

# Changes in Income Distribution and Policy Implications: Focusing on Income Concentration and Mobility

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# I

## Introduction

Income distribution is emerging as a crucial issue in debates and research worldwide on social integration and sustainable economic development. More and more research is attempting to analyze the current structures of income distribution in various states from a phenomenological perspective and identify the implications of policies for improving income distribution.

Identifying the policy implications of income distribution first requires an accurate diagnosis of the current structure of income distribution and how it has been changing. Only when we have an accurate understanding of the facts and causes of changing income distribution can we identify and determine the right policy solutions. However, the conventional style of surveys that are used to assess and measure the distribution of typical indicators of income distribution (Gini coefficients, highest-quintile-to-lowest-quintile income ratios, etc.) have inherent flaws and shortcomings, prompting us to search for better techniques. Moreover, to truly understand the structural changes taking place in income distribution, we need to look into not only the changes in income distribution itself, but also accompanying demographic and social changes. In the case of Korea, which is fast becoming an aged society, with explosively growing numbers of retirees and single-person households, it is crucial that we examine these demographic changes to properly understand the structural changes in income distribution taking place.

This study therefore mainly addresses two related topics. The first is determining and analyzing the degree of income concentration in the highest income group as an indicator of income distribution, as this will help us overcome

the shortcomings of other indicators. The conventional indicators of income distribution, such as the Gini coefficients and the highest-quintile-to-lowest-quintile income ratios are typically derived from household surveys. These surveys, however, do not provide accurate reflections of the highest-quintile households. Yet income concentration in the highest income group, increasingly treated as an alternative indicator of income distribution since Piketty(2001) and Piketty and Saez(2001), may provide a better substitute to indicators based on household surveys. An increasing number of studies in Korea, including Park(2012), Kim(2012), and Kim and Kim(2014), have used income concentration as their main measure.<sup>1)</sup> In particular, Kim(2012) and Kim and Kim(2014) provide significant analyses of the long-term trends and forecasts concerning income concentration in the highest income group in Korea. Nevertheless, the complex income tax regime, frequent tax reforms in Korea, and the dearth of certain required data in the *Yearbooks of National Tax Statistics* have forced these authors to base their income concentration estimates on unverifiable and simplified hypotheses. This study has therefore set out to re-estimate income concentration in the highest group in Korea with greater objectivity, verify the Pareto distribution that forms the core basis of the income concentration estimation process in Kim(2012), and use relatively shorter but more consistent time span data.

The second topic of this study addresses the trend in income mobility in Korea in the light of demographic and social changes. Income mobility is a decisive factor of the structure of income distribution as it serves to minimize the discrepancies in lifetime income estimates in comparison with single-year income estimates. In using income mobility, we also decided that lifetime income is a more important factor of economic decisions made by households and individuals than single-year income. Therefore, this study estimates the trend in income mobility and analyzes the factors underlying it. If income distribution is deteriorating in Korea, it can only be improved by addressing and changing the status of income mobility. By identifying the factors that contribute to the

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1) Kim and Kim(2014) is a supplement to, and a correction of, Kim (2012), using the same methodology of analysis and an expanded span of time.

income mobility of low-income quintiles, using highly reliable Fiscal Panel Data, it might be possible to arrive at more effective policy measures for improving income distribution.

In Part II of this study, we examine our first topic of the income concentration in the highest income group in Korea. In Part III, we examine our second topic of the income mobility in Korea and the decisive factors behind it. In both Parts II and III, the first sections provide a description of the research background and aims, the second sections provide a survey of the topic's established literature and introduce our chosen methodology and data set, and the last sections summarize our findings and the implications of our analysis. Part IV combines and summarizes our findings and the policy implications of the analyses on both topics.

## II

### Analysis of the Trend in Income Concentration

#### 1 Research background

Income inequality has been growing worldwide despite (or because of) economic growth since 2000. More and more people are taking an interest not only in how much they will earn in the future, but also in the overall status of income distribution in their societies. Contributing to this interest are the conflicts and tensions that have arisen directly due to growing income inequality worldwide since the onset of the latest global financial crisis.<sup>2)</sup> Similarly, debates on income inequality began increasing in Korea following the Asian Financial Crisis of 1997.

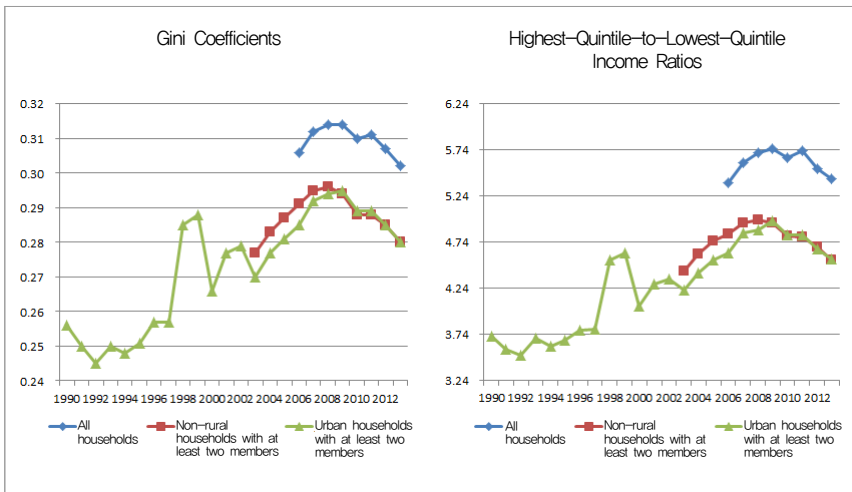
Statistics Korea publishes Gini coefficients and the highest-quintile-to-lowest-quintile income ratios annually as main indicators of income polarization. Its Gini coefficients based on disposable income for all households, for non-rural households with two or more members, and for urban households with two or

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2) A good example is the Occupy Wall Street movement that first erupted on September 17, 2011. Motivating the movement was the rampant moral hazard among Wall Street institutions that rewarded executives, responsible for the outbreak of the global financial crisis, with handsome bonuses, while ordinary Americans suffered with the foreclosure of their homes and properties. The slogan of the movement, "We are the 99 percent!," captures participants' discontent with the growing inequality of income and wealth between the wealthiest one percent of the American population and the remaining 99 percent. The Occupy Wall Street movement soon spilled over into other major American cities and sparked a series of similar movements worldwide, indicating that discontent with income inequality was a global phenomenon.

more members,<sup>3)</sup> have been declining since reaching their peaks in 2008 or 2009, suggesting that income inequality has abated. The highest-quintile-to-lowest-quintile income ratios, also based on disposable income, have been moving in similar fashion. However, these conventional indicators of income inequality fail to reflect the true status of income distribution in Korea. Statistics Korea's reports possibly do not capture public sentiment and perceived facts. Indeed, recovery from the global financial crisis has been slow in Korea, and ordinary Koreans feel that income inequality is worsening in the country.<sup>4)</sup>

[Figure II-1] Trends in Measures of Income Distribution in Korea



Note: The measures of income distribution are based upon disposable income that has been surveyed and analyzed in the Household Income and Expenditure Surveys (HIESs).

Source: Statistics Korea, National Statistics Portal (<http://kosis.kr>, accessed October 28, 2014).

3) Disposable income refers to the total income, combining market income and publicly transferred income, from which public non-consumption expenditure has been subtracted. For definitions of disposable income, Gini coefficients, and highest-quintile-to-lowest-quintile income ratios, see Statistics Korea (2011).

4) It may be possible that what people perceive and feel is wrong and what the official reports say is true.

The official basis for measuring income inequality in Korea is the Household Income and Expenditure Survey (HIES), published by Statistics Korea. However, as the HIESs require participating households to answer various questions, they are not adequately representative of certain groups, including the highest income groups. Households participating in these surveys may also over- or under-report their income. We therefore need to find measures that are more accurately reflective of actual income inequality.<sup>5)</sup>

Since 2001 or so, policymakers worldwide have commissioned an increasing number of studies measuring income inequality in light of income concentration among the wealthiest few. Korea has seen its own share of studies in this regard, including Park(2012), Kim(2012) and Kim and Kim(2014). Using simple combinations of statistics on composite income and wage taxes, as reported in the *Yearbooks of National Tax Statistics*, Park(2012) estimates the proportion of households with annual taxable annual incomes of KRW 100,000 or more from 2006 to 2010—1.0 percent in 2006, 1.2 percent in 2007, 1.1 percent in 2008, 1.3 percent in 2009, and 1.6 percent in 2010—and their income concentrations. Although Park does not succeed in eliminating overlaps between composite and wage income tax data, his is the first attempt in Korea at estimating and analyzing income concentration in the highest income group. Park also makes use of the HIESs and the Korea Institute of Public Finance (KIPF)'s Fiscal Panel Data, both based upon relatively large numbers of sample households, in estimating the income concentration in the wealthiest one percent of Korean households. His conclusion diverges greatly from those of the *Yearbooks*, suggesting the under-represented status of high-income households in the HIESs and the need for finding a new method of analysis similar to those increasingly used in other countries.

Kim(2012) and Kim and Kim(2014) are significant for adopting an advanced method for analyzing income concentration in the wealthiest and also for employing as long a time span as possible in their analysis.<sup>6)</sup> These studies,

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5) See Statistics Korea (2008).

6) See the following second section for a more detailed explanation of the limits of these studies. The biggest problem of these studies is that the inadequacy of statistics used to estimate the trend of income

however, rather indiscriminately use the method of Pareto interpolation without first verifying whether there is a Pareto distribution of income among high-income households in Korea. Moreover, the studies assert simplistic hypotheses, using the much compromised data available in Korea, to estimate income concentration,<sup>7)</sup> while failing to take into account that men in their early 20s in Korea are forced to perform mandatory military service.

This study overcomes the shortcomings of these earlier studies by analyzing and re-estimating income concentration in the highest income group in Korea with greater objectivity, using data superior to those provided in the *Yearbooks*. The goal is to verify whether there is indeed a Pareto distribution of income among high-income households in Korea. Atkinson(2005), in his analysis of the United Kingdom, finds that income distribution in the highest group does not follow the Pareto pattern. This suggests that the method of Pareto interpolation used in Kim(2012) and Kim and(2014) was rather inappropriate in Korea's case. We therefore use Atkinson's mean split histogram technique instead to estimate the trend in income concentration in the highest group during the period of 2007 to 2012. Our study analyzes income concentration not only with respect to persons at age 20 and older, but also with respect to diverse populations, including those at age 15 and older and a working-age population that reflects the completion of military duty.

## 2 Literature review

Since Piketty(2011), which analyzed the trend of income inequality in France from 1901 to 1998 in terms of income concentration in the high income groups, such as the wealthiest one percent of the population, numerous studies have been conducted on income concentration in high-income groups in over 30

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concentration in the period going back to the years prior to 2005 may have led to significant errors in resulting estimates.

7) In particular, assumptions and hypotheses with greater rational grounds should have been used in overcoming the overlaps between wage income tax statistics and composite income tax ones, and also in estimating individual income levels using the National Account data.

countries worldwide. The resulting statistics continue to be regularly updated. This study relies on analyses of income concentration and its trends in the United States, the United Kingdom, and Japan. Comparing the definitions of major variables and the methods of estimation and analyses used, we examine the possibility of comparing different states and different periods of time.

Our survey of the income concentration analyses in Korea and other advanced economies worldwide reveals a number of factors that complicate inter-country and inter-temporal comparisons.

First, with regard to inter-country comparisons, we may decide to compare two or more countries in terms of the direction and pace of income concentration trends and degrees of income concentration. Of these two, the latter particularly warrants greater caution. In calculating the degree of income concentration in a given income quantile, we place total income in the denominator and the total income of the highest income group of the given income quantile in the numerator. However, researchers in different countries use different methods for determining these denominators and numerators.

The income of the highest income group can be estimated on the basis of income tax reports and statistics released by the tax authorities of each country. Yet different countries use different criteria and standards for deciding tax bases, the ranges of taxable income, tax brackets, and the like. Not all countries possess all-inclusive composite income tax systems, and so different countries recognize different ranges of income. The variability of tax exemptions from one country to another also changes the range of non-taxable income from one country to another.<sup>8)</sup> Some countries, such as the United States, use the positive approach to determining taxable income, while others, such as the United Kingdom and Korea, use the negative approach. Moreover, some countries, such as the United States, levy composite taxes on almost all types of income, while others, such as the United Kingdom, Japan, and Korea, levy separate taxes on different types of income.<sup>9)</sup> For these and other reasons, the range of income used to estimate

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8) Moriguchi and Saez(2010) analyzes Japan, which has an income tax regime similar to that of Korea, and sums up the wage income of all taxable subjects, while Kim(2012) also includes the income of certain tax-exempt subjects when summing up the wage income.

9) Types of income not included in the range of composite income taxation may not be wholly included in

the income of the highest income group inevitably differs from one country to another.<sup>10)</sup>

In the past, the United States, France, the United Kingdom, and Japan used to impose income taxes not on individuals, but on married couples and households. Today, however, the United Kingdom, Japan, and Korea tax individuals. Given the same income distribution, then, the degree of income concentration may vary significantly from country to country.<sup>11)</sup>

The quality of the available data also varies from country to country. The United States and France, for instance, provide micro samples on income tax reports filed during certain periods of time, thus minimizing the chances of discrepancies. Other countries, such as Japan and Korea, collect statistics on each income bracket instead of micro-data, but this might compromise the accuracy of income concentration estimates concerning them. The absence of information on specific and small enough income brackets is a leading cause of major errors in income concentration estimates. The varying quality of tax statistics from country to country, therefore, limits the validity of income concentration estimates based on them.

In addition, different countries use different methods for calculating total income. Japan and Korea, for instance, estimate total income after deducting tax-exempt portions from personal income (e.g., self-imputed rents and the cost of financial intermediation services indirectly measured, or FISIM, that are not directly imputed to individuals). By contrast, according to Piketty and Saez (2001)'s analysis on the United States, the reported total income makes up 75 to 80 percent of all income identified in the National Accounts. Accordingly, income concentration estimates based on income tax reports may be 1.25 to

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the sums of income.

10) The recent increase in the similarity of taxable income among advanced economies worldwide may help to abate this problem, but significant discrepancies still persist.

11) Suppose, for instance, that there are only two married couples making up a given economy. The husband and the wife of the first couple earned KRW 1.1 million and KRW 0.9 million, respectively, or KRW 2.0 million in total. Of the second couple, only one spouse earned KRW 1.5 million and the other made no income. Here the income concentration of the upper 50 percent of this economy would be 57.1 percent (i.e.,  $200/350 \times 100$ ) if we used the couple base, but it would change to 74.3 percent (i.e.,  $260/350 \times 100$ ) if we switched to the individual base.

1.33 times greater than the estimates based on the National Accounts. Therefore, comparing various countries in terms of the degrees of income concentration warrants greater caution than comparing trends in income concentration.

Finally, comparing income concentration in the same country, but at different points in time, requires caution. Even in the same country, the quality of tax statistics and collecting methods and the tendency toward tax evasion may change over time—the United Kingdom and Japan, for instance, changed their income tax systems during the analysis period from taxing married couples or households to individuals. The range of taxable income can change over time. The quality of statistics has been improving over the decades, while policymakers have also altered their criteria for keeping National Accounts according to historical demands.<sup>12)</sup> A changing tax regime suggests that the tendency toward tax avoidance or exemption may vary over time, depending on how high or low the tax rates were at the given points in time. These variables complicate researchers' efforts to capture and analyze consistent trends over long stretches of time. In countries that have experienced abrupt changes in regime type—such as when Korea transitioned from being under a Japanese colonial regime to a republican self-government—it may be nearly impossible to identify a consistent trend in income concentration over a century.

### 3 Methodology

#### A. Data

We need three main types of data to estimate and analyze income concentration in the highest income group in a given year: (1) statistics on total income to determine the denominator, (2) statistics on the total population to determine the size of each income group, and (3) statistics on the income of the chosen income group.

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12) For instance, the Bank of Korea transformed the National Accounts system from SNA 1993 to SNA 2008 in 2014.

There are two main methods for estimating the total income for the denominator in income concentration estimation. The first involves estimating total income based on income tax reports. This method is preferred in negative income tax regimes that are able to capture almost all types of income in income tax reports. The other method involves estimating the amounts of income imputed to households in the National Accounts. This method is preferred in positive tax regimes under which income tax reports may under-represent actual amounts of income due to unreported or tax-exempt portions.

Korea runs a positive income tax regime and therefore uses the National Accounts to estimate total income. As in Moriguchi and Saez(2010) and Kim (2012), we counted and estimated the portions of income in the National Accounts that are imputed to households to estimate the total income. The three types of household-imputed incomes are employee wages, operating surpluses, and property gains.

For employee wages, we estimated the wages and benefits paid to employees after subtracting employers' imputed social contributions from the amounts listed on the Economic Statistics System (ECOS) of the Bank of Korea (BOK).<sup>13)</sup> For the operating surpluses, we followed Kim(2012) by first estimating self-imputed rents then subtracting the total amount of self-imputed rents from the household operating surpluses.<sup>14)</sup> Finally, for the property gains, unlike Kim (2012), we estimated the amount of interests households earned using the amounts of interest income reported as part of the withholding tax statistics in the *Yearbooks*. This technique saved us from the need to rely on artificial assumptions and hypotheses to remove the influence of the FISIM from the interest income that forms part of property gains reported in the National

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13) The BOK's ECOS lists wages, benefits, and employers' social contributions as part of employees' wages making up the income of households. Employers' social contributions, in turn, comprise actual contributions and imputed ones.

14) We used Statistics Korea's National Census data on households of different types of housing arrangements to estimate the ratio of home-owning households for each year. Then we multiplied this ratio by the housing service operating surpluses listed on each year's Input-Output Tables, published by BOK, to estimate the amount for self-imputed rents. The National Census takes place every five years, and there are no other comparable surveys providing similar data for the years after until the next census. Therefore, we used the linear interpolation technique to estimate the home-owning household ratios for the non-census years.

Accounts. As for the rest of property gains, we used the portions of the National Accounts imputed to households. Appendix Table 1 lists the sources of different types of income data we used to estimate the total income. Table II-1 below lists the amounts of different types of income as well as the total income.

〈Table II-1〉 **Composition of Total Income**

(Units: KRW 1 trillion, %)

	Total income	Employee wages		Operating surpluses		Property gains	
		Amount	Share	Amount	Share	Amount	Share
	2007	560.5	394.0	70.3	90.5	16.1	76.0
2008	584.0	415.3	71.1	87.5	15.0	81.2	13.9
2009	602.6	432.2	71.7	86.7	14.4	83.6	13.9
2010	635.8	459.2	72.2	88.2	13.9	88.3	13.9
2011	673.6	487.6	72.4	90.8	13.5	95.2	14.1
2012	729.2	539.6	74.0	93.1	12.8	96.5	13.2

We also decided to count the total taxable population and the size of each income group in Korea on an individual basis, which is the practice under the Korean income tax regime and in other countries. In other words, we estimate income with respect to individuals and not couples or households. The size of the total Korean population we used to determine the respective positions of certain income quantiles was the working-age population at age 20 and above, excluding men serving mandatory military service or incarcerated. For the purpose of sensitivity analyses, we also performed the same analysis on different types of populations, i.e., the population at age 15 and above, the population at age 20 and above, and the working-age population at age 15 and above.

For the populations at age 15 and above and at age 20 and above, we used the long-term population projections released by Statistics Korea. The long-term population projections are released every five years, a year after each National Census. Following the announcement of each new set of projections, the projections on the preceding five years are converted into confirmed population data in the light of the new National Census findings. Therefore, as of 2014 when this study was written, the figures on the two types of populations over the period from 2007 to 2010 reflect the confirmed (actual) population data,

while those pertaining to the years 2011 and 2012 are estimates.

For our estimates on the sizes of the working-age population, we used the data on the working-age population at age 15 and above, updated and released monthly by Statistics Korea and based on its monthly Economically Active Population Surveys (EAPSs). Our definition of the working-age population excludes soldiers, persons required by law to work in the social services or police force, and the incarcerated and counts only persons capable of engaging in economic activities. Statistics Korea also provides information on the distribution of this working-age population by sex and age. Because Statistics Korea distributes population information across the five-year age groups, we were able to identify and subtract the working-age population aged 15 to 19, which then enabled us to estimate the size of the working-age population at age 20 and above. <Table II-2> shows the trend in the size of each type of population used in this study.

<Table II-2> Trends in the Sizes of Different Types of Populations

(Unit: 1,000 persons)

Year	Total population at age 15 and above <sup>1)</sup>	Working-age population at 15 and above <sup>2)</sup>	Total population at age 20 and above <sup>1)</sup>	Working-age population at 20 and above <sup>2)</sup>
2007	39,873	39,170	36,641	35,968
2008	40,460	39,598	37,133	36,360
2009	40,950	40,092	37,536	36,808
2010	41,435	40,590	37,968	37,253
2011	42,009	41,052	38,540	37,704
2012	42,445	41,582	39,022	38,284

Sources: 1) Statistics Korea (KOSIS), *Future Population Projections* (accessed September 11, 2014)

2) Statistics Korea (KOSIS), EAPSs (accessed September 11, 2014).

For the total income of each given income quantile, we combined the reports filed by composite income taxpayers and wage income taxpayers and eliminated overlaps. In particular, we gathered statistics on taxpayers whose total income amounted to KRW 60 million or more for each given year,<sup>15)</sup> and then we counted the number of persons for every increment of KRW 10 million beyond the 60-million range and summed up the taxable income amounts reported—

whether composite or wage or both.<sup>16)</sup> The density function of the proportion of people earning high levels of income, based on the estimates drawing upon these statistics, is illustrated in [Figure II-2] below. As the graph shows, the higher the income, the lower the function.

The combined income tax statistics at the basis of this study show the following characteristics. First, the statistics by themselves do not allow for analysis of various types of income, as they provide information only on the number of report-filing taxpayers earning a certain level of taxable income (in the increments of KRW 10 million) and the amounts of taxable income. Second, as these statistics concern only a very limited time period (i.e., the years of 2007 to 2012), they limit our ability to identify and analyze long-term trends in income concentration.<sup>17)</sup> Nevertheless, as these years encompass the latest global financial crisis and period when its immediate impact was felt most harshly, they can show us how the global financial crisis has affected income distribution in Korea and whether that crisis contributed to the deterioration of income inequality. Because we have removed the overlaps between composite income tax reports and wage income tax reports, this study is also free of biases associated with artificial assumptions that are used to eliminate the influence of such overlaps. Finally, whereas the statistics on the 100 percentiles of combined income tax reports omit the levels of income in dividing one percentile from another, and therefore invite biases associated with the attempt to estimate such income levels, the statistics used in this study are fundamentally free of such possible biases.

The statistics on taxable income used in this study provide for various types of income, including business income (subject to the composite income tax),

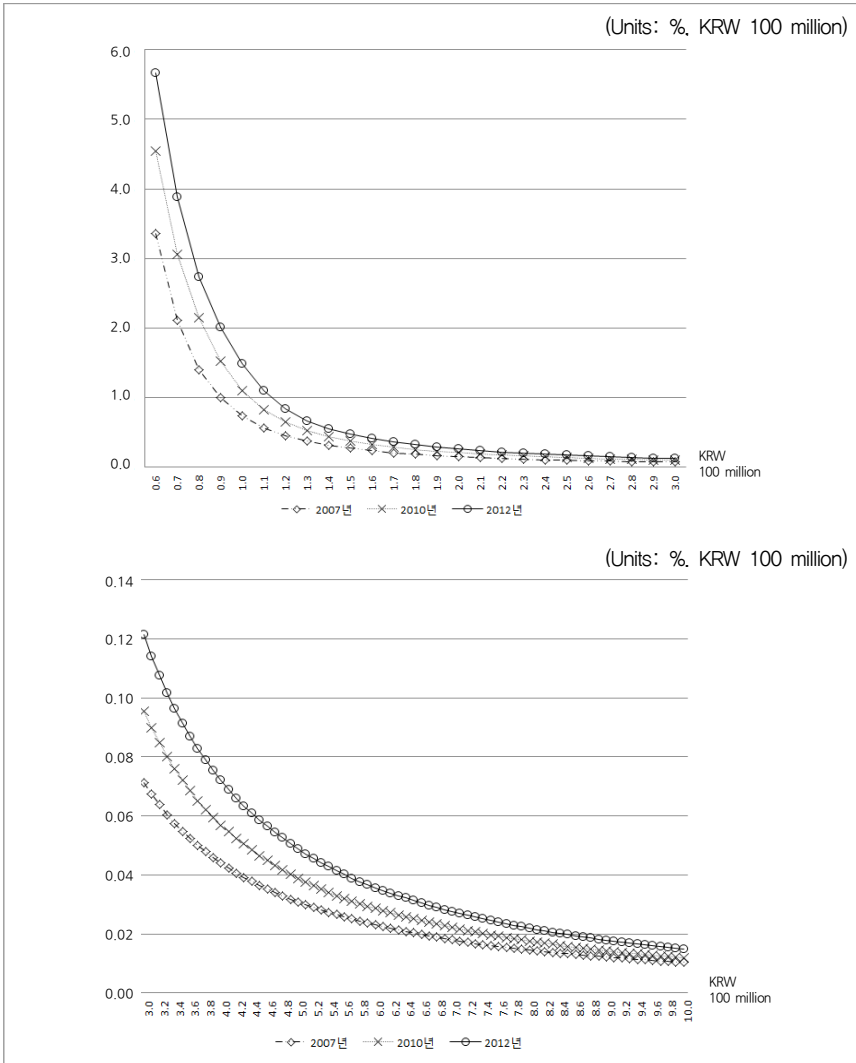
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15) For the years 2007 to 2010, there are official statistics counting persons earning KRW 50 million or more a year. For the years 2011 to 2021, we estimated the number of persons earning KRW 60 million or more a year.

16) The number of income groups throughout the analysis period ranges from 2,762 to 4,240.

17) As in Piketty and Saez (2001), we could first estimate income concentration based on a comparatively longer time series using statistics found in the *Yearbooks*, and then compare our estimates to the estimates we derived from the relatively shorter time series with the more specific income brackets. Comparisons of this kind would allow us to correct income concentration estimates for past years for which such specific income brackets are not available, so as to increase the accuracy of estimates concerning the past.

[Figure II-2] Density Function of the Population in High Income Groups



Note: Concerning the years 2007, 2010, and 2012, the upper parts of the graphs indicate the distribution of people earning between KRW 60 million and KRW 300 million a year, while the lower parts indicate the distribution of people earning between KRW 300 million and KRW 1 billion a year. The base population used for these estimates was the working-age population at age 20 and above.

Source: National Tax Service (NTS).

interest or dividend income, other income, pension income, and wage income. Types of income that are subject to separate rather than composite income tax, such as interest or dividend income, retirement pension income, and capital gains, are omitted from our estimates of income concentration in the highest income group. However, as this study concerns the highest income group, the interest or dividend income this group earns is most likely subject to the global financial income tax. Therefore, the narrower the higher income group, the smaller the portion of interest or dividend income omitted from the estimation process.

## B. Methodology of analysis

In order to estimate income concentration in a certain income quantile, we first need to identify the range of income that defines that quantile and add up the income earned by persons standing on the threshold of that given income bracket or quantile and by persons earning more than the threshold level of income of that quantile. The two main methods used to handle this task are Pareto interpolation and the mean split histogram. Pareto interpolation rests on the assumption that the income in a given income bracket or quantile follows the Pareto distribution pattern. So to use this method, we would need to determine and verify whether the income in the given bracket indeed follows the Pareto distribution pattern. According to Cho et al.(2015) on income distribution in Korea, one cannot nullify the Pareto distribution hypothesis concerning the highest 0.1 percent of income earners or higher, but one's chance of nullifying the Pareto hypothesis increases as we move down the ladder of high income groups, e.g., to the top 0.5 percent, then to the top 1.0 percent, and so on. This study therefore uses the other method, i.e., the mean split histogram to estimate income concentration in the highest income group in Korea.

The mean split histogram method, first formulated in Atkinson(2005) on income concentration in the highest income group in the United Kingdom, is an interpolation technique that is used to locate the thresholds of a given income bracket to which a given income quantile belongs.

Let us label the bottom and topmost thresholds of the income bracket to which a given income quantile belongs  $y_1$  and  $y_2$ , respectively. Now, let  $h_1$  stand for the proportion of population earning  $y_1$  or more in income and let

$h_2$  stand for the proportion of population earning  $y_2$  or more in income. As [Figure II-2] shows, the distribution of the income earned by the highest income group can be expressed as the dots  $H_1 = (y_1, h_1)$  and  $H_2 = (y_2, h_2)$ . Let us suppose that  $\bar{y}$  stands for the average amount of income earned by persons belonging to that income bracket.<sup>18)</sup> The income quantile of our interest,  $h^*$ , is situated somewhere between  $h_2$  and  $h_1$  along the y-axis. Here we need to find the income,  $y^* = y(h^*)$ , corresponding to that income quantile,  $h^*$ , and estimate income concentration as the proportion of the aggregate income of persons earning  $y^*$  or more in total income.

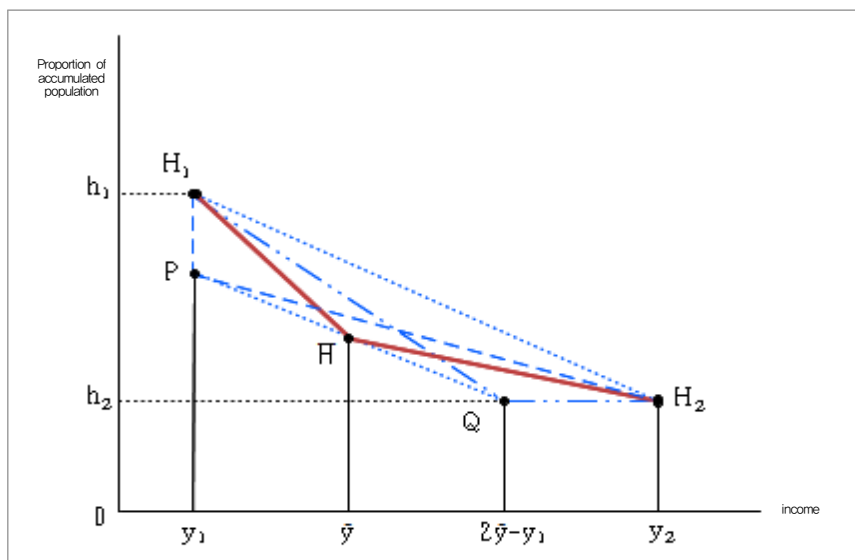
In this situation, the gross lower bound of the income concentration among people belonging to the income quantile,  $h^*$ , arises only if the average income of all persons belonging to the given income bracket amounts to  $\bar{y}$ . On the other hand, the gross upper bound of the same income concentration is found if as many of the persons as possible earning the average income of that bracket are distributed along the top threshold,  $y_2$ , and the rest are distributed along the bottom threshold,  $h_1$ .

If the density function of population to income remains intact or declines as income rises, we can possibly narrow down the gap between the lower and upper bounds of the income concentration. The assumption that the density function of income will not rise in proportion to income is a relatively acceptable one when it comes to the highest income group. As [Figure II-2] shows, the pattern of income distribution in high income groups confirms the rationality of this assumption. In this case, the average income of persons belonging to the same income bracket,  $\bar{y}$ , is located not halfway between  $y_1$  and  $y_2$ , but closer to  $y_1$ . Based on this assumption regarding the density function, we can begin to find a new density function that can narrow the distance between the upper and lower bounds of the given income concentration.

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18) In the highest income group, the higher the income, the smaller the population. Alternatively, the lower the income, the denser the population. Here, the average income,  $\bar{y}$ , of persons belonging to the income bracket between  $y_1$  and  $y_2$  is found not halfway between the two thresholds, but closer to  $y_1$ .

[Figure II-3] Mean Split Histogram Method



Note: The proportion of accumulated population refers to the accumulation of population from the upper right corner of the graph and below, i.e., 1-accumulated distribution function.  
Source: Figure 1 in Atkinson(2005), p. 333, modified by the authors.

First, let us look for a new lower bound to income concentration. In [Figure II-3], look at the point of intersection,  $Q$ , between the income level,  $2\bar{y} - y_1$ , and the proportion of accumulated population,  $h_2$ .<sup>19)</sup> Assume that the lower bound of the original income bracket,  $[y_1, 2\bar{y} - y_1]$ , follows the pattern of equal distribution and that the average income of persons belonging to that bracket equals  $\bar{y}$ . The lines  $H_1Q$  and  $QH_2$  will show the density functions based on this assumption. Given these density functions, and the average income of persons belonging to the income bracket,  $[y_1, y_2]$ , amounting to  $\bar{y}$ , the density function

19) Here the distance between the average income,  $\bar{y}$ , and the income at dot  $Q$ , i.e.,  $2\bar{y} - y_1$  is equal to the distance between the average income,  $\bar{y}$  and  $y_1$ .

of the upper bound of the income bracket,  $[2\bar{y} - y_1, y_2]$ , will equal zero.<sup>20)</sup> This distribution thus serves as a refined lower bound of income concentration, under the assumption that the density function of income does not rise in proportion to income.

Now, let us find a refined upper bound of income concentration. Find the line,  $PQ$ , parallel to the line,  $H_1H_2$ , in [Figure II-3]. The income at the point,  $P$ , marks the bottom threshold of the given income bracket,  $y_1$ . Here, the lines  $H_1P$  and  $PH_2$  are new density functions indicating the average income equaling  $\bar{y}$ . The density functions satisfy the condition that they are not increasing functions. As these two functions satisfy the two given conditions, and locate as many people as possible along the bottom threshold of the income bracket, they serve as refined upper bounds on the income concentration.

In sum, we are able to narrow the gap between the lower and upper bounds of a given income concentration based on the assumption that our density function of income is not an increasing one. We then use Atkinson's mean split histogram to find the representative values of the refined lower and upper bounds of the given income concentration. In [Figure II-3], these are indicated by the lines  $H_1\bar{H}$  and  $\bar{H}H_2$ . Here  $\bar{H}$  indicates the point of intersection along line  $PQ$  with income at  $\bar{y}$  and the proportion of accumulated population at  $\bar{h}$ .

If the income quantile of our interest,  $h^*$ , is larger than  $\bar{h}$ , the corresponding income,  $y^*$ , can be estimated using line  $H_1\bar{H}$ .<sup>21)</sup> Because we know the sum of income belonging to persons in the original income bracket,  $[y_1, y_2]$ , we can find our numerator for income concentration (i.e., the sum of income belonging to the income quantile  $h^*$ ) by adding up the income of the bracket after the sum of income earned by persons earning less than  $y^*$  and the income belonging to the upper income quantiles in that bracket. The sum of income earned by persons earning less than  $y^*$  can be estimated by multiplying the

20) In other words, there are no individuals beyond this upper bound.

21) Conversely, if a given income quantile,  $h^*$ , is smaller than  $\bar{h}$ , the corresponding income,  $y^*$ , can be estimated using line  $\bar{H}H_2$ .

median of the income bracket,  $[y_1, y^*]$ , by the differential in the proportion of accumulated population  $\{h_1, h^*\}$  and by the total population if our income quantile,  $h^*$ , is larger than  $\bar{h}$ .

#### 4 Findings of analysis

In this study, we apply Atkinson's mean split histogram method to the taxable income statistics of 2007 to 2012, available from the NTS, to estimate and analyze the trend in income concentration in the highest income group in Korea. For ease of analysis, we focused our attention on the top five percent, top one percent, top 0.5 percent, top 0.1 percent, and top 0.01 percent of income earners in the country.<sup>22)</sup>

In order to determine the certain income quantile to be analyzed, we need to decide on a few assumptions to apply to given populations. This study uses a number of populations, including the population at age 15 and above, as in Atkinson(2005), the population at age 20 and above, as in Kim(2012) and in Moriguchi and Saez(2010), and the working-age populations at age 15 and above and at age 20 and above, given the fact that the majority of men in their early 20s in Korea are conscripted into military service. Considering the rising college admission rate in Korea, we confine our income concentration analysis to the working-age population at age 20 and above.

Then we determined the threshold income levels of each income quantile under our analysis, together with the real average income of persons earning threshold levels or higher based on the inflation rate. The threshold income levels in our working-age population at age 20 and above continue to decline in the income quantiles of our analysis until 2009, but begin to rise again in 2010 and reach their peak in 2012. The threshold income level of the top one percent, for instance, falls from KRW 105.77 million in 2007 to KRW 105.5 million in 2008 and again to KRW 103.15 million in 2009, before rising to KRW 109.39

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22) We can estimate the income concentration for all income groups including the top five percent and above for all the years under analysis.

million in 2010, to KRW 112.29 million in 2011, and finally to KRW 113.26 million in 2012. As for the top 0.01 percent, the threshold income level falls from KRW 1,199.9 million in 2007 to KRW 1,098.6 million in 2009, before rising back up to KRW 1,179.46 million in 2010 and further to KRW 1,252.76 million in 2012. The same pattern is observed with respect to average income as well.

〈Table II-3〉 Threshold and Average Income of the Highest Income Group

(Unit: KRW 1 million)

		Working-age population 20+		Population 20+	
		Threshold	Average	Threshold	Average
2007	Top 5%	60.4	101.4	59.90	100.65
	Top 1%	105.8	203.3	105.12	201.48
	Top 0.5%	135.7	288.4	134.68	285.57
	Top 0.1%	290.7	721.2	287.68	713.24
	Top 0.01%	1,199.9	2,836.5	1,187.05	2,806.29
2008	Top 5%	60.5	101.2	59.97	100.37
	Top 1%	105.5	201.2	104.85	199.16
	Top 0.5%	134.3	284.9	133.25	281.80
	Top 0.1%	289.4	709.8	286.06	700.97
	Top 0.01%	1,154.4	2,789.2	1,139.15	2,754.98
2009	Top 5%	59.5	99.5	59.05	98.71
	Top 1%	103.1	198.0	102.58	196.16
	Top 0.5%	132.2	281.0	131.14	278.07
	Top 0.1%	288.8	694.1	285.72	686.19
	Top 0.01%	1,098.6	2,700.9	1,087.95	2,669.69
2010	Top 5%	61.2	104.9	60.70	104.03
	Top 1%	109.4	212.4	108.73	210.49
	Top 0.5%	140.5	302.8	139.44	299.73
	Top 0.1%	310.8	753.9	307.60	745.57
	Top 0.01%	1,179.5	2,994.7	1,166.15	2,960.39
2011	Top 5%	62.1	108.0	61.56	107.04
	Top 1%	112.3	222.7	111.53	220.29
	Top 0.5%	144.6	320.2	143.21	316.42
	Top 0.1%	335.2	804.5	330.81	794.27
	Top 0.01%	1,279.9	3,073.0	1,264.40	3,033.94
2012	Top 5%	63.2	108.8	62.74	107.93
	Top 1%	113.3	222.0	112.61	219.93
	Top 0.5%	145.5	318.0	144.31	314.70
	Top 0.1%	332.7	787.4	329.07	778.73
	Top 0.01%	1,252.8	2,998.6	1,238.95	2,965.49

Note: The threshold and average income levels reflect real income levels based on the Consumer Price Index (CPI) of 2012.

The average income of the top one percent, for example, dropped from KRW 203.27 million in 2007 to KRW 198 million in 2009, before rising again to KRW 221.99 million in 2012. The same pattern occurs even when we switch to other populations.<sup>23)</sup>

Now we can estimate the income concentration in each income quantile using the threshold and average income estimates we have obtained. The income concentration in the top five percent of the working-age population at age 20 and above rises steadily from 27.65 percent in 2007 to 29.59 percent in 2011, before taking a slight dip to 28.56 percent in 2012. The same pattern holds true with the top one percent as well (i.e., from 11.08 percent in 2007 to 11.14 percent in 2008, to 11.03 percent in 2009, to 11.71 percent in 2010, to 12.20 percent in 2011, and down to 11.66 percent in 2012). This trend in income concentration remains intact even when we change our population base. Meanwhile, the volatility of income concentration over the six-year period was the smallest in the top five percent of income-earners and the highest in the top 0.01 percent.

The spillover of the global financial crisis in 2009 appears to have caused the marginal drop in income concentration in the highest income group in Korea, such as the 0.26 percentage point decrease in the top five percent, the 0.09 percentage point decrease in the top one percent, and the less than 0.06 percentage point decrease in the other groups. The income-redistributing effect of the financial crisis, however, soon dissipated, with the income concentration in these high income-earners beginning to increase again in 2010, before dropping to the pre-2010 level in 2012. In other words, the global financial crisis may have affected the top income earners adversely, but to a marginal extent and only for a brief period.

This trend in income concentration is rife with policy implications differ markedly from those in Statistics Korea's reports on the Gini coefficients or the highest-quintile-to-lowest-quintile income ratios. Statistics Korea's indicators show income distribution to have deteriorated in 2008 and 2009 but improve since then. To determine the true status of income distribution in Korea today,

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23) The nominal threshold and average income levels, not taking into account the inflation rate, continue to rise year after year.

we need to find and use new indicators based on comprehensive surveys and statistics, such as our income concentration, as substitutes or supplements for Statistics Korea's measures of income distribution.

However, the degree of income concentration may vary depending on which definition of population we use. The differential between the income concentration in the top 0.01 percent of the population at age 20 and above and the income concentration in the top 0.01 percent of the working-age population at age 20 and above may be as marginal as 0.02 percent, since the number of individuals in the top 0.01 percent of the two populations ranges between 67 and 84.

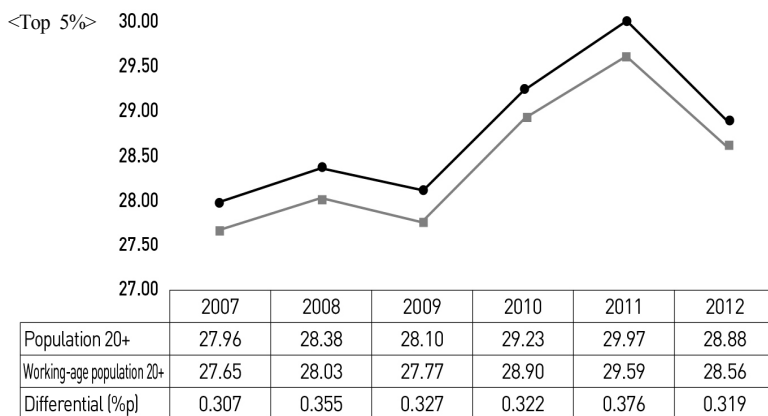
〈Table II-4〉 Income Concentration Estimates and Population-Dependent Differentials

Income group	Population	Code	Unit	Years					
				2007	2008	2009	2010	2011	2012
5%	Population 15+	A		29.40	29.87	29.60	30.75	31.50	30.33
	Population 20+	B	%	27.96	28.38	28.10	29.23	29.97	28.88
	Working-age population 20+	C		27.65	28.03	27.77	28.90	29.59	28.56
	Differentials	A-C B-C	%p	1.75 0.31	1.85 0.35	1.83 0.33	1.85 0.32	1.91 0.38	1.77 0.32
1%	Population 15+	A		11.70	11.79	11.69	12.38	12.89	12.29
	Population 20+	B	%	11.19	11.26	11.17	11.83	12.33	11.77
	Working-age population 20+	C		11.08	11.14	11.05	11.71	12.20	11.66
	Differentials	A-C B-C	%p	0.62 0.11	0.65 0.12	0.64 0.11	0.67 0.12	0.69 0.14	0.64 0.11
0.50%	Population 15+	A		8.26	8.30	8.25	8.77	9.21	8.75
	Population 20+	B	%	7.93	7.97	7.92	8.42	8.86	8.42
	Working-age population 20+	C		7.86	7.89	7.84	8.35	8.77	8.35
	Differentials	A-C B-C	%p	0.39 0.07	0.41 0.08	0.41 0.07	0.43 0.07	0.44 0.09	0.41 0.07
0.10%	Population 15+	A		4.10	4.11	4.05	4.34	4.61	4.32
	Population 20+	B	%	3.96	3.96	3.91	4.19	4.45	4.17
	Working-age population 20+	C		3.93	3.93	3.87	4.16	4.41	4.13
	Differentials	A-C B-C	%p	0.17 0.03	0.18 0.03	0.18 0.03	0.19 0.03	0.20 0.04	0.18 0.03
0.01%	Population 15+	A		1.62	1.61	1.57	1.72	1.76	1.64
	Population 20+	B	%	1.56	1.56	1.52	1.66	1.70	1.59
	Working-age population 20+	C		1.55	1.54	1.51	1.65	1.68	1.57
	Differentials	A-C B-C	%p	0.07 0.01	0.07 0.01	0.07 0.01	0.07 0.01	0.08 0.02	0.07 0.01

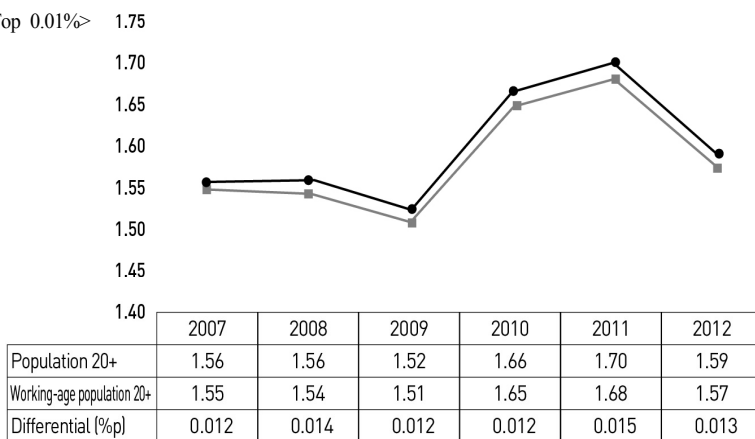
[Figure II-4] Population-Dependent Differentials in Income Concentration

(Unit: %)

<Top 5%>



<Top 0.01%>



● Population 20+      ■ Working-age population 20+

However, the differential widens to 0.30 to 0.38 percent with respect to the top five percent. The switch from the working-age population at age 20 and above to the population at age 20 and above causes the number of individuals included in the top five percent to change from 33,000 to 42,000. This population-dependent gap in income concentration is likely to grow larger as we move down the income hierarchy to the top 10 percent and beyond. If we switch our population base to the population at age 15 and above, as used in Atkinson(2005), the income concentration in the top five percent begins to differ by 1.75 to 1.91 percent, as shown in <Table II-4>. It is therefore crucial for researchers to decide upon a population base that adequately reflects the tax regime and the social and economic characteristics of a given society, and then to adhere consistently to that population base.

The comparison of our estimates with those in Kim and Kim(2014) show the latter to be relatively more accurate with respect to the top one percent. However, the estimates on income concentration in Kim and Kim(2014) with respect to the higher income groups abound with significant errors. The study, for instance, overestimates income concentration in the top five percent by 0.53 percent in 2007, by 0.39 percent in 2008, by 0.47 percent in 2009, and by 1.21 percent in 2012, even when using the same population base. With respect to the years 2010 and 2011, Kim and Kim(2014) underestimates income concentration marginally and yet significantly. The *Yearbooks* provide relatively detailed data concerning the recent six years from 2007 to 2012, but fail to provide as detailed information on the years 2005 and earlier, thus contributing to the likelihood of errors.

〈Table II-5〉 Comparison to Kim and Kim(2014)

Year	Income quantile	Threshold income (in KRW 1 million)			Average income (in KRW 1 million)			Income concentration (%)			Differential (bp)	
		Working-age population 20+	Population 20+	WTID (Korea)	Working-age population 20+	Population 20+	WTID (Korea)	Working-age population 20+A	Population 20+B	WTID (Korea)C	C-A	C-B
2007	5%	60.4	59.9	62.3	101.4	100.7	102.4	27.65	27.96	28.49	0.84	0.53
	1%	105.8	105.1	103.6	203.3	201.5	202.9	11.08	11.19	11.28	0.20	0.09
	0.50%	135.7	134.7	134.6	288.4	285.6	287.4	7.86	7.93	7.99	0.13	0.06
	0.10%	290.7	287.7	288.8	721.2	713.2	719.0	3.93	3.96	4.00	0.07	0.04
	0.01%	1,199.9	1,187.1	1,152.0	2,836.5	2,806.3	2,895.5	1.55	1.56	1.61	0.06	0.05
2008	5%	60.5	60.0	61.9	101.2	100.4	101.6	28.03	28.38	28.77	0.74	0.39
	1%	105.5	104.8	104.8	201.2	199.2	200.8	11.14	11.26	11.37	0.23	0.11
	0.50%	134.3	133.2	134.7	284.9	281.8	284.1	7.89	7.97	8.05	0.16	0.08
	0.10%	289.4	286.1	291.7	709.8	701.0	706.3	3.93	3.96	4.00	0.07	0.04
	0.01%	1,154.4	1,139.1	1,132.0	2,789.2	2,755.0	2,785.7	1.54	1.56	1.58	0.04	0.02
2009	5%	59.5	59.1	60.5	99.5	98.7	99.9	27.77	28.10	28.57	0.80	0.47
	1%	103.1	102.6	103.5	198.0	196.2	198.1	11.05	11.17	11.33	0.28	0.16
	0.50%	132.2	131.1	133.8	281.0	278.1	280.7	7.84	7.92	8.03	0.19	0.11
	0.10%	288.8	285.7	291.6	694.1	686.2	692.3	3.87	3.91	3.96	0.09	0.05
	0.01%	1,088.6	1,088.0	1,102.2	2,700.9	2,669.7	2,713.1	1.51	1.52	1.55	0.04	0.03
2010	5%	61.2	60.7	61.3	104.9	104.0	104.3	28.90	29.23	29.17	0.27	-0.06
	1%	109.4	108.7	112.9	212.4	210.5	210.3	11.71	11.83	11.76	0.05	-0.07
	0.50%	140.5	139.4	146.0	302.8	299.7	298.9	8.35	8.42	8.36	0.01	-0.06
	0.10%	310.8	307.6	306.3	753.9	745.6	748.6	4.16	4.19	4.19	0.03	0.00
	0.01%	1,179.5	1,166.1	1,191.7	2,994.7	2,960.4	2,946.7	1.65	1.66	1.65	0.00	-0.01

〈Table II-5〉 Continue

Year	Income quantile	Threshold income (in KRW 1 million)			Average income (in KRW 1 million)			Income concentration (%)			Differential (%p)	
		Working-age population 20+	Population 20+	WTID (Korea)	Working-age population 20+	Population 20+	WTID (Korea)	Working-age population 20+A	Population 20+B	WTID (Korea) C	C-A	C-B
2011	5%	62.1	61.6	61.7	108.0	107.0	107.3	29.59	29.97	29.86	0.27	-0.11
	1%	112.3	111.5	108.1	222.7	220.3	220.0	12.20	12.33	12.25	0.05	-0.08
	0.50%	144.6	143.2	153.8	320.2	316.4	313.0	8.77	8.86	8.71	-0.06	-0.15
	0.10%	335.2	330.8	331.8	804.5	794.3	795.3	4.41	4.45	4.43	0.02	-0.02
	0.01%	1,279.9	1,264.4	1,273.3	3,073.0	3,033.9	3,028.3	1.68	1.70	1.69	0.01	-0.01
2012	5%	63.2	62.7	62.4	108.8	107.9	108.3	28.56	28.88	30.09	1.53	1.21
	1%	113.3	112.6	111.1	222.0	219.9	220.1	11.66	11.77	12.23	0.57	0.46
	0.50%	145.5	144.3	156.6	318.0	314.7	310.1	8.35	8.42	8.62	0.27	0.20
	0.10%	332.7	329.1	331.4	787.4	778.7	782.8	4.13	4.17	4.35	0.22	0.18
	0.01%	1,252.8	1,239.0	1,250.8	2,998.6	2,965.5	2,974.7	1.57	1.59	1.65	0.08	0.06

Note: WTID stands for Korea's share in the World Top Income Database, upon which Kim (2012) is based. The threshold and average income amounts represent real income based on the CPI of 2012.

Sources: Authors' own estimations; Alvarado, Facundo, Anthony B. Atkinson, Thomas Piketty and Emmanuel Saez, *The World Top Income Database*, <http://topincomes.g-mond.parisschoolofeconomics.eu/> (accessed September 11, 2014).

## 5 Conclusion

In this section we analyzed the trend in income concentration in the highest income group in Korea to identify the current reality of the country's income distribution. The conventional measures, such as the Gini coefficients and the highest-quintile-to-lowest-quintile income ratios, are based on unreliable surveys that tend to underrepresent the highest income group. That is why we needed to resort to income concentration as an alternative measure of income distribution.

To this end, we used internal data of the NTS that go over and beyond the limits of the income tax statistics provided in the NTS's *Yearbooks of National Tax Statistics*. The NTS's internal data are free of overlaps between composite income taxpayers and wage income taxpayers, saving us the need to make and rely on arbitrary assumptions to remove such overlaps. Moreover, the internal data divide the population according to the income level in the increments of KRW 10 million, and the total number of income brackets they encompass ranges from 2,760 to 4,240.

Given these advantages of the data, we also used the mean split histogram, formulated in Atkinson(2005), to estimate the income concentration in Korea's highest income group during the years 2007 to 2012. When we base our estimates on the working-age population at age 20 and above, income concentration in the top one percent tends to grow from year to year, from 11.08 percent in 2007 to 11.14 percent in 2008, to 11.05 percent in 2009, to 11.71 percent, and to 12.20 percent in 2011, before taking a dip to 11.66 percent in 2012. The latest global financial crisis, then, does not appear to have exerted a lasting and far-reaching impact on the income concentration in the highest income group. The dip in income concentration in 2012 appears to reflect the continuing post-crisis recession and not anything unique to the highest income group.

This trend in income concentration provides implications quite different from Statistics Korea's conventional measures of income distribution, such as the Gini coefficients and the highest-quintile-to-lowest-quintile income ratios. Basing its conclusions on these two conventional measures, Statistics Korea states that income distribution worsened in Korea in the years 2008 and 2009 but has been improving ever since. Our estimates of income concentration contradict this,

however, and suggest the need to find and develop measures, such as income concentration, that more accurately reflect the reality of income distribution.

There are also high income groups whose income concentration rates differ significantly, depending on which population base is used. It is therefore crucial for researchers to decide on the population base that adequately reflects the tax regime and socioeconomic characteristics of a given society and to adhere consistently to that population base.

The comparison of our estimates with those in Kim and Kim(2014), as listed in the World Top Income Database, show the latter to be relatively more accurate with respect to the top one percent. However, the estimates on income concentration in Kim and Kim(2014) with respect to the top five percent and the top one percent have significant errors. As we begin to include low income groups, such as the top 10 percent, in our income concentration analysis, these errors are likely to increase. The errors also indicate the likelihood of further errors concerning 2005 and earlier, for which few income brackets are available.

It is important for statistical authorities in Korea to gather and process their data in a manner that allows researchers to analyze income by source and over longer stretches of time. Only when researchers have such data can they understand how and why income inequality has evolved throughout the economic development process in Korea.

# III

## Analysis of Income Mobility and Decisive Factors

### 1 Research background

Interest in the structure of income distribution and how it affects social integration and sustainable development is growing rapidly worldwide. Numerous studies over recent years, analyzing the changes in the structures of income distribution in various countries, conclude that income distribution has been worsening worldwide and that its improvement will require conscious policy efforts (Piketty, 2003; Piketty and Saez, 2006, etc.). Others have also analyzed how income distribution affects economic growth (van der Weide and Milanovic, 2014; Dollar et al., 2014, etc.).

Income distribution has been steadily deteriorating in Korea since the days of the Asian Financial Crisis of 1997 due to the rapid transformation of the country's industrial structure and the growing size of its aging population. As the demand for greater guarantees of old-age income and better income-redistribution in the tax system continues to rise, policymakers and researchers have been undertaking diverse studies on the extent and causes of growing income inequality in the search for policy solutions that will achieve greater social integration.

However, viable solutions can only come based upon an accurate understanding of income mobility because it is a core feature of income distribution.

Friedman(1962), for example, argues that the only way out of deteriorating

income distribution is to encourage and increase income mobility among income brackets. Others have shown how income mobility can serve as an indicator of income equality and how it contributes to the lessening of inequality in lifetime income rather than in single-year income (Shorrocks, 1978; Atkinson et al., 1982). If income brackets are mobile, the degree of income inequality observed with respect to a certain year tends to become irrelevant, as income mobility helps to equalize income over a lifetime. That is why the inequality of lifetime income and not single-year income should be of primary concern for governments (Massoumi, 1998).<sup>24)</sup>

In analyzing income mobility, it is crucial to use panel data, as these data allow researchers to trace the paths along which changes in individual income take place and better capture income mobility. The relatively more accessible cross-sectional data provide good indicators of how single-year income is distributed, but fail to capture changes in individual income as a result of accumulated human capital, etc., and therefore fundamentally limit researchers' ability to capture income mobility. Panel data accumulated over long stretches of time also provide clear information on changes in income levels throughout individuals' lifetimes. By using panel data, we can minimize the impact of transitory income shocks that affect mobility between income brackets as such shocks are only short lived.

In analyzing income mobility in Korea, we also need to identify the influence of population aging on income distribution. Retirement-caused mobility among income brackets conceptually differs from mobility among the income brackets of economically active individuals. Changes in income due to retirement are natural consequences of quitting work, and the scope for policy intervention is more limited than for other causes of income changes, such as poverty. Changes in the incomes of working people therefore warrant greater policy attention. Accordingly, deterioration of income distribution due to the increase in the number of retirees should be approached from a different perspective to that for the deteriorating income distribution among working people.

In the following section, we introduce an analysis model capable of correcting

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24) Re-quoted in Kim, Jeon and Lim(2012).

measurement errors in income variables. Our model is intended to help us maintain a consistency in the estimates we obtain.

## 2 Literature review

Income mobility is increasingly emerging as a central topic of studies on income distribution both in and outside Korea. We surveyed the established literature on this topic in search of diverse definitions of income mobility and proper policy solutions for its different states.

Gottschalk and Danziger(1997) use the Panel Study of Income Dynamics (PSID) data to analyze changes in household income in the United States, successfully demonstrating a high level of income mobility there. Jarvis and Jenkins(1998) use the British Household Panel Survey data to analyze changes in the ordinary income of British households. These authors also show that the longer the time spans over which income data are gathered, the greater the extent of income mobility becomes.

Numerous studies have been done not only on income changes, but also on the decisive factors underlying them. Yet proper policy solutions require a keen understanding of the factors that prompt changes in income. Woolard and Klasen(2005), for instance, measure income mobility in South Africa for the period of 1993 to 1998 and find a significantly higher degree of income mobility in that country than in advanced economies. It was chiefly affected by demographic factors and changes in the employment status of individuals. Shi et al.(2010), in an analysis of the factors of income changes in non-urban regions of China during the period of 1989 to 2006, concludes that a lower initial income level, a greater weight of wage income in the income portfolio, a higher level of educational attainment, and a younger age resulted in greater income mobility. These authors also demonstrate that the changing weight of wage income, the changing ratio of people working in non-agricultural sectors, and the changes in the average number of schooling years are major factors that explain changes in income levels.

In Korea, Ham(2005) applies the source-by-source decomposition technique

of Shorrocks(1982) to the Korean Labor and Income Panel Study(KLIPS) data from 1997 to 2001 to determine the respective contributions of different types of income to income inequality. The author also estimates the probability of income mobility for each income bracket. Seok(2009) similarly uses the KLIPS data from the first nine years of KLIPS data to estimate the probability of income mobility, while analyzing factors of income mobility to forecast the likelihood of the perpetuation of poverty. Seok concludes that women heads of households and the elderly are more vulnerable to the risk of staying permanently poor.

Choi and Hong(2011) also use the data from the first 11 KLIPSs to estimate the elasticity coefficients of intergenerational income and use them to derive implications on income mobility. Their analysis shows a strong correlation between fathers' wage income and sons', suggesting the likelihood of income inequality lasting for generations. Kim, Jeon and Lim(2012) use the KLIPS data for the years 1999 to 2008 to analyze income mobility and determine the decisive factors influencing it. They conclude that the greater the number of persons employed, the smaller the initial income, the more occupational training, and the less social security benefits received, the greater the upward income mobility.

For our part, we use the Fiscal Panel Data from KIPF, which provide accurate income information based on the reported income data gathered by the NTS, to analyze income mobility among households in Korea and the decisive factors that influence it. The Fiscal Panel Data are gathered along with income reports filed with the NTS, and therefore they are free of the measurement errors of income that affect other survey-type data gathering methods.<sup>25)</sup> In addition, to isolate the effect of rapid population aging and retirement from the effects of other changes on the labor market, we analyzed the income mobility of working generations separately. In identifying income mobility, we also examined the year-to-year differences in income mobility rates to distinguish the influences

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25) According to the sixth Fiscal Panel Study of 2012, 64.8 percent of income tax report-filing households had submitted income statements and records to the NTS. The ratio rose to 73.3 percent among wage earners and dropped to 42.4 percent among composite income earners.

of transitory income shocks from income mobility throughout the income lifetime. By explicitly taking into account measurement errors that may be included in income variables, we enhance the validity of our regression analysis.

### 3 Measuring income mobility

#### A. Data

In an attempt to measure income mobility among Korean households, we used the Fiscal Panel Data for the years 2008 to 2012. These data of relatively recent history provide highly reliable information on income distribution in Korea as they are gathered along with income data reported to the NTS. The ratio of households filing proof of income statements to the NTS has increased dramatically throughout the six years under our analysis, from 42.3 percent in 2008 to 64.8 percent in 2012. However, the ratio of households without any members filing income tax reports with the NTS still hovers around the

〈Table III-1〉 Fiscal Panel Studies and the Ratios of Income Report-Filing Households  
(Unit: %)

	2008	2009	2010	2011	2012
Households	47.4 (1,327)	53.8 (1,491)	60.0 (1,661)	61.5 (1,695)	62.3 (1,785)
Household members	42.3 (1,430)	46.3 (1,593)	52.5 (1,797)	52.8 (1,845)	64.8 (2,006)
Wage earners	47.2 (1,217)	52.5 (1,344)	59.2 (1,508)	57.9 (1,531)	73.3 (1,646)
Composite income earners	26.4 (213)	28.4 (249)	33.0 (289)	36.9 (314)	42.4 (360)

Notes: 1. The ratios of households filing income tax reports represent the ratios of households with *individual members* that filed income tax reports with the NTS. About 50 percent of all households have such report-filing members. The ratios of household members represent the number of individuals among the 3,400 persons who filed composite or wage income tax reports with the NTS and that provided income statements and records.

2. The numbers in parentheses indicate the number of households or individuals.

50-percent range throughout the analysis period, forcing us to rely on self-answered surveys to estimate the income of these households. We also excluded the first Fiscal Panel Study of 2007 from our analysis because KIPF expanded its range of samples beginning in 2008 with a second study to overcome the high omission rate in the first year's study.

The summary statistics show that the average household income rose from KRW 33.7 million in 2008 to KRW 37.5 million in 2010, before dropping marginally to KRW 36.3 million in 2011 and to KRW 35.9 million in 2012. The same pattern of change is evident in the changes in market income, not accounting for publicly transferred income. However, the total income per capita, adjusted by the number of household members, kept rising until 2011 before dropping to the 2010-level in 2012. In other words, the decrease in the number of household members appears to explain the decline in the level of household income.

To isolate the effect of rapid population aging and the dramatic growth in the number of retiree households, we also excluded persons aged 60 or above<sup>26)</sup> from our definition of population. In that case, the total household income appears to increase steadily until 2012, i.e., from KRW 39.0 million in 2008 to KRW 43.6 million in 2010 and again to KRW 44.2 million in 2012. Given the relatively little fiscal support for working-age generations, the same pattern is observed with respect to market income as well.

We took into account the effect of the changing sizes of households by estimating the total income per capita per household, which kept increasing without ever dropping throughout the analysis period, from KRW 13.2 million in 2008 to KRW 15.1 million in 2012.

These changes in statistics indicate that a failure to isolate the increase in the number of retiree and elderly households (with household heads aged 60 or older) and the changing number of household members may cause errors in our statistical interpretations.

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26) Retirement age varies from individual to individual, but we have assumed the standard retirement age of 60 for the ease of analysis. The National Pension also recognizes 60 as the common retirement age, at which participants are no longer required to make contributions to the pension scheme.

<Table III-2> Household Income Levels: All Households

(Unit: KRW 10,000)

Year		2008	2009	2010	2011	2012
		(FPS II)	(FPS III)	(FPS IV)	(FPS V)	FPS (VI)
Earned income	Average	3,080.7	3,148.8	3,383.7	3,271.4	3,155.8
	S.D.	2,822.2	3,336.7	3,326.6	3,185.9	3,314.4
	Median	2,539.1	2,559.5	2,800.0	2,652.9	2,371.1
	Minimum	0.0	0.0	0.0	0.0	0.0
	Maximum	41,259.8	100,681.6	93,000.0	38,452.9	70,850.6
	Skewness	2.37	7.72	4.71	2.69	4.23
	Coefficient of variation	0.92	1.06	0.98	0.97	1.05
Market income	Average	3,186.9	3,259.5	3,520.6	3,406.6	3,318.3
	S.D.	2,895.4	3,378.7	3,408.3	3,281.7	3,512.7
	Median	2,568.7	2,573.9	2,880.0	2,769.2	2,540.5
	Minimum	0.0	0.0	0.0	0.0	0.0
	Maximum	43,375.7	100,681.6	93,000.0	45,183.7	70,850.6
	Skewness	2.49	7.51	4.57	3.05	4.78
	Coefficient of variation	0.91	1.04	0.97	0.96	1.06
Total income	Average	3,370.0	3,486.0	3,751.0	3,626.2	3,586.8
	S.D.	2,827.7	3,304.9	3,331.1	3,194.9	3,424.6
	Median	2,693.5	2,864.2	3,000.0	2,884.6	2,822.7
	Minimum	0.0	0.0	0.0	0.0	0.0
	Maximum	43,375.7	100,681.6	93,000.0	45,183.7	70,850.6
	Skewness	2.65	7.91	4.81	3.22	5.02
	Coefficient of variation	0.84	0.95	0.89	0.88	0.95
Total income per capita	Average	1,191.3	1,222.5	1,318.2	1,332.0	1,316.1
	S.D.	986.3	1,070.6	1,124.1	1,110.9	1,149.7
	Median	963.3	1,010.0	1,055.3	1,111.1	1,088.4
	Minimum	0.0	0.0	0.0	0.0	0.0
	Maximum	21,687.8	25,170.4	31,000.0	15,061.2	23,616.9
	Skewness	4.44	6.31	5.35	3.82	5.52
	Coefficient of variation	0.83	0.88	0.85	0.83	0.87

Notes: 1. The earned income represents the sum of wage income and business income. The market income includes earned, property, and pre-transferred income. The total income includes both the market income and the publicly transferred income.

2. The average income is estimated by applying the cross-sectional weight to each year's statistics.

〈Table III-3〉 Household Income Levels: Working-Age Households (with Household Heads under the Age of 60)

(Unit: KRW 10,000)

Year		2008	2009	2010	2011	2012
		(FPS II)	(FPS III)	(FPS IV)	(FPS V)	FPS (VI)
Earned income	Average	3,707.0	3,816.6	4,126.4	4,067.6	4,150.4
	S.D.	2,781.7	3,425.2	3,362.0	3,204.1	3,392.0
	Median	3,173.8	3,191.6	3,595.0	3,461.5	3,387.3
	Minimum	0.0	0.0	0.0	0.0	0.0
	Maximum	41,259.8	100,681.6	93,000.0	38,452.9	70,850.6
	Skewness	2.6	8.8	5.5	3.0	5.0
	Coefficient of variation	0.8	0.9	0.8	0.8	0.8
Market income	Average	3,798.4	3,902.4	4,243.6	4,186.5	4,297.2
	S.D.	2,866.0	3,468.6	3,464.8	3,326.1	3,638.0
	Median	3,173.8	3,294.6	3,600.0	3,461.5	3,528.4
	Minimum	0.0	0.0	0.0	0.0	0.0
	Maximum	43,375.7	100,681.6	93,000.0	45,183.7	70,850.6
	Skewness	2.7	8.5	5.2	3.3	5.5
	Coefficient of variation	0.8	0.9	0.8	0.8	0.8
Total income	Average	3,900.7	4,034.7	4,364.1	4,296.7	4,423.8
	S.D.	2,848.1	3,445.8	3,446.2	3,312.8	3,613.3
	Median	3,271.2	3,437.7	3,607.0	3,607.7	3,717.5
	Minimum	0.0	0.0	0.0	0.0	0.0
	Maximum	43,375.7	100,681.6	93,000.0	45,183.7	70,850.6
	Skewness	2.8	8.7	5.2	3.4	5.5
	Coefficient of variation	0.7	0.9	0.8	0.8	0.8
Total income per capita	Average	1,320.0	1,350.5	1,453.2	1,497.6	1,505.4
	S.D.	1,019.7	1,132.2	1,161.3	1,184.9	1,227.9
	Median	1,079.1	1,126.9	1,200.0	1,221.8	1,270.2
	Minimum	0.0	0.0	0.0	0.0	0.0
	Maximum	21,687.8	25,170.4	31,000.0	15,061.2	23,616.9
	Skewness	4.7	6.6	5.3	3.8	5.7
	Coefficient of variation	0.8	0.8	0.8	0.8	0.8

Notes: 1. The earned income represents the sum of wage income and business income. The market income includes earned, property, and pre-transferred income. The total income includes both the market income and the publicly transferred income.

2. The average income is estimated by applying the cross-sectional weight to each year's statistics.

## B. Mobility among income brackets

### 1) Income distribution by bracket

Following the standard set by the Organization for Economic Cooperation and Development (OECD), we divided the FPS households into three categories; namely, the low-income class (earning less than 50 percent of the median income); the middle class (earning 50 to 150 percent of the median income); and the high-income class (earning over 150 percent of the median income).

Under this categorization, we can see that the respective ratios of low-income and high-income classes have been on rise since 2011, while the middle class has been dwindling. The size of the middle class has shrunk noticeably, in terms of both total income and market income. In the meantime, thanks to the publicly transferred income from the government, the ratio of low-income households is relatively smaller in terms of total income than in terms of market income. The gap in the size of the low-income class between these two income standards has been decreasing somewhat, from 4.2 percentage point (24.7 percent vs. 28.9 percent) in 2008 to 3.1 percentage point (26.0 percent vs. 29.1 percent), suggesting a diminishing impact of publicly transferred income on the household income portfolio.

However, once we isolate retiree households from our population, we begin to see a different pattern. Among the working-age households, the ratios of the low-income and middle classes have been decreasing consistently, while the ratio of the high-income class has been increasing. This contraction of the low-income class is evident whether we use the market income or the total income as our standard.

The steady and significant decrease in the size of the low-income class appears to indicate that the Korean labor market is functioning effectively. Therefore, we can conclude that the apparent deterioration of income distribution in Korea reflects the abrupt increase in the number of retiree and elderly households earning less than they used to while working.

〈Table III-4〉 Changing Class Makeup of Households: All Households

	2008	2009	2010	2011	2012
<b>In terms of total income (%)</b>					
Low-income	24.7	24.5	24.3	26.5	26.0
Middle	44.8	47.4	46.1	42.4	41.3
High-income	30.4	28.1	29.6	31.2	32.6
Total	100.0	100.0	100.0	100.0	100.0
<b>In terms of market income (%)</b>					
Low-income	28.9	27.5	27.3	29.0	29.1
Middle	40.0	40.3	40.8	36.6	37.1
High-income	31.1	32.2	31.9	34.4	33.8
Total	100.0	100.0	100.0	100.0	100.0

〈Table III-5〉 Changing Class Makeup of Households: Working-Age Households

	2008	2009	2010	2011	2012
<b>In terms of total income (%)</b>					
Low-income	14.1	14.0	12.6	12.4	11.9
Middle	48.6	51.6	51.0	46.6	44.6
High-income	37.3	34.4	36.4	41.0	43.5
Total	100.0	100.0	100.0	100.0	100.0
<b>In terms of market income (%)</b>					
Low-income	16.2	14.7	13.6	12.0	11.6
Middle	45.6	45.5	46.7	42.0	42.9
High-income	38.3	39.9	39.8	46.0	45.6
Total	100.0	100.0	100.0	100.0	100.0

Note: The "working-age households" refer to households whose heads are under the age of 60.

## 2) Income mobility by class

Among all the FPS households, the upward income mobility from 2008 to 2012 amounts to 17.4 percent on average, higher than the low income mobility of 15.0 percent. This relatively higher upward mobility indicates the stability of the income-changing structure in Korea. When we remove publicly transferred income and analyze households in terms of market income only, the upward

and downward income mobility rates reach 16.3 percent and 14.2 percent, respectively, thus attesting to the power of publicly transferred income to enhance the upward income mobility of households.

Considering the typically reverse U-shaped age-wage structure of individuals, it is not surprising that the half-life income mobility rates, reflecting structural changes in individuals' employment status, are higher than the single-year income mobility rates. Single-year income mobility rates reflect little of structural changes headed in consistent directions and more of transitory shocks that tend to revert to the average. Thus, the half-life income mobility rates, based on the lifetime perspective, also diverge significantly from single-year income mobility rates. If we used the single-standard rates alone, we could err on the side of underestimating income mobility. So single-year rates serve better as indicators of the larger trend in income mobility than as true indicators of income mobility per se.

From 2008 to 2012, the ratio of households remaining in the same income class was 67.7 percent in terms of total income and 69.5 percent in terms of market income. When we break down this trend year by year, however, the ratios rise significantly, ranging from 75 to 77 percent and from 76 to 79 percent, respectively. Single-year income mobility rates, then, could also tempt us to overestimate the tenacity of income classes.

〈Table III-6〉 Income Mobility Trend: All Households

(Unit: %)

Income type	Direction	2008–2009	2009–2010	2010–2011	2011–2012	2008–2012
Total income	Upward	11.7	13.6	12.0	12.2	17.4
	Remaining	75.2	74.9	76.6	77.3	67.7
	Downward	13.2	11.5	11.4	10.4	15.0
Market income	Upward	13.0	11.6	10.4	10.1	16.3
	Remaining	76.9	75.9	77.8	79.1	69.5
	Downward	10.2	12.5	11.8	10.8	14.2

If we look at the income mobility rates of each class in terms of total income,<sup>27)</sup> the likelihood of low- and high-income households remaining in the same classes is steadily on the rise, while the likelihood of middle-class

households remaining in the same class is clearly decreasing. In other words, the probability of a household remaining in the middle-class range is diminishing due to the widening income gap among the classes. More specifically, the probability of a low-income household remaining in the same class has increased from 18 percent a year to 20 percent a year, suggesting the perpetuation of poverty. From the half-life perspective, taking into account the wage-age effect, the probability remains in the 18-percent range.

The probability of high-income households remaining in the same class has also increased, from 23 percent to 25.8 percent. The probability of remaining in the same class for middle-class households, on the other hand, has dropped from 34 percent to 31 percent, thus suggesting that the structure of income distribution in Korea increasingly supports growing income inequality. From the half-life perspective, the probability of middle-class households remaining in the same class is even lower, at 26.8 percent.

The probabilities of the low-income class moving into the middle-class and the middle class moving into the low-income class are also on the decline, with the former indicating the growing difficulty low-income households have in escaping poverty and the latter indicating the growing stability of economic activities. Even so, the probability of low-income households moving into the middle class is relatively greater than the probability of middle-class households falling into the low-income class, which indicates the relative stability of the income mobility structure in Korea.

Once we remove the effect of the income-redistributing publicly transferred income, income inequality becomes even greater. In terms of market income, low-income households are much more likely to remain in the same class or much less likely to escape their class. The probability of escaping the low-income class remains greater than the probability of falling into the low-income class, but the two probabilities have become almost identical in the recent years. The probability of high-income households remaining in the same class is also rapidly on the rise, attesting to the significant growth in income inequality in Korea.

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27) In the following, “1” stands for the low-income class, “2,” for the middle class, and “3,” for the high-income class.

<Table III-7> **Income Mobility Trend: All Households**

(Unit: %)

Income type	Direction	2008–2009	2009–2010	2010–2011	2011–2012	2008–2012
Total income	1→1	18.4	17.8	19.2	20.3	18.0
	1→2	6.1	6.2	4.6	5.5	7.7
	1→3	0.3	0.5	0.4	0.6	0.7
	2→1	5.7	5.9	5.0	5.0	7.0
	2→2	33.7	34.6	34.3	31.2	26.8
	2→3	5.3	6.9	6.9	6.1	9.0
	3→1	0.6	0.4	0.9	0.7	1.1
	3→2	6.9	5.3	5.6	4.8	6.8
	3→3	23.1	22.5	23.1	25.8	22.9
	Total		100.0	100.0	100.0	100.0
Market income	1→1	22.0	21.1	21.9	23.3	21.0
	1→2	6.3	5.2	4.5	4.7	6.7
	1→3	0.4	0.5	0.4	0.6	1.0
	2→1	4.6	5.0	4.8	4.7	6.4
	2→2	29.2	29.9	30.8	27.3	24.0
	2→3	6.2	5.9	5.5	4.8	8.6
	3→1	0.7	0.6	0.9	0.6	1.4
	3→2	4.9	6.9	6.1	5.5	6.5
	3→3	25.7	24.9	25.1	28.5	24.5
	Total		100.0	100.0	100.0	100.0

Notes: 1. The mobility rates were obtained by applying the cross-sectional weight of each year.

2. "1" stands for the low-income class, "2," for the middle class, and "3," for the high-income class.

The income mobility rates across the three classes provide important indicators of income distribution of the following years. Table 13 shows that, while the likelihood of remaining in the middle class continues to fall below those of the other classes, the likelihood of remaining in either the lower- or high-income class continues to grow over time, along with growing income inequality. Income mobility rates, however, do not reflect the changing class makeup in the population and therefore require some caution in interpretation. If, for example, the size of the low-income class shrinks, the income mobility rate of the low-income class the following year may appear to reflect an increased tenacity of poverty. It is crucial, then, to take into account both the likelihood of remaining in the same class from year to year and the changing class makeup of the population.

〈Table III-8〉 Income Mobility Rates by Year: All Households

(In terms of total income)

		2009			Total
		Low-income	Middle	High-income	
2008	Low-income	74.4%	24.6%	1.0%	100.0%
	Middle	12.8%	75.3%	11.9%	100.0%
	High-income	1.9%	22.6%	75.6%	100.0%
		2010			Total
		Low-income	Middle	High-income	
2009	Low-income	72.6%	25.2%	2.2%	100.0%
	Middle	12.3%	73.1%	14.6%	100.0%
	High-income	1.4%	18.7%	79.9%	100.0%
		2011			Total
		Low-income	Middle	High-income	
2010	Low-income	79.2%	19.1%	1.7%	100.0%
	Middle	10.8%	74.2%	15.0%	100.0%
	High-income	3.0%	18.8%	78.2%	100.0%
		2012			Total
		Low-income	Middle	High-income	
2011	Low-income	76.9%	20.9%	2.3%	100.0%
	Middle	11.8%	73.7%	14.5%	100.0%
	High-income	2.1%	15.4%	82.5%	100.0%

(In terms of market income)

		2009			Total
		Low-income	Middle	High-income	
2008	Low-income	76.6%	22.0%	1.4%	100.0%
	Middle	11.6%	72.8%	15.6%	100.0%
	High-income	2.1%	15.6%	82.3%	100.0%
		2010			Total
		Low-income	Middle	High-income	
2009	Low-income	78.7%	19.3%	2.0%	100.0%
	Middle	12.2%	73.4%	14.4%	100.0%
	High-income	1.9%	21.3%	76.8%	100.0%
		2011			Total
		Low-income	Middle	High-income	
2010	Low-income	81.7%	16.7%	1.6%	100.0%
	Middle	11.7%	74.9%	13.4%	100.0%
	High-income	2.8%	19.0%	78.2%	100.0%
		2012			Total
		Low-income	Middle	High-income	
2011	Low-income	81.5%	16.3%	2.2%	100.0%
	Middle	12.9%	74.1%	13.0%	100.0%
	High-income	1.8%	15.8%	82.4%	100.0%

**<Table III-9> Income Mobility Rates from the Half-Life Perspective: All Households  
(In terms of total income)**

		2012			Total
		Low-income	Middle	High-income	
2008	Low-income	68.3%	29.2%	2.5%	100.0%
	Middle	16.4%	62.6%	21.0%	100.0%
	High-income	3.6%	22.2%	74.3%	100.0%

**(In terms of market income)**

		2012			Total
		Low-income	Middle	High-income	
2008	Low-income	73.1%	23.4%	3.4%	100.0%
	Middle	16.3%	61.6%	22.1%	100.0%
	High-income	4.2%	20.1%	75.6%	100.0%

From the half-life perspective, the likelihood of remaining in the same class is lower than was the case from the single-year perspective, while both the upward and downward mobility rates increase. This means that income inequality from the half-life perspective is not as severe as seen from the single-year perspective. For example, the likelihood of remaining in the low-income class from the half-life perspective is lower than the case with the single-year perspective in terms of both total and market income. The likelihood of escaping the low-income class and of the middle class falling into the low-income class also increases from the half-life perspective, indicating smaller income inequality.

In order to isolate the effect of mass retirement on income mobility rates, we narrowed down our definition of population to working-age households with household heads under the age of 60. Then we began to see relatively greater degrees of income mobility than was the case with all households. Here the upward mobility rate also increases further than the downward mobility rate, hinting at a narrowing of the income gap. From the half-life perspective, the upward mobility rate of all households was 17.4 percent in the case of all households, but it rises to 19.5 percent if we only focus on the working-age households. In other words, the changes in income due to changes on the labor market have a positive impact on income distribution.

The upward and downward income mobility rates of working-age households in terms of market income and from the half-life perspective are 18.0 percent and 14.9 percent, respectively, a little higher than the 16.3 percent and 14.2

percent for all households. More specifically, the upward income mobility rate was higher in 2008 and 2009 than the downward rates, but this was reversed beginning in 2010, which indicates a deterioration of income distribution in the aftermath of the global financial crisis.

〈Table III-10〉 Income Mobility Trend: Working-Age Households

(Unit: %)

Income type	Direction	2008–2009	2009–2010	2010–2011	2011–2012	2008–2012
Total income	Upward	12.2	14.8	12.2	13.2	19.5
	Remaining	73.4	73.8	75.6	76.5	65.7
	Downward	14.4	11.5	12.2	10.4	14.8
Market income	Upward	13.5	13.0	10.4	10.9	18.0
	Remaining	75.3	74.1	75.9	77.2	67.1
	Downward	11.2	13.0	13.7	11.9	14.9

〈Table III-11〉 Income Mobility Trend: Working-Age Households

(Unit: %)

Income type	Direction	2008–2009	2009–2010	2010–2011	2011–2012	2008–2012
Total income	1 → 1	8.4	7.7	8.0	7.3	6.5
	1 → 2	5.4	5.7	4.2	4.6	7.3
	1 → 3	0.3	0.6	0.4	0.5	0.5
	2 → 1	5.2	4.6	4.4	4.3	5.6
	2 → 2	37.1	38.9	38.3	34.3	29.2
	2 → 3	6.2	8.2	8.3	7.8	11.4
	3 → 1	0.7	0.5	1.0	0.7	1.5
	3 → 2	8.3	6.2	6.4	5.5	7.9
	3 → 3	28.4	27.7	28.9	34.8	30.1
	Total		100.0	100.0	100.0	100.0
Market income	1 → 1	9.9	8.8	8.5	7.2	6.8
	1 → 2	5.8	4.9	4.3	4.1	6.3
	1 → 3	0.4	0.6	0.4	0.5	1.0
	2 → 1	4.5	4.3	4.4	4.2	5.3
	2 → 2	33.6	34.4	35.9	31.7	28.2
	2 → 3	7.5	7.0	6.7	6.2	10.9
	3 → 1	0.8	0.6	1.0	0.6	1.5
	3 → 2	5.8	8.4	7.2	6.8	7.8
	3 → 3	31.9	31.0	31.6	38.7	32.2
	Total		100.0	100.0	100.0	100.0

Notes: 1. The mobility rates were obtained by applying the cross-sectional weight of each year.

2. "1" stands for the low-income class, "2," for the middle class, and "3," for the high-income class.

If we consider the income mobility among working-age households, we can see that, unlike in the case with all households, the likelihood of remaining in the low-income class decreases significantly in terms of both total and market income. In other words, there is a great deal of income mobility among working households. The drastic drop in the estimated perpetuity of poverty thus significantly increases the likelihood of escaping the low-income class and poverty, attesting to the income-redistributing effect of Korea's labor market. The income mobility rate in terms of total income (including publicly transferred income) and from the half-life perspective lowers the likelihood of staying poor to 6.5 percent—lower than the likelihood of escaping poverty at 7.3 percent.

Of the working-age households, low-income households were the least likely to remain in the same class. The likelihood of low-income households moving into the middle class in terms of market income diminished during the global financial crisis, but recovered a little in 2011 and 2012.

**〈Table III-12〉 Income Mobility Rates by Year: Working-Age Households**  
(In terms of total income)

		2009			Total
		Low-income	Middle	High-income	
2008	Low-income	59.8%	38.3%	1.9%	100.0%
	Middle	10.6%	76.5%	12.8%	100.0%
	High-income	2.0%	22.1%	75.9%	100.0%
		2010			Total
		Low-income	Middle	High-income	
2009	Low-income	54.8%	40.7%	4.5%	100.0%
	Middle	8.9%	75.3%	15.8%	100.0%
	High-income	1.3%	18.0%	80.6%	100.0%
		2011			Total
		Low-income	Middle	High-income	
2010	Low-income	63.9%	33.0%	3.1%	100.0%
	Middle	8.6%	75.1%	16.3%	100.0%
	High-income	2.7%	17.7%	79.6%	100.0%
		2012			Total
		Low-income	Middle	High-income	
2011	Low-income	58.5%	37.3%	4.2%	100.0%
	Middle	9.2%	73.9%	16.9%	100.0%
	High-income	1.8%	13.5%	84.7%	100.0%

〈Table III-12〉 Continue

(In terms of market income)					
		2010			Total
		Low-income	Middle	High-income	
2009	Low-income	61.3%	34.3%	4.4%	100.0%
	Middle	9.4%	75.3%	15.2%	100.0%
	High-income	1.5%	21.1%	77.5%	100.0%
		2009			Total
		Low-income	Middle	High-income	
2008	Low-income	61.8%	36.0%	2.2%	100.0%
	Middle	9.8%	73.8%	16.4%	100.0%
	High-income	2.0%	15.1%	83.0%	100.0%
		2011			Total
		Low-income	Middle	High-income	
2010	Low-income	64.6%	32.6%	2.9%	100.0%
	Middle	9.4%	76.4%	14.2%	100.0%
	High-income	2.5%	18.0%	79.5%	100.0%
		2012			Total
		Low-income	Middle	High-income	
2011	Low-income	60.8%	34.8%	4.4%	100.0%
	Middle	10.0%	75.3%	14.7%	100.0%
	High-income	1.4%	14.7%	83.9%	100.0%

Even when we limit our focus to working-age households, the half-life likelihood of remaining in the same class is lower than likelihood with single-year income, and half-life income mobility rises above single-year income mobility. When we switch to the market income standard, however, there is greater likelihood of remaining in the low-income class than was the case with total income, while no significant differences are found for the middle and high-income classes (which are rarely subjects of publicly transferred income anyway). The likelihood of a move from the low-income class into the middle class far exceeds the likelihood of a fall from the middle class into the low-income class, which indicates that income distribution in Korea appears far better when we measure it in terms of lifetime income than single-year income.

〈Table III-13〉 Income Mobility Rates from the Half-Life Perspective: Working-Age Households

(In terms of total income)

		2012			Total
		Low-income	Middle	High-income	
2008	Low-income	45.6%	50.8%	3.6%	100.0%
	Middle	12.1%	63.2%	24.7%	100.0%
	High-income	3.7%	19.9%	76.4%	100.0%

(In terms of market income)

		2012			Total
		Low-income	Middle	High-income	
2008	Low-income	48.0%	44.9%	7.1%	100.0%
	Middle	11.9%	63.6%	24.5%	100.0%
	High-income	3.7%	18.8%	77.5%	100.0%

### 3) Long-term equilibrium distribution

If we trace the changes in income mobility rates from year to year, we should be able to forecast the long-term changes in income distribution until it reaches the equilibrium possible in a given economy. We thus decided to extend the income mobility rate of each given period to a lifespan (100 years) in order to forecast income distribution over the long term.<sup>28)</sup>

Yearly income mobility rates are subject to business cycles and fluctuations in other economic and social conditions. We therefore need to compare half-life income mobility rates with our forecast on the equilibrium income distribution to take into account longer-term business cycle fluctuations and structural changes in income. By measuring the gap between the equilibrium based on yearly rates and the equilibrium based on the half-life ones, we can capture structural changes in income distribution.

The long-term equilibrium of income distribution based on yearly income mobility rates changes according to business cycle fluctuations and the points of time we decide to estimate. The proportion of the low-income class, in

28) We see little difference in the distribution even when we stretch our scope of time to 500 years.

particular, is likely to increase to 30 percent of all households in the long term. If we only consider working-age households, however, the proportion of the low-income class will fall by 13 percent from that of 2011-2012, while the proportion of the high-income class will rise to 43.6 percent. The ratio of the middle class, which rose to 50.0 percent in 2009-2010, will drop to 43.6 percent.

The long-term equilibrium of income distribution based on half-life income mobility rates shows that the low-income class will have the least, followed by the middle class and the high-income class in ascending order. Compared to the equilibrium based on yearly rates, this equilibrium shows a smaller middle class and a larger high-income class, with the ratio of the low-income class clearly diminishing. Using yearly income mobility rates, then, could lead us to overestimate the ratio of the low-income class. The half-life equilibrium, reflecting the age-wage structure to a certain extent, also suggests that income inequality will grow over time unless checked by conscious policy interventions.

〈Table III-14〉 Long-term Equilibrium of Class Makeup: Market Income and Yearly Mobility Rates

	All households			Working-age households		
	Low-income	Middle	High-income	Low-income	Middle	High-income
2008-2009	23.0	39.9	37.0	13.3	43.3	43.5
2009-2010	27.5	43.3	29.2	13.6	50.0	36.5
2010-2011	30.9	41.5	27.6	15.4	48.6	35.9
2011-2012	29.8	38.3	31.9	12.6	43.8	43.6

Note: The base yearly income mobility rate was applied repeatedly 100 times to derive the long-term equilibrium.

Compared with the Kim et al. (2012) study based on the KLIPS data, our analysis shows a lower likelihood of those in the low-income class remaining in the same class, a similar likelihood of those in the middle class remaining the same, and a higher likelihood of those in the high-income class remaining the same.<sup>29)</sup> This is because the KLIPs, having been conducted over a relatively

29) In Kim et al. (2012), the long-term equilibrium likelihoods, as of 2007-2008, were 31.4 percent, 37.8 percent, and 30.8 percent for the low-income, middle, and high-income classes, respectively.

**<Table III-15> Long-term Equilibrium of Class Makeup: Market Income and Half-Life Mobility Rates**

	All households			Working-age households		
	Low-income	Middle	High-income	Low-income	Middle	High-income
2008–2012	27.6	35.9	36.4	12.6	40.0	47.5

Note: The base half-life (four years) income mobility rate was applied repeated 25 times to derive the long-term equilibrium.

longer time span (since 1998), show the increasing exclusion of high-income households over time.

#### 4 Decisive factors of income mobility

##### A. Estimation model

We relied on the models used in Fields et al.(2003) and Shi et al.(2010), both of which identify and analyze the decisive factors of income mobility by positing the rate of increase in income as the dependent variable. This contrasts models that explain income mobility according to pre-defined income brackets rather than income levels, as they focus on the relative positions of income groups on a given income distribution and can, as a consequence, fail to capture increases in real income. Furthermore, we needed a model of analysis that could make full use of the available information on income levels provided by the Fiscal Panel data we used.

We derived our model for analyzing decisive factors from the following income model:

$$\ln(y_{i,t}) = \beta_t x_{i,t} + \gamma_t z_i + \delta_i + \epsilon_{i,t}$$

$$\epsilon_{i,t} = \rho \epsilon_{i,t-1} + \eta_{i,t}, \eta_{i,t} \sim \left[0, \sigma_\eta^2\right]$$

$$\delta_i = \lambda z_i + v_i, v_i \sim \left[0, \sigma_y^2\right]$$

Here  $y_{i,t}$  stands for household income,  $x_{i,t}$  for the attribute vector of household  $i$  that changes over time,  $z_i$  for the attribute vector of household  $i$  that does not change over time,  $\delta_i$  for the unobservable attribute vector of household  $i$ ,  $\beta_i, \gamma_i$  for the related coefficients, and  $\epsilon_{i,t}, \eta_{i,t}, v_i$  for random disturbance.

We can convert this income equation into the following equation for the income growth rate:<sup>30)</sup>

$$\ln y_{i,t} - \ln y_{i,t-1} = \beta_t \Delta x_i + \tilde{\beta}_t x_{i,t-1} + \tilde{\gamma}_t z_i + (\rho - 1) \ln y_{i,t-1} + w_{i,t}$$

Here  $\Delta x_i = x_{i,t} - x_{i,t-1}$ ,  $\tilde{\beta}_t = \beta_t - \rho \beta_{t-1}$ ,  $\tilde{\gamma}_t = \gamma_t - \rho \gamma_{t-1} + \lambda(1 - \rho)$   
and  $w_{i,t} = (1 - \rho)v_i + \eta_{i,t}$ .

We can consider the income measurement error according to the following equation:

$$\ln y_t^{rep} = \ln y_t + \mu_t, \mu_t \sim \left[ 0, \sigma_\mu^2 \right]$$

Here  $y_t^{rep}$  represents the income as identified in the surveys, and it includes errors of certain patterns to the real income,  $y_t$ .

The final estimation model we arrive at, after isolating the measurement errors, is as follows:

$$\ln y_{i,t}^{rep} - \ln y_{i,t-1}^{rep} = \beta_t \Delta x_i + \tilde{\beta}_t x_{i,t-1} + \tilde{\gamma}_t z_i + (\rho - 1) \ln y_{i,t-1} + \xi_{i,t}$$

Here  $\xi_{i,t} = w_{i,t} + \mu_t - \mu_{t-1}$ . The real income of the previous year used in this equation is made up of consumption, properties, and other such variables and can be estimated as follows:

30) Even after we convert the income equation using the income growth rate, the auto-correlation of the disturbance keeps the variables that do not change over time intact in the equation.

$$\ln y_{i,t-1} = \beta_{t-1} x_{i,t-1} + \gamma_{t-1} z_i + \kappa_{t-1} w_{i,t-1} + \xi_{i,t}$$

## B. Summary statistics

The summary statistics at the basis of our analysis of the income growth rate are listed in Tables 22 and 23. For the purposes of our analysis, we present different statistics for all households and working-age households. The working-age households are identified based on the initial-year age of household heads or the age of households in the year when the initial panel survey was held.<sup>31)</sup>

The household income was then converted into the income per capita<sup>32)</sup> given the differing household sizes. All income levels were also converted into real income using the CPI of 2010.

The ratio of households with women as household heads is steadily on the rise, while little change has taken place with respect to the number of schooling years that household heads underwent. Notwithstanding the marginal dip in income and expenditure since 2010, the value of net wealth per household has been consistently increasing. The relative household income level, as a measure of the relative position of individual households to average household income, has been decreasing and thus indicating growing income inequality.<sup>33)</sup>

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31) This policy may cause us to include households with household heads at age 60 or older in our analysis period, but the ratio of such households is not significant enough to cause biases in the analysis of all households.

32) We may readjust the income for differing household sizes using square roots. As the objective of this study is to analyze the income growth rate, however, we decided to use per-capital income instead, so that the readjusted sizes of households would not affect the resulting income growth rate estimates.

33) Because this variable indicates the relative position of each household to the average income of all households (to which the per-household weights have been applied), the simple average of the RI is bound to differ from 1.0. The fact that the simple average of the RI is smaller than 1 indicates that the ratio of households earning less than the average income is greater than the weighted ratio. Conversely, an RI greater than 1 indicates that the ratio of households earning more than the average income is greater than the weighted ratio.

**〈Table III-16〉 Summary Statistics of Regression Analysis: All Households**

(Unit: KRW 10,000, year 2010)

Variable	Definition	2008–2009	2009–2010	2010–2011	2011–2012
N	Total number of samples	4,225	4,259	4,260	4,221
PCI	Per–capital income	1,215.84	1,262.23	1,366.32	1,316.80
Sex	Household head sex (1 = male)	0.79	0.79	0.74	0.74
Age	Household head age	48.44	48.97	49.46	51.75
Edu	Household head schooling years	11.59	11.92	11.92	11.77
Emp	Number of employed persons	1.21	1.23	1.22	1.18
S_white	Share of white–collar workers	0.22	0.23	0.23	0.20
S_dep	Share of persons under age 20 or over age 60	0.45	0.45	0.45	0.50
S_wage	Share of wage income	0.57	0.57	0.56	0.54
PCAsett	Net household assets per capita	6,085.72	6,342.24	7,328.89	7,775.28
PCCon	Household consumption spending per capita	856.55	909.50	967.92	947.17
Ri	Relative household income level	0.98	0.98	0.96	0.92
SS	National Basic Living Security Benefits (1 = beneficiary)	0.04	0.04	0.04	0.04
Ch_S_wa	Changing share of wage income	–0.01	–0.01	0.00	–0.01
Ch_Dep	Change in dependency rate	0.03	0.01	0.01	0.03
Ch_Edu	Change in schooling years	0.24	0.09	0.04	0.02
Ch_Emp	Change in number of employed persons	0.02	0.01	0.00	0.00
Ch_S_wh	Change in share of white–collar workers	0.00	–0.01	–0.02	0.00

Note: The statistics on time–dependent variables (“PCI,” “Sex,” “Age,” “Edu,” “Emp,” etc.) are based on the base year.

〈Table III-17〉 Summary Statistics of Regression Analysis: Working-Age Households

(Unit: KRW 10,000, year 2010)

Variable	Definition	2008–2009	2009–2010	2010–2011	2011–2012
N	Total number of samples	3,049	2,984	2,934	2,859
PCI	Per-capital income	1,344.74	1,394.81	1,516.54	1,508.69
Sex	Household head sex (1 = male)	0.83	0.83	0.79	0.80
Age	Household head age	42.20	42.49	42.67	43.39
Edu	Household head schooling years	12.99	13.31	13.35	13.52
Emp	Number of employed persons	1.34	1.36	1.37	1.37
S_white	Share of white-collar workers	0.27	0.28	0.29	0.26
S_dep	Share of persons under age 20 or over age 60	0.32	0.33	0.31	0.33
S_wage	Share of wage income	0.68	0.68	0.68	0.69
PCAseet	Net household assets per capita	5,354.68	5,635.87	6,478.09	6,701.93
PCCon	Household consumption spending per capita	938.83	1,000.18	1,067.89	1,091.79
Ri	Relative household income level	1.13	1.13	1.11	1.12
SS	National Basic Living Security Benefits (1 = beneficiary)	0.02	0.02	0.02	0.02
Ch_S_wa	Changing share of wage income	-0.01	-0.01	0.01	-0.02
Ch_Dep	Change in dependency rate	0.05	0.01	0.02	0.04
Ch_Edu	Change in schooling years	0.17	0.05	0.01	0.01
Ch_Emp	Change in number of employed persons	0.02	0.03	0.01	0.01
Ch_S_wh	Change in share of white-collar workers	0.00	-0.01	-0.02	0.00

Note: The statistics on time-dependent variables (“PCI,” “Sex,” “Age,” “Edu,” “Emp,” etc.) are based on the base year.

### C. Estimation results

#### 1) Rates of changes in single-year and half-life variables (OLS analysis)

We performed an ordinary least squares (OLS) analysis on the yearly and half-life income growth rates to obtain base estimates free of the attributes of the panel data we used. We used the pooled OLS method to analyze the yearly income growth rate, using all the data available within the given scope of analysis, and we used the year dummy variables to reflect year-to-year changes in economic conditions.

〈Table III-18〉 Year-by-Year Income Growth Rate Estimates (Pooled OLS)

	All households		Working-age households		Low-income households	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
lnPCI	-0.39225	0.000	-0.38176	0.000	-0.41655	0.000
Sex	-0.0624	0.000	-0.03734	0.009	-0.07877	0.001
Age	0.010387	0.000	0.005567	0.332	0.017044	0.000
Age_sq	-7.1E-05	0.000	-3.8E-05	0.564	-0.00014	0.000
Edu	0.016492	0.000	0.018003	0.000	0.015847	0.000
Emp	0.020262	0.002	0.02126	0.010	0.064674	0.000
S_white	0.315807	0.000	0.26779	0.000	0.322839	0.000
S_dep	-0.13534	0.000	-0.26195	0.000	-0.1057	0.002
S_wage	0.045917	0.000	0.070199	0.000	0.158	0.000
S_S	-0.11847	0.000	-0.11352	0.001	-0.11517	0.000
Ch_S_wage	0.046301	0.006	0.010221	0.577	0.330146	0.000
Ch_dep	-0.05358	0.000	-0.06361	0.000	-0.11006	0.000
Ch_Edu	0.000353	0.929	0.0018	0.758	-0.01016	0.197
Ch_Emp	0.195632	0.000	0.184968	0.000	0.225746	0.000
Ch_S_white	0.294076	0.000	0.286076	0.000	0.326969	0.000
Rl	0.039959	0.000	0.042501	0.000	-0.84921	0.000
Year dummies and constants	Included		Included		Included	
Obs.	14,818		10,263		3,639	
Adj. R-square	0.2488		0.2316		0.3492	

Our analysis of the yearly income growth rates shows that the higher the initial per-capital income (ln PCI), the lower the income growth rate and that the higher the relative income level (RI = household income/average household income), the higher the income growth rate. The level of the initial per-capital income induces a narrowing of the income gap, while the relative income level induces a widening of the gap. In the low-income class, however, both variables serve to minimize the income gap, indicating difficulties of increasing income for the low-income class. In the low-income class, in particular, the higher the relative income level, the lower the income growth rate, with a significantly large coefficient, which suggests that these factors limit the increases in income of the relatively higher earning, low-income households.

〈Table III-19〉 Mid-term(2008~2012) Income Growth Rate Estimates (OLS)

	All households		Working-age households		Low-income households	
	Coefficient	P-value	Coefficient	Coefficient	P-value	Coefficient
lnPCI	-0.61496	0.000	-0.58818	0.000	-0.67087	0.000
Sex	-0.11719	0.000	-0.08764	0.010	-0.05387	0.298
Age	0.00853	0.084	-0.02351	0.070	0.021536	0.024
Age_sq	-2.7E-05	0.568	0.000326	0.032	-0.00016	0.059
Edu	0.019951	0.000	0.0205	0.000	0.010789	0.051
Emp	0.033734	0.043	0.046859	0.025	0.067187	0.106
S_white	0.394983	0.000	0.281249	0.000	0.510909	0.002
S_dep	-0.27707	0.000	-0.39119	0.000	-0.26863	0.000
S_wage	0.124132	0.000	0.177713	0.000	0.345333	0.000
S_S	-0.20011	0.000	-0.21678	0.019	-0.14398	0.033
Ch_S_wage	0.080389	0.010	0.090771	0.009	0.293775	0.000
Ch_dep	-0.06912	0.000	-0.09567	0.000	-0.0941	0.007
Ch_Edu	0.013623	0.013	0.008515	0.307	0.00524	0.569
Ch_Emp	0.165005	0.000	0.167843	0.000	0.183497	0.000
Ch_S_white	0.391484	0.000	0.35056	0.000	0.351219	0.006
RI	0.118243	0.000	0.107961	0.000	-0.52525	0.150
Constants	Included		Included		Included	
Obs.	3,634		2606		863	
Adj. R-square	0.3749		0.3230		0.4954	

Our analysis of half-life income growth rates (2009 to 2012) also reveals the convergence of income, as well as the income-polarizing effect of relative income levels on working-age households. The relative income levels, however, were statistically insignificant in explaining the income growth rate of low-income households. Therefore, the income growth rate gaps in the low-income class due to relative income levels can be ignored. To increase income for low-income households, we need to enhance the initial educational attainments of household members instead of providing them with continuing education (after joining the labor market). We also need to increase the number of employed household members and the share of the wage income.

## 2) Panel analysis

Panel analysis provides a greater range of information than the pooled OLS method as the former traces changes in each household from year to year. We used instrumental variables to mitigate the biases in estimates and thus overcome the measurement errors associated with surveys.

Our general panel analysis, which did not take into account the measurement error problem, revealed that the higher the initial income, the lower the income growth rate. It also revealed that relative income levels were statistically insignificant factors. Of the various initial conditions, those that significantly affect the income growth rate were the number of employed persons per household and the ratio of white-collar workers per household. Whether a household was on the National Basic Living Security Program benefits (“S\_S”) was statistically insignificant, even when we switched our focus to low-income households alone. Changes in the ratio of dependent members generally serve to lower the income growth rate, but this had little statistical significance in the case of low-income households.

Once we correct the measurement error of income using the instrument variables, we begin to enhance the statistical significance of our results. The relative income level, along with the initial income level, was a statistically significant factor that lowered the income growth rate. The sensitivity to the relative income level, however, was the highest among low-income households, suggesting the greater difficulty these households face in trying to escape poverty.

〈Table III-20〉 Panel Analysis of Year-by-Year Income Growth Rates (LSDV)

	All households		Working-age households		Low-income households	
	Coefficient	P-value	Coefficient	Coefficient	P-value	Coefficient
lnPCI	-1.04521	0	-1.02702	0	-1.1201	0
Sex	-0.09609	0.03	0.009193	0.87	-0.22992	0.012
Age	-0.00989	0.259	-0.03793	0.002	0.011211	0.55
Age_sq	6.67E-05	0.415	0.000396	0.001	-0.00018	0.28
Edu	-0.00051	0.947	0.003179	0.795	-0.02254	0.091
Emp	0.219581	0	0.220166	0	0.204792	0
S_white	0.336587	0	0.355842	0	0.222638	0.043
S_dep	-0.06488	0.025	-0.09491	0.006	-0.04195	0.457
S_wage	0.069228	0.031	0.020537	0.559	0.26825	0.001
S_S	0.015814	0.766	-0.00535	0.956	0.090844	0.192
Ch_S_wage	0.050909	0.028	-0.00243	0.923	0.243413	0
Ch_dep	-0.03037	0.005	-0.02718	0.029	-0.04753	0.105
Ch_Edu	-0.00305	0.634	-0.00499	0.627	-0.01717	0.141
Ch_Emp	0.209898	0	0.204001	0	0.198852	0
Ch_S_white	0.245389	0	0.262581	0	0.246543	0.001
Rl	-0.01739	0.27	-0.01734	0.317	0.106881	0.132
Year dummies and constants	Included		Included		Included	
Obs.	10,008		7,080		2,524	
R-square	0.1780		0.1697		0.2527	

Notes: 1. The working-age and low-income households were based on the base year, 2008.  
2. The Hausman test supports the fixed-effect model.

The initial educational attainment level and the change in the number of schooling years over time were insignificant factors of income growth rate increases. With the initial per-capital income controlled, initial educational attainment levels exerted a limited effect on the income growth rates. While the dependency ratio and its changes exerted significantly negative effects on the income growth rate over time, the impact was especially evident in the low-income class. Whether or not a household was supported by the National Basic Living Security Program was still an insignificant factor of income growth in low-income households.

The age variable was an insignificant factor of income growth with respect to all households, but its significance rose with respect to working-age and low-income households. Age was a variable that caused the income growth rate curve to resemble a reversed U-shape among low-income households—the older the household, the lower its income. As low-income households age, it becomes all the more difficult for them to escape the cycle of poverty, unless specific policy interventions are provided.

Age was relatively less significant with respect to working-age households, but served to lower the income growth rate overall, most likely reflecting the decline in individuals' labor productivity as they age.

These results are not directly comparable to the earlier analyses of the factors that cause transition from the middle class to the high-income class or vice versa. Those earlier studies based their conclusions on household income without controlling endogeneity, whereas this study analyzes the rate of growth in the household income per capita by controlling endogeneity. Moreover, the earlier studies failed to take into account the changes in major variables over time, such as educational attainments and employment status. Nevertheless, comparison of our results and these earlier studies reveal that age is a relatively weak factor and educational attainments exert little significant effect on household income growth.

In the top 10 percent of income-earners, the initial per-capita income exerts even a greater negative impact on income growth, while the relative income level is statistically insignificant. We explain this as the tendency of income to revert to the mean. This phenomenon, in other words, may be a natural consequence of the evaporation of the dramatic income shock that has induced the current high level of income. Households that have been subjected to relatively great temporary income shocks experience drastic decreases in income after such shocks dissipate.

On the whole, the relative income level is a statistically insignificant factor, indicating that the income growth rate in the top 10 percent of the population is not subject to the existing income distribution in the given economy and other policies based upon it.<sup>34)</sup> Sex, age, and educational attainments were similarly insignificant, since these factors have already contributed to the high per-capita income that determines the high-income class.

〈Table III-21〉 Panel Analysis of Year-by-Year Income Growth Rates (LSDV-IV)

	All households		Working-age households		Low-income households	
	Coefficient	P-value	Coefficient	Coefficient	P-value	Coefficient
lnPCI	-0.61934	0.000	-0.67324	0.000	-0.57417	0.000
Sex	-0.01977	0.685	0.06549	0.273	-0.08058	0.456
Age	0.005538	0.565	-0.02088	0.109	0.050501	0.030
Age_sq	-8.8E-05	0.332	0.000223	0.087	-0.00051	0.014
Edu	-0.00256	0.754	-0.00089	0.944	-0.01631	0.266
Emp	0.220723	0.000	0.222385	0.000	0.244481	0.000
S_white	0.225336	0.000	0.258511	0.000	0.130337	0.289
S_dep	-0.11938	0.000	-0.12734	0.001	-0.16844	0.018
S_wage	0.0425	0.213	0.004477	0.902	0.220211	0.011
S_S	-0.02554	0.652	0.007182	0.943	0.005538	0.945
Ch_S_wage	0.06586	0.008	0.001495	0.954	0.263019	0.000
Ch_dep	-0.04658	0.000	-0.0342	0.008	-0.108	0.003
Ch_Edu	-0.00533	0.432	-0.00715	0.501	-0.01625	0.202
Ch_Emp	0.223669	0.000	0.210904	0.000	0.230977	0.000
Ch_S_white	0.210825	0.000	0.240462	0.000	0.164393	0.051
RI	-0.32146	0.000	-0.24664	0.000	-0.82726	0.003
Year dummies and constants	Included		Included		Included	
Obs.	10,008		7,080		2,524	
R-square	0.1580		0.1537		0.2529	

Notes: 1. The working-age and low-income households based on the base year, 2008.  
2. The Hausman test supports the fixed-effect model.

34) The government may affect the income growth rate of households with relatively low relative income levels with subsidies and other such support measures. The high-income class is fundamentally immune to the effect of these government measures.

〈Table III-22〉 Panel Analysis of Income Growth Rates (LSDV-IV): Top 10 Percent

	All households		Working-age households	
	Coefficient	P-value	Coefficient	P-value
lnPCI	-0.73529	0.000	-0.74427	0.000
Sex	0.084525	0.640	0.179466	0.320
Age	0.040136	0.188	0.037044	0.296
Age_sq	-0.0003	0.278	-0.00028	0.402
Edu	-0.02697	0.487	-0.06023	0.247
Emp	0.153385	0.005	0.19357	0.001
S_white	0.402373	0.008	0.44835	0.005
S_dep	-0.26943	0.000	-0.24883	0.001
S_wage	-0.054	0.594	-0.09575	0.372
Ch_S_wage	0.138001	0.065	0.164008	0.035
Ch_dep	-0.02923	0.381	-0.0179	0.598
Ch_Edu	-0.0373	0.210	-0.0707	0.066
Ch_Emp	0.158243	0.000	0.167262	0.000
Ch_S_white	0.285126	0.000	0.302619	0.000
Rl	-0.12922	0.154	-0.10768	0.233
Year dummies and constants	Included		Included	
Obs.	996		880	
R-square	0.1177		0.1044	

Notes: 1. The working-age and low-income households were based on the base year, 2008.  
2. The Hausman test supports the fixed-effect model.

## 5 Conclusion

Along with the growing social interest in income distribution, policymakers are increasingly interested in learning more about the evolution of the income mobility that decides income distribution and what factors decide income mobility. This study analyzes income mobility and the decisive factors behind it in Korea using the Fiscal Panel data that provide highly reliable information on the country's income distribution.

During the analysis period, the ratios of low-income and high-income classes increased, while the ratio of the middle class dwindled. The likelihood of both the lower- and high-income classes remaining in the same class increased, while the likelihood of the middle class remaining static dropped, suggesting the calcification of the unequal income structure in Korea. However, once we isolated the effect of retiree households and narrowed down our population base to working-age households alone, the likelihood of the low-income class remaining static drastically declined. Moreover, this switch in the population base also revealed much higher upward income mobility rates across all classes, suggesting that the income of wage earners remains highly mobile. Policymakers therefore need to discern the apparent effect of the elderly and retirees on income mobility in Korea and adopt different solutions for retiree and working-age households. Nevertheless, the phenomenon of income polarization, with the dwindling size of the middle class, persisted even after we switched to working-age households, revealing the need for new policy measures intended to minimize income inequality. Single-year or year-by-year income mobility rates, in comparison to half-life rates, also lead us to overestimate the likelihood of households remaining in the same class and to underestimate upward and downward mobility rates. Policymakers therefore need to pay more attention to half-life income mobility rates, reflective of structural income changes in individuals' lifespans, in the quest for more effective policy solutions.

Our panel analysis of the factors deciding income changes avoided biases in estimation by taking into account possible measurement errors in income. Our analysis reveals that, the higher the initial per-capital income level and the higher the relative income level (against the average income), the lower the income growth rate. The influence of the relative income level was especially manifest among low-income households, suggesting that relatively well-earning low-income households face greater difficulties in trying to escape poverty. Policymakers therefore need to develop more effective policies in support of low-income households on the verge of escaping their class. Meanwhile, over the analysis period, the initial educational attainment level and the changes in the number of schooling years had little impact on the income growth rate, suggesting that policy efforts to improve income distribution by providing more pre-job market education and/or continuing education face inherent limits.

Whether a household receives support from National Basic Living Security Program benefits was also insignificant with respect to the income growth rate in the low-income class, suggesting that these benefits do little to help low-income households escape poverty. Other quantitative indicators, such as the increase in the number of employed household members and the increase in the share of wages in the household income portfolio were far more significant. With the government's effort to increase well-paying jobs, income distribution may improve noticeably. These quantitative indicators were also significant variables in explaining the income growth rate in the top 10 percent of income-earners. The Korean government therefore needs to reform and improve its taxation system to increase its fairness and income-redistributing function.

# IV

## Conclusion and Policy Implications

This study attempts to understand the current structure of income distribution and its changes in Korea in two ways: first, by analyzing income concentration in the highest income group; and second, by analyzing the income mobility rates among income classes and the decisive factors contributing to them.

This study estimates the income concentration in the highest income group in Korea and analyzes its trend over time, thus providing a more effective measure of income distribution than the Gini coefficients or the highest-quintile-to-lowest-quintile income ratios that Statistics Korea and other researchers generally use. The conventional measures of income distribution are based on self-answered household surveys that tend to underrepresent the highest income groups, such as the top one percent and the top 0.1 percent of income earners. This study therefore uses income concentration in the highest income group—as done in Piketty(2001) and subsequent studies—based on the NTS's internal data for the period of 2007 to 2012.

To estimate the degree of income concentration in the highest income group, without micro-sample data on tax report-filing taxpayers and only with information on each income bracket's income, we needed to employ an interpolation technique to determine the thresholds of the given income quantiles and the accumulated amount of income of persons earning more than the thresholds. Our verification process, based on the NTS's internal data, revealed that income distribution in the upper income quantiles in Korea does not follow the Pareto distribution pattern. Consequently, we decided to use the mean split histogram technique, first formulated in Atkinson(2005), to estimate income

concentration in the highest income group.

Our estimates revealed that the income concentration rates in the high-income quantiles of the working-age population at age 20 and above in Korea, from 2007 to 2012, ranged between 27.6 and 29.6 percent for the top five percent, between 11.0 and 12.2 percent for the top one percent, between 3.8 and 4.5 percent for the top 0.1 percent, and between 1.5 and 1.7 percent for the top 0.01 percent. The income concentration rate in these groups continued to rise until 2011, suggesting that the latest global financial crisis may have rendered the income distribution structure more equal for the time being in Korea, but it also suggested that income inequality continued to deteriorate during the years the country struggled to overcome the effects of the financial crisis.<sup>35)</sup> The income concentration in the highest income group again dropped to the pre-2010 level in 2012, suggesting that income distribution may be improving in Korea. All in all, however, our estimates of income concentration contradict Statistics Korea's conclusion—based on Gini coefficients and the highest-quintile-to-lowest-quintile income ratios—that income distribution in Korea has been steadily improving since 2008-2009. If Statistic Korea's conventional measures of income distribution adequately took into account the true status of income distribution in Korea, they would have shown the dwindling ratio of the middle class and the rising ratios of the high- and low-income classes. The failure to capture these rising ratios of income in the high- and low-income classes in the years surrounding the global financial crisis suggests that the conventional measures of income distribution are not reliable reflections of reality.<sup>36)</sup> Therefore in addition to conventional measures, we need more effective measures to understand the reality of income distribution in Korea, such as our measures on income concentration.

We also need to enhance the accuracy of the analysis of income concentration

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35) Income concentration in the highest income group in Korea slightly dropped in 2009 in the aftermath of the outbreak of the global financial crisis, but climbed again the following year.

36) As economic crises tend to hit low-income households most severely, it is unlikely that income concentration in the low-income class will improve as we struggle to overcome the aftermath of the financial crisis. If this assumption is right and income concentration in the highest income group has increased, the Gini coefficient ought to rise concomitantly.

by processing data not only on composite and wage income tax reports, but also on the per-capita income of other sources subject to separate and associated income taxes. If we could construct a time series that is sufficiently longer, we would also be able to identify the evolution of income concentration and income distribution in Korea and how industrialization—the Asian Financial Crisis, and other such economic shocks—have affected them. In other words, we need more detailed per-capita income information on income tax reports in 2007 and the preceding years plus statistics on income brackets than what currently appears in NTS's *Yearbooks of National Tax Statistics*. If we could obtain information not only on the sums of taxable income, but also on the amounts of income by source, we could estimate income concentration among wage earners and gauge which type of income is most responsible for the changes of income concentration in the high-income class.

In this study, we also point out the need for a more cautious approach to making international comparisons of income concentration in high-income classes of various countries. Different countries possess different income tax regimes, along with different tax brackets, and the quality of available data and taxpayer compliance also differs from country to country. Most importantly, we ought not to attempt to rank different countries based on simple comparisons of estimated income concentration rates. Nevertheless, we may make international comparisons to determine how similar or different trends of income concentration in high-income classes are from country to country and what factors explain those similarities or differences.

We analyzed the income mobility rates of different income groups, and the decisive factors behind them, to understand the reality of income distribution in Korea not captured by the income concentration trend alone. By tracing the changing income level of individuals and estimating their income mobility rates, we can determine the likelihood of each income class retaining its status in a way that is not reflected in cross-sectional statistics. For example, although the high-income class based on the cross-sectional statistics in the *Yearbooks* contains different individuals and households from year to year, it does not adequately reflect the reality faced by actual individuals and households. We sought to overcome this limit by using the Fiscal Panel data of KIPF instead of *Yearbook* statistics.

Our analysis reveals that the ratios of lower- and high-income classes are steadily on the rise, while the ratio of the middle class continues to decline. Similarly, the likelihood of the lower- and high-income classes remaining the same continues to increase, while the likelihood of the middle class remaining the same continues to dwindle, suggesting the perpetuation of income inequality. However, once we isolated the effect of retiree households from the working-age population, we saw that the likelihood of households remaining in the low-income class dropped significantly, with the lack of evidence supporting any trend. In addition, the income mobility rates increased across all the classes. Policymakers therefore need to adopt different approaches and solutions for improving income equality among the elderly and among working-age households. The increase in income inequality due to population aging should be tackled not by inducing retirees to re-enter the labor market, but by inducing working people to save and create post-retirement income and assets. The phenomenon of income polarization accompanying the contraction of the middle class, however, is evident among both the employed and the retired.

The likelihood of the top 10 percent of income earners remaining in the same class was smaller than the likelihood of people earning 150 percent of the median income or more remaining in the same income bracket. This contrasts the belief that the higher one's income level, the more likely one is to remain in the same class. In other words, the overall income level of the highest group may continue to rise, but it does not necessarily mean that the same households will remain in that group year after year. Nevertheless, households in the top 10 percent are still far more likely to stay in the upper part of the overall income distribution structure than households in the lower part. These households have a 94 percent chance of staying in the top 40 percent (i.e., in the sixth quantile or above) of the income distribution structure from a year-by-year perspective and an 89 percent chance from a half-life perspective.

Year-by-year income mobility rates, compared with half-life rates, led us to overestimate the likelihood of households remaining in the same classes and to underestimate upward and downward income mobility rates. Policymakers therefore need to pay greater attention to half-life income mobility rates as these better capture structural changes in income over a lifetime.

Our panel analysis of the factors deciding income changes avoided biases

in estimation by taking into account possible measurement errors in income. Our analysis reveals that, the higher the initial per-capital income level and the higher the relative income level (against the average income), the lower the income growth rate. The influence of the relative income level was especially manifest among low-income households, suggesting that relatively well-earning low-income households face greater difficulties in trying to escape poverty. Policymakers therefore need to develop more effective policies in support of low-income households on the verge of escaping their class. Meanwhile, over the analysis period, the initial educational attainment level and the changes in the number of schooling years had little impact on the income growth rate, suggesting that the policy efforts to improve income distribution by providing more pre-job market education and/or continuing education face inherent limits. Whether a household receives support from National Basic Living Security Program benefits was also insignificant with respect to the income growth rate in the low-income class, suggesting that these benefits do little to help low-income households escape poverty. Other quantitative indicators, such as the increase in the number of employed household members and the increase in the share of wage in the household income portfolio, were far more significant. With the government's effort to increase well-paying jobs, income distribution may improve noticeably.

Our analysis also suggests that we need to adopt different approaches toward interpreting income distribution among the employed and among retirees. The Korean labor market functions so effectively that income mobility among working households still remains significantly high. However, retiree and elderly households are much more vulnerable to perpetual poverty. As the amount of income that retirees could earn by re-entering the labor market is fundamentally limited, the Korean government needs to encourage people to save and prepare post-retirement income while still in the workforce by participating in public pension programs and other such means. While the stasis of income was not evident among the top 10 percent of income earners, a cross-sectional analysis reveals that the gap between classes is widening over time. Participation in the labor market and access to white-collar jobs are significant factors of income growth. The Korean government therefore needs to enhance the fairness and income-redistributing function of the tax regime.

As already mentioned, the likelihood of households in the top 10 percent remaining in that group is smaller than the likelihood of households remaining in the middle class. This means that the highest income group in Korea still remains quite flexible. If income mobility rates remain high even among the top one percent, the top 0.1 percent, or the top 0.01 percent of income earners, and if most of the members of these groups have accumulated their wealth not by means of inheritance, but by entrepreneurship and innovation, then separate taxes on the income of the super-rich may not be necessary. However, if the income mobility rates of these high income groups remain consistently low, and if the members of these groups maintain their wealth and status not through work, but by means of inheritance and bequeathal, then income-redistributing taxes will gain wide social support. The absence of available data has prevented us from analyzing the income mobility rates and the sources of income for the top one percent, 0.1 percent and 0.01 percent of income earners in Korea. With the gathering and processing of this necessary data in the future, we will be able to decide whether we need new taxes on the super-rich.

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