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정책학석사학위논문

Income Insecurity of the Elderly, 1998-2013

노인가구의 소득위험, 1998-2013

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Abstract

Income Insecurity of the Elderly, 1998-2013

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A surge of interest in economic situation of the elderly Koreans has led many to question the viability and effectiveness of public pensions. The broadest encompassing form of social safety nets in Korea, public pensions are on the one hand criticized for its weak provisions, and on the other for its lack of sustainability. The two sides are seemingly at odds against each other, with one calling for its expansion and the other its reduction. Yet, no constructive agreement can be reached without understanding the way in and the extent to which public pensions affect financial circumstances of the elderly. This paper attempts to fill the gap surrounding this debate by assessing the role of public pensions in mitigating the economic insecurity of the elderly Koreans from a

longitudinal perspective – that is, by focusing on long term changes in the extent of income insecurity during old age.

I first attempt to better document the changes of income insecurity of elderly Koreans using half the squared coefficient of variation (GE2) as a measure for overall income insecurity and decomposing the measure into income inequality and income volatility. I document the situation of different cohort groups over the last 16 years; for a rigorous assessment, I compare the situation of the older old and the younger old to see whether the situation is worsening for the emerging elderly. I then examine the effect of public pensions on overall income insecurity as well as the two components. I compare its effect with that of other subsidiary income sources, mainly private transfer income, which has been for long the predominant form of income source for elderly Koreans.

The deployed dataset is Korean Labor & Income Panel Study (hereafter KLIPS) from 1998 to 2013 (wave 2 – 17). I provide trends of GE2, as well as its two components inequality and volatility, following a method developed by Nichols (2008). The trends reflect changes arising from differences in the three factors: age, cohort, period. I take this into consideration by using a standard cohort table for GE2, income inequality and income volatility. This allows me to draw a comprehensive and careful interpretations of the trends.

Main findings are as follows. First, income insecurity first tends

to rise then returns back to a level similar to or slightly higher than where it began. Of the two components of income insecurity, inequality was found to increase over time while volatility declined. Hence, increase in income insecurity was arguably driven by inequality, while the drop in latter periods was driven by growing stability of incomes. Second, in regards to the economic situation during old age, I found income insecurity to be much higher during old age. However, younger elderly displayed greater level of income security than their predecessors in both of the dimensions considered: inequality and volatility, suggesting that the situation during old age has been, in fact, improving. Lastly, public pensions were found to have gained in significance, reducing both inequality and fluctuations for the emerging old at a much higher proportion than their predecessors. Its impact was more forceful in reducing fluctuations of income, and less so for inequality, however. In contrast, effects of private transfers were eroding, suggestive of a shift of risk from household to society.

This paper is not without limitations. Especially worth consideration is the measurement of economic insecurity employed in this paper; income insecurity and volatility measures fail to capture the all the complexities surrounding economic insecurity, for example the on-going insecurities or future risks that elderly households face. However, it is a good indicator of the observed insecurities reflected in income changes, and is significant in that it provides a comprehensive,

unified framework and one that is practical and feasible to use with given data. Especially noteworthy finding, in this paper, is the growing presence of public pensions in determining situations of the elderly. My method also revealed its differential effects on inequality and volatility, an aspect that should be taken into account when designing related policies.

Keywords: Income Insecurity, Public Pensions, Decomposition of General Entropy, Income Inequality, Income Volatility, Elderly

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I. Introduction

1. Purpose of Study

The dire circumstances of elderly Koreans can be easily spotted in the academic literature and media. Extensive literature has documented the precarious lives of the elderly; in fact, official statistics report that 50.6% of those aged over 65 were under relative poverty in 2013[1]. Among various demographic groups, seniors are with the highest probability of falling into poverty and, even upon exiting, are likely to re-enter the status (Ku, 2005; Seok, 2009). Some studies have gone as far as to suggest that poverty and inequality have risen since the late 1990s (Ku, 2000; Ku & Shon, 2005).

Often associated with this topic is the role of the state in reducing income insecurity of the elderly. For example, Social Security in the United States has been credited for the reduction of elderly poverty, hailed as a major policy success[2] (Englehardt & Gruber, 2000). However, the

[1] Relative poverty, measured by 50% of the median income, for all elderly households (aged 65+), rose from 46.1% in 2006 to 50.6% in 2013 (Korea Institute for Health and Social Affairs, 2014).

[2] There is a wide agreement that Social Security has been a successful policy story in the United States. However, this is coming to a change, due to its

effectiveness and viability of South Korea's social security has been called into question numerous times, still standing as one of weakest public insurance among OECD countries (OECD, 2015). For example, public pension spending accounts for 2.2% of GDP in Korea, compared to 7.9% OECD average in 2014 and only slightly higher than Mexico's 1.8% and Iceland's 2.1%, the lowest two of the group.

This paper focuses on South Korea's elderly for the following reasons. First, its population is aging faster than ever witnessed before, with elderly constituting over 13% of the population, a figure that is rapidly rising and is expected to reach up to 40% by 2060 (Statistics Korea, 2015). Second, while Korea is renowned for its rapid economic advancements since the 1960s, elderly has raked less from such developments. Third, forces of globalization and technological innovation are argued to pose a pervasive threat to the working population (Rodrik, 1998), which in turn deteriorate their ability to support the elderly whose economic status are heavily dependent. As South Korea's elderly have traditionally relied on private transfers from their children, rising risks in the market may threaten sustainability of private transfers. Lastly, its social safety net has been criticized as failing to meet its growing needs. Contrary to reduction of poverty rates among the elderly seen in most of the developed countries, South Korea's elderly has not been faring so well (OECD, 2015).

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waning contributions as well as its adverse effects on inequality (Englehardt & Gruber, 2000; Hacker, 2011)

These challenges have led many - scholars, activists and politicians alike – to raise concerns about the economic security of today's elderly, and about the impact of secondary income sources, such as private transfers, public transfers and public pensions, in alleviating their financial burdens. Changing socioeconomic environments – including economic advancements, growing volatility in the market, and the expansion of public pension – could have, overall, affected the elderly's economic situation for better or for worse. Despite mounting attention, there is surprisingly meager amount of research on the trend and the nature of economic security of elderly Koreans.

Related studies have mostly employed cross-sectional measures, which focuses on poverty level or inequality level at a point in time. This has been criticized as producing different, and often distorted view on trends (Bane & Ellwood, 1983). To date, no study has documented a long term longitudinal trends in income changes of Korea's elderly. Hence a full account of their situation as well as its changes have yet to be thoroughly investigated, a challenge I intend to take on in this paper. For this purpose, I assess longitudinal changes in income during old age in Korea and how they have evolved over time. I then examine the role of public pensions and its development over the course of last 16 years.

2. Research Questions

Concerns about the economic insecurity of the elderly continue to heighten, with some even asserting that the situation has worsened over the years. However, there has been no unified framework for understanding economic insecurity; most of existing studies have restricted their analysis to select parts of the income distribution and on arbitrarily selected years, revealing not much about the trend of elderly's circumstances. Hence I attempt to provide a rigorous analysis of the full extent and the nature of insecurities, and how they have changed throughout the years. The questions I attempt to answer in this paper are: 1) has income insecurity increased for the elderly? 2) how does public pension affect income insecurity of the elderly?

The first question is aimed at better documenting the changing circumstances of the elderly. Extensive literature in the United States have employed different datasets and reached a general agreement that income volatility has exponentially increased over the years, a finding that brought new policy needs and potential solutions (Hacker 2008). While descriptive in nature, it is critical to assess the economic situation of Korea's elderly before attempting to make policy proposals. I document the situation of each cohort group over the last 16 years to see if it has improved or exacerbated for the group as a whole; for a rigorous assessment, I compare the situation of the older old and the younger old to see whether the situation is worsening for the emerging elderly and for generations to come.

My second question is important for considering policy implications. Of various sources of income, I shed light on the role of public pensions: the most pertinent source of income for insuring against income losses and instability during old age. Korea is the fastest aging country among OECD members (OECD, 2015), and yet, there is a contentious debate surrounding the role of public pension schemes. On the one hand, they have been criticized as falling too short in its provision amount and coverage scope; on the other, it is criticized for lack of sustainability. There also remain controversies surrounding the impact of public pensions on poverty and inequality. To justify the expansion or reduction of the pension scheme, there should precede closer examination of its intended effects: helping to secure stable livelihood during old age.

To answer these questions, one essential task of the paper is to operationalize economic insecurity. I limit my analysis to income insecurity, and of many components of income insecurity, I pay attention to changes in income inequality and income volatility to study how relative positions of individuals are changing over time. The former consists of differences among households, and latter about the changes in income of individual elderly households. This method is drawn from Nichols (2008), in which he defined income risk as GE_2 and decomposed it into income inequality, volatility and mobility. I do not draw a distinction between volatility and mobility in this paper, and consider both to be a form of volatility, however. My earlier working paper with Baek

and Kum (2016) saw that mobility was an insignificant part in this method; also, mobility can be perceived as a form of volatility: changes in income of individual households. Building upon this work, I use different data and methods to cover a longer span of period and to complement the results through a rigorous examination of the trends. What further distinguishes this paper from prior research is that I take into consideration the concurrent effects of aging and period changes that each cohort goes through using a standard cohort table. This allows for a comprehensive evaluation of changes in income insecurity.

Discussion on dynamics of income has expanded the scope of our understanding of the direct circumstances and changes in economic situations that individuals go through, made possible by increasing availability of panel data – employed here is the Korean Labor Income Panel. I use all but the first year of this data, thus covering 16 years from 1999 to 2014 (corresponding to income years from 1998 to 2013). I examine the trends for each cohort group, limiting my analyses to cohorts born earlier than 1958.

My analyses on income insecurity of elderly Koreans revealed several findings worthy of mention. First, income insecurity for the elderly cohorts displayed an inverse U curve over the course of 16 years, first rising then retreating back to a level similar to or slightly higher than where it began. Of the two components of income insecurity, inequality was found to increase over time while volatility declined. Hence, increase

in income insecurity was arguably driven by inequality, while the drop in latter periods was driven by growing stability of incomes.

Second, in regards to the economic situation during old age, I found income insecurity to be much higher during old age, continually increasing as individuals age; there is a noticeable increase during ages 60-69 as can be expected during ages of retirement. However, younger elderly displayed greater level of income security than their predecessors in both of the dimensions considered: inequality and volatility. This contrasts some of earlier findings that concluded the situation has exacerbated for the elderly.

Third, from decomposition of gross income to its income sources, public pensions were found to have gained in significance, reducing both inequality and fluctuations for the emerging old at a much higher proportion than their predecessors. Its impact was more forceful in reducing fluctuations of income, and less so for inequality, however. In contrast, effects of private transfers were eroding. In other words, it does less to reduce inequality and volatility of incomes for the younger old than the older old.

The remainder of this paper is organized as follows. First, to set the scene for analysis, I review literature on economic circumstances of the elderly, and provide a thorough theoretical account of economic insecurity. The subsequent chapter lays out research questions and hypotheses. I follow this with description of the employed data and methods, and then

present my findings. I carefully interpret and discuss my findings and conclude with policy implications

II. Literature Review

1. Income Insecurity of the Elderly

1) Income Insecurity of Korea's Elderly

Prior studies have consistently revealed that both absolute and relative inequality levels are higher for the elderly compared to other age groups. There has been an increasing trend of poverty, contrary to what has been witnessed in other OECD member countries where rates of poverty have been on a declining trend (Yeo, 2013; OECD, 2015). Ku and Sohn (2002) noted of an increase in absolute poverty between 1996 and 2000; Sohn (2013) followed up with a similar research, in which he found an increase in absolute poverty and relative poverty between 2008 and 2009. Yeo (2013) corroborates this finding by showing that both absolute and relative poverty increased from 2005 to 2009.

Similar conclusions have been made regarding income inequality amongst the elderly. Kim (2008) found a rise of Gini coefficient between 1996 and 2006 using two data points of cross-section data. Lee (2012) is notable in that it employed a panel data, same as the one used in this paper, finding inequality to have increased during the 1999-2002 period, but declining afterwards from 2002 to 2008. Lee (2012)'s finding is

noteworthy as it reveals diverging trends based on the years selected for analysis. Hence, I employ data points of all reliable years in KLIPS, 1999 to 2014 (corresponding to incomes earned in 1998 to 2013).

Aside from poverty and inequality levels, some scholars have also attempted to better document the dynamics of income changes. Ku (2005), for example, re-assessed the extent of long-term poverty from 1998 to 2003. While prior research generally conceded on the frequent exit rates of poverty in Korea, he found a high proportion of people in long-term poverty when estimating the spell distribution at a particular time. He also found re-entry rates to be high, causing the proportion of those experiencing long-term poverty to be about twice as high despite transitory flights in between, suggesting those under or near the poverty line are in constant threat of financial destitution. Although this paper did not solely focus on the elderly population, it found the elderly group as consisting the highest proportion of those entering poverty and re-entering poverty.

Seok (2009) focused on the elderly population, using dynamic random effects probit model to estimate probability of entering and exiting poverty status, using KLIPS from 1998 to 2007. He came to similar conclusion as Ku (2005); the elderly was suffering from persistent poverty, in particular the female-headed and single-headed households among the elderly. He also found prior experience of poverty having an effect on future probability of experiencing poverty, similarly implying financial

instability of the elderly. Using longitudinal data, both Ku (2005) and Seok (2009) enhanced our understanding of poverty in Korea. These only reflect a small fragment of income insecurity, however, as they only capture movements occurring at the poverty line. Each also suffer from a relatively short period used for conducting analysis, hence failing to account for varying trends that may have occurred when using different periods.

Analyses have expanded to include changes that occur within individual households, an important characteristic of households' economic security. Jang (2015), for example, estimates changes in income volatility from 1998 to 2009 and dissects the trends for a comparison across income class and various household compositions. She found income volatility to be higher for low-income class, but found it to decline over the analysis period for all income groups. Their study is significant as it was the first to document volatility trends in Korea.

These studies have advanced our understanding of poverty and other features of income dynamics, mostly income inequality. What limits the aforementioned analyses in providing a full account of the elderly's situation in Korea is that they are incomprehensive in both their coverage of the income distribution and the years in which it has evolved, thus failing to account for the full narrative of what has happened. For example, poverty spells reveal income insecurity of the poor, but it is limited as they focus on one end of the income distribution: events falling in and climbing

out from poverty. Other studies that have shed light on income volatility and mobility have been an important contribution, but still lacked a comprehensive, unified framework for understanding the changes in relation to each other.

2) Income Insecurity and Public Policy

Vulnerability during old age comes from falling stability of what constitutes their income; as individuals enters old age, their primary earnings is reduced, especially upon retirement. Instead, they are likely to grow dependent on saved assets like rent and interests or transfer incomes from within the family or from public institution. Hence, much of their income insecurity is dependent on the level of and stability of these subsidiary income sources. Among these sources, government institutions play a critical role in helping to buffer or alleviate growing insecurities in the market (Hacker, 2008; Bartels & Bonke, 2013; Hardy & Ziliak, 2014).

Private income has been a major source for the elderly in Korea (Kim, 2008). So far, studies have generally agreed on the equalizing impact that private transfer has had on the elderly– that is, it reduces income inequality as well as poverty. Kim (2008) found that three out of five households supported their aged parents in one form or another, while two out of five provided for their parents on a regular basis. Its role has been subsiding however, as society is increasingly individualized, and further aggravated by continually aging population, setting forth a new challenge before us.

A natural corollary is the growing significance of public institutions. Public pensions remain the broadest social security available for the elderly. Yet, they have also been subject to controversy due to doubts about its impact as well as the sustainability of it, compounded by downsizing of the working population. Especially controversial has been its effects on inequality; much of public pensions are earnings-based, which means that those who have contributed more are subject to greater entitlements. Studies regarding the effects of public transfer and pensions have produced mixed results. Most studies found public pensions as important in reducing income inequality (Kang and Lim, 2009; Kim, 2008), while some found it to increase inequality due to a low coverage rate (Lee, 2013). Hong (2002) and Lee (2013) found both public and private transfers to reduce income volatility, and Kum and Baek (2014) found public pension as critical in reducing volatility of the elderly recipients, although less so than private transfers. In my working paper with Kum & Baek (2016), pensions were found to consistently reduce income volatility and mobility, while their effects on inequality were less prominent. By comparing effect of these income sources on different dimensions of income risk, one is better able to distinguish and identify the effects.

In sum, rising interests in elderly's economic viability have brought to light the relative vulnerability of old age compared to other age groups and shifts in roles of different income sources. Despite the voluminous

amount of research studying economic insecurity of the elderly, it has fell short of providing a comprehensive account of the economic situation of the elderly for three reasons. First, most studies have often relied on cross-section datasets which fail to take into account the changes of income that individual households go through. Second, years under investigation were often arbitrarily chosen, limiting our understanding of the full trend of changes. Third, studies that took employed panel data have more or less focused on just one part of the distribution, and hence overlooked how income changes simultaneously occur across and within households. To date, there still remains the task of shedding light on the issue from a more comprehensive perspective.

I try to overcome these limitations by using all 16 years of KLIPS, the longest panel data that provides a detailed account of household and individual incomes, and by using a comprehensive measure that better reflects economic insecurity of the elderly. This first requires conceptual understanding of economic insecurity as well as its significance, which I attempt to convey in the next section. I then review existent measures used to capture the phenomenon, and justify my selection of one measure in particular.

2. Understanding Economic Insecurity

1) Definition

Economic insecurity is essentially about the economic dangers that pervade people's lives, and this includes experienced, anticipated as well as perceived changes related to their economic well-being. Definitions vary from the likelihood or risk of an adverse event in one's life, perceptions of this risk, anxieties and concerns associated with this risk, and the ability to cope with or recover from the costly consequences in case of an adverse event (Ivlves, 2014).

The core distinguishing factor in the wide array of definitions revolves around the span of time in consideration. Some scholars put more emphasis on the present situation, some on the future, and some on the discrepancies in between. For example, Dercon (2006, p. 188) relates the concept of insecurity to vulnerability, which he defines as "the existence and the extent of a threat of poverty and destitution; the danger that a socially unacceptable level of wellbeing may materialize." Some make clear distinctions between the two notions; Osberg and Sharpe (2010) for example strictly restrain insecurity to the future, contrasting it with poverty, which, they assert, primarily deals with current levels of consumption or wealth. On the other hand, Hacker (2014) describes economic insecurity as the degree of economic loss or the uncertainty attached to it; likewise, Gosselin & Zimmerman (2008) defines it as the

discrepancy between expected and realized economic well-being. Here, focus is on the link between present and future.

Another issue inherent in the discussion is whether the idea of insecurity is about the perceived or the objective state of being at risk. Perceptions are important because people make decisions not only by one's present and past but expectations on his or her future status. This makes perceptions of insecurity another important subject matter. As mentioned above, Osberg and Sharpe (2010) focuses on the perception: anticipation and anxieties. Other definitions like those of Hacker (2014) and Gosselin & Zimmerman (2008) are future-oriented, but theoretically are about the actual likelihood of the risk. Ideas behind the concepts of economic insecurity vary, but they are not unrelated. Experiences affect perceptions, and perceptions have shown to be good predictors of future experiences (Ivlevs, 2014). Friedman et al. (2014) finds that subjective economic insecurity is shaped by current exposure to adverse events, which in turn leads to greater anxiety and concerns about the future.

Overall, economic insecurity remains an obscure concept, one that is difficult to define, and even more difficult to measure. Naturally, a whole strand of literature is concerned with measuring economic insecurity. A common thread underlying these definitions is that they revolve around time; while the time variant essentially distinguishes aforementioned multitude of definitions, it is fundamentally the common denominator, incorporated into studies in one fashion or another.

2) Determinants and Consequences

The basic motivation for studying economic insecurity is that it is likely to have adverse effects on one's welfare, be it financial, physical, or psychological. Hacker (2012) outlines the theoretical basis underlying the relationship between economic insecurity and individual welfare, much of which is rooted in features of human cognition and information-processing system. For one, people fear and are sensitive to economic losses, as explained by Kahneman and Tversky (1979)'s illuminating theory on "loss aversion" – the tendency for individuals to be more sensitive to losses than gains. Secondly, individuals make poor decisions when they face economic contingencies which dis-incentivizes savings and investments. The final factor is the incomplete character of private insurance markets, and asymmetry in individuals' ability to insure against economic contingencies depending on their personal wealth and resources (Hacker, 2012).

This discussion essentially points to two main driving forces in shaping the level and effect of economic insecurity: market and institutions. On the side of the market, globalization heightens economic vulnerabilities and job insecurity; institutional changes like deregulation raises the risk of being laid off and reduces the risk of securing a stable job (Rodrik, 1998). Institutions then, both formal and informal, may either expedite or

inhibit the effects of economic insecurity driven by the market. Bartels and Bonke (2013) lay out two coping strategies: private and public insurance. The household – a private institution – contributes by smoothing income variation and stabilizing consumption. The ongoing demographic trends of downsizing households, however, put this insurance at stake. They argue that welfare state plays a pivotal role as an insurer and may improve welfare through progressive taxation and compulsory social security system.

3. Operationalizing Economic Insecurity

Measuring economic insecurity essentially derives its form from the chosen definition. Like the above definitions, there are two main branches on the measurement of economic insecurity: perception and observed changes in economic situations. First, perceptions can be measured either as a proxy for actual insecurities one is facing, or as the object of interest. Perceptions are important due to their welfare consequences. They also affect future behavior, which in turn may improve or aggravate one's situation. Its usage as a proxy for actual income (or other resources) changes is less useful. It is difficult to predict one's future status when income swings occur frequently and wildly, especially if one is not secured against potential loss of income.

Observed income changes can be argued to better reflect both risks coming from the market and one's own ability to secure against those risks. Since the purpose of this paper is not in examining the relationship between insecurity and welfare, but in documenting the changes of economic insecurity over a fairly long period of time, I focus on measures for tracking observed or objective changes in economic insecurity.

Hacker (2012, 2014) describes three main approaches that are used to measure observed economic insecurity. I review these three approaches and attempt to outline the variety of measures used within each category. The first approach uses index of multiple measures, thereby embracing various dimensions related to economic insecurity. Osberg and Sharpe (2005), for example, adopt four components to construct an aggregate measure of economic insecurity: risks associated with unemployment, medical illnesses, divorce and separation, and insecurity in old age. This measure is notable in that it takes into account the major life events that have predominant effect on one's economic stability. Issues can be raised, however at both the components and the way in which they are aggregated in constructing the measure.

Hacker (2014) raises concerns about the weights applied in constructing the index, especially as they are unable to consider how the included components interact with each other. More importantly, life events such as those primarily reflect temporary shifts in income rather than the realized changes in income that one goes through in a life span.

He instead suggests a more direct index measure that poses less restrictions and assumptions. The Economic Security Index measures the proportion of people at risk, identified as those experiencing more than 25% of income loss and expenditure, including from medical expenditures and debt, while also lacking sufficient financial wealth to buffer the loss. They leave out those who are transitioning into retirement.

However, an index consisting of multiple components can always be challenged for its choice of each component as well as the ways in which they are aggregated. The measure itself is a product of subjective judgment of the researcher and is severely restricted to the very environment it was designed to measure. Hence, it would be difficult to apply this measure for making comparisons of economic insecurity across space and time.

The second approach focuses on the resource or assets individuals hold. This includes documenting the paucity of variety of assets like emergency funds (Caner & Wolff, 2004), and looking at this among certain groups of the population (Caner and Wolff, 2004; Oliver and Shaprio, 1995), or even the ability to come up with 2000 dollars in a month (Lusardi et al., 2011). This approach has been criticized for a number of reasons. Individual heterogeneity as well as unobserved characteristics of the environment affect preference for risk and the amount of wealth they wish to hold (Deaton, 1992; Browning & Lusardi, 1996). It is also possible that people have already depleted their savings and assets as a consequence of already

having experienced shocks (Lusardi et al., 2011). And while these are still important sources in securing individuals from economic risk, these are not income risk, per se, but the extent to which individuals are protected from possibility of risks.

The third approach, which has been by far most advanced methodologically and one I choose to adopt in this paper, focuses on changes in income. It is worth noting that changes in income encompasses a variety of components. Discussion dates back to Shorrocks' study (1978) on income inequality and income mobility, which called to attention the dynamic measures of income changes. The argument is that true economic situation depends on how relative positions of individuals change over time. This paper painstakingly explains the relationship between inequality, mobility and time used to construct these measures and documents their changes. Basic idea is that using longer interval of time between income results in lower inequality, where the extent to which it changes is driven by the level of mobility, the changes in relative positions among individuals.

Gottschalk (1997) expounds on these concepts, noting of its confused use in the literature and media. Changes in absolute incomes are affected by the amount of economic growth, changes in inequality and changes in mobility: these factors each describe an aspect of the distribution of income over time. Economic growth between two periods reflect differences in the means of their marginal distributions of income;

changes in inequality reflects changes in the variance of the marginal distributions and changes in mobility reflect changes in the covariance of income across the periods. Since low earnings in one period does not necessarily lead to low earnings in the next, permanent inequality is jointly determined by inequality in each observed period and mobility across periods.

Similarly, in a series of papers, Gottschalk, Moffitt and colleagues (Dooley & Gottschalk, 1984; Gottschalk, Moffitt, Katz, & Dickens, 1994; Gottschalk & Moffitt, 1999, 2009; Gottschalk, 1997; Moffitt & Gottschalk, 2002) put forth the issue of income (or earnings) instability, caused by volatility of earnings in the labor market. By decomposing inequality into variance of permanent income changes and that of the transitory, they emphasized the two components may have vastly different welfare consequences. Transitory changes in income may be relatively easy to smooth over and may enhance income mobility, thereby increasing the level of social welfare in society. The effect of permanent changes in inequality is more complex, as wider income distribution may imply higher mobility in the long term; on the other hand, it brings about a greater gap among individuals, thereby reducing individuals' chance of changing relative position (Gottschalk & Moffitt, 2009). Methodologically, however, their use of parametric models of earnings dynamics to decompose cross-sectional earnings into permanent and

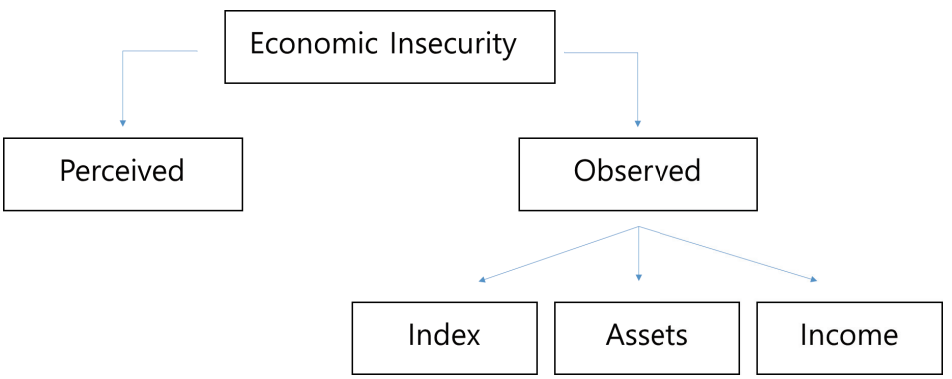
transitory components were criticized as being sensitive to arbitrary variations in model specification.

Current research on income risk has tended to focus on directly measuring observed income and expenditure volatility. Scholars like Dynarski and Gruber (1997), Shin and Solon (2011) and Dynan et al (2012) measured volatility, for example by using changes in variance or standard deviation of income over time as to avoid making assumptions about income changes. Dynamics of income mobility, income inequality and income volatility together reflect experience of income changes of individuals. These, when jointly considered, reflect observed insecurities of individuals. Hence, income volatility in itself is an incomplete picture of changes in income that individuals go through.

Nichols (2008) developed a measure of income risk using the general entropy measure GE2, by additively decomposing it into income inequality, income mobility, and income volatility. By applying it to 30 countries, Nichols and Rehm (2014) found the three components to be widely consistent with other measures of the kind. This measure earns its appeal from a comprehensive inclusion of components of risk, while making making minimal of assumptions about the changes in income – an issue often raised in decomposition methods. These measures of income volatility are often criticized for failing to reflect true level of economic insecurity: voluntary changes in income, such as job dislocation, are often not considered. They also overlook the importance of wealth and assets in

the actual level of insecurities individuals face as a result of changes in the labor market. However, no measure is able to fully capture the complexities of the phenomenon.

Figure 1. Operationalizing Economic Insecurity



III. Research Questions and Hypotheses

Based on my review of previous literatures, I formulate my research hypotheses regarding income insecurity of the elderly in Korea. Rise in poverty and inequality since the late 1990s, as suggested by Ku (2005) and Lee (2013), implies that the income insecurity of the elderly has risen. However, for rigorous assessment we need to document the longitudinal changes in income from a comprehensive perspective. Observed longitudinal changes can be described by changing inequality and volatility of incomes over a specified period.

RQ1. How has economic risk evolved among Korean elderly?

Most studies have alluded to a rising trend of income insecurity of elderly Koreans. Hence, I postulate that both income inequality and volatility have risen amongst the elderly.

Hypothesis 1. Income insecurity of the elderly has increased

i) **Hypothesis 1.1** Income inequality of the elderly has increased

ii) **Hypothesis 1.2** Income volatility of the elderly has increased

Next, current research and trends suggest that the eroding role of the family has rendered deplete the traditional form of insurance in Korea. As

a corollary, public pensions function as most critical source of income as well as insurance for protection against risks.

RQ2. How has the role of public pensions evolved in reducing income insecurity of the elderly?

The role of public pensions has been controversial, some arguing that it may work to widen the income gap among the elderly (Lee, 2013). While most empirical studies have found public pensions to reduce inequality, there is room for closer examination. There are also evidence suggesting positive effects of public pensions in reducing income volatility. Due to a relative short history of studies on income volatility in Korea, this also has not been extensively reviewed. Combining studies up to date, it is reasonable to say that public pensions have been reducing income insecurity for elderly Koreans. Hence, I postulate that public pension has had the effect of reducing both inequality and volatility of elderly Koreans.

Hypothesis 2. Public pensions reduce income insecurity of the elderly

i) **Hypothesis 2.1** Public pensions reduce income inequality of the elderly

ii) **Hypothesis 2.2** Public pensions reduce income volatility of the elderly

IV. Research Design

1. Description of Data & Scope of Analysis

In order to document changes in income inequality and volatility as described above, I employ Korean Labor & Income Panel Study (hereafter KLIPS), a longitudinal survey data consisting of labor market and income activities of households and individuals in Korea. Beginning in 1998, individuals and household have been surveyed every year. KLIPS is now the longest running panel data on labor-related topics in Korea, spanning 17 years from 1998 to 2014, with its income data corresponding to years 1997 to 2013. I incorporate all but the first wave in my analysis in order to examine the long run changes in income inequality and volatility. The first wave is left out due to inconsistencies in the way income was surveyed.

KLIPS provides detailed information on various sources of income of households, including wage, non-wage income, capital income, property income, private and public transfer, and pension. Individual level data only provide total earnings, transfer incomes and social securities. Hence, I conduct most of my analyses based on the household unit. I adjust for inflation by applying the 2010 CPI index to all years, and use equivalized income when conducting analyses on the household unit.

To focus on the elderly, I study trends of income distributional changes of cohorts born between 1929 and 1954. The cohorts are grouped by 5 birth years: 1929-1933, 1934-1938, 1939-1943, 1944-1948, 1949-1953, 1954-1958. The youngest group, born between 1954 and 1958, reach into their late 50s by 2013, the final year under analysis. The oldest group, born between 1929-1933 are at the age of 65-69 during the first year analyzed and reach the age of 80-84 by the final year. Those born before 1929 are left out due to negligible sample size. Observations of cohort groups in each wave are described in **Table 1**.

Table 1. Observations by cohort group, waves 2-17

Wave	1929-33	1934-38	1939-43	1944-48	1949-53	1954-58
2	664	511	467	400	316	237
3	627	465	429	379	291	237
4	591	464	408	370	284	222
5	586	453	402	370	286	226
6	599	465	399	378	290	222
7	603	464	416	387	297	216
8	600	458	415	390	302	219
9	604	468	421	394	304	227
10	596	468	413	394	306	220
11	573	451	412	396	303	213

12	568	451	413	392	296	215
13	577	447	417	382	292	207
14	556	438	407	382	294	201
15	562	442	416	382	284	201
16	559	439	416	386	281	189
17	564	433	409	383	279	191

Table 1 reveals that there is attrition of observations within each cohort group, a major limitation of using long-running longitudinal datasets. Some studies have gone about by constructing a balanced panel, in which only the households that have answered every year are kept in the sample for analysis. However, the same decision applied to my dataset would leave less than 50% of the original sample, which would pose greater threats on its representativeness of the elderly population. Nichols (2014) constructs his own weights to consider attrition possibilities. However, this brings additional assumptions into the data that are not very clear cut. Hence, I restrict to using balanced data for each three consecutive years I analyze, and apply cross-section household weights to overcome compositional fallacies arising from loss of data.

2. Main Variables of Interest

1) Dependent Variable: Income Insecurity

For simplicity, I focus on economic risk pertaining to changes in income only. I utilize a decomposition method developed by Nichols (2008) to simultaneously consider changing levels of income inequality and income volatility.

Nichols (2008) developed a measure of income risk using the general entropy measure GE_2 as the overall risk, and decomposing the measure into income inequality, income mobility, and income volatility while making minimal of assumptions about the changes in income. The three components add up to GE_2; hence, we can understand the nature of risk, or insecurity as defined in this paper. For example, a rise of GE_2 could be driven by increase in any of the three components, or their mixtures.

GE_2 is equal to the squared coefficient of variation, a measure that can be easily decomposed into subgroups and sources, demonstrated by Shorrocks (1984). Income risk for L people at T points in time can be measured by GE2 across people and time.

$$\boldsymbol{R} = \mathrm{GE}_2 = \frac{1}{2\overline{y^2}}\left[L^{-1}\sum_{i=1}^{L}T^{-1}\sum_{t=1}^{T}(\overline{y_i})^2 - \overline{y^2}\right]$$

$$+\frac{1}{2\overline{y^2}}\left[L^{-1}\sum_{i=1}^{L}T^{-1}\sum_{t=1}^{T}(\overline{y})^2 - \overline{y_i^2}\right]$$

$$= \boldsymbol{B} + \boldsymbol{W}$$

R represents the level of overall risk across people and time, and is measured by GE_2 which can be additively decomposed into the between inequality (**B**), expressed in the first term of the above equation, and within inequality (**W**), the second term in the equation. **B** represents between variation across individuals using their incomes averaged over the time period, T. **W** is the within variation of individual income at each point in time around his or her mean income over the time period.

$$\boldsymbol{R} = \left(\boldsymbol{B} - \frac{\boldsymbol{W}}{T-1}\right) + \left(\frac{T}{T-1}\right)\boldsymbol{W} = \boldsymbol{I} + \boldsymbol{D}$$

B and **W** are adjusted for the sampling variation in the individual-specific sample means, a component related to individuals' volatility in incomes, measured by individual-specific standard deviation over time. New measures, inequality (**I**) and deviation (**D**) are computed. **I** represents long-term inequality of individual mean incomes over T-years, excluding the movements of income across the time period. **D** represents variation of deviations over time around the individual-specific means, and can be further decomposed to volatility(**V**) and mobility(**M**). **V** is measured by calculating the mean over individuals using individual-specific sum of squared residuals, and thus captures the level of fluctuations around mean income that individuals as a group experience, and **M** reflects how income grow or fall over time, using the expected squared trend in income over T years. **M** is closer conceptually to relative mobility, as absolute mobility becomes negligible as it is divided by mean income squared. For the

purpose of this paper, I use inequality and deviation, neglecting the distinction between mobility and volatility as they both reflect movements of income within a household over a specified time frame. Since deviation is essentially the variation of volatility over time, I simply refer to it as volatility hereafter.

2) Covariates: Public Pension and Other Subsidiary Income Sources

The main goal of this paper is to assess the distributional impact of public pension, and from it devise policy proposal. Public pensions include the national pension, occupational pension schemes, unemployment pension, health insurance, and occupational health and safety insurance. The National Pensions Act was adopted in 1988, but began to rapidly expand since 1999 when it began to include workers in urban areas[3]. The pension age is currently 60, although one is able to receive a reduced early pension from the age of 55. The normal pension age is being increased to 65 and early pension age to 60 by 2033, which implies a cut in social security for the younger old. Entitlements are received by those with at least ten years of contributions; hence they are

[3] Few of the pension schemes were adopted prior to the Act. The first form of public pensions to be employed was public officials pensions in 1960, followed by military pension in 1963, and teachers pension in 1975; these form the occupational pensions.

largely dependent on one's prior earnings. Earnings-related targeted replacement rate is 47% for those who made over 40 years of contributions (as of 2014) and is being gradually reduced until it reaches 40% by 2028[4] (OECD, 2015).

In assessing the effect of public pensions, however, I do a comparison with other forms of subsidiary income sources including private transfer and public transfer. Private transfer consists of income provided by family members outside of the household. Public transfer differs from public pension in that it is a form of means-tested assistance, rather than provision of entitlements based on individuals' contributions. Eligibility is given to those whose household earning is less than the minimum cost of living and has no person under obligation to support. Public transfer consists of seven forms of Basic Livelihood benefits: housing benefits, self-sufficiency benefits, education benefits, childbirth benefits, funeral benefits, and medical benefits.

[4] This was part of a reform that amended the National Pension Act in 1998.

Figure 2. Subsidiary Income Source (percentage of total income)

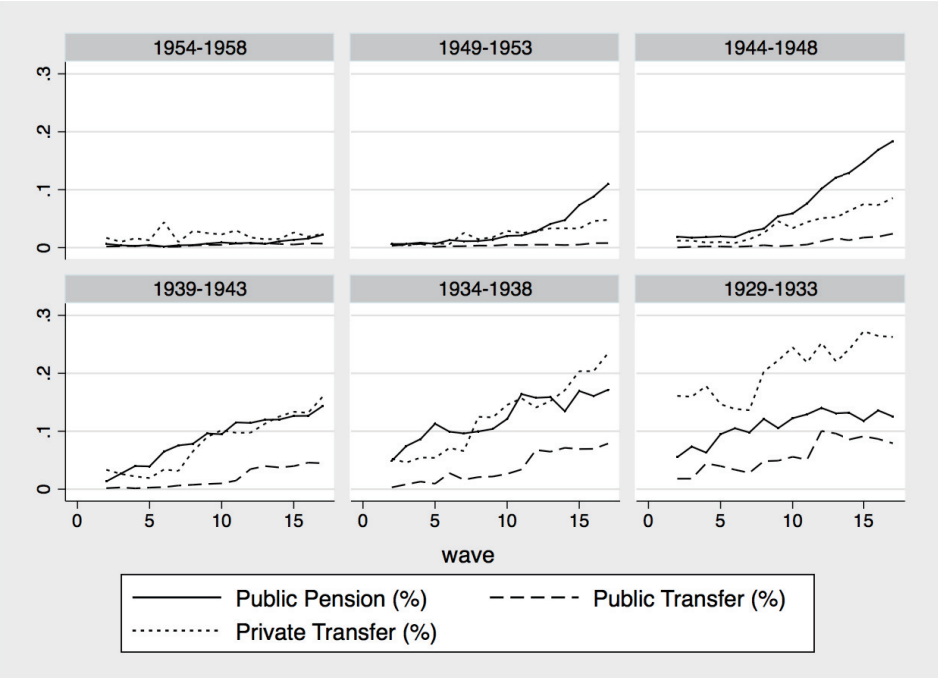


Figure 2 describes the evolution of Korea's public pension, along with changes in other subsidiary incomes, as percentage of total income. There is a steep rise of public pension, as a percentage of total income for each cohort group, especially for those born between 1939 and 1953. This contrasts the income profile of two oldest cohort groups, for which private transfer constitutes a greater part of total income and has continuously increased during the last 16 years. Public transfer takes up the least percentage of income for all cohorts, but also displays an increasing trend.

From this I speculate that the role of private transfer has been, and still remains, the prominent source of income for the old elderly, while public pension is becoming the dominant form of security for the emerging elderly. Further investigation is needed to assert if there, indeed, is a shift

of responsibility from individual households to society taking place, and to understand the way in which each income source is affecting the elderly population.

3. Methodology

Results of my analyses are presented in the following way. To address my first question: whether the level of income insecurity has increased for the elderly, I first track the level of income insecurity for each cohort groups over the last 16 years. I examine this case further to see if the emerging elderly (those who have just reached retirement age) face a higher level of income insecurity than the older old. For this question, I limit my analysis to gross income of individual households.

As for my second question: whether public pensions are reducing income insecurity of elderly Koreans, I decompose gross income into primary income, private transfer, public transfer, and public pensions. By doing so, I am able to compare effects of each subsidiary incomes in reducing income insecurity.

In approaching these questions, I first estimate overall income insecurity, defined here as GE2, following Nichols (2014), and additionally track changes of trends in pure inequality (I) and volatility (V). Inequality can be understood as long run income gaps of households, estimated by using individual household incomes averaged over a

specified period, and volatility as the movement around average household income during the course of a specified period. I provide the trends of inequality and volatility by estimating them for each consecutive three years: 1998-2000, 1999-2001, … , 2010-2012, 2011-2013; this is to smooth the trends and provide a stable account of the changes.

It is important to understand, however, that these changes over time occur simultaneously as cohorts age. Furthermore, in order to compare income insecurity of today's emerging elderly to that of the older cohorts, it is necessary to simultaneously consider cohort effect, period effect and age effect. I use the standard cohort table to address this issue. A standard cohort table was produced to provide a description of the effects of age, period and cohort by creating 5-year age groups and corresponding 5-year birth cohorts. Age group formed the rows of the table and time period formed the columns, providing 5-year birth cohorts in each diagonal line running downwards from left to right across the table (Glenn, 2005).

V. Results

1. Overall Income Insecurity, 1998-2013.

For an overall account of changes in aggregate inequality over the period of 1998 to 2013, yearly income inequality levels are estimated using different income indices; these reflect yearly inequality of gross income for all households (not just the elderly) in my data. The indices include half the squared coefficient of variation (GE2), Theil coefficient (GE_1), Mean logarithmic deviation (GE_0), and the Gini coefficient[5]; each index puts emphasis on different parts of the income distribution and uses different scales.

[5] These indices vary in the way they take into account the distribution of income in estimating inequality; half the squared coefficient of variation (GE2), Theil coefficient (GE_1), Mean logarithmic deviation (GE_0) are all members of the General Entropy (GE) family GEα. α reflects the part of the income distribution to which the index is more sensitive to; the more negative the α, the more sensitive it to income differences at the bottom of the income distribution rather than at the top (Jenkins, 1995). Gini coefficient is more sensitive to the median of the distribution.

Figure 3. Aggregate Inequality, 1998-2013

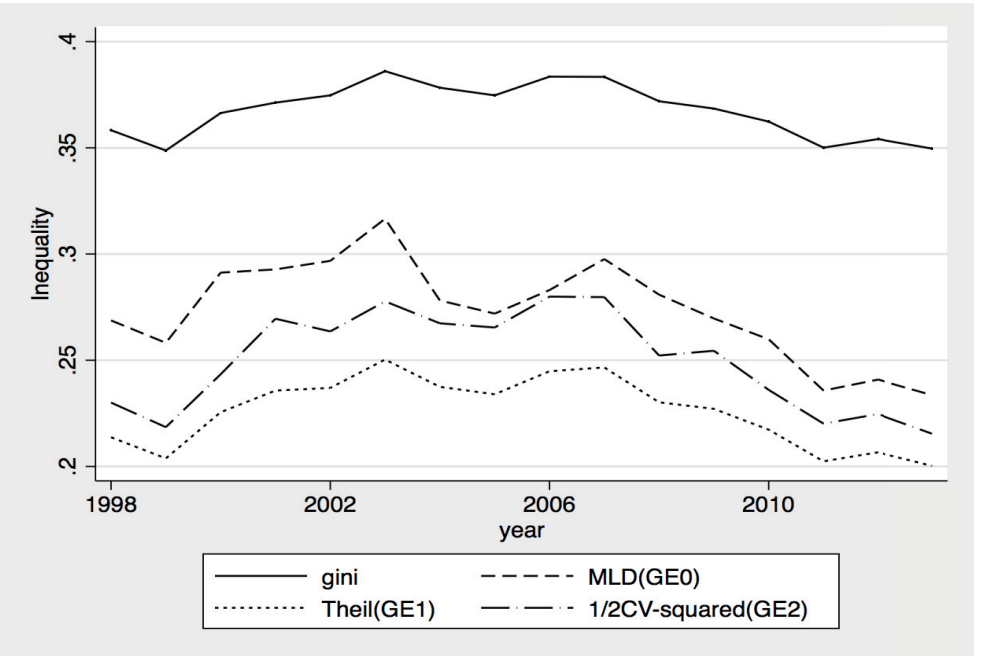


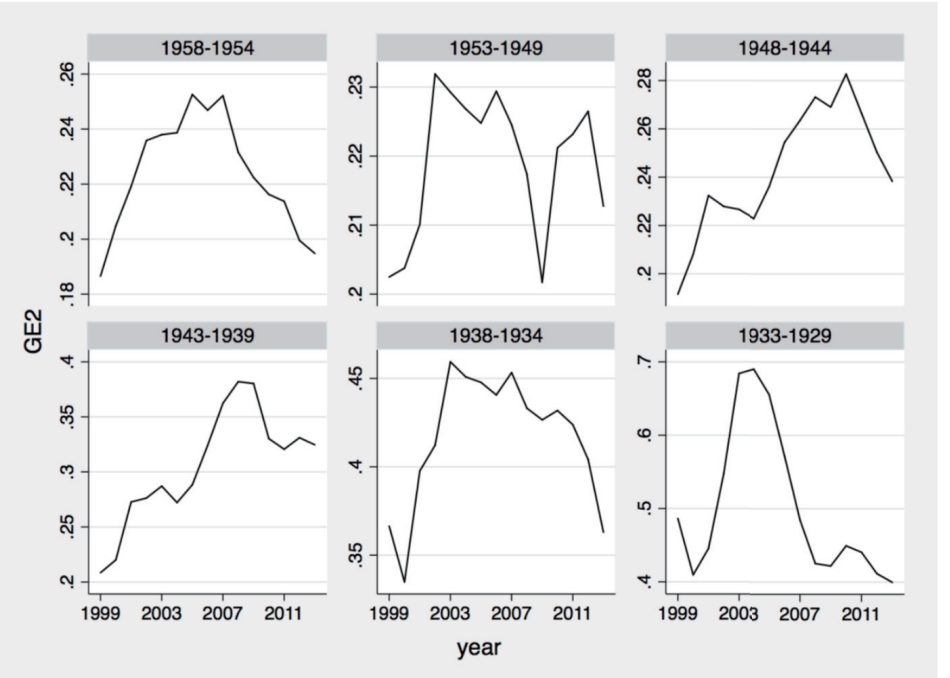
Figure 3 suggests that estimates using these indices, although varying in the level of inequality, follow a similar pattern across the periods. There are three main sub-periods; rise in inequality from late 1990s to early 2000s; fairly stable period during the mid-2000s (with the exception of a dip in 2005, captured by all the indices more or less); decline in the level of inequality during the latter years, beginning around 2007. The Gini index portrays a relatively stable income distribution throughout the whole period, but corroborates the overall pattern. What this figure tells us is that first, these estimates are reliable in examining trends: depending on the index chosen, the level may differ but the overall trends are similar. Hence, it would be fair to make assessments of whether or not aggregate inequality has increased from one period to the next. Another important

characteristic of changes in the level of inequality, although not explicit through the graph alone, is that it reflects both income gaps among households and income changes that individual households go through. As previously stated, permanent inequality is jointly determined by inequality in each observed period and mobility across periods. That is why scholars have attempted to distinguish between pure inequality and income volatility. GE_2 is the natural index used for decomposition purposes (Nichols, 2014). In other words, it is easily divided into pure inequality and volatility, Hence, as stated in the previous section, the remainder of this section uses half the squared coefficient of variation (GE_2) as the overall inequality measure, which I define here as overall income insecurity.

Figure 4 tracks GE_2, estimated using a 3-year window, from 1998 through 2013 (1998-2000, 1999-2001, ... , 2010-2012, 2011-2013), separately for each cohort group, separated by 5 birth years (1929-1933, 1934-1938, … , 1949-1953, 1954-1958). Two features are worthy of mention. Immediately noticeable is the differences in level of GE_2 among cohort groups; earlier born cohorts experience higher GE_2 than their successive cohorts throughout the 16 years under analysis. GE_2 of younger cohorts rises and falls within the range of around 0.15 and 0.25, while that of older cohorts shows a significantly higher level, ranging between 0.2 and as high as 0.7. This tells us that income insecurity is higher for during old age.

Second, the figure suggests an inverse U-turn of GE2 over the analysis period, first rising and then retreating to around or slightly higher than its initial levels, although the timing and extent differ across cohorts. GE_2 of cohorts born between 1954 and 1958, for example, was approximately 0.20 in its initial year, rising to about 0.25 by mid-2000s, and dipping back to around 0.20 by the end of the analysis period. GE_2 of cohorts born between 1949 and 1953 begins at around 0.20, undergoes a moderate increase to slightly below 0.23 and then scales back to 0.21. Similar trend is experienced by the next two cohorts (1944-1948, 1939-1943), but the numbers do not drop back to their lowest levels seen in their first few years. For example, GE_2 of cohorts born between 1944-1948 is initially 0.21, hits as high as 0.28, and then drops only to about 0.24. Similar trend is found for the 1939-1943 cohorts, who begin with a GE2 of 0.21 and finish off at around 0.32, which is nearly 0.10 points higher than its initial level. They are the only cohort groups to witness a trend of rising income insecurity GE_2 that is followed by a very moderate decline during the last few years. Overall, income insecurity in recent years appears as being slightly higher than levels seen during the late 1990s and early 2000s, despite the rollback in recent years.

Figure 4. GE2 by Cohort Group



I further my analysis by constructing a standard cohort table to understand the changes described above in relation to age, period and cohort. Separating age effect from cohort and period effects will better address my research question: whether income insecurity has risen for elderly Koreans. **Table 2** displays changes of GE_2 for these cohort groups over selected periods, with their corresponding ages. Four periods are displayed, each period representing GE_2 estimated using a 3-year window

(again, 1998-2000, 2002-2004, 2007-2009, 2011-2013), and with approximately 5-year-interval in between[6].

Interpreting the table requires three-fold comparisons: vertical, horizontal and diagonal. First, vertical comparison running down the columns reflects changes arising from aging and progression of time, noted as age and period effects, respectively. For example, cohorts born in 1954-1958 are between the age of 40 and 44 during the first period of analysis (1998); 45-49 in the second period (2003); 50-54 in the third period (2008); and 55-59 (2013) in the last period. Hence, their experience with changes in aggregate inequality may arise from aging or from the passing of time.

Second, diagonal examination enables comparison among different age groups of different cohorts at a given time frame; hence, there coexist age and cohort effects. For example, first diagonal line running from top left to bottom right of **Table 2** presents GE2 of cohorts 1954-1958 who were between the ages 40 and 44, cohorts 1949-1953 between 45-49, cohorts 1944-1948 between the age of 50-54, and cohorts 1939-1943 around the age of 60-64, that appear in period 1 (1998).

Lastly, rows represent differences in level of inequality across time and cohort groups, allowing for an examination of cohorts' GE2

[6] Although distance between each period does not always match 5 years, I assume that it is for simplicity. Thus, I notate the first period as year 1998, second period as 2003, third as 2008 and last period as 2013.

experienced while they fall into a certain age group. For example, the 7th row provides GE2 levels during ages 70-74 of cohorts born in 1929-1933 at period 2, 1934-1938 at period 3, 1943-1939 at period 4. The differences in the level of GE2 may be understood as either period effect or cohort effect.

Table 2. Standard Cohort Table of GE2

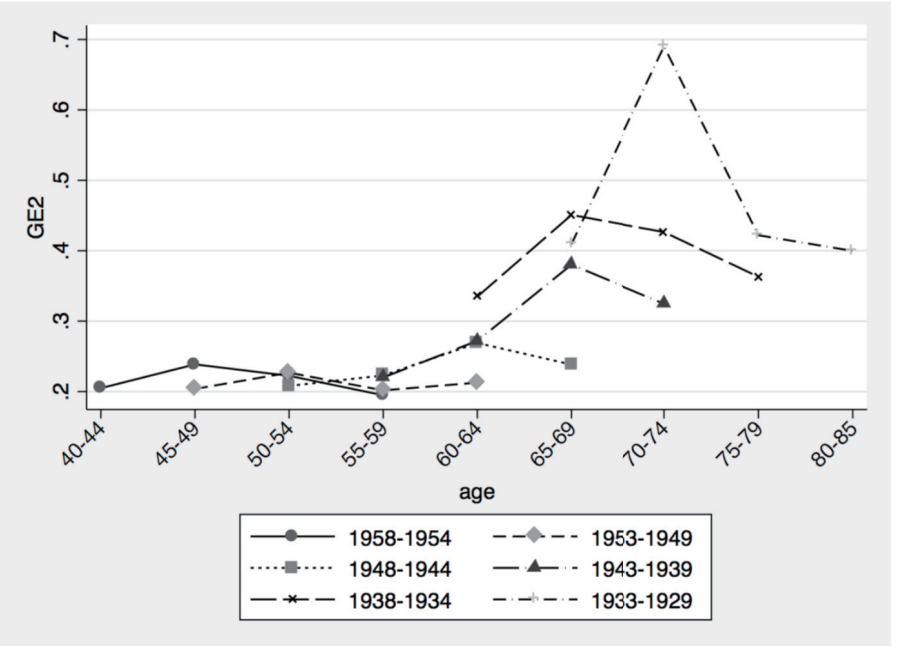
Age	1958-1954	1953-1949	1948-1944	1943-1939	1938-1934	1933-1929
40-44	0.20					
45-49	0.24	0.20				
50-54	0.22	0.23	0.21			
55-59	0.19	0.20	0.22	0.22		
60-64		0.21	0.27	0.27	0.33	
65-69			0.24	0.38	0.45	0.41
70-74				0.32	0.43	0.69
75-79					0.36	0.42
80-84						0.40

I present my results in order of i) vertical (columns), ii) diagonal, iii) horizontal (rows) assessments of the table, and from it derive a comprehensive account of changes in overall income insecurity.

i) Two marked elements appear from a vertical assessment of **Table 3**. First, all cohorts experience a rise in GE_2 between period 1 and period 2. This may be attributed to either age or period effect. In contrast, what follows is a decline of GE_2 in later periods. However, the inflection point varies by group, suggesting that this may be influenced by age at which the change occurs. Specifically, GE_2 spikes up at around age 60 through 69 and falls down afterwards, hinting at higher level of instability around this age. This is seen across cohorts that reach at that age within the time frame under analysis.

ii) Second, from a diagonal examination of GE_2 across different age groups and cohort groups at a given period, GE_2 is higher for earlier born, older cohorts. This can be also interpreted as differences among cohorts or age. It appears that earlier born cohorts generally face higher GE_2; those born in between 1929-1938 stand out from other cohorts, recording a much higher level of GE_2 at all periods. However, there's a noticeable spurt between ages 55-59 and 60-64 and from 60-64 to 65-69, suggesting age effect is also taking place around that age: this is demonstrated in the figure below:

Figure 5. Standard Cohort Table of GE2



iii) Finally, horizontal examination allows for a comparison among same age groups of different cohorts (cohort effect) at different time periods (period effect). **Table 3** indicates that later born cohorts experience lower GE_2 during their elderly years, compared to those born earlier; at age 70-74, GE_2 for cohorts born between 1929 and 1933 was 0.69, while that of those born later, between 1934-1938, was 0.43, and was even lower for those born between 1939 and 1943, GE_2 being 0.32. This trend is similarly found throughout ages 55-74. While this may arise from changes over time, an opposite trend is found for levels during ages 40-54. Although not as significant in degree, younger cohorts face higher GE2 than

their predecessors during ages 45-49 and 50-54. This is also better illustrated in **Figure 5**, when comparing GE2 levels across cohorts of the same age.

The findings can be summarized as follows. First, older cohorts experience higher level of overall income insecurity (GE_2) throughout the analysis period. GE_2 follows an inverse "U" shape, first rising then falling, but mostly ends on a higher note suggesting that income insecurity for the elderly/near-elderly groups is generally higher than it was in the past. However, a closer examination reveals that income insecurity also increases with age, especially at ages 60 through 69, regardless of when it occurs and when one was born. Most importantly, GE_2 before the age of 60 is higher for younger cohorts, while GE_2 drops afterwards for those recently entering old age, signifying a more stable livelihood of the emerging elderly. Hence, it is fair to say that while income insecurity generally rises with age, today's emerging elderly is now facing somewhat lower levels of insecurity during old age.

2. Nature of Income Insecurity: Inequality and Volatility

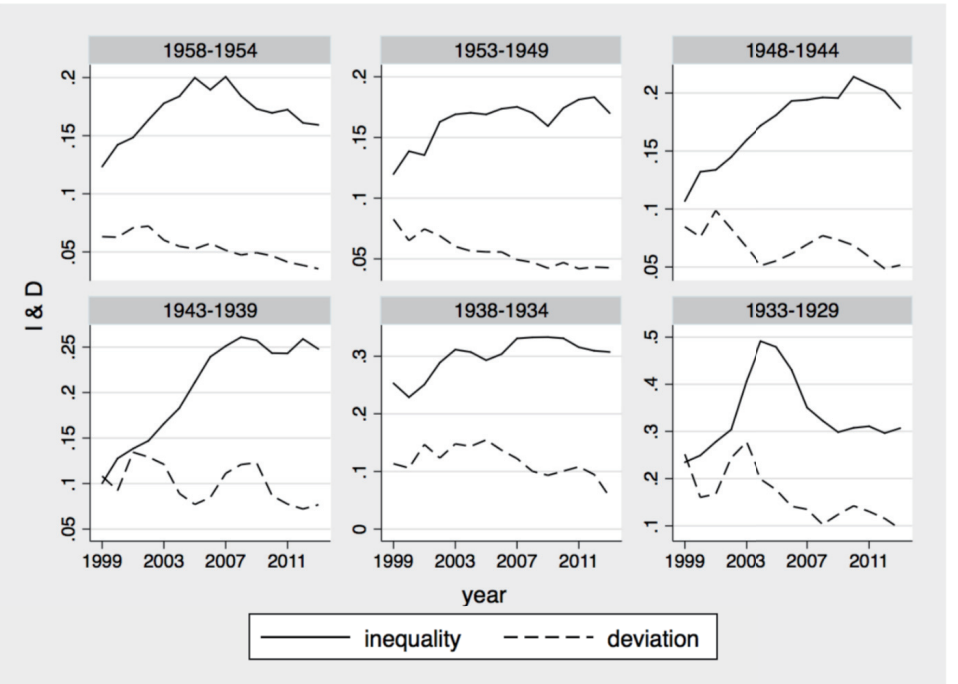
Next, we turn to the sources of income insecurity, first by examining trends of (pure) inequality and volatility for each cohort group. **Figure 6**

displays the level of inequality and volatility, measured by gross income for each cohort group. As aforementioned, the two components add up to GE_2. Thus, this decomposition shows whether the level of and changes in income insecurity levels attribute to those of inequality or volatility. Three features are of significance here. One is that inequality is significantly higher than volatility. This suggests that the level of overall income insecurity (GE_2) mainly attributes to the level of inequality component of income insecurity, while volatility component takes a smaller portion. Even more striking is the diverging trend of the two components: inequality has increased over time for most cohorts, while volatility declined over the same period, although with fluctuations throughout. Also, both components are higher for older, earlier born cohorts.

Inequality follows a similar pattern as that of GE_2, an inverse "U" curve, although the level does not appear to decline as much during the latter years. Although the youngest and oldest cohorts clearly take that inverse U-turn, other cohorts almost consistently experienced a rise in inequality. Cohorts born between 1939 and 1948, those who have recently entered their elderly years, most distinctly experience their incomes widen over the years. In contrast, volatility almost continuously declines over time. It is fair to say that inequality, income differences among households, has immensely contributed to a rise in income insecurity. On the other hand, volatility, the income changes that occur within individual

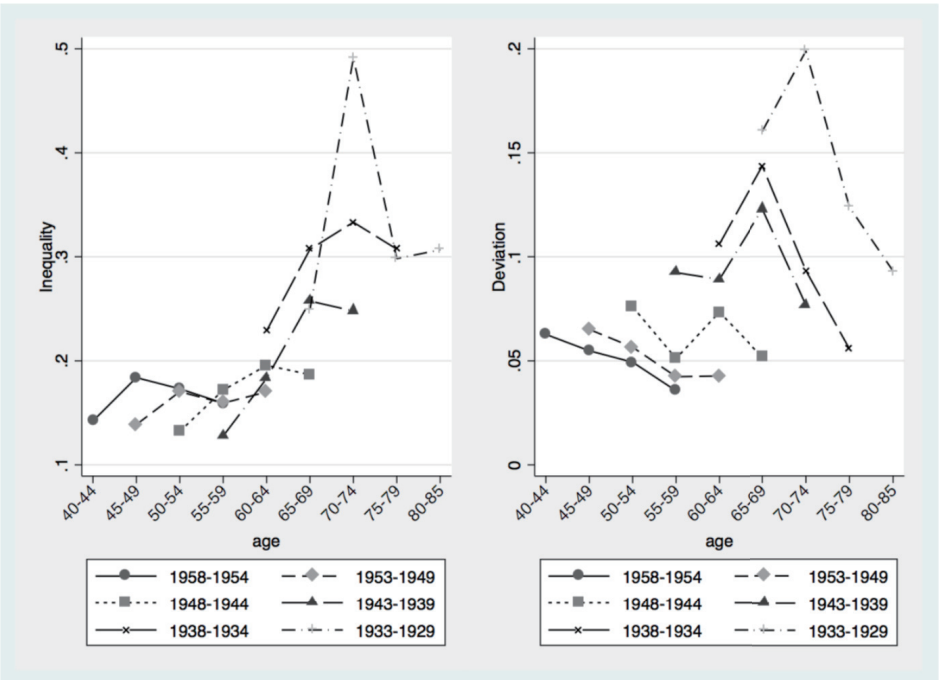
households, has reduced (or prevented an increase of) income insecurity, although its impact is relatively minor in magnitude to that of inequality.

Figure 6. Inequality and Volatility



Again, the standard cohort table provides for a more detailed account of these changes. Depicted in **Figure 7** is the trend of inequality (left) and volatility (right) over age and period, as represented in the cohort table.

Figure 7. Standard Cohort Table: Inequality and Volatility



First, I look at the trend of inequality, follow up with an assessment of changes in volatility, and then sum up the results. I again describe the standard cohort table in the order of i) vertical lines, ii) diagonal lines, then iii) horizontal lines. First a look at inequality trends:

Table 3. Standard Cohort Table: Inequality

Age	Cohorts					
	1958-1954	**1953-1949**	**1948-1944**	**1943-1939**	**1938-1934**	**1933-1929**
40-44	0.14					
45-49	0.18	0.14				

50-54	0.17	0.17	0.13			
55-59	0.16	0.16	0.17	0.13		
60-64		0.17	0.20	0.18	0.23	
65-69			0.19	0.26	0.31	0.25
70-74				0.25	0.33	0.49
75-79					0.31	0.30
80-84						0.31

i) First, columns in **Table 3** represent changes in pure inequality that occur over time (period effect) and as cohorts age (age effect). As seen with changes in the level of overall income insecurity, within-cohort changes of inequality follow a similar inverse "U" curve, indicating a common period trend across groups. Overall, inequality increased over time; it begins to hike at around age 60 through 70, again following a similar pattern as GE_2.

ii) Looking diagonally across the table, I compare levels of inequality across cohorts (cohort effect) of different ages (age effect) within the same time frame. This shows a very consistent rise of inequality, meaning earlier born cohorts who are also older in age face higher inequality throughout the four periods. There is a noticeable hike when one reaches their mid 60s.

iii) A feature spotted by looking across the rows is the divergent pattern between younger and older ages. Up to the age of 59, inequality level rises as we move closer to younger cohorts, meaning that younger cohorts experience higher inequality at corresponding ages than their older cohorts had experienced. For example, while cohorts born in years 1948-1944 experienced inequality of around 0.13 during ages 55-59, younger cohorts born in 1958-1954 experience a higher level of inequality at that age, reaching over 0.17 during their late 50s. In contrast, the relatively younger cohorts are experiencing smaller income gaps than older cohorts after the age of 60. From this divergence in pattern across age groups, it is possible to rule out the period effect. Later born, younger cohorts experience lower inequality during old age than earlier born cohorts while they experience higher inequality before reaching the age of 60.

Here is a summation of the results for inequality. All cohort groups similarly experienced an inverse U curve track of inequality, and this seems to be mainly stemming from period effect. Inequality was higher for earlier born, older cohorts, and hence this is affected by age and cohort effect. Lastly, inequality was higher for earlier-born cohorts at an earlier

period during old age (and lower before old age). These results, overall, suggest that inequality was higher for earlier-born cohorts, and then it declined for later-born cohorts recently entering elderly-hood.

Next, volatility reflects the extent of changes of income that individual households go through. As mentioned above, level of volatility is lower than inequality for all cohorts across all years; hence, the level of insecurity is mainly driven by changes in income gap rather than changes in income of individual households. Also clear was the declining trend of volatility, one of the most defining features since the late 1990s. For a closer look, what follows is an interpretation of the cohort table on volatility.

Table 4. Standard Cohort Table: Volatility

Age	Cohorts					
	1958-1954	**1953-1949**	**1948-1944**	**1943-1939**	**1938-1934**	**1933-1929**
40-44	0.06					
45-49	0.05	0.07				
50-54	0.05	0.06	0.08			
55-59	0.04	0.04	0.05	0.09		
60-64		0.04	0.07	0.09	0.11	
65-69			0.05	0.12	0.14	0.16
70-74				0.08	0.09	0.20

75-79					0.06	0.12
80-84						0.09

i) Running down the columns of **Table 4**, volatility declines with age (age effect) and over time (period effect). This trend is most consistent among younger cohorts born between 1949 and 1958. The relatively older cohorts (born before 1943) experience a rise in volatility between period 1 and 2 or period 2 and 3, although they all drop during the last period to a lower level than where it began. Cohorts 1944-1948 experience a rise in volatility as they turn 60-64, and cohorts 1939-1943 and 1934-1938 experience a rise as they turn 69-69.

ii) Diagonally, from left to right, volatility appears higher among earlier born cohorts (cohort effect), and it increases with age (age effect). Increase in volatility is especially noticeable during ages 60-69, as in the case of inequality.

iii) Comparing across ages of different periods show that younger cohorts experience lower levels of volatility than their predecessors at a given age. This is consistent throughout all ages, and may be attributed to period and cohort effects.

Combining these results, there is a strong indication that volatility declined over time (period effect) and for earlier born cohorts (cohort effect). It is less clear how volatility responds to aging, with the exception of clear rise of the measure when cohorts reach their 60s.

Results from decomposing GE_2 into inequality and volatility are summarized as follows. First, those born earlier generally face higher levels of inequality and volatility. While income insecurity mainly stems from income gaps among households, income volatility also constitutes a sizable amount of risk as we move towards older cohorts.

Second, there is a diverging trend between the two components, with an increasing trend of inequality and a declining trend of volatility. This indicates that GE2 has undergone an increase during the first few periods due to a rise in inequality, while its recent declines (or a lack of further increase) have been affected by the clear drop of volatility.

Third, there's a tendency for a rise of insecurity during ages 60-70, seen in both inequality and volatility components: income gap widens and fluctuates as individuals enter old age. This may reflect differences between those who lose a job and sustain a job or those who have other assets to buffer income shocks compared to those who don't. Volatility also shows a moderate increase, possibly arising from a loss of income or a loss of stable income.

Finally, however, a comparison among cohorts at a given age reveals that younger cohorts experience lower inequality and volatility during old age compared to their predecessors. The difference is greater in volatility, suggesting that a secondary source of income (aside from primary income) is helping to reduce the income shock from retirement and provide some form of security for the emerging elderly. I probe this issue further in the next section, by focusing on the role of public pension in comparison to other subsidiary income sources.

3. Decomposition by Income Source

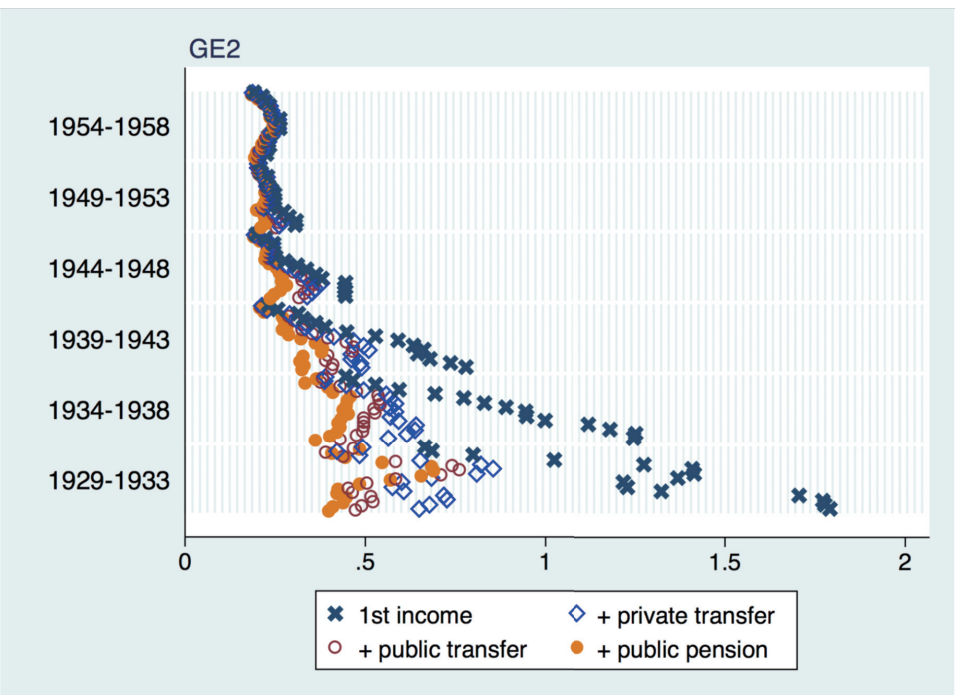
1) Effect of Subsidiary Income Sources on Overall Income Insecurity

Next, I use different units of income to examine their effects on the level of income insecurity, specifically to assess the role of public pensions in mitigating income insecurity of the elderly: the main motivation of this study. Presentation of my results are structured in the following order. First, I describe how levels of income insecurity are altered by each income source; this is done by estimating GE_2 using primary income of households, and then by estimating the percentage change of GE_2 as a result of cumulatively adding other sources of income. Next I estimate the effects of each subsidiary income source on the level

of GE_2 induced by primary income, by setting GE_2 of primary income as the baseline for comparison. This way, I am able to compare the magnitude and evolution of their effects on overall income insecurity as well as its components: inequality and volatility. Lastly, I attempt to describe their effects in relation to age, cohort and period, by utilizing the standard cohort table.

Figure 8 displays GE2 of cohorts from 1998 to 2013, using primary income (1^{st} income), market income (1^{st} income + private transfer), market income + public transfer, and gross income (+ public pension). In other words, income sources are cumulatively added to show how the level of risk was affected.

Figure 8. GE_2 by Income Sources Cumulatively Added



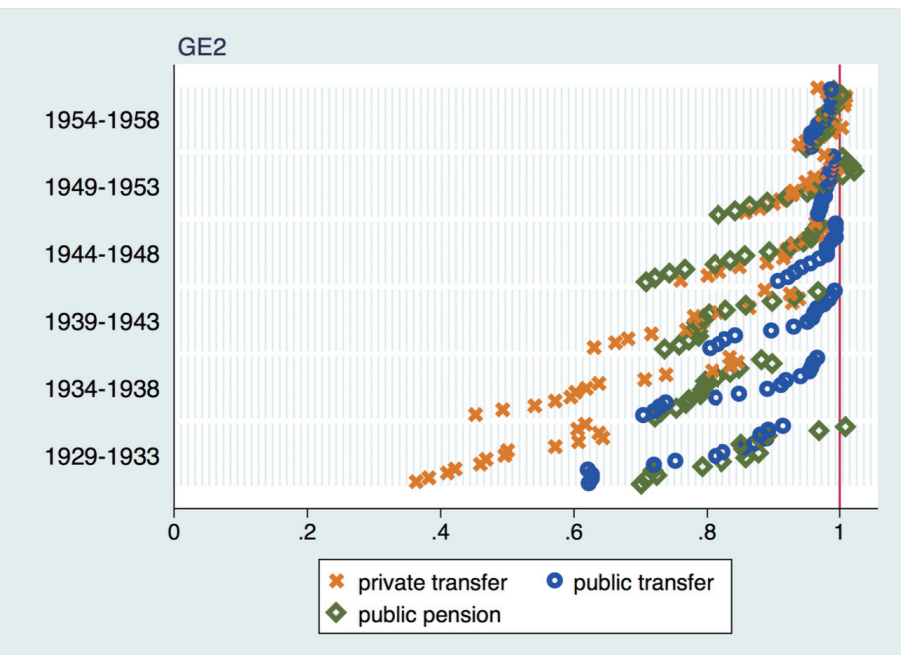
It is evident that GE_2 has been rising for the earlier born cohorts, when estimated using primary income. That is, between 1998 and 2013, income insecurity has noticeably increased for cohorts born earlier than 1953[7]. With intensifying risk from the market, the role of the family and of the public institutions have both increased in importance. Hence, supplementary incomes are critical in providing some type of financial security for the elderly, while they play a minor role in reducing the risk of the younger groups. Private transfer appears as the predominant income source in reducing income insecurity; this effect, shown by the distance between GE_2 measured by primary income only and that measured when adding private transfer, continually expands. Despite the case being, private transfer does not suffice in driving down the level of GE_2. The level is reduced only when public transfers and pensions are introduced. This hints at the eroding role of private transfer as the traditional source of income for the elderly, and simultaneously the rising influence of public institutions in helping elderly Koreans sustain adequate living conditions.

While the above figure depicts the level of GE_2 by cumulatively adding each income source onto 1st income, one should take caution when comparing their effects against each other. To roughly compare effects of

[7] Although I present analysis confining to cohorts born before 1958, similar analysis of younger cohorts reveals that GE2 using 1st income follows an inverse U-shape curve over time, and does not rise substantially over time. This supports my case for focusing on the elderly group for this paper.

individual income sources, GE_2 is estimated separately for the following compositions of income: 1st income + private transfer, 1st income + public transfer, and 1st income + public pension. I set primary income as the baseline of comparison, and plot GE_2 levels for each composition as a proportion of the given baseline (e.g. {GE_2 of 1st income + private transfer} / GE_2 of 1st income). This describes the extent to which risk is reduced by adding other income sources. This signifies the extent to which risk is reduced by adding individual income source.

Figure 9. Effect of Subsidiary Income Source on GE_2



Depicted in **Figure 9** is the effect of each income source, and its changes from 1998 to 2013, again using three-year estimates for an overview of the trend. Cohorts born between 1954 and 1958, who were

between the age of 40 and 44 in the first year of analysis, and in their late 50s by the end of the analysis, do not gain substantially from the three supplementary sources of income. Older cohorts, in contrast, see their incomes secured at the benefit of these three additional income sources.

Two features stand out. First is the growing presence of all three sources over the last 16 years. The role of private transfer and public transfer and pension have become increasingly strengthened; as individuals age, their ability to secure income from the market dwindles, and a result seeks assistance from other family members or the government.

Another striking feature to note here is the differential role that these income sources play for the older elderly and the younger emerging elderly. For the two oldest groups, its risk brought upon by 1st income (X=1) is reduced by private transfer as much as 60%, by public transfer by about 30~40%, and public pension by about 20~30%. For cohorts born between 1939-1943, public pension outperforms public transfer in reducing the level of insecurity, although it falls slightly short compared to that of private pension. For the two younger cohorts, born between 1944-1953, public pension's contribution prevails over that of private transfer, while public transfer plays relatively meager role.

For yet another closer investigation, I construct a standard cohort table of effect of these subsidiary income sources on GE_2. The effect of private transfer income in reducing GE_2 is laid out in the left section of

Table 5; that of public transfer in the center; that of public pension in the right section of the table. I first describe the impact of private transfers using the standard cohort table in the order of i) vertical lines, ii) diagonal lines, then iii) horizontal lines.

i) Impact of private transfers clearly increases over time for all cohorts. The magnitude of effect is particularly high for older, earlier-born cohort groups; GE_2 of the earliest born group, born between 1929-1933, is reduced by 38% in the first period and as much as 64% by the final period; for the next oldest group, it is reduced by 16% in the first period and the effect intensifies to 55% in the last period. The impact of private transfers is also strengthened for younger cohorts as well, increasing from about 4% to 24% for cohorts born between 1944 and 1948. The rising trend can be attributed to either period or age effect.

ii) A diagonal view confirms that older aged cohorts' reliance on private transfer is greater; the magnitude of its effect is always higher for older, earlier-born cohorts. The trend may be due to age and/or cohort effect.

iii) The most notable feature, however, is found in comparison across rows: its impact diminishes as we move towards younger cohorts and later time periods at any given age group. This implies that each successive cohort benefits

less from private transfer, and the decline is particularly evident between ages 55 and 69. At age 55-59, for example, the effect has declined from reducing 11% of GE2 to only 6%; at age 65-69, its effect went from reducing 38% of GE2 to 24% for younger cohorts.

Combining these results, the effect of private transfer was increasing with age; higher for earlier born cohorts; lower for cohorts born later. The common trend here is that the oldest group, born between 1929 and 1933, are ones to benefit most from public transfer, with successive cohorts benefitting less from it.

Effect of public transfer on GE_2 also shows a similar trend.

i) Equalizing effect of the income component increases over time for all cohorts as they age. The magnitude is much smaller than that caused by private transfer; nevertheless, it rises to a considerable level by the last period: 38% for oldest, followed by 30%, 20%, 9% for the next three successive cohorts.

ii) Diagonally, impact is found to be greater for earlier born cohorts who are also older at all of the given time frames.

iii) Comparison across rows, however, reveal a slightly different picture: that benefit increases slightly for younger cohorts at later periods at a given age. There is no marked

difference, however, suggesting that both cohort and period effects do not exert significance influence.

In sum, strength of public transfer seems to grow most markedly with age. While, it is generally on an upward trend over time and for older cohorts, the difference does not seem very significant.

Finally, I turn to the impact of public pensions in reducing overall income insecurity:

i) Running down the columns, its effect appears to have grown over time as in the case of private and public transfers. There is a huge leap between ages 55-59 and 60-64 and again between 60-64 and 65-69, indicating its strong presence as one enters his or her elderly years.

ii) Diagonal comparison reveals some inconsistencies across cohort groups: public pension generally exerts greater influence on earlier-born cohorts, but younger, later-born cohorts benefit more from time to time. Thus, compared to other subsidiary income sources, this particular source is not more favorable to older elderly, most likely due to its relatively recent and on-going expansion.

iii) Finally, comparison across the rows again corroborates this finding: younger cohorts are increasingly benefitting from public pension during their later years in life. For example,

the magnitude of its effect on GE2 increases from 12% to 18% at ages 60-64, and from 15% to 26% at age 70-74.

Most distinctive features are that 1) private transfer and public transfer both favor the older and earlier-born cohorts more, while public pension is benefitting the younger cohorts recently entering old age; 2) the effect of three sources are increase with age, and this is especially marked during one's 60s, thus when one is most likely to have just retired; 3) the effect of private transfer is declining for the younger old cohorts, partially made up for by the growth of public pension.

The last point is particularly interesting, as it reflects a shift of risk from family to society. At age 70-74, private transfer used to reduce GE_2 by 39% in the first period, but has slightly reduced to 37% in the last period. This is more than compensated for by a rise of the effect of public pension, from 15% to 26%, although the magnitude itself remains smaller. At age 65-69 and 60-64, public pension begins to override private transfer in magnitude as well; public pension reduces GE2 by 29% at ages 65-69, and by 18% at ages 65-69 during the last period, while private transfer exerts an influence of 25% and 14%, respectively.

Table 5. Standard Cohort Table: Effects of Transfers and Public Pension on Overall Income Insecurity

age	*Private Transfer Effect (%)*						*Public Transfer Effect (%)*						*Public Pension Effect (%)*					
	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33
40-44	-0.03						-0.01						-0.01					
45-49	0.01	-0.02					-0.01	-0.01					-0.01	0.01				
50-54	0.00	-0.02	-0.04				-0.03	-0.02	-0.01				-0.02	0.00	-0.03			
55-59	-0.06	-0.07	-0.05	-0.11			-0.04	-0.02	-0.01	-0.01			-0.05	-0.08	-0.05	-0.03		
60-64		-0.14	-0.11	-0.14	-0.16			-0.03	-0.04	-0.03	-0.03			-0.18	-0.19	-0.17	-0.12	
65-69			-0.24	-0.23	-0.26	-0.38			-0.09	-0.10	-0.06	-0.08			-0.29	-0.21	-0.18	0.01
70-74				-0.37	-0.40	-0.39				-0.20	-0.19	-0.13				-0.26	-0.23	-0.15
75-79					-0.55	-0.54					-0.30	-0.28					-0.28	-0.21
80-84						-0.64						-0.38						-0.30

2) Effect of Subsidiary Income Sources on Inequality and Volatility

The previous section revealed the diverging trend of inequality and volatility, with the former increasing and latter decreasing over time. Hence, one may expect aforementioned income sources to differentially affect the two dimensions. By examining their effects for the two dimensions, I describe the ways in which each income source affects the type of insecurity that the elderly goes through.

Figure 10. Effect of Subsidiary Income Source on Inequality and Volatility

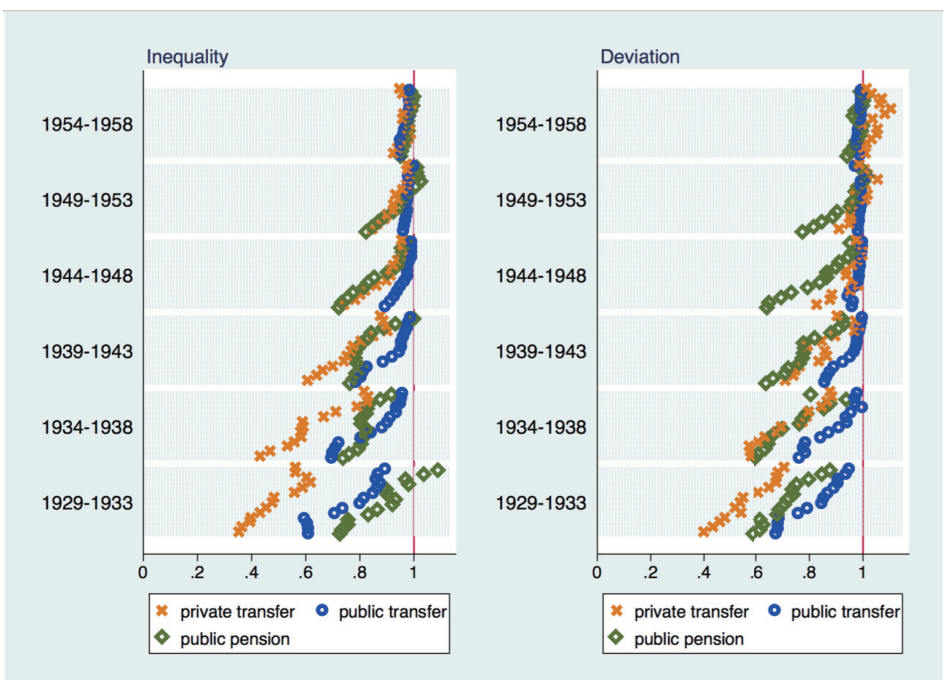


Figure 10 illustrates the effect of each income source on inequality and volatility, the two components of overall insecurity, GE_2. Again, primary income is set as the baseline of comparison. Private transfer, public transfer and public pension exert influence on both of the two dimensions for cohorts born before 1953, as were found in the case of overall insecurity. Inequality dimension is affected by the supplementary incomes in an analogous fashion as GE_2, with the oldest cohorts benefitting most from private transfer, then public transfer and lastly public pension, and younger cohorts increasingly benefitting from public pension.

Volatility is affected in a slightly different manner, however, with public pension exerting a noticeably greater influence. Public pension outperforms public transfer for the oldest cohort group, 1929-1933, it exerts comparable amount of influence for the next oldest cohort, 1934-1938, and begins to surpass private transfer for successive cohorts, born between 1953 and 1939. Thus, public pension is more effective in reducing volatility.

Below is the standard cohort table on the effects of each income source on inequality and volatility; this provides a comprehensive assessment of changes of private and public transfer as well as pubic pension over time, and across cohorts. First, I compare the effects of income sources on inequality component, displayed in the upper section of **Table 6**.

The effect of private transfers on inequality is displayed in the top left corner of **Table 6** and its effect on volatility is on the bottom left corner of the same table.

i) Private transfer appears to be a powerful source in reducing inequality, shown by the magnitude of the effect. For the earliest born cohorts, it reduces inequality by 44% in the first period, and by 65% in the last period: this can be attributed to age and period effects. This impact shows a steady growth for all other cohort groups as well. The same trend holds for volatility; private transfer reduces volatility by 29% in the first period, and as much as by 60% in the last period for the earliest born cohorts.

ii) Diagonally, it becomes clear that earlier born cohorts benefit more from private transfer. Looking at the table from top left to bottom right, the magnitude of effect steadily increases in both inequality and volatility dimensions. This may be attributed to either cohort or age effect.

iii) Across the rows are the effect of private transfer across different cohort groups and different time periods at a given age group. As in the case of GE_2, its effect is smaller for those born later at later time periods. For example, its effect on inequality is 44% for earliest born cohorts (1929-

1933) at period 1, but only 26% for cohorts born between 1944 and 1948. Compared to its effect on inequality, its effect on volatility is much smaller throughout whole period and further declines over time. Its effect on volatility is 29% for earliest born cohorts at period 1, and this further drops to 17% by period 4.

Combining these results, it is fair to say that private transfer becomes more important as individuals age, that it has been consistently more important for earlier born cohorts, and that its effects are waning for later born cohorts, the emerging elderly.

By dissecting its effect on inequality and volatility, contribution of public transfer is found to have grown for the inequality dimension, but less so for volatility. Not only is the effect of public transfer greater on inequality than volatility in terms of extent, but it is also growing in size for younger cohorts.

i) Its impact on inequality and volatility grows with age and time, as seen from running down the rows,

ii) and have had greater presence for the older cohorts, suggested by a diagonal comparison.

iii) Finally, comparison across rows reveals that younger cohorts benefit more from public pension in reducing inequality, but the same does not hold for volatility. Thus,

the growth of public transfer has been mainly carried by its growing distributional impact on inequality.

Recall that public pensions were becoming increasingly important in reducing income insecurity (GE_2) of elderly Koreans, partially making up for the loss of impact brought by private transfer. Here, I examine how this differs for inequality and deviation components of income insecurity.

i) Vertically, its impact is highly enhanced in both of the components for all cohorts. This may be due to aging or evolution of time. The increase is dramatic in volatility component, indicating that public pensions have been more effective in driving down the volatility component of income insecurity.

ii) Diagonally, public pension mostly increases as we move towards earlier born cohorts. However, this is not always the case. Effect is generally higher when groups reach the age of 60s.

iii) Lastly, comparing the rows reveal yet another interesting picture. The overall trend is similar as one found in overall income insecurity. However, public pensions have been becoming especially important in reducing the level of volatility for later-born cohorts at any given age. This is

somewhat true in inequality dimension, but the difference is less clear.

Overall, the trends of effects are similarly found in the two dimensions of inequality and volatility, but the magnitude appears to be much higher for volatility, implying the relative effectiveness of public pension in reducing income fluctuations for the elderly. Nonetheless, public pensions have become increasingly important in reducing both of the inequality and volatility components of income insecurity.

Table 6. Standard Cohort Table: Effects of Transfers and Public Pension

Inequality																		
age	Private Transfer Effect(%)						Public Transfer Effect(%)						Public Pension Effect(%)					
	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33
40-44	-0.05						-0.02						-0.01					
45-49	-0.02	-0.03					-0.01	0.00					-0.01	0.01				
50-54	-0.01	-0.03	-0.04				-0.04	-0.02	-0.01				-0.02	0.01	-0.02			
55-59	-0.07	-0.08	-0.06	-0.12			-0.05	-0.02	-0.01	-0.01			-0.05	-0.07	-0.04	0.00		
60-64		-0.15	-0.14	-0.15	-0.18			-0.04	-0.05	-0.04	-0.04			-0.17	-0.18	-0.17	-0.08	
65-69			-0.26	-0.26	-0.29	-0.44			-0.11	-0.11	-0.06	-0.10			-0.27	-0.21	-0.17	0.09
70-74				-0.39	-0.42	-0.41				-0.21	-0.20	-0.13				-0.23	-0.19	-0.10
75-79					-0.57	-0.57					-0.30	-0.29					-0.26	-0.16
80-84						-0.65						-0.39						-0.27

Volatility																		
age	Private Transfer Effect(%)						Public Transfer Effect(%)						Public Pension Effect(%)					
	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33	1954-58	1949-53	1944-48	1939-43	1934-38	1929-33
40-44	0.01						0.00						-0.01					
45-49	0.11	-0.01					0.00	-0.03					-0.02	-0.01				
50-54	0.05	0.01	-0.02				-0.02	-0.01	0.00				-0.01	-0.01	-0.04			
55-59	0.01	-0.05	-0.02	-0.10			-0.01	-0.01	-0.01	0.00			-0.06	-0.09	-0.08	-0.08		
60-64		-0.09	-0.01	-0.10	-0.12			-0.02	-0.03	-0.02	-0.02			-0.22	-0.20	-0.18	-0.19	
65-69			-0.17	-0.16	-0.20	-0.29			-0.04	-0.07	-0.04	-0.05			-0.36	-0.23	-0.21	-0.12
70-74				-0.29	-0.36	-0.35				-0.14	-0.16	-0.11				-0.36	-0.35	-0.26
75-79					-0.42	-0.46					-0.24	-0.24					-0.40	-0.32
80-84						-0.60						-0.32						-0.41

VI. Discussion & Conclusion

1. Summary of Results

This paper was an attempt to gauge the extent of income insecurity during old age in South Korea, especially its evolution during the last 16 years. In doing so, I focused on the role of public pension, as it is the broadest encompassing form of social insurance for the elderly but one that has been subject to contentious debate. These efforts were taken to answer my research questions: 1) does today's elderly experience greater income insecurity? 2) how does public pension affect income insecurity of the elderly?

To answer my first question, I estimated overall income insecurity using GE_2, and further decomposed the measure into inequality and volatility components, adopting method developed by Nichols (2014). Analyses revealed that earlier-born cohorts in general face higher income insecurity, which has gone up in the last 16 years, although it has retreated somewhat in recent years. Interesting finding was that the rise of insecurity came from mounting inequality, the income gap among households, while its decline in recent years can be attributed to a large drop in volatility, or volatility, experienced by individual households.

This does not in itself explain whether or not the emerging elderly experiences greater income insecurity. To prosecute my case further, I constructed standard cohort tables, and made a thorough and comprehensive assessment by comparing changes over time and across age and cohort groups. From this, I found that income insecurity increases between ages 60 through 69, regardless of when it occurs and when one was born. This applies for both inequality and volatility, suggesting that as one enters old age, households experience widening of the income gap as well as higher level of income fluctuations. Finally, those recently entering old age face lower levels of income inequality and especially volatility at a given age than their predecessors. Thus, although income insecurity rises with age, today's elderly can be arguably said to have a greater level of income security than their predecessors.

As for my second question, I assessed the evolution of public pension compared to private and public transfers. By examining its effect on overall income insecurity, as well as its two components – inequality and volatility – I purported to distinguish the effects of each subsidiary income source, and in particular that of public pensions. I found that private pension was the most forceful in reducing income insecurity, and that its effect grew with age. However, its role has ebbed during the last 16 years: that is, the emerging elderly is benefiting less from private transfers.

In contrast, public transfer has a greater equalizing impact for the emerging elderly. Its effect increases with age, and has grown over time.

However, most of the contributions came from its effect on on inequality, and less so from volatility. Thus, the growth of public transfer has been mainly carried by its growing distributional impact on inequality. However, its effect remains relatively low in magnitude and its increase was also not markedly clear.

Public pensions were the only income source to have grown over time in both of these dimensions, providing the newly elderly with greater amount of security as they age. The trends of effects are similarly found in dimensions of inequality and volatility, but the magnitude appears to be much higher for volatility, implying the relative effectiveness of public pension in reducing income fluctuations for the elderly.

2. Significance of Findings

What distinguishes this research from prior literature is that first, that it employed a long running panel to analyze changes of income insecurity over the last 16 years. In doing so, I documented changes for each cohort group approaching or already in their elderly years, allowing for a closer examination of the trends undergone by each group.

Another major contribution of this paper is the use of standard cohort table in understanding the changes in relation to age, time, and cohorts. This allowed me to see if income insecurity indeed increased over time and if it is increasing for the newly emerging elderly. Interestingly,

income insecurity was found to increase with age, but was declining for the elderly at a given age.

Third, I attempted to describe the changes within a unified framework: changes of income differences among households (pure inequality) and within households over time (volatility) which add up to overall income insecurity (GE2). By distinguishing between the two components, I was able to tell the nature of income insecurity for the elderly Koreans; inequality was a predominant source of income insecurity compared to income volatility, and it continued to rise throughout the period. Nonetheless, income volatility was also a significant part contributing to income insecurity. Its decline was particularly important in reducing income insecurity of the elderly in recent years.

Finally, decomposition of gross income into primary income, private transfer, public transfer, and public pensions allowed me to examine how each income source helped to reduce income insecurity that is induced by primary income. Especially, I found that public pensions were much more impactful in reducing income volatility of the elderly, but so far had a less of an impressive role in reducing inequality. This indicates that the recent decline of volatility was in large due to the enhanced role of public transfers. Public pensions were also becoming more critical in cushioning income insecurity caused by household's primary income, due to the eroding role of private transfers. It more than

made up for the decline in effect of private transfer on volatility, but partially substituted the effect of private transfer on inequality. This calls to attention both the strength and weakness of this subsidiary income. With expansion of coverage of public pensions, however, it is likely to exert more influence in reducing inequality. This is a point worth taking into consideration in the debate surrounding public pensions today. Since entitlements and pension age are expected to decline in the next two decades, however, this may have an adverse effect on income insecurity of Korean elderly.

3. Limitations

This paper was an attempt to assess the economic situation of the elderly over the course of 16 years and also the role of public transfers compared to other forms of subsidiary incomes. By using all available years of the data, by examining the trends for each cohort group, and by constructing cohort tables, I was able to derive a comprehensive evaluation of the changes, find that income insecurity is in fact induced more by pure inequality than changes of income, and that public pensions were increasing in importance and especially so for reducing income volatility. Despite these findings, however, there are many limitations of my analyses as well as conclusions drawn from them.

One limitation of this paper is the data used for conducting my analyses. There is a great amount of attrition of observations over the 16

years. Hence, one may call into question the representativeness and consistency of the sample. There is no clear-cut solution for this problem. Hence, I used the cross-section household weights to partially remedy this problem.

Another issue that can be raised is that the role of public pensions as well as other subsidiary income sources evaluated here do not reveal their causal effects. The effects described above should be understood as observed effects, due to a lack of a counterfactual group that remains unchanged by introduction of a specific income source. Hence, it is difficult to argue definitively that the expected cuts in public pensions benefits will necessarily increase income insecurity of Korean elderly. In fact, some studies (Kim, 2008) have shown that public pensions have crowded out private transfers. Hence, with smaller entitlements, it is possible that elderly can secure their incomes through private transfers. Due to aging population and low birth rate, however, this will remain a challenge for decades to come.

Although the effects of public pensions as well as other income sources are not causal effects, per se, I believe they are still important in considering related policy changes. First, my findings are important for understanding the present status of elderly Koreans. Trends of overall income insecurity as well as its two components (inequality and volatility) reflect the observed economic circumstances of the elderly as a whole, and by cohort group. Also, my analysis clearly demonstrated the

differential role each income source has had on pure inequality and volatility. When considering to make changes to public pensions or other forms of social safety-nets, one should take into account that the two components of income insecurity may be affected in a different fashion.

References

Bane, M., & Ellwood, D. T. (1983). Slipping into and out of Poverty: the dynamic of spells. NBER Working Papers Series.

Bartels, C., & Bonke, T. (2013). Can households and welfare states mitigate rising earnings instability? Review of Income and Wealth, 59(2), 250–282.

Deaton, A. (1992). Understanding consumption. Oxford University Press.

Dooley, M. D., & Gottschalk, P. (1984). Earnings inequality among males in the United States: Trends and the effects of labor-force growth. Journal of Political Economy, 92(1), 59–89.

Dynan, K., Elmendorf, D., & Sichel, D. (2012). The Evolution of Household Income Volatility. The B.E. Journal of Economic Analysis & Policy, 12(2).

Dynarski, S., & Gruber, J. (1997). Can Families Smooth Variable Earnings? Brookings Papers on Economic Activity, 1997(1), 229–303.

Engelhardt, G. V., & Gruber, J. (2004). Social security and the evolution of elderly poverty. National Bureau of Economic Research, w10466.

Friedman, M. (1962). Capital and freedom.

Gosselin, P., & Zimmerman, S. (2008). Trends in Income Volatility and Risk, 1970-2004. Urban Institute.

Gottschalk, P. (1997). Inequality, Income Growth, and Mobility: The Basic Facts. Journal of Economic Perspectives, 11(2), 21–40.

Gottschalk, P., & Moffitt, R. (1999). Changes in job instability and insecurity using monthly survey data. Journal of Labor Economics, 17(4), S91–S126.

Gottschalk, P., & Moffitt, R. (2009). The Rising Instability of U.S. Earnings. Journal of Economic Perspectives, 23(4), 3–24.

Gottschalk, P., Moffitt, R., Katz, L. F., & Dickens, W. T. (1994). The Growth of Earnings Instability in the U.S. Labor Market. Brookings Papers on Economic Activity, 1994(2), 217–272.

Hacker, J. S., Huber, G., Nichols, A., Rehm, P., Schlesinger, M., Valletta, R. G., & Craig, S. (2012). The Economic Security Index: A New Measure for Research and Policy Analysis.

Hacker, J. S., Huber, G. A., Nichols, A., Rehm, P., Schlesinger, M., Valletta, R., & Craig, S. (2014). The economic security index: A new measure for research and policy analysis. Review of Income and Wealth, 60(S1), 5–32.

Hardy, B., & Ziliak, J. P. (2014). Decomposing trends in income volatility: The "wild ride" at the top and bottom. Economic Inquiry, 52(1), 459–476.

Ivlevs, A. (2014). Economic insecurity in transition: A primary commodities perspective. Review of Income and Wealth, 60(S1), S117-S140.

Jang, Hyojin. (2015). Social Risk Management and the Variability of Korean Family Incomes. Korean Social Security Studies, 1(2), 205-231.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. Econometrica: Journal of the Econometric Society, 263-291.

Kim, Hisam. (2008). Private Income Transfers and Old-Age Income Security. KDI Journal of Economic Policy, 30(1), 71-130.

Ku, Inhoe & Sohn, Byeongdon. (2005). Old-age Population Excluded from Social Security in Korea: Why did it increase during he late 1990s? Journal of the Korean Gerontological Society, 25(4), 35-52.

Kim, Kyung-Ah. (2008). A Study on the Inequality of the Old-Age's Income and the Redistributive Effect in Korea. Social Welfare Policy, 32(3), 79-107.

Lee, Won-Jin. (2012). Changes in Income Inequality and Income Mobility Associated with a Transition to Old Age. Korean Journal of Social Welfare, 64(2), 5: 185-212.

Lee, Wonjin (2013). Why does Income Inequality Rise in Old Age?: An Exploratory Analysis on a Cumulative Advantage/Disadvantage Model. The Korean Sociological Association, 47(5), 241-275.

Lim, Wansub & Lee, Ju-mi. (2014). Poverty Statistical Year Book 2014. Korea Institute for Health and Social Affairs.

Lusardi, A., Schneider, D., & Tufano, P. (2011). Financially Fragile Households: Evidence and Implications. Brookings Papers on Economic Activity, 83–134.

Moffitt, R. A., & Gottschalk, P. (2002). Trends in the transitory variance of earnings in the United States. Economic Journal, 112(478).

Nichols, A. (2008). Trends in Income Inequality, Volatility , and Mobility Risk IRISS Working Paper Series Trends in Income Inequality , Volatility , and Mobility Risk, (November).

Nichols, A., & Rehm, P. (2014). Income Risk in 30 Countries. Review of Income and Wealth, 60(S1), 1–19.

OECD. (2015). Pensions at a Glance 2015: OECD and G20 indicators, OECD Publishing, Paris.

Osberg, L., & Sharpe, A. (2005). How Should We Measure the “Economic” Aspects of Well-being?. Review of Income and Wealth, 51(2), 311-336.

Osberg, L., & Sharpe, A. (2014). Measuring economic insecurity in rich and poor nations. Review of Income and Wealth, 60(S1), S53-S76.

Rehm, P., Hacker, J. S., & Schlesinger, M. (2012). Insecure Alliances: Risk, Inequality, and Support for the Welfare State. American Political Science Review, 106(02), 386–406.

Rodrik, D. (1988). Closing the technology gap: Does trade liberalization really help? NBER Working Paper Series.

Seok, Sang-hun. (2009) A Study on Dynamics of the Elderly Poverty. Korean Social Security Studies. 25(4): 77-99

Shin, D., & Solon, G. (2011). Trends in men's earnings volatility: What does the Panel Study of Income Dynamics show? Journal of Public Economics, 95(7-8), 973–982.

Shon, Byong-don. (2009). Income Inequality of the Aged: Trends and Factor Decomposition. Journal of the Korean Gerontological Society. 29(4), 1445-1461.

Statistics Korea, 2015. Report on Elderly Population Statistics.

Yeo, Eu-Gene. 2013. Old-age Poverty by Household Type and Policy Efforts to Reduce it. Journal of Critical Social Policy, 40(8), 185-219

You, S., & Baek, S., & Kum H. (2016). Income Risk of Korea's Elderly Population: Focusing on Income Inequality, Income Mobility, and Income Volatility. *Working Paper.*

국 문 초 록

본 논문은 우리사회의 노인가구가 당면하는 소득불안정성의 정도와 변동 양태를 살펴보고, 공적연금이 이에 미치는 영향을 알아보고자 하였다. 공적연금에 대하여 노후 소득보장으로서의 기능적 측면과 제도의 재정적 불안정성 등 다양한 문제가 지적되어 왔지만 공적연금이 지난 십여년간 노인가구에 어떠한 영향을 얼만큼 주었는지를 파악하려는 시도는 부족한 실정이다. 본 논문은 우리사회의 노인가구가 경험하는 소득불안정성 정도와 변동 양태에 대한 이해가 선행되어야 한다는 점에 착안하여 지난 16년간(1998-2013) 노인가구들이 경험한 소득불안정성 정도를 소득불평등과 소득변동성이라는 개념을 사용하여 측정하고, 이에 대한 공적연금의 영향을 살펴보았다.

본 논문의 특징은 다음과 같다. 첫째, 소득불안정성의 변화를 보다 장기적인 시간을 두고 측정하였다는 점이다. 둘째, 소득불안정성에 대한 개념적 고찰을 통하여 시간적 요소에 대한 고려가 필요하다고 판단되었다. 따라서 소득불안정성을 측정하기 위하여 집단의 상대적 격차를 의미하는 소득불평등과 각 가구가 경험하는 소득의 변동 정도에 대한 정보를 구분하여 측정하였다. 셋째, 지난 16년 동안 노년기를 경험한 적이 있는 가구를 출생연도(코호트) 집단에 따라 분석을 진행하였다. 그리하여 소득불안정성의 변화가 연령, 시기, 혹은 코호트의 차이에 따른 것인지에 대한 포괄적인 해석이 가능하였다.

한국노동패널(2-17차)을 이용하여 우리나라 노인가구가 당면한 소득위험을 측정·분해한 결과 지난 십여년간 전반적 소득위험 수준은 증가하였다가 다시 감소하는 추세를 보였으며, 세부적으로는 소득격차가 초기에 크게 증가하고 이후 소득불안정성이 크게 감소한 것으로 나타났다.

먼저 태어난 코호트일수록 소득불평등과 소득변동성은 높은 수준을 보였으며 모든 코호트 집단에서 연령이 증가할수록 두 요소 모두 증가하는 것으로 나타났다. 한편, 최근 노년기에 진입한 코호트일수록 소득불안정성은 낮은 것으로 나타나 노년기에 당면하는 소득불안정성 수준은 과거에 비해 감소한 것으로 파악되었다. 특히 그 차이는 소득변동성에서 더 크게 나타났는데, 이는 공적연금의 기여도가 큰 것으로 판단되었다. 공적연금의 영향은 지난 십여년간 확연하게 증가하였으며, 특히 소득변동성을 감소시키는 데에서 그 기능을 찾을 수 있었기 때문이다. 반면, 사적이전이 미치는 영향은 점차 감소하고 있어, 노년기에 당면하는 소득위험에 대한 부담이 가구에서 사회로 이전되고 있음을 확인하였다.

이러한 분석을 통해 공적연금이 오늘 우리 사회에서 보다 중요한 자리를 차지하고 있다는 것, 그리고 이것이 소득변동성을 낮추는 데에 특히 효과적이었다는 것을 알 수 있었다. 더욱이 소득불평등에 대한 효과도 점차 증가하고 있는 추세를 보여 공적연금이 확대될 경우 그 긍정적인 효과를 기대해볼 수 있을 것이다. 이로써 향후 공적연금에 대한 논의에 있어서 소득불평등과 소득변동성 두 측면에 대한 고려가 동시에 이루어져야 한다는 함의를 도출할 수 있었다.

주요어 : 소득불안정성, 공적연금, 소득분해, 소득불평등, 소득변동성, 노년기
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