods when they have a difficult time contributing to the pension system with reasonable causes; Korea provides pension credit to women who gave birth to a child, and to those who serve military duties. But this policy is widely implemented in much more active ways in various countries, including the U.K., France, Germany, Sweden, Japan etc. Expanding the pension credit policy to various other areas— such as providing pension credit to temporarily unemployed, unstably employed, or low income— can be a way to expand coverages in more effective ways.

Increasing role of basic pension also should be in consideration. There will be limitations to narrow down the gap through expanding coverage of public pension with pension credit, as it is a targeted policy. Basic pension, on the other hand, is at a more universal level, which can cover more people, including non-public pension participants, and non-homeowners which discovered as vulnerable groups in this study. Although the proper distribution of roles between the national pension and the Basic Pension is essential in terms of long-term financial stability, it will be necessary to consider ways to partially strengthen the role of the Basic Pension for the socially

disadvantaged, or vulnerable groups.

#### 4. Limitation of the study

This study attempted to find the effect of housing and public pension on individual pension purchases. Although this study explicated some meaningful findings, there are a few limitations as well. First, this study failed to incorporate the effect of the occupational pension system. As a second pillar pension scheme, this could also play an important role as a ‘future income,’ and is expected to have an unignorable effect on an individual pension. However, the data was not available to perform the analysis. Only about 1 percent of total data from NaSTaB contained information on occupational pension. This study considered using Worker’s compensation insurance as a proxy to occupational pension since two systems have a considerable overlapping range of coverage. However, the Workers’ compensation insurance variable was also not available. Thus, the second pillar pension scheme could not be included in the study; the future study should try to incorporate this gap when data becomes available, as occupational pension also can have a significant influence on individual pension purchase, as public pension or housing.

Second, this study used homeownership and house price as a housing variable to see whether Kemeny’s trade-off theory also has its effect in Korea. As mentioned, Kemeny’s trade-off theory can have two different mechanisms— need-induced and

constraint-induced ones. Although homeownership and house price can be valid variables to examine the need-induced mechanism, they may not be perfectly fitted variables to investigate the constraint-induced mechanism. If variables such as 'housing mortgage' or 'percentage of housing mortgage payment in income' could be used as additional housing variables, this could be another reasonable analysis that could examine constraint-induced mechanisms. However, housing mortgage payment was not available in NaSTaB (or other panel datasets), so this could not be used in this study. This is another limitation of this dissertation, that should be supplemented in future studies.

Third, there are common critics on individual pension studies that individual pension is not actually used as a 'pension' or old age preparation in real life. Some people choose to participate in order to receive tax benefits from the government and receive lump-sum money at the end to utilize for other purposes. And like other previous individual pension literatures, this study also failed to avoid this criticism. Because individual pension itself has the purpose for 'old age preparation' as a surface reason, no survey including NaSTaB asks the respondent about the future purpose of the individual pension. Thus, there was no viable way to differentiate the group which actually join individual pensions for retirement preparation and the group which has other purposes at this point.

Finally, NaSTaB gathers information on individual pension insurance and individual pension saving (Individual pension trust/mutual fund/mutual insurance)

separately, but this study combined all cases and used them as a single variable because the case does not have the sufficient number, separately. However, the effect on public pension and housing on individual pension insurance and individual pension saving might not exactly the same, as individual pension saving is qualified for tax relief, and individual pension insurance is tax-free upon receipt. This study was not able to consider the possibility of this difference. In addition, there were some cases with duplicate participation of individual pensions, but this study could not incorporate this diversity as well. Although it can be seen that duplicated participation in individual pension is purposed for active old age preparation, it is disappointing that it could not be actively considered. This will be passed to future studies as well.

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## APPENDIX : Subgroup Analysis

In this appendix, subgroup analysis was performed in order to examine the detailed group difference that did not presented thoroughly through the original analysis. The relationship among public pension, homeownership and individual pension might differ according to different group or class; through this process, deeper insight into the pension-homeownership dynamic will be provided. Subgroup analysis was examined based on homeownership status, public pension participation status, house price and income level.

First of all, there was subgroup analysis based on homeownership status. How individual pension purchase might differ according to public pension status among homeowners and non-homeowners were compared. As this study assumes the status of homeownership and public pension alters the individual pension purchase, it was thought to be necessary to examine the subgroup analysis according to homeownership status and see whether the purchase level of individual pension will be differed according to public pension status between the two groups. Although there was analysis on homeownership status and individual pension in previous section, the result of non-owner group was not presented in the analysis as being the reference group. Through the subgroup analysis, the detailed comparison between homeowners and non-owners will be possible.

Second, the subgroup analysis of housing effect on individual pension

purchase depending on public pension participation status was analyzed. Again, as this study assumes the status of homeownership and public pension alters the individual pension purchase, it was also thought to be necessary to examine the subgroup analysis according to public pension status and see whether the purchase level of individual pension will be differed according to homeownership status among three groups. Through the subgroup analysis, the detailed comparison among non-public pension participant, NPS, and SOP participant will be possible.

Third subgroup analysis was based on house value. House price can have a close relationship with the need effect and possibly with constraint effects as well. If house price is low, the need for an additional pension might increase, while constraints possibly could diminish. In opposite, if house price is high, the need for an additional pension might decrease, while economic constraints can increase. Thus, subgroup analysis according to house price could help better understand the housing and pension relationship.

Fourth, this subgroup analysis was based on income class. People in lower income class might experience greater economic constraints, due to limited income, while people in higher class might experience less economic constraints. Thus, the effect of public pension and homeownership on individual pension purchase thought to be differ according to income groups as the relationship can be altered by economic constraint level.

## (1) Subgroup analysis based on homeownership status

### Result

First of all, there was subgroup analysis based on homeownership status; how individual pension purchase might differ according to public pension status among homeowners and non-homeowners were compared, and the result is presented in Tables 1-2.

Subgroup Model 1-1 compared the individual pension participation of non-public pension participants, NPS participants and SOP participants among homeowners groups. As non-participants as a reference group, the coefficient of the NPS group was  $\beta=0.3093$ , and that of SOP was  $\beta=0.4725$  both were statistically significant ( $p<0.001$ ). The analysis outcome of the individual pension purchase amount (Subgroup Model 1-3) was different from Subgroup Model 1-1. As non-participant group as a reference, NPS group had coefficient of  $\beta=0.0300$  ( $p>0.1$ ), while SOP had  $\beta=0.0578$  ( $p>0.1$ ), showing both were non-significant.

Meanwhile, Subgroup Model 1-2 and Model 1-4 were purposed to investigate the effect of contribution amount on public pension on individual pension among homeowners. In model 1-2, the contribution amount had positive effect ( $\beta=0.1307$ ,  $p<0.001$ ) on individual pension participation. However, in model 1-4, the contribution amount did not have a significant effect ( $\beta=0.0202$ ,  $p>0.1$ ) on the individual pension purchase amount.

Subgroup Model 1-5 through 1-8 represent the result of individual pension purchase of non-public pension participants, NPS participants and SOP participants among the non-homeowner group. The result of individual pension participation (subgroup model 1-5) showed that both NPS and SOP were significantly higher than the non-participant (reference) group. The coefficient of NPS group was  $\beta=0.1644$  ( $p<0.001$ ), and that of SOP was  $\beta=0.3746$  ( $p<0.001$ ). The outcome of the individual pension purchase amount (Subgroup Model 1-7) was also similar to the result of Subgroup Model 1-5. Both NPS and SOP group had significant effect, with coefficient of  $\beta=0.0728$  ( $p<0.1$ ) for NPS and  $\beta=0.1187$  ( $p<0.05$ ) for SOP.

Subgroup Model 1-6 and Model 1-8 investigated the effect of contribution amount on individual pension purchase among homeowners. In model 1-6, the contribution amount had positive effect ( $\beta=0.0864$ ,  $p<0.05$ ) on individual pension participation. On the other hand, contribution amount did not have a significant effect ( $\beta=0.0217$ ,  $p>0.1$ ) on individual pension purchase amount in model 1-8.

[Table 1] Individual pension purchase of Homeownership group

	Individual pension participation		Individual pension purchase amount	
	SModel1-1 (n=17,388)	SModel1-2 (n=17,387)	SModel1-3 (n=17,388)	SModel1-4 (n=17,387)
nps	0.3093*** (0.0560)		0.0300 (0.0520)	
sop	0.4725*** (0.0548)		0.0578 (0.0495)	
cont		0.1307*** (0.0353)		0.0202 (0.0217)
age	-0.0083*** (0.0023)	-0.0073** (0.0027)	0.0128*** (0.0024)	0.0130*** (0.0021)
gen	-0.0485 (0.0438)	-0.0737* (0.0451)	-0.0654** (0.0248)	-0.0688** (0.0238)
marD1	0.0700 (0.0591)	0.0350 (0.0546)	0.0417 (0.0573)	0.0347 (0.0578)
eduD2	0.1343** (0.0687)	0.1393* (0.0733)	0.2446*** (0.0555)	0.2429*** (0.0563)
eduD3	0.2774*** (0.0570)	0.2796*** (0.0586)	0.3793*** (0.0540)	0.3787*** (0.0540)
jpoD1	0.2863*** (0.0561)	0.2853*** (0.0486)	-0.1311*** (0.0285)	-0.1322*** (0.0267)
jpoD2	-0.2276*** (0.0702)	-0.1998** (0.0766)	-0.0535 (0.0590)	-0.0447 (0.0607)
cnum1	0.0900*** (0.0274)	0.0885*** (0.0286)	0.0551** (0.0190)	0.0539** (0.0193)
cnum2	0.0489* (0.0359)	0.0448 (0.0413)	0.0231 (0.0312)	0.0205 (0.0303)
cnum3	0.0335 (0.0600)	0.0346 (0.0650)	-0.0259 (0.0431)	-0.0278 (0.0433)
Indebt	0.0143*** (0.0015)	0.0129*** (0.0017)	0.0025 (0.0036)	0.0022 (0.0036)
Incashasset	0.1719*** (0.0149)	0.1687*** (0.0152)	0.0838*** (0.0156)	0.0833*** (0.0154)
Innoncash	0.0047* (0.0029)	0.0057** (0.0029)	0.0048** (0.0031)	0.0050* (0.0033)
second	0.1692*** (0.0490)	0.1704*** (0.0490)	0.0206 (0.0405)	0.0210 (0.0397)
cons	-2.4282*** (0.1389)	-2.4363*** (0.1678)	4.0463*** (0.1453)	4.0324*** (0.1316)
sigma			0.7231*** (0.0170)	0.7228*** (0.0174)
log-likelihood			-12660.879	-12603.055

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

[Table 2] Individual pension purchase of Non-homeownership group

	Individual pension participation		Individual pension purchase amount	
	Model1-5 (n=12,093)	Model1-6 (n=12,093)	Model1-7 (n=12,093)	Model1-8 (n=12,093)
nps	0.1644*** (0.0356)		0.0728* (0.0453)	
sop	0.3746*** (0.0594)		0.1187** (0.0443)	
cont		0.0864** (0.0311)		0.0217 (0.0380)
age	-0.0054** (0.0022)	-0.0049 (0.0024)	0.01191*** (0.0021)	0.0121*** (0.0025)
gen	-0.1043** (0.0370)	-0.1294*** (0.0401)	0.1486*** (0.0391)	0.1455** (0.0475)
marD1	-0.0554* (0.0392)	-0.0661** (0.0373)	-0.0829* (0.0518)	-0.0869** (0.0514)
eduD2	0.0487 (0.1184)	0.0509 (0.1138)	0.0264 (0.1011)	0.0329 (0.0998)
eduD3	0.1485* (0.1057)	0.1497* (0.0995)	0.1673* (0.01105)	0.1749* (0.1095)
jpoD1	0.0777** (0.0451)	0.0705** (0.0390)	-0.1960*** (0.0392)	-0.1931*** (0.0563)
jpoD2	-0.2697*** (0.0609)	-0.2477*** (0.0617)	-0.1914** (0.0868)	-0.1956** (0.0868)
cnum1	0.1364*** (0.0428)	0.1346*** (0.0422)	-0.0310 (0.0394)	-0.0306 (0.0400)
cnum2	0.0982** (0.0325)	0.0918** (0.0321)	0.0225 (0.0236)	0.0208 (0.0225)
cnum3	0.0639 (0.0686)	0.0707 (0.0706)	-0.0325 (0.01245)	-0.0286 (0.1241)
Indebt	0.0260*** (0.0069)	0.0253*** (0.0071)	0.0027 (0.0041)	0.0026 (0.0038)
Incashasset	0.2064*** (0.0109)	0.2025*** (0.0119)	0.1132*** (0.0108)	0.1125*** (0.0114)
Innoncash	0.0148*** (0.0053)	0.0127** (0.0052)	0.0058** (0.0035)	0.0055* (0.0035)
second	0.2479*** (0.0448)	0.2375*** (0.0462)	0.0502 (0.0434)	0.0488 (0.0424)
cons	-2.6159*** (0.1777)	-2.5935*** (0.15887)	4.0041*** (0.2000)	4.0178*** (0.2180)
sigma			0.7386*** (0.0093)	0.7386*** (0.0100)
log-likelihood			-6710.8705	-6700.2561

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

## Summary & Discussion

Subgroup Model 1-1 through 1-8 analyzed how individual pension purchases differ according to public pension status between homeowners and non-homeowners. The groups shared some similarities, while there were some disparities. The result on individual pension participation was similar; when one participates in public pension (especially in SOP than NPS), and when the contribution amount of the public pension is high, the probability of individual pension purchase raises statistically. This result was similar in the owner and non-owners' model, and also concurred with the result of the original model.

However, the effect of public pension participation status and contribution amount on individual pension purchase amount turned out to be different between owners and non-owners groups. For owner groups, public pension participants (either NPS or SOP) and non-participant did not show significant differences. However, the non-owners group showed a difference: NPS had better participation amount than non-participants and SOP had better results than NPS.

Two possible reasons can explain the result. The homeowner's group did not have different effect on individual pension purchase amount according to the status (NPS or SOP), because they are all less in need for higher individual pension, or experience economic constraint, as they own the houses; thus, all three groups might show similar level or individual pension purchase. However, if there is no housing, the need for higher pension would be greater and the economic constraints may be smaller;

the NPS or SOP group, which are more stable economically compared to the non-participants, might increase the purchase level. This might result the difference in individual pension purchase amount according to public pension status.

Another explanation is because owners' group have better individual pension purchase amounts than non-owners in general, as earlier shown in [Table 11]. Thus, when owners were separately analyzed, there might be the possibility that the group itself already has a higher average amount of purchase amount, that there might be no clear difference spotted according to public pension participation status. Non-public pension participant homeowners also possibly can have a certain level of individual pension purchase amount that the difference might not that great compared to that of NPS or SOP group. In contrast, the non-owners group might have greater variance in individual pension purchase amount throughout the sample, which might possibly that a noticeable difference according to the public pension participation status.

## (2) Subgroup analysis based on public pension participation status

### Result

The subgroup analysis of housing (homeownership and house price) effect on individual pension purchase (participation and purchase amount), depending on public pension participation status was analyzed, and the result is presented in Table 3 and 4.

Subgroup models 2-1 through 2-6 represent the result of the effect of homeownership and house price on individual pension participation. Subgroup models 2-1 and 2-2 show the result of the non-participant group, model 2-3 and 2-4 shows the result of NPS group, and model 2-5 and 2-6 is about the result of SOP group: Homeownership in Model 2-1 was not significant on conventional level ( $\beta=-0.0154$ ,  $p>0.1$ ), and house price in Model 2-2, on the other hand, was significant ( $\beta=0.0703$ ,  $p<0.1$ ). The Homeownership variable in the NPS group (Model 2-3) was  $\beta=-0.1626$  and it was statistically significant ( $p<0.001$ ). House price in Model 2-4 was also showed a meaningful level of significance ( $\beta=0.1280$ ,  $p<0.001$ ). Lastly, for SOP group, the homeownership variable in Model 2-5 was significant ( $\beta=0.3287$ ) in 0.05 level, while house price variable in Model 2-6 was not significant ( $\beta=0.0457$ ,  $p>0.1$ ).

Subgroup models 2-7 through 2-12 present the result of the effect of homeownership and house price on individual pension purchase amount. Again, Subgroup model 2-7 and 2-8 shows the result of the non-participant group, model 2-

9 and 2-10 shows the result of NPS group, and model 2-11 and 2-12 shows the result of SOP group. Homeownership variable in Model 2-7 was  $\beta = -0.0906$  and not significant ( $p > 0.1$ ), while house price in Model 2-8 was also not significant ( $\beta = 0.0333$ ,  $p > 0.1$ ). The result of NPS group was different from the non-participant group. Homeownership in Model 2-9 was significant ( $\beta = -0.0489$ ,  $p < 0.05$ ), and house price in Model 2-10 was also significant ( $\beta = 0.1590$ ,  $p < 0.001$ ). The homeownership variable for the SOP group in Model 2-11 was not significant at the conventional level ( $\beta = -0.0331$ ,  $p > 0.1$ ). Lastly, the house price variable in Model 2-12 was  $\beta = 0.2226$  and it was statistically significant.

[Table 3] Individual pension purchase of three public pension groups

Individual Pension Participation						
	Nonparticipant		NPS		SOP	
	SModel2-1 (n=5,137)	SModel2-2 (n=2,154)	SModel2-3 (n=18,277)	SModel2-4 (n=10,851)	SModel2-5 (n=1,952)	SModel2-6 (n=1,348)
HO	-0.0154 (0.0776)		0.1626*** (0.0428)		0.3287** (0.1901)	
Lnprice		0.0703* (0.0470)		0.1280*** (0.0216)		0.0457 (0.0575)
age	-0.0180*** (0.0033)	-0.0297*** (0.0047)	-0.0040** (0.0024)	-0.0107** (0.0035)	-0.0070 (0.0057)	-0.0131* (0.0101)
gen	-0.0723 (0.0630)	0.2096** (0.0805)	-0.0756** (0.0380)	-0.1166** (0.0612)	0.1067 (0.1061)	0.0748 (0.1327)
marD1	-0.0840 (0.0870)	-0.1869* (0.1416)	0.0884** (0.0439)	0.1098* (0.0831)	-0.6008** (0.3430)	-0.4250* (0.2700)
eduD2	0.0514 (0.1255)	0.0028 (0.1315)	0.1653** (0.0900)	0.0693 (0.1036)	0.0053 (0.2302)	-0.0059 (0.2596)
eduD3	0.0845 (0.1163)	0.0302 (0.1222)	0.3070*** (0.0830)	0.1533** (0.0921)	0.4828 (0.3863)	0.4814 (0.4017)
jpoD1	0.2120** (0.0740)	0.4194*** (0.1302)	0.2480*** (0.0555)	0.3411*** (0.0540)		
jpoD2	-0.2653** (0.1045)	-0.2350** (0.1302)	-0.2551** (0.1053)	-0.2616** (0.0863)		
cnum1	-0.0037 (0.0776)	0.0140 (0.0766)	0.1363*** (0.0373)	0.0959** (0.0475)	0.1791* (0.1177)	0.0470 (0.1050)
cnum2	0.0268 (0.0453)	-0.0918 (0.1236)	0.0968** (0.0351)	0.0357 (0.0521)	0.0122 (0.0536)	-0.0800 (0.0899)
cnum3	0.0149 (0.1350)	-0.0419 (0.1850)	0.0959* (0.0564)	0.0322 (0.0655)	-0.1490 (0.1938)	-0.2525 (1.6109)
Indebt	0.0214*** (0.0068)	0.0178** (0.0090)	0.0177*** (0.0029)	0.0105*** (0.0017)	0.0225** (0.0133)	0.0155* (0.0109)
Incashasset	0.2051*** (0.0241)	0.2139*** (0.0451)	0.1822*** (0.0145)	0.1623*** (0.0172)	0.1517** (0.0852)	0.1415** (0.0820)
Innoncash	-0.0057 (0.0066)	-0.0118 (0.0105)	0.0036 (0.0038)	0.0071** (0.0031)	0.0143* (0.0089)	0.0107 (0.0083)
second	0.2146** (0.0861)	0.1349 (0.1216)	0.2062 (0.0304)	0.1609*** (0.0471)	0.2311** (0.1392)	0.3278** (0.1847)
cons	-1.8770*** (0.2646)	-2.1608*** (0.3384)	-2.6214*** (0.1407)	-3.1241*** (0.2821)	2.7541 (4.7749)	-1.4417 (3.6725)

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

[Table 4] Individual pension purchase amount of three public pension groups

Individual Pension Purchase Amount Model						
	Nonparticipant		NPS		SOP	
	SModel2-7 (n=5,137)	SModel2-8 (n=2,154)	SModel2-9 (n=18,277)	SModel2-10 (n=10,851)	SModel2-11 (n=1,952)	SModel2-12 (n=1,348)
HO	-0.0906 (0.1279)		-0.0489** (0.0240)		-0.0331 (0.0764)	
Inprice		0.0333 (0.0695)		0.1590*** (0.0278)		0.2226** (0.0867)
age	0.0032 (0.0057)	0.0144* (0.0110)	0.0142*** (0.0025)	0.0105*** (0.0030)	0.0139** (0.0054)	0.0106* (0.0075)
gen	0.1192* (0.0889)	-0.4255** (0.1751)	0.0447 (0.0627)	0.0428 (0.0679)	-0.0220 (0.1864)	-0.1135 (0.1950)
marD1	-0.0522 (0.1063)	0.2212* (0.1484)	-0.0037 (0.0984)	0.0224 (0.1114)	-0.1603* (0.1205)	-0.2029 (0.1800)
eduD2	0.0872 (0.1422)	0.3522** (0.1653)	0.1903** (0.0766)	0.1332** (0.0634)	0.3261** (0.1771)	0.0754 (0.2116)
eduD3	0.0020 (0.1298)	0.3550* (0.2420)	0.3600*** (0.0809)	0.2173*** (0.0666)	0.4502** (0.1631)	0.0303 (0.2065)
jpoD1	-0.2600*** (0.0700)	-0.2051* (0.1352)	-0.1452*** (0.0343)	-0.0983** (0.0447)		
jpoD2	-0.1555** (0.0796)	-0.0367 (0.1619)	-0.1293 (0.1059)	-0.0879 (0.0827)		
cnum1	0.1290 (0.01411)	0.2350 * (0.1667)	-0.0065 (0.0397)	0.0463* (0.0303)	0.0735* (0.0519)	0.1129* (0.0863)
cnum2	-0.0094 (0.0938)	0.0617 (0.1359)	0.0239 (0.0344)	0.0319 (0.0471)	0.0568 (0.0701)	0.0145 (0.0951)
cnum3	-0.0518 (0.1549)	0.1237 (0.1537)	0.0034 (0.0751)	0.0074 (0.0664)	-0.4235** (0.2356)	-0.1879 (0.7755)
Indebt	-0.0056 (0.0080)	-0.0145 (0.0174)	0.0069** (0.0035)	0.0019 (0.0038)	-0.0053 (0.0074)	-0.0051 (0.0096)
Incashasset	0.1516*** (0.0265)	0.1224*** (0.0318)	0.0948*** (0.0155)	0.0770*** (0.0156)	0.0420** (0.0141)	0.0485** (0.0189)
Innoncash	-0.0063 (0.0095)	0.0045 (0.0091)	0.0019 (0.0021)	0.0039 (0.0038)	0.0018 (0.0063)	0.0017 (0.0079)
second	0.1259 (0.1258)	0.0881 (0.1813)	-0.0083 (0.0355)	-0.0313 (0.0600)	0.1084** (0.0576)	0.1228* (0.0877)
cons	4.2939*** (0.3207)	3.4633*** (0.9368)	3.9673*** (0.1943)	2.6821*** (0.2787)	4.6979 (2.9045)	2.7383** (1.0560)
Sigma	0.7033*** (0.0323)	0.6191*** (0.0344)	0.7359*** (0.0111)	0.7228*** (0.0189)	0.6157*** (0.0895)	0.6188*** (0.1118)

Log-likelihood	-1585.091	-728.937	-13223.460	-8322.917	-1652.184	-1300.619
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Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

### Summary & Discussion

This subgroup analysis was based on public pension participation status: how individual pension purchase might differ according to housing status among groups of non-public pension participants, NPS participants, and SOP participants were compared. For the non-participant group, homeownership did not have a statistical effect on the individual pension participation model, but the direction turned out to be negative. Compared to the original model, this was a distinct result, as it was significantly positive in the original. The complementary relationship that was shown in the original model got somewhat weakened. The house price variable was significant but in 0.1 level; this also was weakened result as in original it was significant in 0.001 level. The effect of homeownership on individual pension purchase amount was in a negative direction and significant, and this was similar to the original model. However, the house price variable was non-significant. Overall, for non-public pension participation group showed weakened complementary relationship between homeownership and pension. This could be partially explained by the fact that a fairly large proportion of people in non-participants could be in the non-regular job market. The regular employees often got obligated to participate in public pension, while non-

regular (including temporary) employees are often time excluded or opt-out from public pension programs. And these non-regular employees often have low or unstable incomes, which could lead them to heavier economic constraints that make it hard for them to contribute to housing or pension.

For the NPS group, the result was similar to the original model. Homeowners and owners with higher valued property tended to have better participation rates in a individual pension. Homeowners tended to have lower individual pension purchase amounts, while higher valued property owners tended to have a higher amount of individual pension purchases.

For the SOP group, the effect of homeownership had a positive impact on individual pension participation. However, it did not have a significant effect on the individual pension purchase amount. On the other hand, house price was not significant on individual pension participation. SOP is the group with the most generous public pension. If this group owns a high valued house, this may indicate a decent preparation of old age, or a (possibly) high constraint on the household budget, or both. This may lead to the non-significant individual pension participation. However, if this group decide to participate in an individual pension, they showed a significantly higher amount. Paradoxically, since people in this group can be economically stabled ones; so, once they decide to join, they might participate with a larger amount. This explanation might be one way to explain the result.

### (3) Subgroup Analysis based on house price

#### Result

The subgroup analysis according to house price was analyzed, and the result is presented in Tables 22-24. Homeowners were clustered into two groups; people own a house valued under 200,000 thousand won and people who own a house valued over 200,000 thousand won. Subgroup models 3-1 through 3-4 presents the result of house price effect on individual pension purchase of lower house value group (Model 3-1 and 3-3) and higher house value group (Model 3-2 and 3-4). The house prices of each group had a different effect on individual pension participation. House price in Model 3-1 was significant ( $\beta=0.0937$ ,  $p<0.05$ ), but house price in Model 3-3, was not significant at statistical level ( $\beta=0.0387$ ,  $p>0.1$ ). However, the house prices of both groups had a similar effect on the individual pension purchase amount. House price in Model 3-2 ( $0.0329$ ,  $p<0.05$ ) and Model 3-4 ( $0.1802$ ,  $p<0.001$ ) was both significant in conventional level.

As non-participants as a reference group, both coefficients of NPS group  $\beta=0.3074$ , and that of SOP  $\beta=0.5681$  of lower house value group, were statistically significant ( $p<0.001$ ) in Model 3-5. The analysis outcome of the individual pension purchase amount was different from Model 3-5. As non-participant group as a reference, NPS group had coefficient of  $\beta=-0.0692$  ( $p>0.1$ ), while SOP had  $\beta=-0.0068$  ( $p>0.1$ ), showing both were non-significant (Model 3-7).

Meanwhile, Subgroup Model 3-6 and Model 3-8 were purposed to investigate the effect of contribution amount on individual pension purchase among low house value groups. In model 3-6, the contribution amount had positive effect ( $\beta=0.1360$ ,  $p<0.001$ ) on individual pension participation. However, in model 3-8, the contribution amount did not have a significant effect ( $\beta=0.0024$ ,  $p>0.1$ ) on the individual pension purchase amount.

Subgroup Model 3-9 through 3-12 represent the result of individual pension purchase of NPS participants and SOP participants among higher house value group. The result of individual pension participation (subgroup model 3-9) showed that both NPS and SOP were significantly higher than the non-participant group. The coefficient of NPS group was  $\beta=0.3219$  ( $p<0.001$ ), and that of SOP was  $\beta=0.4288$  ( $p<0.001$ ). The result of the individual pension purchase amount (Subgroup Model 3-11) was also similar to the result of Subgroup Model 3-9. Both NPS and SOP group had significant effect, with coefficient of  $\beta=0.1231$  ( $p<0.05$ ) for NPS and  $\beta=0.1580$  ( $p<0.05$ ) for SOP.

Lastly, Model 3-10 and Model 3-12 investigated the effect of contribution amount on individual pension purchase among high value house groups. In model 3-10, the contribution amount had significant positive effect ( $\beta=0.1223$ ,  $p<0.001$ ) on individual pension participation. On the other hand, contribution amount did not have a significant effect ( $\beta=0.0292$ ,  $p>0.1$ ) on individual pension purchase amount in model 3-12.

[Table 5] Individual pension purchase according to house price (1)

	Individual pension participation		Individual pension purchase amount	
	Smodel3-1 (n=7,566)	Smodel3-2 (n=6,715)	Smodel3-3 (n=7,566)	<b>Smodel3-4 (n=6,715)</b>
Inprice	0.9375** (0.0336)	0.0328** (0.0187)	0.0387 (0.0309)	0.1802*** (0.0452)
age	-0.0107** (0.0036)	-0.0133**** (0.0033)	0.0108** (0.0049)	0.0095*** (0.0030)
gen	-0.0635* (0.0485)	-0.1298 (0.1177)	-0.1715** (0.0714)	0.1391** (0.0961)
marD1	-0.0685 (0.0690)	0.3155** (0.1207)	0.1438* (0.1115)	-0.4421** (0.1633)
eduD2	0.0758 (0.0828)	0.1408 (0.1153)	0.1497** (0.0787)	0.1738 (0.1399)
eduD3	0.1806** (0.0673)	0.2864** (0.1006)	0.2399** (0.0879)	0.203** (0.0993)
jpoD1	0.3674*** (0.0675)	0.4284*** (0.0551)	-0.0822** (0.0294)	-0.0854* (0.0537)
jpoD2	-0.2747** (0.1079)	-0.4868*** (0.1165_)	-0.0537 (0.0681)	-0.0326 (0.1049)
cnum1	0.0976** (0.0377)	0.6586 (0.0630)	0.0989* (0.0706)	0.0469** (0.0241)
cnum2	0.0713* (0.0484)	-0.0415 (0.0650)	0.0914* (0.0682)	-0.0057 (0.0449)
cnum3	0.1407** (0.0576)	-0.1352 (2.8146)	-0.0130 (0.1259)	0.0182 (1.4563)
Indebt	0.0146*** (0.0047)	0.0095*** (0.0002)	-0.0031 (0.0055)	-0.0006 (0.0040)
Incashasset	0.1753*** (0.0210)	0.1562*** (0.0199)	0.0767*** (0.0125)	0.0727** (0.0367)
Innoncash	0.0071** (0.0036)	0.0065* (0.0048)	0.0137*** (0.0040)	-0.0006 (0.0056)
second	0.1798** (0.0817)	0.1961*** (0.0496)	0.0083 (0.0337)	0.0107 (0.0816)
cons	-2.8879*** (0.3834)	-2.2385*** (0.4287)	3.8124*** (0.3699)	2.9406*** (0.4840)
Sigma			0.7190*** (0.0269)	0.6926*** (0.1818)
Log-likelihood			-4541.791	-5788.756

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

[Table 6] Individual pension purchase according to house price (2)

	Individual pension participation		Individual pension purchase amount	
	SModel3-5 (n=9,454)	SModel3-6 (n=9,454)	SModel3-7 (n=9,454)	SModel3-8 (n=9,454)
nps	0.3074*** (0.0740)		-0.0692* (0.0598)	
sop	0.5681*** (0.0702)		-0.0067* (0.0693)	
cont		0.1360*** (0.0302)		0.0024 (0.0156)
age	-0.0105*** (0.0033)	-0.0090** (0.0037)	0.0070** (0.0035)	0.0070** (0.0034)
gen	-0.0259 (0.0474)	-0.0616 (0.0535)	-0.1817* (0.0518)	-0.1949*** (0.0465)
marD1	-0.0361 (0.0732)	-0.0680 (0.0666)	0.1600* (0.0777)	0.1627** (0.0791)
eduD2	0.0933* (0.0719)	0.1070* (0.0724)	0.1942* (0.0719)	0.1905** (0.0735)
eduD3	0.1553** (0.0568)	0.1860** (0.0558)	0.2347* (0.0712)	0.2380*** (0.0705)
jpoD1	0.2434*** (0.0610)	0.2397*** (0.0499)	-0.0955** (0.0238)	-0.1003*** (0.0245)
jpoD2				
cnum1	0.0866** (0.0323)	0.0841** (0.0314)	0.0541** (0.0455)	0.0521 (0.0442)
cnum2	0.0810** (0.0421)	0.0750** (0.0446)	0.0425** (0.0421)	0.0382 (0.0393)
cnum3	0.1766** (0.0466)	0.1779*** (0.0505)	-0.0314* (0.0809)	-0.0366 (0.0794)
Indebt	0.1571** (0.0043)	0.0142*** (0.0043)	-0.0007** (0.0050)	-0.0007 (0.0050)
Incashasset	0.1776** (0.0178)	0.1756*** (0.0182)	0.0774** (0.0112)	0.0773*** (0.0110)
Innoncash	0.0061** (0.0032)	0.0084** (0.0028)	0.0115** (0.0033)	0.0119*** (0.0035)
second	0.1338** (0.0748)	0.1446** (0.0778)	0.0332** (0.0343)	0.0395 (0.0354)
cons	-2.3053*** (0.2346)	-2.3483*** (0.2689)	4.4161*** (0.0222)	4.3699*** (0.2089)
sigma			0.7253*** (0.0222)	0.7258*** (0.0225)
log-likelihood			-5702.457	-5676.792

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

[Table 7] Individual pension purchase according to house price (3)

	Individual pension participation		Individual pension purchase amount	
	SModel3-9 (n=7,903)	SModel3-10 (n=7,903)	SModel3-11 (n=7,903)	SModel3-12 (n=7,903)
nps	0.3219*** (0.0674)		0.1231** (0.0642)	
sop	0.4288*** (0.0736)		0.1580** (0.0582)	
cont		0.1223** (0.0366)		0.0291* (0.0266)
age	-0.1133*** (0.0023)	-0.0101*** (0.0025)	0.1223*** (0.0023)	0.0125*** (0.0023)
gen	-0.1334* (0.0958)	-0.1482* (0.0939)	0.1242** (0.0656)	0.1247** (0.0630)
marD1	0.2928** (0.0944)	0.2644** (0.0946)	-0.4558 (0.1315)	-0.4626** (0.1341)
eduD2	0.2032** (0.1066)	0.1810* (0.1141)	0.1758** (0.1298)	0.1592* (0.1217)
eduD3	0.3441*** (0.0995)	0.3141** (0.1058)	0.2877* (0.1050)	0.2729** (0.0838)
jpoD1	0.3171*** (0.0643)	0.3247*** (0.0577)	-0.1544** (0.0456)	-0.1458** (0.0470)
jpoD2	-0.4395*** (0.0987)	-0.3944*** (0.0935)	-0.0700** (0.0854)	-0.0709 (0.1001)
cnum1	0.0764* (0.0540)	0.0772* (0.0555)	0.0333 (0.0260)	0.0331* (0.0252)
cnum2	-0.0095 (0.0448)	-0.0094 (0.0487)	-0.0042 (0.0406)	-0.0042 (0.0406)
cnum3	-0.1290 (3.4201)	-0.1279 (1.2495)	-0.0106 (1.2720)	-0.0136 (1.4244)
Indebt	0.0095** (0.0026)	0.0086** (0.0029)	0.0003 (0.0040)	0.0001 (0.0044)
Incashasset	0.1593*** (0.0167)	0.1566*** (0.0166)	0.0797** (0.0329)	0.0792** (0.0385)
Innoncash	0.0045 (0.0477)	0.0046 (0.0049)	0.0013 (0.0046)	0.0016 (0.0049)
second	0.1830*** (0.0416)	0.1833*** (0.0416)	0.0071 (0.0650)	0.0071 (0.0682)
cons	-2.2886*** (0.2474)	-2.2805*** (0.2467)	4.5313*** (0.3395)	4.5731*** (0.3348)
sigma			0.7085*** (0.1565)	0.7083*** (0.1764)
log-likelihood			-6865.916	-6842.492

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

## Summary & Discussion

The next subgroup analysis was based on house value. Here, the homeowners were clustered into low value house homeowner group (under house price of 200,000 thousand won) and high value house homeowner group (over 200,000 thousand won) and analyzed if the two groups have differences.

For the low value homeowner group, house price was significant in the participation model, but not significant in the purchase amount model. But in higher value homeowner group, house price was significant to both individual pension participation and purchase amount. Low value homeowner group choose to participate in an individual pension because they might need for additional preparation for old age. Or they might choose to participate to receive different government incentives or benefits. However, at the same time, people in low value homeowner group might be the group who are less fortunate compared to higher valued property owners in general— reflecting house price as one of the most important economic measurements of the household. Therefore, they might not necessarily participate with a higher level of individual pension. In contrast, people in higher valued homeowner group are capable of purchasing higher level of individual pension, and this could be reflected in the analysis.

Meanwhile, when people in lower value homeowner groups participated in

public pension (either NPS or SOP), they tended to have a better individual pension participation than non- public pension participants but did not have a better individual pension purchase amount than non-participants. Rather, NPS and SOP participant tended to have significantly lower individual pension purchase amount. However, people in higher value homeowners who participated in public pension had a different result: NPS group participants had significantly higher purchase results (both participation and amount) than non-participant, and SOP had a better result than NPS. Contribution also had similar result; there was no difference in purchase amount according to public pension contribution level among low value homeowner group. But for the higher value homeowner group, it was the higher the better amount.

The group with higher valued house with public pension tended to have better individual pension participation rate as well as purchase amount, that showed complementary relationship. The group with lower valued house with public pension, on the other hand, had significant negative relationship with both individual pension participation and purchase amount; this indicates possibility that there are some levels of trade-off between housing and individual pension in lower valued house group. Compared to higher value homeowner, a lower value homeowner might be those who are economically less fortunate, thus, in reality, if they buy a house and pension at the same time, they have less chance to afford a more generous purchase amount. This could have led to the trade-off relationship within lower valued house group.

#### (4) Subgroup analysis based on income

##### Result

The subgroup analysis of housing and public pension on individual pension, depending on income level (low third, mid third and high third) was analyzed, and the result is presented in Tables 8-11.

Subgroup model from 4-1 to 4-6 represent the result of the effect of public pension status on individual pension participation, according to income level. NPS and SOP variable of low-income model was significant on conventional level ( $\beta=0.2893$ ,  $p<0.001$ ;  $\beta =0.5953$ ,  $p<0.001$ ). Similarity, NPS and SOP of mid-income model ( $\beta =0.2488$ ,  $p<0.001$ ;  $\beta =0.4360$ ,  $p<0.001$ ) and high-income model ( $\beta =0.2242$ ,  $p<0.001$ ;  $\beta=0.2064$ ,  $p<0.001$ ) was also significant. Public pension contribution level was also had statistically significant effect on individual pension participation, regardless of income level ( $\beta =0.1037$ ,  $p<0.001$  for low-income group,  $\beta =0.1155$ ,  $p<0.001$  for mid-income group and  $\beta=0.0565$ ,  $p<0.05$ ) for high-income group).

Subgroup model from 4-7 to 4-12 shows the result of the effect of public pension status on individual pension purchase amount, according to income level. This result was quite different with that of individual pension participation. NPS was not significant in low-income group ( $\beta =0.0684$ ,  $p>0.1$ ), but SOP was significant ( $\beta=0.5732$ ,  $p<0.001$ ). For mid-income group, NPS and SOP were both significant on conventional level ( $\beta=0.0542$ ,  $p<0.1$ ;  $\beta=0.0856$ ,  $p<0.05$ ). But for high-income group

model, both NPS and SOP were not significant ( $\beta=-0.0019$ ,  $p>0.1$ ;  $\beta=0.0244$ ,  $p>0.1$ ). Public pension contribution also was not significant on low-income model ( $\beta=0.0140$ ,  $p>0.1$ ) and high-income model ( $\beta=-0.0062$ ,  $p>0.1$ ), but it had significant effect in mid-income model ( $\beta=0.0218$ ,  $p<0.1$ ).

Subgroup model from 4-13 to 4-18 represent the result of the effect of homeownership and house price on individual pension participation, based on income levels. Homeownership ( $\beta=-0.0206$ ,  $p>0.1$ ) and house price ( $\beta=0.0280$ ,  $p>0.1$ ), both were not significant in low-income group. However, in mid-income group and high-income group, both homeownership ( $\beta =0.1752$ ,  $p<0.001$  for mid-income, and  $\beta=0.1203$ ,  $p<0.001$  for high income) and house price ( $\beta=0.2432$ ,  $p<0.001$  for mid-income and  $\beta =0.0471$ ,  $p<0.05$  for high income) showed a meaningful level of significance.

Lastly, model from 4-19 to 4-24 shows the effect of homeownership and house price on individual pension purchase amount, depending on income level. The result was similar to that of individual pension participation. Both homeownership ( $\beta=-0.0405$ ,  $p>0.1$ ) and house price ( $\beta=0.0928$ ,  $p>0.1$ ) were not statistically significant in low-income group. Meanwhile, mid-income group and high-income group, homeownership ( $\beta=-0.0447$ ,  $p<0.05$  for mid-income, and  $\beta=-0.0856$ ,  $p<0.05$  for high income) and house price ( $\beta=0.1581$   $p<0.001$  for mid-income and  $\beta=0.1639$ ,  $p<0.05$  for high income), both showed a significant effect.

[Table 8] Individual pension purchase according to income level (1)

<b>Individual pension participation</b>						
	Smodel 4-1	Smodel 4-2	Smodel 4-3	Smodel 4-4	Smodel 4-5	Smodel 4-6
	Low (n=9,514)	Mid (n=29,384)	High (n=9,910)	Low (n=9,514)	Mid (n=29,384)	High (n=9,910)
<b>nps</b>	0.2893*** (0.0573)	0.2488*** (0.0340)	0.2242*** (0.0564)			
<b>sop</b>	0.5953*** (0.1420)	0.4360*** (0.0361)	0.2064*** (0.0456)			
<b>cont/inc</b>				0.1037*** (0.0184)	0.1155*** (0.0350)	0.0565** (0.0199)
<b>age</b>	-0.0187*** (0.0020)	-0.0039*** (0.0009)	-0.0016 (0.0013)	-0.0180*** (0.0020)	-0.0031** (0.0017)	-0.0012 (0.0016)
<b>gen</b>	-0.1173** (0.0497)	-0.0646** (0.0344)	-0.2841*** (0.0545)	-0.1221** (0.0507)	-0.0939** (0.0377)	-0.2715*** (0.0571)
<b>marD1</b>	0.0074 (0.0616)	0.0252 (0.0263)	0.1748*** (0.0433)	-0.0124 (0.0571)	0.0007 (0.0241)	0.1563*** (0.0431)
<b>eduD2</b>	0.0915 (0.0812)	0.1241** (0.0656)	0.0985 (0.0848)	0.1030* (0.0749)	0.1287** (0.0642)	0.0995 (0.0901)
<b>eduD3</b>	0.0806 (0.1151)	0.2545*** (0.0559)	0.0382 (0.0621)	0.1120 (0.1050)	0.2564*** (0.0532)	0.0364 (0.0650)
<b>jpoD1</b>	-0.2287*** (0.0371)	0.2047*** (0.0472)	0.4109*** (0.0502)	-0.1986*** (0.0421)	0.2008*** (0.0408)	0.4090*** (0.0464)
<b>jpoD2</b>	-0.3234*** (0.0729)	-0.2448*** (0.0543)	-0.0966 (0.1458)	-0.3319*** (0.0698)	-0.2131*** (0.0550)	-0.1012 (0.1457)
<b>cnum1</b>	0.0181 (0.0433)	0.1210*** (0.0207)	0.1919*** (0.0265)	0.0276 (0.0388)	0.1177*** (0.0220)	0.1904*** (0.0269)
<b>cnum2</b>	-0.0422 (0.0453)	0.0931*** (0.0244)	0.1695*** (0.0383)	-0.0385 (0.0445)	0.0864** (0.0286)	0.1682*** (0.0416)
<b>cnum3</b>	-0.1040 (0.0827)	0.0683* (0.0477)	0.2091*** (0.0524)	-0.0919 (0.0879)	0.0683* (0.0508)	0.2097*** (0.0499)
<b>Indebt</b>	0.0303*** (0.0034)	0.0214*** (0.0027)	0.0159*** (0.0025)	0.0297*** (0.0035)	0.0199*** (0.0031)	0.0154*** (0.0027)
<b>Incashasset</b>	0.1863*** (0.0118)	0.1879*** (0.0135)	0.1514*** (0.0183)	0.1869*** (0.0120)	0.1840*** (0.0141)	0.1515*** (0.0184)
<b>Innoncash</b>	-0.0033 (0.0049)	-0.0053*** (0.0015)	-0.0081*** (0.0028)	-0.0023 (0.0049)	-0.0046** (0.0016)	-0.0078** (0.0029)
<b>second</b>	0.1234*** (0.0378)	0.1941*** (0.0293)	0.1448*** (0.0267)	0.1202** (0.0391)	0.1893*** (0.0295)	0.1447*** (0.0272)
<b>cons</b>	-1.8079*** (0.1718)	-2.6428*** (0.0829)	-2.0638*** (0.1513)	-1.8128*** (0.1545)	-2.6418*** (0.1061)	-2.0295*** (0.1699)
<b>sigma</b>						
<b>log-likelihood</b>						

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

[Table 9] Individual pension purchase according to income level (2)

<b>Individual pension purchase amount</b>						
	Smodel 4-7	Smodel 4-8	Smodel 4-9	Smodel4-10	Smodel4-11	Smodel4-12
	Low (n=9,514)	Mid (n=29,384)	High (n=9,910)	Low (n=9,514)	Mid (n=29,384)	High (n=9,910)
<b>nps</b>	0.0684 (0.0548)	0.0542* (0.0333)	-0.0019 (0.0387)			
<b>sop</b>	0.5743*** (0.1359)	0.0856** (0.0332)	-0.0244 (0.0534)			
<b>cont/inc</b>				0.0140 (0.0405)	0.0218* (0.0254)	-0.0062 (0.0112)
<b>age</b>	0.0022 (0.0058)	0.0121*** (0.0017)	0.0114*** (0.0017)	0.0026 (0.0065)	0.0122*** (0.0017)	0.0112*** (0.0015)
<b>gen</b>	0.1869** (0.0867)	0.0385* (0.0286)	-0.0803** (0.0388)	0.1884** (0.0887)	0.0336 (0.0299)	-0.0769** (0.0389)
<b>marD1</b>	-0.1145 (0.1070)	-0.0146 (0.0538)	0.0387 (0.0671)	-0.1151 (0.1101)	-0.0206 (0.0537)	0.0420 (0.0681)
<b>eduD2</b>	0.2748*** (0.0766)	0.1980*** (0.0460)	0.2745** (0.0893)	0.2813*** (0.0781)	0.1985*** (0.0464)	0.2744** (0.0899)
<b>eduD3</b>	0.2043** (0.0850)	0.3356*** (0.0379)	0.4478*** (0.0883)	0.2234** (0.0821)	0.3368*** (0.0377)	0.4460*** (0.0893)
<b>jpoD1</b>	-0.2225*** (0.0579)	-0.1509*** (0.0226)	-0.2734*** (0.0262)	-0.2012*** (0.0525)	-0.1511*** (0.0291)	-0.2752*** (0.0303)
<b>jpoD2</b>	-0.0422 (0.0759)	-0.1154** (0.0531)	-0.2024 (0.1945)	-0.0538 (0.0730)	-0.1128** (0.0472)	-0.2049 (0.1935)
<b>cnum1</b>	0.0622 (0.0783)	0.0269 (0.0256)	-0.0130 (0.0365)	0.0735 (0.0778)	0.0259 (0.0266)	-0.0126 (0.0369)
<b>cnum2</b>	-0.1421* (0.0935)	0.0231 (0.0258)	0.0227 (0.0281)	-0.1358* (0.0959)	0.0207 (0.0251)	0.0240 (0.0270)
<b>cnum3</b>	-0.1814 (0.1868)	-0.0283 (0.0537)	-0.0311 (0.0651)	-0.1593 (0.1874)	-0.0288 (0.0545)	-0.0297 (0.0641)
<b>Lndebt</b>	0.0097** (0.0058)	0.0027 (0.0027)	0.0004 (0.0033)	0.0088* (0.0065)	0.0025 (0.0027)	0.0005 (0.0033)
<b>Incashasset</b>	0.1039*** (0.0124)	0.0927*** (0.0137)	0.0826*** (0.0159)	0.1049*** (0.1247)	0.0921*** (0.0137)	0.0828*** (0.0156)
<b>Innoncash</b>	0.0062 (0.0070)	0.0049*** (0.0013)	0.0039** (0.0026)	0.0063 (0.0076)	0.0050*** (0.0012)	0.0038* (0.0026)
<b>second</b>	0.0056 (0.0487)	0.0383* (0.0298)	0.0178 (0.0398)	0.0055 (0.0478)	0.0382* (0.0295)	0.0174 (0.0398)
<b>cons</b>	4.2582*** (0.3035)	4.0043*** (0.0129)	4.3516*** (0.1566)	4.2486*** (0.3278)	4.0084*** (0.1229)	4.3696*** (0.0142)
<b>sigma</b>						
<b>log-likelihood</b>						

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

[Table 10] Individual pension purchase according to income level (3)

<b>Individual pension participation</b>						
	SModel4-13	SModel4-14	SModel4-15	SModel4-16	SModel4-17	SModel4-18
	Low (n=8,048)	Mid (n=25,307)	High (n=8,586)	Low (n=4,039)	Mid (n=14,246)	High (n=5,285)
<b>HO</b>	-0.0206 (0.0584)	0.1752*** (0.0335)	0.2432*** (0.0378)			
<b>price</b>				0.0280 (0.0433)	0.1203*** (0.0195)	0.0471** (0.0233)
<b>age</b>	-0.0176*** (0.0021)	-0.0055*** (0.0014)	-0.0067*** (0.0021)	-0.0284*** (0.0039)	-0.0120*** (0.0026)	-0.0136*** (0.0039)
<b>gen</b>	-0.0950** (0.0463)	-0.0709** (0.0357)	-0.2749*** (0.0670)	0.0675 (0.0576)	-0.0699* (0.0528)	-0.2944** (0.1428)
<b>marD1</b>	0.0056 (0.0525)	0.0127 (0.0299)	0.1322** (0.0542)	0.0393 (0.1439)	0.0398 (0.0645)	0.1484* (0.1024)
<b>eduD2</b>	0.1744** (0.0781)	0.1578** (0.0721)	0.0795 (0.0904)	0.1075 (0.0887)	0.0838 (0.0772)	0.0882 (0.1103)
<b>eduD3</b>	0.2090** (0.1156)	0.3286*** (0.0596)	0.0759 (0.0750)	0.1522 (0.1228)	0.2128*** (0.0587)	0.0601 (0.0911)
<b>jpoD1</b>	-0.1520*** (0.0471)	0.3113*** (0.0528)	0.4876*** (0.0475)	-0.0249 (0.0544)	0.4029*** (0.0558)	0.5497*** (0.0449)
<b>jpoD2</b>	-0.4773*** (0.1075)	-0.3173*** (0.0666)	-0.0450 (0.1528)	-0.4940*** (0.1089)	-0.3352*** (0.0801)	-0.3011** (0.0788)
<b>cnum1</b>	0.0548** (0.03277)	0.1271*** (0.0243)	0.1887*** (0.0345)	-0.0122 (0.0645)	0.0859** (0.0337)	0.1085** (0.0569)
<b>cnum2</b>	-0.0452 (0.0450)	0.0803*** (0.0252)	0.1368*** (0.0340)	-0.1842** (0.0792)	0.0162 (0.0421)	0.0601 (0.0485)
<b>cnum3</b>	-0.1049 (0.1042)	0.0666 (0.0529)	0.2098*** (0.0527)	-0.4609*** (0.1471)	0.0033 (0.0694)	0.2265 (0.0616)
<b>Indebt</b>	0.0316*** (0.0035)	0.0192*** (0.0025)	0.0127*** (0.0028)	0.0292*** (0.0060)	0.0120*** (0.0023)	0.0065*** (0.0036)
<b>Incashasset</b>	0.1948*** (0.0154)	0.1829*** (0.0153)	0.1427*** (0.0195)	0.1759*** (0.0184)	0.1641*** (0.0177)	0.1258** (0.0254)
<b>Innoncash</b>	-0.0042 (0.0045)	0.0046* (0.0031)	0.0046 (0.0038)	-0.0057** (0.0033)	0.0068** (0.0034)	0.0074*** (0.0039)
<b>second</b>	0.1109** (0.0499)	0.2242*** (0.0324)	0.1856*** (0.0300)	0.1409 (0.1104)	0.1973*** (0.0528)	0.1709** (0.0431)
<b>cons</b>	-1.8370*** (0.1899)	-2.5666*** (0.1242)	-1.8095*** (0.1934)	-1.5469*** (0.4622)	-3.0648*** (0.1908)	-1.5544*** (0.3521)
<b>sigma</b>						
<b>log-likelihood</b>						

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

[Table 11] Individual pension purchase according to income level (4)

Individual pension purchase amount						
	SModel4-19	SModel4-20	SModel4-21	SModel4-22	SModel4-23	SModel4-24
	Low (n=8,048)	Mid (n=25,307)	High (n=8,586)	Low (n=4,039)	Mid (n=14,246)	High (n=5,285)
<b>HO</b>	0.0405 (0.0733)	-0.0447** (0.0216)	-0.0856** (0.0412)			
<b>price</b>				0.0928 (0.0759)	0.1581*** (0.0198)	0.1639*** (0.0236)
<b>age</b>	0.0020 (0.0073)	0.0131*** (0.0022)	0.0122*** (0.0019)	0.0146** (0.0081)	0.0109*** (0.0026)	0.0070** (0.0039)
<b>gen</b>	0.1980** (0.1098)	0.0397 (0.0361)	-0.0590* (0.0422)	-0.1023 (0.0866)	-0.0496 (0.0407)	-0.0080 (0.0602)
<b>marD1</b>	-0.1255 (0.1376)	-0.0209 (0.0741)	0.0247 (0.0886)	0.0208 (0.1994)	-0.0095 (0.0695)	-0.0239 (0.1156)
<b>eduD2</b>	0.2862*** (0.0799)	0.1922*** (0.0600)	0.2496** (0.1185)	0.4005** (0.1343)	0.1513** (0.0651)	0.2216* (0.1381)
<b>eduD3</b>	0.2551** (0.0934)	0.3374*** (0.0546)	0.4053*** (0.1152)	0.4024** (0.1487)	0.2231*** (0.0624)	0.2845** (0.1263)
<b>jpoD1</b>	-0.1996** (0.0694)	-0.1476*** (0.0256)	-0.2976*** (0.0260)	-0.1617** (0.0807)	-0.0934** (0.0332)	-0.1890*** (0.0336)
<b>jpoD2</b>	-0.1167 (0.0978)	-0.1604*** (0.0491)	-0.2055 (0.2148)	-0.0537 (0.1055)	-0.0635* (0.0403)	-0.750 (0.0542)
<b>cnum1</b>	0.0124 (0.0670)	0.0207 (0.0299)	-0.0127 (0.0421)	0.2466*** (0.0774)	0.0739** (0.0266)	0.0047 (0.0411)
<b>cnum2</b>	-0.1801** (0.0903)	0.0302 (0.0318)	0.0413* (0.0309)	-0.0131 (0.1101)	0.0335 (0.0450)	0.0173 (0.0520)
<b>cnum3</b>	-0.2648* (0.1714)	-0.0411 (0.0609)	-0.0431 (0.0686)	0.0281 (0.1792)	-0.0027 (0.0615)	-0.0712 (0.0945)
<b>Indebt</b>	0.0078 (0.0074)	0.0043* (0.0031)	0.0026 (0.0035)	-0.0022 (0.0077)	-0.0007 (0.0034)	-0.0003 (0.0032)
<b>Incashasset</b>	0.1061*** (0.0150)	0.0921*** (0.0154)	0.0835*** (0.0183)	0.0649*** (0.0134)	0.0746*** (0.0164)	0.0705*** (0.0185)
<b>Innoncash</b>	0.0140** (0.0084)	0.0015 (0.0011)	-0.0028* (0.0019)	0.0268*** (0.0079)	0.0047** (0.0023)	-0.0013 (0.0031)
<b>second</b>	-0.0393 (0.0318)	0.0272 (0.0332)	0.0030 (0.0486)	-0.2714** (0.0933)	0.0119 (0.0564)	0.0407 (0.0736)
<b>cons</b>	4.2836*** (0.3804)	4.0729*** (0.1514)	4.4449*** (0.1798)	3.0434*** (0.8203)	2.7969*** (0.2442)	3.0438*** (0.3331)
<b>sigma</b>						
<b>log-likelihood</b>						

Note: \*\*\* p<0.001; \*\* p<0.05; \* p<0.1

Reported likelihood refers to the joint estimation of the two equations in the model (first and second hurdles)

## Summary & Discussion

This subgroup analysis was based on income class. The income class was clustered into three groups within the dataset; lowed third, mid third and higher third. Subgroup models 4-1 through 4-24 shows the result of each income class' effect on individual pension purchase.

For mid-income group, the result was similar to the original model. Homeowners and owners with higher valued property tended to have better participation rates in an individual pension. Homeowners tended to have lower individual pension purchase amounts, while higher valued property owners tended to have a higher amount of individual pension purchases. NPS and SOP group tended to have better participation and better purchase amount than non-participant group, while public pension contribution level also had significant effect on participation rate and purchase amount.

Lower income group, on the other hand, had somewhat distinct result. Homeownership and house price was not significant in both participation and purchase amount model, which was different result from original model. This result could be rooted on the 'low income' of the group; Because low-income group might have higher economic constraint by having house, or having higher valued house, this might act as a greater financial constraint compared to other income groups. Thus, it will be hard for this group to purchase additional individual pension if they own a house or higher valued house. This can explain the non-significance of the

homeownership and house price variable. Meanwhile, people of low-income class group who participated in public pension tended to have better individual pension participation rate and better purchase amount than non-participants. The reference group—non-public pension participants—of lower income group are likely to be in ‘low-income class’, with higher chance of being part of instable job market; but having NPS or SOP indicates stable job status compared to the non-participants, even though they are in low-income class. In short, NPS and SOP participants in low-income group might be more stable financially than non-public pension participant, which might lead NPS and SOP participants to purchase more individual pension.

Higher income group showed similar result to original model in housing related analysis; Homeowners and owners with higher valued property tended to have better individual pension participation rates. Homeowners tended to have lower individual pension purchase amounts, and higher valued property owners tended to have a higher amount of individual pension purchases. On the other hand, the result of higher income group in terms of pension related analysis showed difference compared to the original model. NPS and SOP participant had significantly better participant rate compared to non-participants, but they did not have better purchase amount. The possible reason could be related to the nature of reference group; Although the reference group is not part of public pension program for some reason, they still belong to higher income group, which means they are capable at having certain level of individual pension purchase. Furthermore, because the reference

group cannot expect public pension income in the future, they might have motive to prepare retirement with individual pension. These features possibly drive the non-participant group to purchase individual pension with higher amount. On the other hand, NPS and SOP participant might have relatively less motive to participate in individual pension compared to non-participants because they can expect some level of future income from public pension. With higher level of the individual pension purchase amount of the reference group and diminished level of individual pension purchase within NPS and SOP group, might led to the result of non-significant difference among the groups.

# 공적연금과 주택소유가 개인연금에 미치는 영향에 관한 연구

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김소연

본 연구는 미래 노후 소득원이 될 수 있는 공적연금 및 주택소유 관련 변인들이 사적연금 가입 여부와 가입액에 어떠한 영향을 미치는지를 분석하고자 하였다. 한국의 노인 중 과반이 노후의 가장 큰 문제점으로 경제적 어려움을 꼽았으며, 2019년도 기준 44%의 노인이 빈곤한 것으로 나타나는 등 한국 노인의 노후 소득과 빈곤 문제는 사회적으로 중요한 이슈이다. 이러한 노년의 경제적 문제에 대한 가장 효과적인 해결책 중 하나로 공적연금이 꼽히는데, 통상적으로 연금의 소득대체율이 은퇴 전 임금의 70% 정도가 되면 이상적인 노후 소득 수준으로 인식된다. 하지만 한국의 공적연금은 소득대체율이 40% 정도에 불과해, 이상적인 소득대체율과 비교해 매우 낮은 수준이다. 오늘날 실질적 소득대체율과 이상적 소득대체율의 차이는 상당부분 개인의 책임으로 인식되고 있으며, 이에 자연스럽게 개인연금의 중요성이 점점 커지고 있는 실정이다.

개인연금 구매의 주요 목적 중 하나가 부족한 노후 소득을 충당하는

것이기 때문에 개인연금의 구매 수준은 다른 유형의 노후소득에 크게 영향을 받을 수밖에 없다. 본 연구에서는 공적연금이 개인연금 구매에 주요한 영향을 미칠 것으로 가정하였다. 공적연금은 많은 이들에게 중요한 노후소득의 원천이기 때문에, 개인연금에 상당한 영향을 미칠 수 있다는 가정이다. 실제로 공적연금과 개인연금의 관계에 관한 많은 연구들이 존재하는데, 둘 사이에는 공적연금이 사적연금을 구축하는 대체 관계와 (life-cycle theory), 공적연금과 사적연금의 상호보완적 관계 (extended life-cycle theory)가 모두 나타나는 것으로 알려져 있다.

주택 소유 역시 연금과 유사한 역할을 한다. 주택 소유는 노년기에 ‘현금 소득’ 과 ‘현물 소득’ 으로 금전적 혜택을 제공할 수 있고, 빈곤으로부터 개인을 보호할 수 있다. 주택 자산은 현금 형태로 실현 가능하기 때문에 주택 소유자에게 직접 현금을 제공할 수 있다. 또한 주택을 소유할 경우 임대료에 비해 주거 관련 지출이 상당부분 줄어들 수 있기 때문에 다양한 비현금성 혜택도 존재한다. 따라서 개인에게 일정한 소득이 없는 인생의 후반기에는, 주택을 소유하는 것이 은퇴자들에게 큰 혜택이 될 수 있다. 연금-주택의 관계성에 대한 연구들도 둘의 관계는 대체관계 (Kemeny' s trade-off theory)와 보완관계 (extended life-cycle theory)가 모두 나타날 수 있다고 보고하고 있다.

개인연금, 공적연금 및 주택 소유는 노후소득으로서의 역할만 공유하는 것은 아니다. 세 요인 모두 개인의 생애 노동기간 동안의 소득 범위 내에서 발생한다. 이는 연금과 주택구입은 경쟁관계에 놓일 수 있다는 것을 의미한다. 그 중에서도, 공적연금 기여금과 주택 구입 관련 비용은 상당 기간 동안 지불되어야 하며 생애 전반에 걸쳐 지속적인 지출이 필요하다. 때문에 공적 연금 가입과 주택 소유 여부는 개인의 예산 제약 수준에 영향을 미쳐 개인연금 구입에도 영향을 미칠 가능성이 크다.

이와 같은 논의들을 바탕으로 다음의 세 가지 주요 연구 질문을 설정하였다. 첫 번째, 공적연금이 개인연금에 미치는 영향은 어떠한가? 공적연금 가입 형태와 공적연금 기여액에 따라 그 효과가 다른가? 두 번째, 주택 소유가 개인연금에 미치는 영향은 어떠한가? 또한 주택가격이 개인연금에 미치는 영향은 어떠한가? 세 번째, 공적연금과 주택소유의 상호작용 효과는 어떠한가?

연구질문에 대한 분석을 위해 본 연구는 재정패널 2차~12차 데이터를 사용하였다. 분석대상은 20 - 60세의 가구주이며, 총 3,461명의 데이터가 활용되었다. 종속 변수는 개인연금 가입 여부와 개인연금 가입액이었고, 독립 변수는 공적연금 가입여부, 공적연금 가입액, 주택 소유, 주택 가격, 그리고 공적 연금과 주택의 상호작용이었다. 주요 분석 모델은 이중허들 모형과 통제함수 모형을 활용하였다.

분석 결과 공적연금 가입 형태와 공적연금 기여액이 모두 개인연금 가입과 가입액에 유의한 긍정적 영향을 미치는 것으로 나타나, 상호보완적 관계가 확인되었다. 더 관대한 유형의 공적연금에 가입한 그룹과 더 많은 공적연금 기여액을 납부하는 그룹이 개인연금에 더 많이 가입하고, 가입액도 높은 것으로 나타났다. 이러한 관계가 나타난 주요 이유 중 하나는 예방적 동기일 것으로 추정된다. 낮은 공적연금 대체율과 공적연금의 불안정한 재정상태에 대한 심리적 불안이 예방적 동기를 유발할 수 있으며, 이것은 공적연금과 개인연금 사이의 관계에 영향을 미쳤을 가능성이 크다.

주택 소유여부와 주택 가격 역시 개인연금 가입에 긍정적인 영향을 미쳤는데, 이것은 둘 사이의 관계가 대체적이기보다는 상호보완적임을 나타낸다. 그러나 주택 소유여부는 개인연금 가입액에 유의한 부정적 영향을 미치는 것으로 나타나, 연금과 주택소유 사이의 trade-off 관계의

가능성을 보여주었다. 주택 소유자는 주택을 노후에 연금으로 활용할 수 있기 때문에 비소유자보다 적은 금액의 개인연금을 구입하거나, 비소유자보다 더 큰 재정적 제약에 직면할 수 있어 이러한 결과가 나타났다고 볼 수 있다.

한편, 상호작용 효과 분석 결과에 의하면 주택 소유와 공적 연금(가입형태, 기여액)은 개인연금 가입에는 긍정적 상호작용 효과가 있는 반면, 개인연금 가입액에 관해서는 상호작용 효과가 없는 것으로 나타났다. 주택 가격과 공적 연금 (가입형태, 기여액)은 개인의 연금 가입에 상호작용 효과가 없는 것으로 나타난 반면, 개인연금 가입액에 대해서는 유의한 상호작용 효과가 있었다. 대체적으로 상호작용 효과의 결과는 공적연금, 주택, 개인연금 사이에 상호보완적 경향이 있음이 확인됐다.

본 연구는 몇 가지 중요한 이론적 의미를 가지고 있다. 첫째, 본 연구는 그동안 학계에서 다소 배제되었던 개인의 노후 준비 측면에서의 주택의 중요성을 강조하였다. 노년기에 주택 소유의 중요성은 널리 받아들여지고 있지만, 복지나 노후 준비와 관련된 연구에서 주택에 대한 관심은 그 중요성에 비해 학계에서 크게 미흡한 실정이었다. 본 연구는 복지 분야에서 연구 비중이 낮았던 '주택'을 조명하고, 한국의 개인연금 구매에 있어 주택의 역할을 검토해 기존 문헌의 한계를 극복하였다. 둘째, 본 연구는 Kemeny의 trade-off 이론을 이용하여 미시적 수준에서 주택과 연금의 관계를 조사하였다는 의미가 있다. Kemeny의 이론은 대체로 국가 수준에서 연금과 주택 소유 사이의 trade-off를 설명하였지만, 미시적 수준에서도 적용될 수 있다. 그러나 현재까지는 Kemeny의 이론을 이용하여 연금-주택소유의 미시적 관계를 설명하려는 시도는 거의 없었다. 본 연구는 거시적 수준의 담론을 미시적 시각으로 전환하여 살펴보았다는 점에서 그 의의를 찾을 수 있다. 셋째, 본 연구는 공적연금과 주택이

개인연금 구매에 미치는 상호작용 효과를 조사한 최초의 연구라는 점에서 의미가 있다. 본 연구는 공적연금과 주택의 상호작용에 따라 개인연금 구매 결과가 달라질 것으로 가정하였으며, 연구결과 유의한 상호작용 효과를 확인하였다.

마지막으로, 본 연구는 개인연금에 대한 중요한 정치적 예비 자료가 될 수 있다는 정책적 함의를 지닌다. 정확한 정책 개입을 위해서는, 관련된 기능에 대한 정확한 상황을 파악하는 것이 무엇보다 중요함에도, 개인연금에 대한 정확하고 종합적인 정보가 부족한 실정이었다. 본 연구는 개인연금에 관하여 정책적 환경에서 사용될 중요한 기초자료가 될 수 있다. 또한, 본 연구는 다음과 같은 정책적인 제안을 제시하였다. 첫째, 개인연금에 가입하지 못하는 취약계층을 지원하는 제도가 필요하다는 것이다. 본 연구는 공적연금, 개인연금, 주택 간에 상호보완적 관계를 발견해 부익부 빈익빈 현상을 확인하였는데, 이는 경제적으로 취약한 사람들이 개별연금제도로부터 더 배제될 위험이 있다는 것을 나타내기도 한다. 경제적으로 어렵지만 개인연금에 참여할 의사가 있는 사람들에게 보조금을 지원하는 등의 정책적 노력을 통해 부익부 빈익빈 현상을 완화시킬 필요가 있다. 둘째, 공공부문의 역할 확대도 필요할 것이다. 연금 크레딧 확대를 통해 공적연금의 적용범위를 확대하고 사회적 약자나 취약계층을 위해 기초연금 역할을 증가시키는 노력은 계층 간 격차를 줄이는 해법으로 작용할 수 있을 것이다.

주요어: 공적연금, 주택소유, 개인연금, 노후준비, 이중허들모형, 통제함수모형