

Wealth Inequality in Korea, 2000–2013 Evidence from Inheritance Tax Statistics

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Abstract

This paper estimates the individual wealth distribution since 2000 by applying the estate multiplier method to the inheritance tax statistics. Based on these estimates, the main findings are as follows. First, the top 1% (or 10%) of the adult population aged 20 and above owned 24% (or 63%) of total wealth for 2000–2007 and 25% (or 66%) for 2010–2013. Wealth concentration was much higher than income concentration, which was 12.1% (or 44.1%). Second, the wealth concentration in South Korea was lower than Anglo-Saxon countries but somewhat higher than European continental countries such as France, falling in the middle of these two groups. A similar international status was true of income concentration. Third, Statistics Korea's *Survey of Household Finances and Living Conditions* does not adequately cover the financial assets of the top wealth brackets and consequently underestimates wealth inequality.

Keywords

Wealth inequality, inheritance tax statistics, estate multiplier method

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Introduction

In recent years, income equality and wealth¹ inequality have been coming into focus as indicators that shed light on the economic divide. Piketty(2014) made the observation that the decreasing rate of economic growth means that accumulated wealth and the profit that accrues from that wealth is gradually becoming more important than income earned through labor. The same observation could be made about South Korea. Not only has a significant amount of wealth already been accumulated here, but the economic growth rate has fallen considerably, with low growth projected to continue in the future. Nevertheless, there is little reliable data available about what the level of wealth inequality is in South Korea and what trends are evident there. The objective of this paper, therefore, is to make available the current state of wealth inequality in Korea, based on the new data and methods that will be mentioned later.

Efforts to ascertain the facts about wealth distribution are challenging because of major limitations with the data. These efforts can be divided into two approaches according to the kind of data being used. The first approach is based on household surveys. In South Korea, this corresponds to the *Household Asset Survey* (2006) and the *Survey of Household Finances and Living Conditions* (since 2010) by Statistics Korea,² which selected sample households and surveyed their real estate, financial assets, and debt. This sort of data is widely used by researchers because it provides microdata not only about households' wealth and income but also about household characteristics. But one serious problem that has been identified in these sample surveys is that the more wealth households have, the more they tend to underreport that wealth. South Korea is no exception, as we shall see later. There are also attempts exemplified by *the Global Wealth Report* to use household surveys from various countries while supplementing them with data about billionaires that appears in *Forbes* (Credit Suisse Research Institute, 2014a, 2014b).

The second approach draws upon taxation data, and this consists of two distinct methods. The first is the capitalization method of wealth estimation, in which capital income is extracted from income tax data and divided by the earnings rate. This method was applied to the United States by Saez and Zucman (2014). Because it requires microdata about income, including capital income, it is not feasible in South Korea, whose tax authority, called the National Tax Service, does not provide microdata about individual income. The second way to use taxation data is the estate multiplier method, which takes advantage of data about inheritance taxes. This method has already been applied to studies about nineteenth-century Europe and has been further developed since then. Some examples of this are Lampman (1962) and Kopczuk and Saez (2004) in the United States; Atkinson, Gordon, and Harrison (1978) in the United Kingdom; and Piketty, Postel-Vinay and Rosenthal (2006) in France. According to a survey of research trends about wealth inequality by Roine and Waldenstrom (2015), this is the most widely used method, and it is also the

¹ In this paper, "wealth" will be used alongside "assets" and "property" as appropriate in the context without strictly distinguishing between them.

² The data from the *National Survey of Tax and Benefit* and the *Korean Labor and Income Panel Survey* also sometimes include survey sections about wealth, but this is inferior to the *Survey of Household Finances and Living Conditions* both in terms of the purpose of the survey and the number of samples.

method used here.

The idea of the estate multiplier method can be explained as follows. Data about the inheritance tax includes information about the estate of the deceased (technically speaking, decedents). This information about the deceased is then used to estimate the wealth of the living. If deaths occurred randomly, the distribution of the wealth of the dead would be identical to that of the living, but the mortality rate varies considerably with age, gender, and social class. If it is possible to determine the mortality rate for each of these groups, the living population of each group can be estimated by multiplying the number of decedents in each group by the reciprocal of the corresponding mortality rate (this is the multiplier). Multiplying the estate of the deceased by this same multiplier will return the wealth distribution of the living. While estimating the wealth distribution of the living from information about the estates of the deceased is simple in theory, the inheritance tax data and the mortality rate statistics contain limitations that are not easy to compensate for. It is also necessary to carefully consider the possibility that the results of this estimate may be divorced from reality.

This paper is organized in the following manner. The second section, which deals with data and methods, describes the characteristics and limitations of inheritance tax data in South Korea and how those limitations can be compensated for. Because of those limitations, this analysis is limited to the period after the year 2000. There is a lack of data illustrating the gap in mortality rate between social classes, so an attempt is made to estimate that gap. Next, the estate multiplier method is used to estimate the wealth of the living, which provides the basis for the wealth distribution that is provided in the third section. This distribution covers the percentage of total wealth held by several brackets of each class (the top 1%, the top 10%, the top 50%, and the bottom 50%) among the adult population. These findings are then compared to the results of the *Survey of Household Finances and Living Conditions* and the *Global Wealth Report*. Wealth inequality in South Korea is also compared with research findings in other countries that estimate wealth equality using methods similar to those in this paper. Finally, the fourth section summarizes this paper's findings and addresses how its findings are limited.

Data and Methods

Inheritance Tax Data

First of all, the inheritance tax statistics that are used in this paper are based on the *Statistical Yearbook of National Tax* (*Yearbook* for short). The 2013 figures from the *Yearbook* are provided below (Table 1) to illustrate what data is found there. These statistics divide decedents (that is, the deceased) into taxed individuals and untaxed individuals. When it comes to taxed individuals, it is possible to determine not only the number of decedents by the size of their estate but also their distribution by age. Age is roughly divided into intervals of ten years, without distinguishing between gender. However, only 6,275 individuals were subject to the inheritance tax, and the majority of the deceased were untaxed. The table shows that taxed individuals only

accounted for 2.2% of all the deceased and that most people with smaller estates were not subject to the inheritance tax. While untaxed individuals are distributed according to the size of their estate, they are not distributed by age. Some of the information that appears in Table 1 is not provided in statistics from an earlier time period. The age distribution for taxed individuals only goes back to 2007. The statistics about untaxed individuals first appear in the *Yearbook* in 1995, while earlier editions only provide cursory information about taxed individuals.

Table 1. An example of inheritance tax data (2013, units: people, KRW billion)

	Taxed individuals									Untaxed individuals		Taxation rate	Estate per person	
	No. of decedents (A)	Estate (B)	Distribution of decedents by age							No. of decedents (C)	Estate (D)	E=A/(A+C) (%)	B/A (millions)	D/C (millions)
			<40	40s	50s	60s	70s	>80	Misc.					
Sub total	6,275	10,639	30	121	379	693	1986	3,024	42	275,957	15,141	2.2	1,695	55
< 100m	206	14	1	5	10	12	66	112		234,419	3,263	0.1	69	14
100–300m	1,261	221	5	6	26	46	361	815	2	28,291	4,909	4.2	175	170
300–500m	442	176	4	5	11	28	132	259	3	7,258	2,786	5.7	398	384
500m–1b	1,189	906	12	25	49	113	349	628	13	4,610	3,142	20.5	762	681
1–2b	1,843	2,669	6	43	154	275	654	702	9	699	866	72.5	1,448	1,238
2–3b	680	1,680	2	23	69	118	224	237	7	28	65	96.0	2,471	2,308
3–5b	360	1,425		9	44	50	121	134	2	13	48	96.5	3,958	3,704
5–10b	201	1,395		4	10	34	55	95	3	9	63	95.7	6,942	6,948
10–50b	87	1,620		1	5	17	22	39	3			100.0	18,618	
> 50b	6	533			1		2	3				100.0	88,886	

Note: Since the inheritance tax deduction is typically worth at least KRW 500 million, some readers may find it strange that there are taxed individuals in the asset brackets below that amount. But decedents with a small estate can still be liable for the inheritance tax because gifts made during the decade before their death cause the inheritance tax deduction to decrease accordingly (Inheritance Tax and Gift Tax, Article 24).

Source: National Tax Service, *Statistical Yearbook of National Tax* (2014), Tables 6-2-3 and 6-2-5.

While the statistics for taxed individuals were compiled from the inheritance tax filed by the heirs, we are left with the question of how statistics were compiled for the estates of untaxed individuals, considering that they did not file inheritance tax. According to an official at the National Tax Service, when a death report is filed, the property under the name of the deceased is calculated using the information about real estate and financial assets that is accessible through the National Tax Service's computer network. This provides the grounds for determining who is subject to the

inheritance tax and whether any property has been omitted from their filing. Under the current system, therefore, we can conclude that the real estate and financial assets of the deceased are being calculated regardless of whether or not they are being taxed. However, there are some kinds of taxable property that are not covered through this system. These omissions include property such as jewelry, artwork, and antiques that do not appear on the network. While individuals who are subject to the tax are supposed to report such property, they are unlikely to be caught if they fail to do so. In this regard, it is possible to conclude that the overall taxable property in the inheritance tax data is underreported to some extent.³ The National Tax Service's computer network was reportedly set up in the late 1990s. In light of that fact, this paper deals with statistics after 2000.⁴

The coverage of most of the estates of untaxed individuals is a major advantage of South Korea's inheritance data, since such data is rarely available in other countries. In the United States, inheritance tax data only covers 2% of the deceased (Kopczuk & Saez, 2004), though this varies with the period in question. Even in France, which has reliably kept inheritance tax records since the French Revolution, estates are not reported for every deceased individual, and assumptions are used to fill the gaps (Piketty, 2010). Offsetting this advantage, however, is the difficulty of using South Korea's inheritance tax data prior to the creation of the computer network. There are also shortcomings with the data itself, such as the fact that it does not provide us with the age distribution of untaxed individuals (or of taxed individuals prior to 2006). The subject of analysis in this paper will be the period after 2000, and estimates will be used to compensate for shortcomings in the data (such as the age distribution).

First, the age distribution of untaxed individuals is estimated as follows. When the estate is worth more than KRW 1 billion, the age distribution of untaxed individuals is assumed to be the same as the age distribution of taxed individuals in the same wealth bracket.⁵ But as can be seen in Table 1, taxed individuals make up a very small percentage of estates that are worth less than KRW 1 billion, which prevents us from applying their exact age distribution to all untaxed individuals. Statistics Korea (The Korean Statistical Information Service) provides the age distribution for all the deceased, which can be compared to the age distribution of taxed individuals in Table 1 (cf. D and E in Table 2). This shows that the percentage of elderly individuals (in their seventies and eighties) is higher and the percentage of people in their fifties and below is lower than all the deceased (that is, the average level), which implies that there are considerable differences between the age distribution of the two groups. As a result, applying the age distribution of taxed individuals to the below KRW 1 billion estate bracket, of which taxed individuals

³ Since debt is deducted from estates that are subject to inheritance tax, it can be assumed that all debts have been reported for taxed individuals. It is possible, however, that not all debt has been reported for untaxed individuals.

⁴ There are also statistics for untaxed individuals between 1995 and 1999, but these were not used in this paper because several categories in these statistics contain severe discontinuities with the period after 2000.

⁵ According to Table 1, untaxed individuals occasionally have large estates. The reason for this is the high deduction (up to KRW 50 billion) that is given for the estate of family businesses (cf. Article 18 of the Inheritance Tax and Gift Tax Act). The goal of this deduction is to ensure that individuals are not prevented from inheriting the family business because the inheritance tax is too onerous.

only compose a small percentage, could exacerbate the sampling error. It is necessary to find different information about the age distribution of untaxed individuals, given their overwhelming majority.

Table 2. The number of deaths by age and the composition ratio of the deceased by age (2013, unit: %)

	Total	20s–30s	40s	50s	60s	70s	>80s
20yr+ population A	39,499,131	14,677,372	8,531,557	7,718,223	4,368,978	2,980,754	1,222,247
20yr+ deaths B	263,237	9,055	15,270	29,754	35,696	74,130	99,332
Mortality rate (%) C=B/A	0.67	0.06	0.18	0.39	0.82	2.49	8.13
Composition ratio of deaths by age (B) D	100.0	3.4	5.8	11.3	13.6	28.2	37.7
Composition ratio of taxed decedents by age E	100.0	0.5	1.9	6.1	11.1	31.9	48.5
Composition ratio of E with less than 1b F	100.0	0.7	1.3	3.1	6.5	29.5	58.9
Composition ratio of E with more than 1b G	100.0	0.3	2.5	9.0	15.7	34.2	38.4
Composition ratio by age (100m–1b household survey) H	100.0	2.0	7.7	15.5	18.4	31.5	25.0

Note: The population aged 20 years and above and the number of deaths in that population were found in Statistics Korea, KOSIS; the decedents assessed for inheritance taxes were found in the *Statistical Yearbook of National Tax*; and H in Table 2 was found using the microdata from the *Survey of Household Finances and Living Conditions*.

At this point, a decision was made to use microdata from *Survey of Household Finances and Living Conditions*, which includes information about household assets. One unsatisfactory aspect of this survey is that these assets belong not to the individual but to the household. As a result, these assets were assumed to belong to individual householders and were used to calculate the age distribution for the KRW 100 million–1 billion bracket. While there are probably some asset-holding individuals who are not householders, this paper assumes that they all belong to the below KRW 100 million bracket. By multiplying that age distribution by the mortality rate per age for that year (C in Table 2), it is possible to calculate the number of deaths, and the composition ratio of the resulting deaths per age in 2013 is presented in H of Table 2.⁶ This composition ratio per age is applied to untaxed

⁶ Household surveys about assets were conducted in 2006 and in 2010–2013. The periods in which no data was available were dealt with as follows: the figures for 2006 and 2010 were linearly interpolated for the period between 2007 and 2009, and the 2006 figures were applied for the period before 2005.

individuals in the KRW 100 million–1 billion bracket of Table 1 to calculate the age distribution. The age distribution for the below KRW 100 million bracket can be calculated by subtracting the already calculated age distribution of the deceased in the bracket above KRW 100 million from the age distribution of all the deceased.

Second, information about the age distribution of taxed individuals is not available before 2007. To estimate the distribution prior to 2007, the decision was made to extend the pattern found in the age distribution of taxed individuals after 2007 to that earlier period. As was already mentioned, considerable differences are found when we compare the age distribution of all the deceased and of taxed individuals (D and E in Table 2). When the age distribution of taxed individuals is divided once again at the threshold of KRW 1 billion in wealth, the result is the distribution found in F and G in Table 2. Elderly individuals account for more taxed individuals among the highest brackets than among all the deceased, which seems reasonable.⁷ But these age distribution patterns are found not only in 2013 but also appear to a similar degree in each year of the period for which data is available (2007–2013). The age distribution of taxed individuals was calculated on the assumption that this 2007 pattern also appeared in the preceding period.⁸

Third, there is a gap between the number of decedents in the inheritance tax data and the number of deceased reported by Statistics Korea. There are two reasons for this. First, individuals who live outside of South Korea but have an estate therein are included in the inheritance tax statistics but not in Statistics Korea's death statistics. Second, the deadline for filing inheritance tax is six month after death,⁹ which means that the actual year of death may not be the same as the year when that death is added to the inheritance tax data. In fact, the two figures for the number of deaths flip each year between 2000 and 2005, apparently because of the gap between the date of death and the date when the inheritance tax was filed. But after 2006, the number of decedents in the inheritance tax data is considerably greater than the number of deaths reported by Statistics Korea, and the amount of that gap varies with the year. The standard in this paper is the number of deaths (aged 20 and above) reported by Statistics Korea. When this figure is greater or fewer than the number of decedents in the inheritance tax data, the number of untaxed individuals is adjusted to ensure that the number of decedents in the inheritance tax data coincides with the number of deaths for that year.

The distribution of estate brackets by age for all the deceased each year and the distribution of their estates was estimated as explained above.¹⁰ By way of example,

⁷ It is logical that taxed individuals in the highest brackets would account for a higher percentage of older individuals and a lower percentage of younger individuals than in all the deceased. But when the two classes in taxed individuals are compared around the KRW 1 billion threshold, the opposite result is found among those aged 80 years and above (F and G in Table 2). A similar pattern is found in all the years for which data is available (2007–2013). This suggests that greater wealth has the effect of reducing the mortality rate but that once this wealth surpasses a certain point, this effect is counteracted. This is a question that will require further research.

⁸ The first thing calculated was the ratio of the composition ratio of taxed individuals by age (F and G in Table 2) relative to the composition ratio of all the deceased by age (D) at the threshold of KRW 1 billion in 2007 (that is, F/D and G/D by age). This ratio was then multiplied by the composition ratio of all the deceased by age prior to 2006 (D) to find the composition ratio by age for each year.

⁹ In reality, this deadline is often not kept.

¹⁰ Panel 1 of Supplementary Table 1 contains the number of deaths for each estate bracket by age, while Panel 2 contains their estates. The number of deaths in each cell in Panel 1 represents the sum of taxed

the results for 2013 are provided in Supplementary Table 1. Because of limitations with the inheritance tax data, it was necessary to rely on several assumptions in the estimation process, which should be kept in mind when interpreting the final results.

Estate Multiplier Method

Another necessary step in the estate multiplier method is estimating the mortality rate for each group. The mortality rate for age and gender can be calculated using Statistics Korea's KOSIS. It is also necessary to consider the difference in mortality rates between social classes, but Statistics Korea does not provide information about that. This is also the case for statistics in other countries, which has motivated earlier scholars to explore alternative methods. Drawing upon the mortality rate for level of educational attainment estimated Brown, Liebman and Pollet (2002), Kopczuk and Saez (2004) assumed that the mortality rate of white university graduates is the same as the mortality rate of the wealthy. Piketty (2010) borrows from Attanasio and Hoynes (2000) to assign a different mortality rate to each social class. He assumes, for instance, that the mortality rate of the poor is twice as high as the rich until their forties but that this gap narrows with increasing age until it reaches 10% in their eighties.

The mortality rate by educational attainment can be estimated in South Korea, too, and that will be used in this paper as a proxy variable for the mortality rate of social classes. While an individual with a high level of educational attainment is not necessarily very wealthy, educational attainment is presumed to have some utility as a yardstick for distinguishing the rich and poor. Educational attainment also has some advantages over income as a gauge of social class. For example, while the income level observed at a given point of time is not very representative of lifetime earnings, educational attainment can actually be an effective indicator. Calculating the mortality rate by educational attainment requires knowledge of the total population and educational attainment by age and gender of the deceased, for which we can refer to data from Statistics Korea's population census and microdata from *Causes of Death Statistics*.¹¹ There are three years during which both of these data sets are available: 2000, 2005, and 2010. After first calculating the population and the number of deaths by age and educational attainment (elementary school graduate and below, middle school graduate, high school graduate, university graduate and above), I calculated the mortality rate for each of these groups (by dividing the number of deaths for the relevant age and educational attainment by the population with the relevant age and educational attainment). This divides educational attainment into four categories, but here social class is only divided into two categories, namely the rich (representing the top 50%) and the poor (representing the bottom 50%).

These results appear in Figure 1, which shows how much the average mortality rate for individuals corresponding to the top and bottom halves of educational

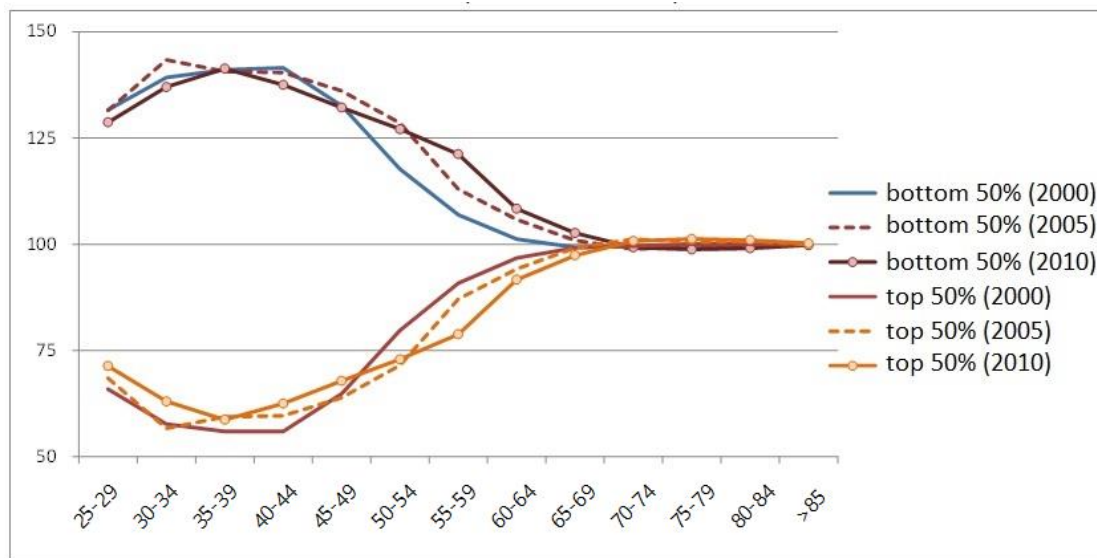
and untaxed individuals. Multiplying this by the respective per capita estate (B/A and D/C in Table 1) returns the estate for each cell.

¹¹ Lee, Sangeun (2006) is an example of a previous study that has used the same data to calculate the mortality rate by gender, age, and educational attainment in the 2000s.

attainment for each age group deviate from the overall average. While there were some differences between the genders, this figure shows the combined results of male and female. Taking the 50–54 age group, for example, the mortality rate in 2010 for the top 50% was 73 (relative to the average of 100), while the mortality rate for the bottom 50% was 127. Assuming that these are the mortality rates of the rich and poor classes, we can infer that the mortality rate of the poor is 74% higher ($= 127/73$) than that of the rich. The gap between the classes is the highest in the late thirties and early forties before rapidly declining with increasing age. Once we reach the seventies, the gap between the classes is almost nonexistent and is sometimes even reversed.

Another remarkable point about Figure 1 is how the gap in the mortality rate between the classes has changed over time. For example, there is a significant mortality rate gap through the forties, while generally being observed to decrease. But in the late fifties and sixties, the mortality rate gap is seen to grow considerably every five years since 2000. While there is little difference between the classes in terms of the old age mortality rate, the age at which that difference disappears seems to be gradually increasing. Considering that this change occurred in just a decade, we can infer that there are rapid structural changes in the mortality rate gap. While the society is aging rapidly because of advances in medical technology that bring down the overall mortality rate, it is notable that the mortality rate gap is gradually increasing in certain age groups.

Figure 1. Gap in mortality rate between social classes by age (average mortality rate=100)



Note: This shows the mortality rate of the top 50% and the bottom 50% in terms of educational attainment relative to the average mortality rate (100).

Source: Calculations using microdata from *Causes of Death Statistics*, and population census, both provided by Statistics Korea.

We will now compare the gap in the mortality rate between classes in South Korea with previous research in France and the United States (Table 3). In all three countries, an identical observation can be made: the mortality rate of the poor is

found to be nearly double the mortality rate of the rich until the forties, after which the gap rapidly decreases with increasing age. But whereas the gap between the classes nearly disappears in South Korea in the seventies, a small gap is maintained in France. In the United States, where the mortality rate of white university graduates stands in for the mortality rate of the rich, that rate is maintained at a level of 60–70% until the sixties and then narrows to the level of 95% in the eighties. In this respect, the United States is found to be quite similar to France.

Table 3. The gap in the mortality rate between social classes by age: South Korea, the US, and France

		<40	40s	50s	60s	70s	>80
SK 2000	Bottom 50%	131.4	138.7	113.5	100.9	100.1	100.2
	Top 50%	68.6	61.3	86.5	99.1	99.9	99.8
SK 2005	Bottom 50%	129.5	139.5	123.7	104.0	100.4	100.3
	Top 50%	70.5	60.5	76.3	96.0	99.6	99.7
SK 2010	Bottom 50%	128.3	135.6	125.9	107.2	99.9	100.4
	Top 50%	71.7	64.4	74.1	92.8	100.1	99.6
France	Bottom 50%	133.3	133.3	128.6	120.0	113.0	104.8
	Top 50%	66.7	66.7	71.4	80.0	87.0	95.2
US	White univ. grads	73.3	62.5	64.1	72.1	83.4	95.3

Note: 1) The gap in the mortality rate between classes is expressed as a percentage of the average mortality rate (100).

2) Males and females are combined in this mortality rate.

3) The US figures represent the gap in the mortality rate between white university graduates and the overall average.

Sources: The French figures are from Piketty (2000), the American figures are from Kopczuk and Saez (2004), and the South Korean figures are explained in the main text.

Examining how the gap in the mortality rate between social classes in South Korea changes over time (Table 3), we see the gap narrowing in the forties but widening in the fifties and sixties. Should this trend continue, the mortality rate gap among the elderly could exhibit a similar phenomenon to that seen in France and the United States. What is notable here is that the mortality rate gap has undergone a considerable change during the brief period of just ten years. While previous studies in the United States and France applied the identical mortality rate gap in Table 3 to every year, this paper employs the mortality rate of the year in question.¹²

The two data series described above (that is, the age and wealth distribution of the deceased in Supplementary Table 1 and the data on the mortality rate gap by age and social class in Table 3) can be used to estimate the wealth of the living (adults aged 20 and above). The process is as follows. First, since the mortality rate was estimated by dividing the data between the top 50% and the bottom 50% by age, it is also necessary to separate the bottom 50% of the deceased who appear in Supplementary Table 1 on this basis. The threshold for the bottom 50% falls in the

¹² For years in which the mortality rate could not be estimated because of limited data, the rate was linearly interpolated from adjacent years for which estimates were available. For 2011 and following years, the mortality rate was assumed to be the same as 2010.

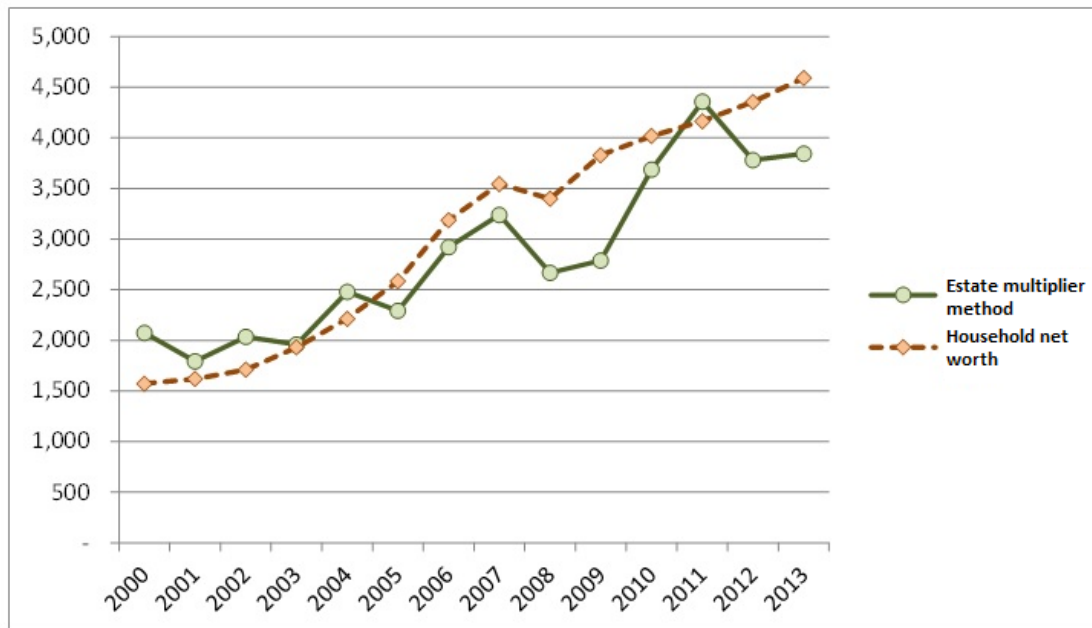
below KRW 100 million wealth bracket, which is split into two categories at this threshold¹³ (see Supplementary Table 1). Second, if the number of deaths by age is multiplied by the corresponding multiplier (that is, the reciprocal of the mortality rate by age), the population of the living can be extrapolated. For example, the mortality rate for the fifties age group in 2013 (C in Table 2) is 0.39%, and the mortality rate for the bottom 50% group can be found by multiplying the rate by the gap in the mortality rate in question (125.9), resulting in 0.485% ($= 0.39 * 125.9 / 100$). The mortality rate for the top 50% is also found by multiplying the rate by the gap in the mortality rate in question, resulting in 0.286% ($= 0.39 * 74.1 / 100$). Therefore, the multipliers (the reciprocals of each mortality rate) are 206 ($= 1 / (0.485 / 100)$) and 350 ($= 1 / (0.286 / 100)$). Since the mortality rate for the rich is lower than for the poor, they are underrepresented among the deceased. Estimating the population of the living from the number of deaths basically means adjusting this by the difference of the multiplier. Applying this to all age groups makes possible the calculation of the “adult population” in Supplementary Table 1. This shows us that the entire adult population has been extrapolated. Third, when the method of extrapolating the adult population by multiplying the multiplier by the number of deaths in each cell in Supplementary Table 1 is applied to the estate of the deceased (“estate” in Supplementary Table 1), it is possible to calculate the wealth of the living population. That result is found in “estimated estate” in Supplementary Table 1.

The adult population and its estimated wealth for each year that are found by applying the aforementioned method to the other years appear in Supplementary Table 2. They also appear in Figure 2 (“estate multiplier method”), in which estimated wealth trends upward, though unevenly. This paper’s estimates can be checked by comparing them to the data in other studies. One option is the statistics for the net worth of households and non-profit institutions serving households in the *National Balance Sheet*, which contains the results of the Bank of Korea’s estimate of total wealth in South Korea. According to these statistics, there was KRW 6,366 trillion in household net worth in 2013, which diverges considerably from the KRW 3,710 trillion that this paper estimated from the inheritance tax data. There are a few reasons for this divergence. First of all, the statistics for household net worth include the assets of non-profit institutions serving households as well as assets that are not covered in the inheritance tax data. Another difference is the valuation standard for real estate: the inheritance tax data is assessed according to government appraisal values, but household net worth is assessed according to market prices, which are considerably higher. The data does not allow us to accurately calculate which part of

¹³ What we need to bear in mind here is that the bottom 50% must be calculated in terms of the living, not the deceased. In terms of the deceased, the number of deaths in the fifties age group in 2013, for example, would be 14,877, or half of all the deceased (29,754, see Supplementary Table 1). In terms of the living, however, we must take into account the difference in the mortality rate between social classes. For example, since the mortality rates of the top and bottom 50% of the fifties age group relative to the average are 125.9 and 74.1, respectively, the number of deaths for the lower 50% in terms of the living is 18,733, calculated as follows: $\text{total deaths} * 125.9 / (125.9 + 74.1)$. Looking at the total population estimated through this method (“adult population” in Supplementary Table 1), we can see that the lower 50% represents half of the total adult population. In order to estimate the wealth of the bottom 50%, we interpolated the below KRW 100 million wealth bracket at the threshold of the number of deaths for the bottom 50% (calculated as explained above) using the mean-split histogram, an interpolation method that will be discussed later.

household net worth corresponds to the inheritance tax data. The differences in the scope of coverage and valuation criteria in the two data sets are calculated using an admittedly crude method,¹⁴ the results of which are presented in “household net worth” in Figure 2.

Figure 2. Estates estimated through the estate multiplier method compared to household net worth (unit: KRW 1 trillion)



Note: The figures for household net worth were adjusted so that the net worth of households and non-profit institutions serving households would correspond to the inheritance tax statistics.

Comparing the wealth estimated from the inheritance tax data and the household net worth shows an upward trend that is similar overall, despite including considerable gaps. These gaps in the upward trend are particularly

¹⁴ The net worth of households and non-profit organizations was calculated by subtracting financial debt from the sum of financial assets and non-financial produced and non-produced assets (refer to the table showing net capital stock by institutional sectors and financial assets and liabilities outstanding in the *National Balance Sheet*). The share of non-profit institutions serving households (which the Bank of Korea says has steadily increased from 5% to 6.5% in 2000–2013) needs to be subtracted from that figure. Additionally, the household net worth in the *National Balance Sheet* also includes categories that are not covered in the inheritance tax statistics, such as equipment and inventory owned by self-employed individuals and the products of intellectual property. These remain in the data, though they ought to be identified and removed. Furthermore, real estate accounts for 76.2% (the 2000–2013 average) of household net worth. Since this real estate is valued at market prices, matching this data with the inheritance tax statistics requires that these market prices be converted into government appraisal values. The yearly ratio of market prices to government appraisal values can be calculated by comparing the sum of government appraisal values for individual lots of land (the *Yearly Report on the Appraisal Value of Real Estate* by the Ministry of Land, Infrastructure, and Transport) and the sum of the market prices of land around the country (the *National Balance Sheet* by the Bank of Korea), resulting in 67.2% (the 2000–2013 average). The household net worth that appears in Figure 2 was calculated by adjusting these differences.

substantial in 2008–2009. Tracking down the cause of these gaps raises questions about the inheritance tax statistics. To elaborate further, we can see that the per capita estate for untaxed individuals in 2013 (D/C in Table 1) is KRW 55 million and the average of the below KRW 100 million bracket is KRW 14 million. The changes in average wealth for untaxed individuals shows that this was considerably underreported in 2008–2009. That is, the per capita wealth of untaxed individuals fell from KRW 41–43 million in 2005–2007 to KRW 28 million and KRW 34 million in 2008–2009 before bouncing back to KRW 50 million in 2010. Per capita wealth in the below KRW 100 million bracket dropped from KRW 14 million in 2007 to KRW 8 million in 2008–2009 before recovering its value.

It is impossible to rule out the possibility that the deaths of individuals with little (or much) wealth could be concentrated in a particular year, and that could be the cause of the yearly fluctuations in the total estimated value of wealth. When interpreting estimation results, a greater focus should be placed on the long-term trend than on yearly fluctuations. But it does not seem logical that the average amount of wealth of all untaxed individuals could have decreased by 20–30% as it did in 2008–2009. Because there are few deaths in the highest brackets, the average amount of wealth there may fluctuate from year to year because of a sampling error. But it is not plausible that the average amount of wealth in the below KRW 100 million bracket, which consists of more than 200,000 individuals, would decrease by more than 40%. The cause of these results could not be determined. When interpreting the results of the estimates for 2008–2009, attention must be paid to such issues with the data.

Wealth Distribution and an International Comparison

Estimating Wealth Distribution: A Review of the Findings

The 2013 distribution of the wealth of the living as estimated in the previous section is provided as an example in Table 4. The challenge here is to use this to estimate the top wealth shares—for example, what percentage of total wealth is held by the top 1%. The cumulative ratio of population and wealth (F, G) in the table shows that the top 0.97% owns 24.77% of total wealth and that the top 3.63% owns 43.60% of total wealth. It follows from this that the wealth share of the top 1% (the figure we are seeking) falls between 24.77% and 43.60%. It is necessary to divide the KRW 500 million–1 billion wealth bracket in Table 4 at the threshold of the top 1%, and there are two interpolation methods available for this. The first method assumes that the wealth distribution follows the Pareto distribution, and the second uses a mean-split histogram. This second method, which was adopted by Atkinson (2005: 333–334), is also adopted in this paper. It consists of first narrowing as much as possible the upper and lower bounds into which the number of people can be distributed for each wealth bracket and then using a mean-split histogram to estimate what would be the most reasonable distribution between those bounds.

This method has the advantage of not assuming a specific pattern of distribution, such as a Pareto distribution.

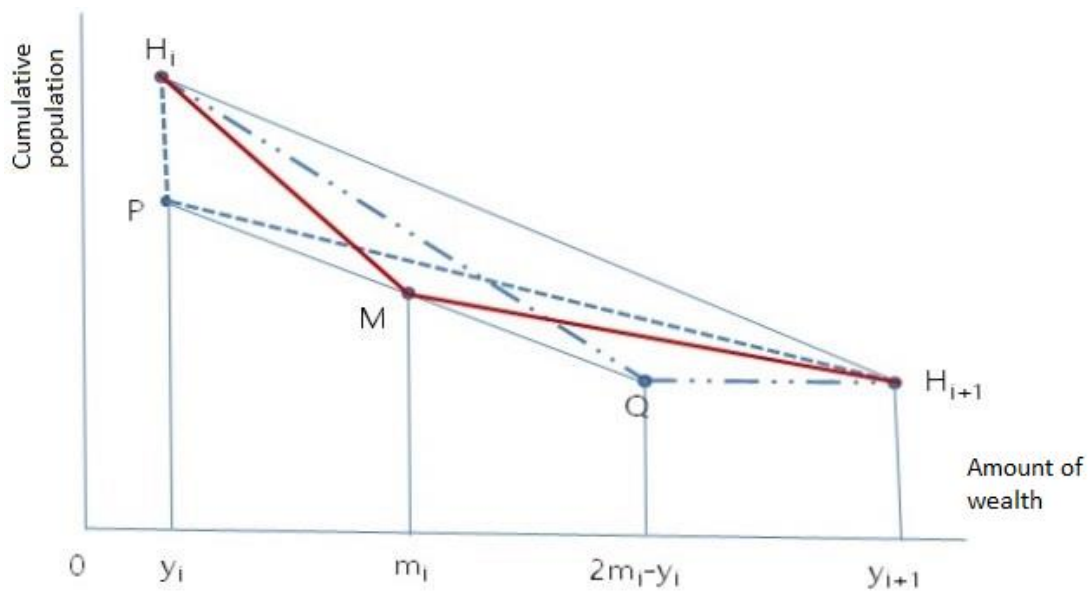
This interpolation method can be explained using Figure 3.¹⁵ This figure depicts the population distribution inside a wealth bracket, with the X axis representing the amount of wealth and the Y axis representing the cumulative population through the bracket in question. Taking for example the KRW 500 million–1 billion wealth bracket in Table 4, the lower bound (y_i), upper bound (y_{i+1}), and average (m_i) of this bracket turn out to be KRW 500, 1,000, and 689 million, respectively (the subscript i here indicates the wealth bracket). The cumulative population for the lower and upper bounds on the Y axis (H_i , H_{i+1}) prove to be 1,434,406 and 384,466 people, respectively. But if we introduce the assumption that population decreases or at least does not increase with increasing wealth, it is possible to significantly narrow the scope within which the population is distributed. The average wealth (m_i) in this figure is marked to the left of the intermediate point, signifying that in this bracket a higher population is associated with less wealth, rather than greater wealth.

Table 4. Distribution by wealth bracket for the estimated adult population (2013)

Lower bound	Upper bound	Adult population	Wealth	Per capita wealth	Cumulative population	Cumulative wealth	Cumulative rate (%)	
(KRW 1m)		A (people)	B (KRW 1b)	C=B/A (KRW 1m)	D=∑A	E=∑B	F Population	G Wealth
	9	19,749,566	69,490	4	39,499,131	3,843,897	100.00	100.00
9	100	10,814,965	499,780	46	19,749,566	3,774,407	50.00	98.19
100	300	5,982,908	1,015,751	170	8,934,601	3,274,626	22.62	85.19
300	500	1,517,287	582,883	384	2,951,692	2,258,875	7.47	58.77
500	1,000	1,049,940	723,730	689	1,434,406	1,675,993	3.63	43.60
1,000	2,000	243,906	338,953	1,390	384,466	952,262	0.97	24.77
2,000	3,000	80,068	197,210	2,463	140,559	613,309	0.36	15.96
3,000	5,000	37,841	149,390	3,948	60,492	416,099	0.15	10.82
5,000	10,000	15,735	109,247	6,943	22,650	266,708	0.06	6.94
10,000	50,000	6,448	115,904	17,976	6,915	157,461	0.02	4.10
50,000		468	41,557	88,886	468	41,557	0.00	1.08
Sum		39,499,131	3,843,897	97				

¹⁵ This is the same method used to estimate the tax burden for each class in Kim, Nak Nyeon (2014).

Figure 3. Mean-split histogram method of interpolating wealth brackets



Note: This figure is borrowed from Atkinson (2005: 333).

In this case, the scope of the population distribution is provided as follows. While maintaining the average wealth (m_i) in the wealth bracket, the point where there is the greatest distribution of individuals with relatively little wealth will be called the lower bound of the population distribution, and conversely, the point where there is the greatest distribution of individuals with relatively large wealth will be called the upper bound. First, the lower bound of the population distribution can be expressed by lines H_iQ and QH_{i+1} . Here the wealth corresponding to Q ($2m_i - y_i$) is placed as far to the right of the average (m_i) as y_i is to the left of m_i . In this case, the population of this bracket will be distributed equally in all the wealth brackets $[y_i, 2m_i - y_i]$ and the wealth will be 0 in wealth brackets that are greater than this $[2m_i - y_i, y_{i+1}]$. The upper bound of this population distribution is provided as the lines H_iP and PH_{i+1} . When line PQ is drawn in parallel to line H_iH_{i+1} , triangles that share the base (H_iH_{i+1}) of the trapezoid $H_iH_{i+1}QP$ (such as triangles H_iQH_{i+1} and H_iPH_{i+1}) all have the same area. This implies that average wealth is also maintained at m_i on the straight lines H_iP and PH_{i+1} , which constitute the upper bound of the population distribution. In this case, as much population as possible (equivalent to H_iP in the figure) is concentrated at the lowest level of wealth in this bracket (y_i), and then the rest is distributed equally throughout the wealth bracket $[y_i, y_{i+1}]$.

While the actual distribution of the population in this bracket probably falls between the upper and lower bounds mentioned above, how should this be specified? While one way would be to calculate the average of the upper and lower bounds, it would be more logical to regard this as a distribution of H_iM and MH_{i+1} around M . M corresponds to the average (m_i) of this bracket, and in that sense, this can be regarded as the mean-split histogram method. As is indicated by the fact that the slope of line H_iM is steeper than that of line MH_{i+1} , we can see that more people

are distributed below the average of the bracket (m_i) and fewer are distributed above it.

Now we will look at an example of how this interpolation method and the data in Table 4 can be used to calculate the percentage of wealth owned by the top 1% of the adult population. We can see that the individual who belongs to the top 1% (that is, the 349,991st individual ranked by wealth) falls in the KRW 500 million–1 billion wealth bracket in Table 4. This bracket data from Table 4 can be used to calculate the slope and intercept (that is, the function) of lines H_iM and MH_{i+1} . If the number of people in the top 1% (349,991) are substituted for the Y value, the corresponding threshold wealth is calculated as being KRW 992 million.¹⁶ In other words, this means that an individual must have more than KRW 992 million in wealth to enter the top 1%. Furthermore, the value of the wealth of the people in the top 1% of this wealth bracket can be calculated by multiplying the average value of the boundary wealth (KRW 992 million) and the upper limit (KRW 1 billion) of this wealth bracket by the number of people in question (= 394,991 - 384,466). By adding this wealth to the wealth of the people above the KRW 1 billion won wealth bracket, we can calculate the wealth of the top 1%. Finally, dividing this wealth by the total wealth gives us the percentage of total wealth (25.0%) that belongs to the top 1%.

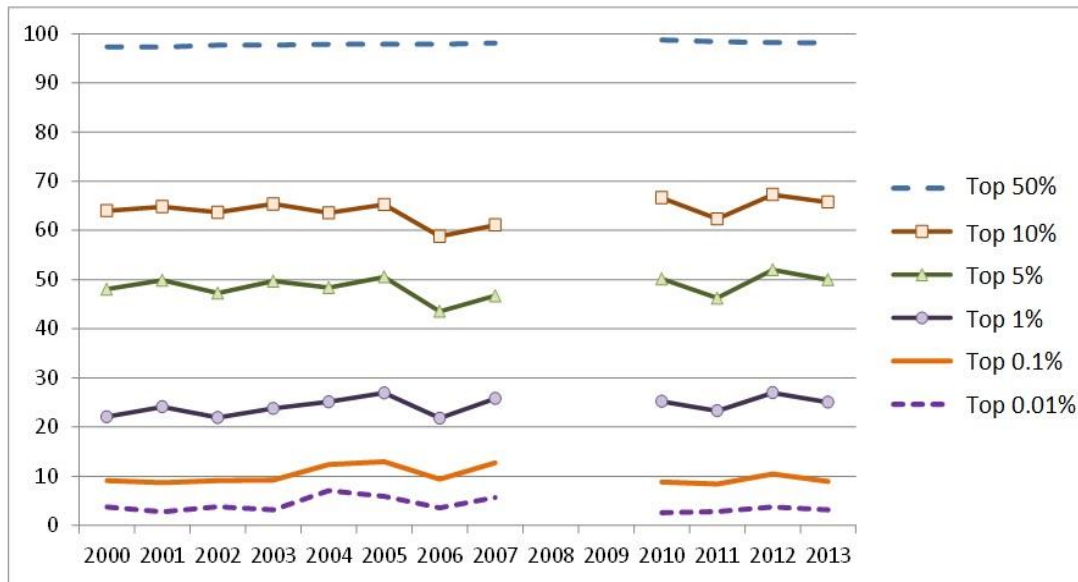
This method can be applied in the same way to calculate different asset concentrations, such as the top 0.1% or the top 10%. The results of this calculation – in other words the threshold wealth, average wealth, and share of wealth owned – are provided in Supplementary Tables 3, 4, and 5, respectively. When these groups are subdivided beyond the top 0.1%, the extremely small sample size can exacerbate sampling errors. For example, the wealth of the entire adult population for 2013 is estimated from the data for 263,237 decedents, which means that the top 0.01% of this group only consists of 26 individuals. That is also why the yearly fluctuations in these figures become more severe as we approach the top. The Supplementary Tables only provide data up to the top 0.1%. The estimated figures for 2008–2009 are not adopted here because of the previously mentioned issues with the raw inheritance tax data, but they are provided for readers' reference.

Figure 4 shows what share of total wealth belongs to each top percentage. Because of the data issues, the shares for 2008–2009 were unusually high, so these two years have been removed from consideration. First, we can see that the top 50% have around 98% of the total wealth, which means that the bottom 50% only have 2% of the total. We must keep in mind that “top x%” means the percentage of the adult population aged 20 and above (in 2013, this was 39,499,131 people). As a consequence, the bottom 50% includes a large portion of the economically inactive population, members of whom hardly own any assets. The percentage of wealth held by the top 10% is above 60%, a figure that is found to increase somewhat, from 63.3% in 2000–2007 to 65.5% in 2010–2013. The result is that the percentage of wealth held by the top 10–50% has decreased accordingly during the same period, from 34.4% to 32.9%. The percentage of wealth held by the top 1% increased somewhat during the same period, from 24.0% to 25.1%. Figures are also provided for the top

¹⁶ Either Line H_iM or line MH_{i+1} should be used depending on whether the number of people in the top 1% (what we are trying to calculate here) is located above or below the cumulative number of people in M (that is, 781,986 people), which corresponds to the average wealth m (KRW 689 million) of that bracket. Since the number of people in the top 1% (394,991) is lower than M, the latter line should be used.

0.1% and the 0.01%, whose wealth share fell from 10.5% to 9.1% and from 4.5% to 3.1%, respectively, during the same period. Since sample sizes are smaller in higher brackets, we must bear in mind that these estimates may be divorced from reality.

Figure 4. The share of wealth that belongs to each top percentage



Note: Because of problems with the data, 2008–2009 are not provided here.
Source: Supplementary Table 5.

A few questions can be asked about the reliability of the estimates above and about the possibility of distortions arising during the estimation process. Such potential issues will be examined here. First, there is the possibility that the estimation results were affected by the potential failure to report inheritance tax and by changes to the inheritance tax regime. Because there are normally strong incentives to underreport income and assets when filing taxes, it is common for tax data to be lower than the actual figures. But as we have previously mentioned, the estate data that is used here includes all the assets found in the National Tax Service's computer network, so those real estate and financial assets are unlikely to be omitted regardless of whether they are subject to taxation. As for the other assets that are not found on the computer network, there is a high likelihood that these will go unreported, not only by those who do not owe taxes but also by those who do. Therefore, it can be said that the wealth distribution estimated by this paper is basically limited to real estate and financial assets. Furthermore, revisions to the tax code have expanded the scope of the inheritance tax and therefore increased the percentage of estates that are subject to taxation. But the subject of analysis here is the total estates as determined by the National Tax Service, regardless of whether those estates are taxed or not. Therefore, even if revisions to the tax code expand the scope of taxation, that does not affect the estimates made in this paper.

Second, considering that giving away assets prior to death reduces a decedent's estate accordingly, could this be problematic for estimating the assets of the living? If parents give assets to a child, for example, the remaining inheritable estate will be

reduced, while the child who received those assets will see their wealth increase by the same amount (minus the gift tax). Furthermore, the child who received those assets could die during this period (though this is less likely than their parents dying), in which case they would be included in the inheritance tax data. It is therefore fair to say that the inheritance data already accounts for wealth that has been dispersed through gifts. The problem is those cases in which the gift itself is related to death. If, for example, a gift is made on the understanding that death is imminent, calculating the wealth based on the estate remaining after the gift will yield a low estimate.¹⁷ But such problems are precluded to a certain extent under the current inheritance tax system. First of all, assets given to inheritors within the ten years prior to the time of death are included in the estate (Inheritance Tax and Gift Tax Article 13). Furthermore, the portion of the estate that has been liquidated in the year (or two years) prior to death in excess of KRW 200 million (or 500 million) is assumed to be part of the estate unless a legitimate use can be proven (Article 15). Such property is regarded as having been inherited and thus is already included in the data.¹⁸

Third, greater wealth is accompanied by a greater incentive to dodge or reduce inheritance tax (since the inheritance tax rate goes up to 50%), and the estate that is actually inherited is commonly reduced through pre-death gifts and other practices of questionable legality. Among the highest brackets, it is typical to devise elaborate long-term plans for avoiding the inheritance tax. One such questionable practice is for a controlling stockholder to give their children stock in an affiliated company and then pump orders into that company to increase the value of its stock. Another option is to create and fund a foundation that essentially serves as an inheritance. Though such practices are basically gifts and inheritance, they are not included in the taxation data.

Fourth, since this paper's approach can be regarded as estimating (with an average multiplier of 150) the assets of the living adult population (39,499,131 people) from a sample consisting of the estates of the deceased (263,237 people), the sampling error is liable to get worse as we move into higher asset brackets.¹⁹ This is not much of a concern with the top 1%, for example, given a sample size of 2,632, but when this is subdivided to the top 0.01%, there are only 26 people left in the sample. Given such considerations, it is possible to entertain doubts about the extent to

¹⁷ The estate multiplier method calculates total wealth by multiplying the reciprocal of the mortality rate of each population group by its wealth. In such cases, individuals cannot artificially adjust their probability of dying, but that is not true of wealth. If estates are reduced because individuals dispose of their possessions in the expectation of death, this method is biased toward underestimating wealth. Kopczuk and Saez (2004: 20-24) cite the deteriorating ability to manage assets and excessive medical expenditures prior to death as reasons for a negative correlation between the probability of an individual's death and their wealth, but pre-death gifting is thought to be the most important and general reason.

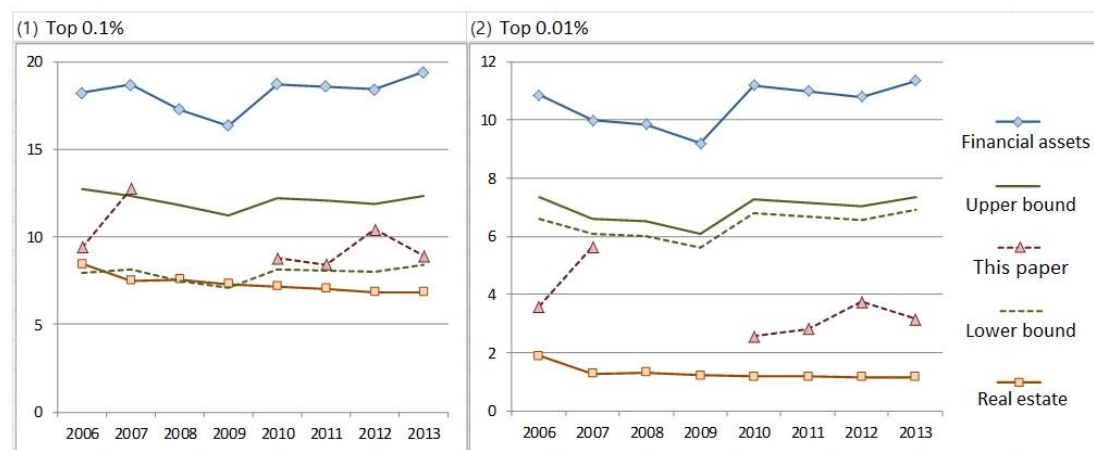
¹⁸ According to the *Yearbook*, the inheritance tax levied in 2013 amounted to KRW 10.6 trillion. Assets given to inheritors in the previous 10 years (Inheritance Tax and Gift Tax Article 13) accounted for 18.7% of the tax levied, and assets assumed to have been inherited (Article 15) accounted for 1.2%.

¹⁹ When using the income tax data to calculate the top income shares, sampling error is not an issue because that data series is completely enumerated, including information about all income earners. But using the inheritance tax data to calculate the top wealth shares requires the additional process of estimating the wealth distribution for the living from information about the deceased, and the sampling error can be aggravated during that process.

which this paper's estimation of the wealth of the highest brackets conforms to reality.

One way to check this is through taxation data that directly captures wealth trends in the highest brackets. First, the data for the comprehensive tax on financial income can be used to determine the concentration of financial assets in the highest bracket. This data includes everyone whose yearly financial income (the sum of their dividends and interest) exceeds KRW 40 million (since 2013, KRW 20 million). Though this figure represents yearly income from financial assets, a ranking of financial income can be regarded as reflecting a ranking of financial assets. Figure 5 shows what percentage of total financial assets belong to the top 0.1% and the top 0.01%, ranked by financial assets.²⁰ The top 0.1% have about 18% of financial assets and the top 0.01% about 10%, representing quite a high concentration of wealth. The wealth share decreased somewhat during the 2008–2009 financial crisis but soon recovered. Outside of this period, the wealth share exhibits a slight upward trend.

Figure 5. Share of financial assets and real estate held by the top 0.1% and 0.01% (unit: %)



Notes: 1) "Top x%" expresses the top share of wealth in terms of the total adult population aged 20 and above.

2) The upper bound was calculated on the assumption that financial assets and real estate are both included in the top x%, while the lower bound was calculated on the assumption that real estate assets are equal to 0.

The comprehensive real estate tax data offers an alternative approach to determining the real estate owned by individuals. In order to levy the comprehensive real estate tax, the National Tax Service determines the houses and land owned by individuals and corporations across South Korea and adds up each individual's property. The tax levied is based on the sum of their property's government appraisal values.²¹ This was the basis for calculating the percentage of

²⁰ The distribution by income bracket of the comprehensive tax on financial income was estimated using the mean-split histogram discussed above, with the relevant data obtained from the *Yearbook* (Table 3-1-5). Just as earlier, the top 0.1% here is relative to the adult population and consisted of 39,499 adults in 2013.

²¹ Here I used percentile data for home and land ownership that was obtained from the National Tax Service by the office of lawmaker Park Won-seok.

total real estate value that belongs to the top 0.1% and 0.01%, which is presented in Figure 5. This suggests that wealth concentration in real estate is much lower than in financial assets. Real estate can be divided into housing and land, and the wealth concentration in housing is much lower than in land.²² Also notable is the fact that the concentration of wealth in real estate is exhibiting a decline. The downward trend is a little more distinct in the top 1% and 10%, whose share decreased from 28.9% to 24.7% and from 74.3% to 67.6%, respectively. This seems to reflect the fact that housing prices have been rising more quickly among medium and small properties than among large ones.²³

But since these top wealth shares are separate into financial assets and real estate, we need to find the top wealth shares that combine these two types of wealth. Despite the inadequacy of the available data, a rough attempt was made to combine them as detailed below. If all the individuals in the top 0.1% in terms of financial assets are also in the top 0.1% in terms of real estate, the combined concentrations of these two types of wealth can be found by taking the weighted average of the two concentrations.²⁴ But since there are probably also individuals with a large amount of financial assets but little real estate or vice versa, this is an overestimation and thus serves as the upper bound for wealth concentration. Conversely, a hypothetical individual who owns some financial assets but no real estate serves as the lower bound of wealth concentration. These results are provided as the “upper bound” and “lower bound” in Figure 5.

Starting with the top 0.01%, the gap between the upper and lower bounds is narrow because there is a low wealth concentration in real estate. This paper’s estimates for the wealth share of the top 0.01% are presented in this figure, where it is apparent that they do not even reach the lower bound. This essentially confirms that this paper’s methodology tends to underestimate the wealth of the highest brackets, including the top 0.01%. When the upper and lower bounds of wealth concentration are calculated in the same way for the top 0.1%, this paper’s estimates are found to fall within those bounds.²⁵ Our conclusion is that this paper’s estimates do not correspond to reality when we zoom in to the highest wealth brackets, such

²² The top 0.1%’s share of land fell from 18.6% to 17.8% in 2007–2013 and its share of housing fell even further, from 4.5% to 3.2%, during the same period.

²³ Examining the price index for apartments around the country, we can see that the 2013 index for large apartments divided by the 2006 index was stagnant at 106 while the index for small apartments shot up to 166 (Statistics Korea, KOSIS).

²⁴ In order to find the weighted average, we need to know the relative shares of real estate and financial assets. The figures used here are the value of assets by amount and by type (Table 6-2-4 in *Yearbook*), limited to decedents on whom the inheritance tax was levied. A calculation is made of the shares of real estate and financial assets for asset holders who exceeded the threshold wealth (Supplementary Table 3) for the top 0.1% and 0.01%, which was an average of KRW 4.1 billion and KRW 15.8 billion, respectively, in 2007–2013. The resulting shares of real estate and financial assets were 56.5 and 43.5 for the top 0.1% and 39.1 and 60.9 for the top 0.01%. These shares were used as the weighted value for combining these two types of assets. We can see that real estate accounts for a much higher share in the overall average, but that the share of financial assets grows as we move into higher income brackets.

²⁵ Given the wide gap between the upper and lower bounds in the top 0.1%, we will try relaxing our assumption about the lower bound (namely, that individuals have no real estate assets). If we instead adopt the more realistic assumption that the average real estate owned by this group is half the average assets (KRW 5.5 billion in 2013) of the top 0.1% in terms of real estate, the lower bound is higher than its current level. In that case, this paper’s estimate of the top wealth shares is found to be in the proximity of this new lower bound.

as the top 0.01%, but they do approximate reality to some extent when we zoom out to the top 0.1%.²⁶ That is why estimates for brackets smaller than the top 0.1% are not included in Supplementary Tables 3–5.

A Comparison with Previous Surveys and Studies

We will proceed to compare this paper's estimation results with the wealth distribution that Statistics Korea found in its sample surveys. Household surveys of assets include the *Household Asset Survey* (2006) and the *Survey of Household Finances and Living Conditions*, which has been carried out every year since 2010. It is necessary to note that these series survey the wealth (real estate and financial assets) owned not by individuals but by households, which diverges from this paper's individual basis. First, the net worth (that is, total assets minus debt) found in microdata from the household surveys was used to calculate wealth distribution by amount. Figure 6 compares the distribution by amount of wealth in the household surveys and in this paper for the year 2010. The Y axis is formatted as a logarithmic scale, while "household surveys" represents the number of households and this paper represents the population aged 20 and above. Figure 6 shows that there were no households whose net worth exceeded KRW 50 billion in the household surveys, while there were far fewer households in the KRW 10–50 billion bracket and the KRW 5–10 billion bracket in the household surveys than the individuals estimated in this paper. Since the household surveys add up the assets of household members, there ought to be more households than the individuals estimated by this paper except in the lower asset brackets. The fact that there are nonetheless far fewer households in several of the highest wealth brackets means that the household surveys are substantially underestimating those households' assets.²⁷ On top of that, it is necessary to consider that even this paper's calculations underestimate the highest asset brackets. The reason there are far more people in this paper's below KRW 100 million bracket than in the household surveys is because individuals with few or no assets are clustered in that bracket. The figures from 2010 are provided as an example here, but the other years are largely the same.

In order to trace these problems back to their origins, let's compare each of the assets reported in the household surveys with the assets and debt in each household sector that is reported in the Bank of Korea's *National Balance Sheet*. The real estate (buildings and land) reported in the household surveys in 2013 amounted to KRW 4,001 trillion, which was somewhat less than the KRW 4,782 trillion in the *National Balance Sheet*. Considering that the latter includes the assets of non-profit institutions serving households, the two figures can be regarded as being relatively comparable. As for financial assets, the household surveys report KRW 1,601 trillion and the *National Balance Sheet* reports KRW 2,421 trillion; in terms of financial debt, the respective figures are KRW 1,063 trillion and KRW 1,140 trillion.²⁸ Rental deposits

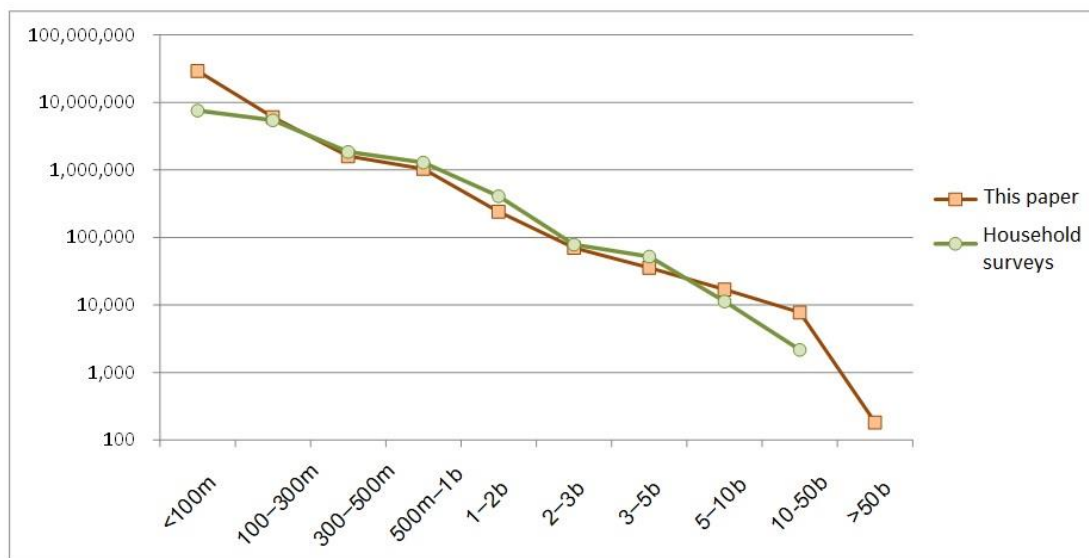
²⁶ I wanted to check the top 1% in the same way, but this turned out to be impossible because there are fewer individuals subject to the comprehensive tax on financial income than there are in the top 1%.

²⁷ This is even more cogent when we consider that this paper estimated real estate using government appraisal values, which are 30% lower than market prices.

²⁸ The financial assets and debt listed here for the *National Balance Sheet* are calculated by subtracting

given by tenants (KRW 429 trillion) and rental deposits received by landlords (KRW 342 trillion) are included under financial assets and debt, respectively, in the household surveys, but not in the *National Balance Sheet*. If we are to compare the two data sets by the same standards, these two types of deposits need to be removed from the household surveys. After doing so, the financial assets (or debt) in the household surveys only amount to 48.4% (63.2%) of the total financial assets (debt) in the *National Balance Sheet*. Even accounting for the share of the latter that belongs to non-profit institutions serving households, the household surveys only cover about half of financial assets. Considering that financial assets make up an increasingly large share of wealth as we move into higher brackets, we can infer why the household surveys underreported wealth in the higher bracket in Figure 6.

Figure 6. A comparison of the distribution of individuals/households by wealth bracket (2010): this paper versus household surveys



Note: "Household surveys" represents the number of households, while "this paper" represents the adult population aged 20 and above.
 Source: Statistics Korea, *Survey of Household Finances and Living Conditions* (raw data); this paper presents 2010 statistics estimated as in Table 4.

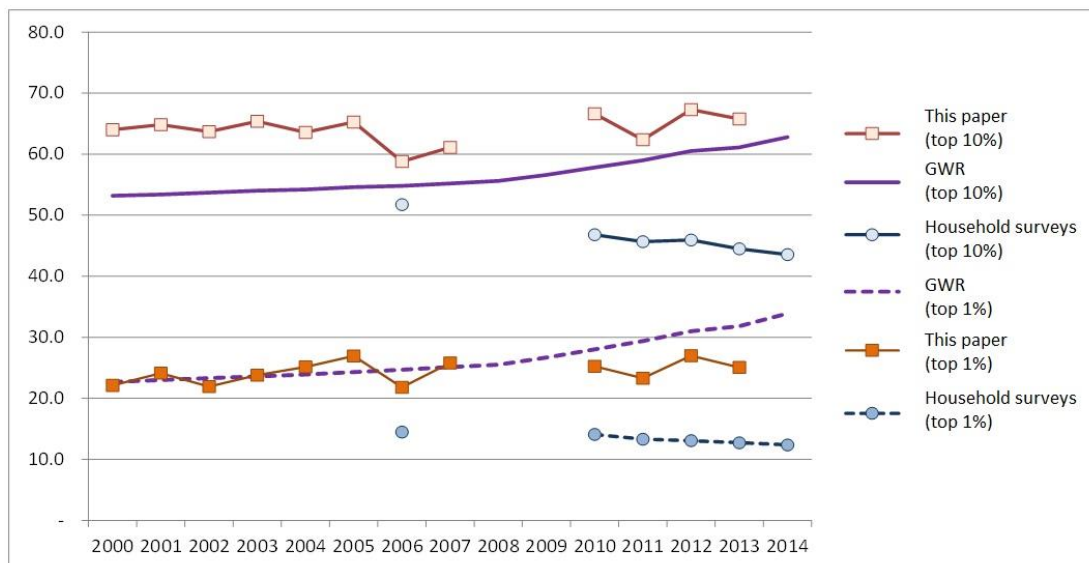
Next, we will compare the wealth concentration of the top 1% and 10% as estimated in this paper and the household surveys (Figure 7). The top 1% in this paper means the share of wealth of the 394,991 people who constitute the top 1% of the adult population for 2013 (39,499,131) ranked in order of wealth. In contrast, the top 1% in the household surveys means the share of wealth of the 181,412 households that constitute the top 1% of the 18,141,231 total households ranked in order of wealth. Since the top 1% in this paper was calculated relative to the adult population, which includes a large number of individuals with no assets, the concentration is higher here than in the household surveys, which take households as their basic unit. The wealth shares held by the top 1% and 10% in the household

the share of non-profit institutions serving households, estimated to be 6.5% of the total.

surveys are seen to decrease from 14.5% to 12.4% and from 51.7% to 43.6%, respectively, between 2006 and 2014. This contrasts with the slight upward trend found in this paper's estimates, and the gap between the two is gradually widening.

Figure 7 also features the South Korean figures from the 2014 *Global Wealth Report* (Credit Suisse Research Institute, 2014), a yearly report that has tracked the top wealth shares in countries around the world since 2000. The *Global Wealth Report* uses household surveys like the *Survey of Household Finances and Living Conditions* while also drawing upon data on the wealthy provided by *Forbes* and other media to compensate for underreporting by people in the highest wealth brackets. Though the report claims to have converted the household surveys' household basis to the basis of individuals aged 20 and above, just like this paper, the exact estimation method is unclear.²⁹ The report's estimate of the wealth share of the top 1% is similar to this paper's findings during the early 2000s, but the report's estimate for the top 10% is considerably lower than this paper's. In both brackets, however, the report says that the wealth share is increasing at a faster speed than this paper and categorizes South Korea as one of the countries with the fastest growing wealth inequality. This runs counter to Statistics Korea's household surveys.

Figure 7. A comparison of wealth concentration (%) findings by this paper, household surveys, and the *Global Wealth Report*



Notes: 1) The household surveys are conducted on a household basis, while the others are based on the adult population aged 20 years and above.

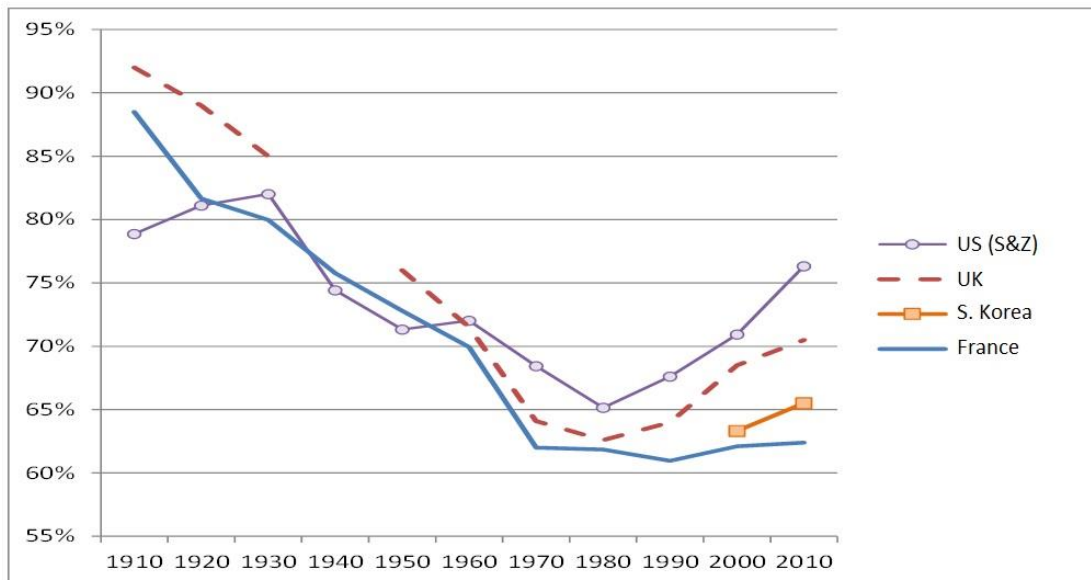
2) Because of problems with the data, 2008–2009 are not provided here.

Sources: Credit Suisse Research Institute, *Global Wealth Databook 2014*, pp. 125–126; Statistics Korea, *Survey of Household Finances and Living Conditions*; Supplementary Table 5.

²⁹ While the *Global Wealth Report* has published estimates since 2000, it is not certain how it made estimates for years when no household surveys were carried out for wealth. Furthermore, converting to an individual basis necessarily involves making assumptions about how household assets should be divided into shares for household members, and the manner in which this is done can affect the overall estimates about individual wealth distribution.

Let us recall at this point that wealth concentration in financial assets exhibits a different trend than in real estate (Figure 5). While Figure 5 only displays figures for the top 0.1%, there is an even more obvious downward trend in the real estate share of the top 1% and 10%. In Figure 7, we can see that the wealth share of the household surveys is falling. One likely reason for this is that the household surveys are focused on real estate (housing, mostly) and do not adequately reflect financial assets, especially those of the highest brackets. This contrasts with the *Global Wealth Report*, which estimates that wealth concentration is continuing to rise across all groups. But the fact that the real estate concentration fell during this period and that the financial asset concentration made a temporary dip during the financial crisis is not obvious from the report.

Figure 8. An international comparison of the wealth share of the top 10%



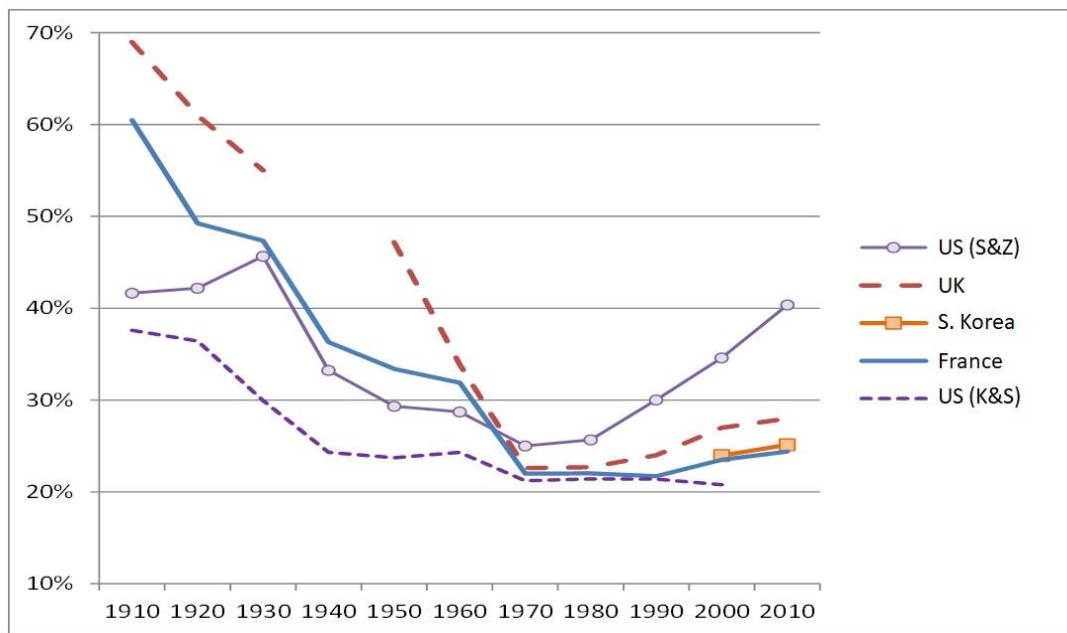
Notes: Each year represents a ten-year average (for example, 2000 is the average for 2000–2009). Sources: US (S&Z) is from Saez and Zucman (2014); France and the UK are from Piketty's (2014) Excel file (Table S10.1); South Korea is from Supplementary Table 5.

To take a different tack, we will examine how this paper's estimate of the wealth concentration in South Korea compares to other countries. Figure 8 presents the wealth share of the top 10% in South Korea alongside the United States, the United Kingdom, and France.³⁰ The top 10% was compiled on the basis of the adult population aged 20 and above, and the concentration levels provided are ten-year averages. The changes in wealth concentration form a U shape. From highs above 80% and 90% in the early part of the twentieth century, the levels drop during the Great Depression, World War II, and the postwar period until the 1980s and then rise once more. The rise since the 1990s is most noticeable in the United States and

³⁰ The wealth concentration of these countries was estimated using inheritance tax data and the estate multiplier method, just as for South Korea. But the wealth concentration for the top 10% was not estimated using the estate multiplier method (Kopczuk & Saez, 2004) for the United States, so a figure is provided that was estimated using a different method (Saez & Zucman, 2014).

the United Kingdom and contrasts with France, which has remained steady since hitting a low of 62% in the 1970s.³¹ This comparison shows that the United States had less wealth inequality than Europe before 1910 and that the opposite has been true since 1970. While the corresponding figures for South Korea are only available during the brief period since 2000, they show that South Korea falls between France on the one hand and the United States and the United Kingdom on the other and that wealth concentration has risen somewhat, from 63% to 66%.³²

Figure 9. An international comparison of the wealth share of the top 1%



Notes: Each year represents a ten-year average (for example, 2000 is the average for 2000–2009). Sources: US (S&Z) is from Saez and Zucman (2014); US (K&S) is from Kopczuk and Saez (2004); France and the UK are from Piketty's (2014) Excel file (Table S10.1); South Korea is from Supplementary Table 5.

In connection with this, the wealth share for the top 1% (Figure 9) forms a U shape that is much the same as the one in Figure 8. The wealth share starts to increase again in the United States and the United Kingdom in the 1990s, and an increase can even be seen in France since the 2000s. In the 2010s, the wealth share for the top 1% is particularly high for the United States (40.4%), followed in descending order by the United Kingdom (28.0%), South Korea (25.9%), France (24.4%), and Sweden (19.0%). But it is important to note that there is a significant gap between the two estimates provided for the United States. The US (K&S) estimate is based on inheritance tax data and the estate multiplier method, just like this paper, while the US (S&Z) estimate is based on the capitalization of capital income. Because of

³¹ Wealth concentration data is also available for Sweden. According to Roine and Waldenstrom (2009), the wealth share of the top 10% (or 1%) has been at 57% (or 19%), since the 1970s, which is lower than France.

³² The figures for South Korea were found by taking the average of 2000–2007 and 2010–2013, while omitting 2008–2009, the period for which the data is questionable.

differences in the underlying data, US (K&S) is based on the adult population aged 20 and above, while US (S&Z) is based on the tax unit (a married couple is processed as one tax unit). Because of these differences, it is not feasible to compare the two series directly, but it is possible to compare changes in those series over time. What we should note here is that the gap between the two levels has been increasing greatly since the late 1990s.

Where are these differences coming from? Saez and Zucman (2014: 35–37) focus on the fact that Kopczuk and Saez (2004) assumed that the mortality rate gap between classes was the same for each year when they used the estate multiplier method. When Saez and Zucman estimated the mortality rate for each class (the top 1%, 5%, 10%, and the overall average) using individual data about sex, age, and date of death from inheritance tax microdata from 1979–2008, they found that there were not only considerable differences between these classes, but that the mortality rate fell faster for the upper class than for the lower class.³³ Taking into account the widening gap in the mortality rate between classes would presumably narrow the gap between the two estimates since the 1990s. As we have already seen (Figure 1 and Table 3), this sort of mortality rate gap has also widened rapidly in South Korea, in the fifties and sixties age groups.

South Korea's example may suggest another reason for this gap. When we further subdivide the top 1% share in US (S&Z) in Figure 9, we find that the increase in this share resulted from an increase in the share of the top 0.1% and even the very top 0.01%, while the share of the 0.1–1% remained stagnant, just as with US (K&S). In other words, the gap between the two estimates mostly results from the accuracy with which they identified trends in the highest bracket. Since the income tax data used by S&Z is completely enumerated, it includes all individuals in the highest bracket. As we have already seen in this paper, however, approaches based on inheritance tax statistics such as K&S are more prone to sampling errors as they move into the highest brackets. Furthermore, such approaches are also likely to underestimate wealth because of the intricate tax-saving measures employed by individuals in the highest brackets. These points should be considered when using the estate multiplier method.

Conclusion

In this paper, I have sought to ascertain the actual distribution of individual wealth since 2000 using the inheritance tax data and the estate multiplier method. The main findings here can be summarized as follows.

First, the top 1% (or 10%) of South Korea's adult population when ranked by wealth was found to possess 24.0% (or 63.3%) of total wealth in 2000–2007 and 25.1% (or 65.5%) in 2010–2013. To enter the top 1% (or 10%) in 2010–2013, one's assets had to exceed KRW 1 billion (or KRW 250 million). For the sake of comparison, the share

³³ For men aged 65–79, for example, the mortality rate for the top 1% fell from 88% of the average in 1979 to 60% in 2008. In contrast, Kopczuk and Saez (2004) applied the same mortality rate of 78% every year.

of the top 1% (or 10%) of the adult population when ranked by income increased from an average of 9.6% (or 38.7%) to 12.1% (or 44.1%) during the same period (Kim and Kim 2014). This shows that wealth inequality is much more severe than income inequality and that the gap between the two widens as we move into the highest brackets.

Second, when South Korea is compared with other countries in terms of wealth inequality, it is found to fall between Anglo-Saxon countries and European continental countries such as France and Sweden. A similar tendency was observed in an international comparison of income inequality. Trends since 2000 show that the wealth share of the top 1% in South Korea is rising gradually, as in the United Kingdom and France, rather than rising rapidly, as in the United States. But in terms of the top 10%, South Korea more closely models the rising wealth concentration in Anglo-Saxon countries than France and Sweden.

Third, this paper identified how the *Survey of Household Finances and Living Conditions* was biased in its survey of wealth. Comparing the distribution of individuals in each asset bracket in this paper and the household surveys showed that the surveys were not able to accurately assess wealth in the highest brackets. The surveys failed to find even half of financial assets, in contrast with real estate. Considering that as total wealth goes up, the portion of that wealth consisting of financial assets increases accordingly, it is easy to understand why wealth was underestimated in the highest brackets. When the asset share for the top 1% and 10% is calculated according to the household surveys, the share is not only lower than this paper's estimates but also exhibits a downward trend. The fact that the real estate share fell during this period (exactly the opposite of financial assets) appears to correspond to the household surveys' bias toward real estate assets. In contrast with the household surveys, the *Global Wealth Report* appears to exaggerate how wealth inequality is rising in South Korea.

That said, it is necessary to take note of the following limitations in this paper's estimates. First, this paper was forced to rely upon assumptions when the inheritance tax data did not include age information. When estimating the gap in the mortality rate between classes, I substituted the gap in the mortality rate between different levels of educational attainment, which could also cause errors. In the future, such issues should be corrected by acquiring new data. Second, the overall wealth is underreported because of characteristics inherent to South Korea's inheritance tax statistics: the scope of assets is generally limited to what is accessible through the National Tax Service's computer network, and real estate prices reflect the government appraisal value. If the difference between the government appraisal value and the market price did not vary with the size of property, there would not be much of an effect on the wealth share of the various top brackets that these prices are used to estimate. But we must remember that threshold wealth and average wealth are underestimated. Third, considering that the wealth in this paper was not derived from a complete enumeration but was estimated from information about the deceased and that wealthy people tend to make meticulous plans far in advance to minimize their inheritance tax liability, the wealth of people in the highest brackets was likely underestimated.

To conclude, I will briefly mention some of the challenges that remain for future research. First is taking a different approach to wealth distribution than this paper did. Property tax data, including the comprehensive real estate tax mentioned above,

could be used for real estate assets, while all the financial income tax data, including information about the comprehensive tax on financial income, could be used for financial assets. The household surveys offer a way to combine these two assets, and an attempt could be made to compensate for those surveys' omissions of certain assets that were mentioned in this paper. It is expected that such methods can be used to gain a richer understanding of the reality of wealth distribution. The next challenge is to explore intergenerational wealth transfers by augmenting the inheritance tax data used in this paper with gift tax data. While this paper did not inquire whether the wealth had been saved up by the individuals themselves or had been given to those individuals through transfers, I think this is an important distinction to make.

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Supplementary Tables

Supplementary Table 1. Distribution of the number of deaths and estate by age and wealth bracket, estimated population, and estimated estate (2013)

(1) Number of deaths (unit: people)

	Sum	<40	40s	50s	60s	70s	>80	Adult Population
Subtotal	263,237	9,055	15,270	29,754	35,696	74,130	99,332	39,499,131
<100m	215,630	8,222	12,012	23,006	27,394	59,090	85,906	30,564,530
(bottom 50%)	140,900	5,808	10,350	18,733	19,133	37,018	49,857	19,749,566
(the rest)	74,730	2,414	1,662	4,273	8,261	22,072	36,049	10,814,965
100-300m	30,182	573	2,220	4,501	5,364	9,467	8,057	5,982,908
300-500m	7,700	147	561	1,134	1,363	2,418	2,077	1,517,287
500m-1b	5,799	103	379	764	963	1,804	1,786	1,049,940
1-2b	2,542	8	60	213	381	906	973	243,906
2-3b	708	2	24	73	124	236	249	80,068
3-5b	373	-	9	46	52	126	140	37,841
5-10b	210	-	4	11	36	58	101	15,735
10-50b	87	-	1	5	18	23	40	6,448
>50b	6	-	-	1	-	2	3	468

(2) Estate (unit: KRW 1 billion)

	Sum	<40	40s	50s	60s	70s	>80	Estimated estate
Subtotal	25,455	356	1,247	2,957	4,090	7,953	8,852	3,843,897
<100m	3,013	115	167	321	382	826	1,202	569,271
(bottom 50%)	564	21	31	60	71	155	225	69,490
(the rest)	2,449	93	136	261	311	672	977	499,780
100-300m	5,129	97	377	764	911	1,609	1,372	1,015,751
300-500m	2,962	56	215	436	524	930	801	582,883
500m-1b	4,046	71	260	525	665	1,258	1,267	723,730
1-2b	3,533	12	83	297	530	1,260	1,352	338,953
2-3b	1,744	5	60	179	306	580	614	197,210
3-5b	1,473	-	37	181	206	498	551	149,390
5-10b	1,458	-	29	74	250	405	700	109,247
10-50b	1,564	-	19	93	317	410	726	115,904
>50b	533	-	-	89	-	178	267	41,557

Notes: 1) Both the number of deaths and the population represent individuals aged 20 and above.
 2) The below KRW 100 million bracket is divided into the bottom 50% and the rest.
 For the methodology, see the main text.

Supplementary Table 2. Number of deaths, estates, and results of estimation

	No. of deaths (people)	Estates (KRWbillion)	Adult population A (people)	Estimated assets B (KRW billion)	B/A (KRWmillion)
2000	238,722	13,957	33,254,450	2,075,281	62
2001	234,540	11,690	33,888,464	1,794,163	53
2002	239,084	12,747	34,471,859	2,033,607	59
2003	238,737	12,132	35,007,246	1,959,967	56
2004	239,079	15,422	35,435,994	2,479,192	70
2005	239,389	14,046	35,760,423	2,291,241	64
2006	238,045	16,859	36,225,975	2,921,077	81
2007	240,696	19,512	36,640,987	3,238,717	88
2008	242,250	17,945	37,133,082	2,666,032	72
2009	243,176	19,454	37,536,274	2,788,561	74
2010	251,713	24,170	37,967,813	3,687,492	97
2011	253,909	28,868	38,539,334	4,358,141	113
2012	263,892	26,014	39,021,687	3,779,080	97
2013	263,237	25,455	39,499,131	3,843,897	97

Note: Both the number of deaths and the population represent individuals aged 20 and above.

Supplementary Table 3. Threshold wealth (Unit: KRW million)

	Top 50%	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%
2000	9	150	277	655	868	1,919
2001	8	129	220	609	849	1,955
2002	7	151	265	600	801	1,862
2003	7	140	246	611	846	2,086
2004	8	160	282	660	909	2,338
2005	8	148	260	629	887	2,664
2006	9	187	308	688	955	2,856
2007	9	197	320	767	1,064	3,519
2008	(5)	(157)	(298)	(943)	(1,467)	(3,908)
2009	(4)	(154)	(325)	(983)	(1,658)	(4,899)
2010	7	256	413	992	1,685	4,185
2011	9	292	468	1,066	1,708	4,459
2012	9	226	387	1,057	1,663	4,264
2013	9	238	394	992	1,634	4,011

Notes: 1) "Top x%" refers to the top percentage of the adult population aged 20 and above ranked in terms of wealth.

2) Wealth here refers to the real estate and financial assets available on the National Tax Service's computer network, with real estate reflecting the government appraisal value, not market prices.

3) 2008–2009 were not adopted because of issues with the raw inheritance tax data, but they are provided for readers' reference.

Supplementary Table 4. Average wealth (unit: KRW million)

	Top 50%	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%
2000	122	399	600	1,380	2,016	5,685
2001	103	343	528	1,278	1,851	4,617
2002	115	376	557	1,293	1,912	5,372
2003	109	366	556	1,332	1,965	5,178
2004	137	445	677	1,759	2,752	8,672
2005	125	418	648	1,727	2,727	8,317
2006	158	474	702	1,759	2,696	7,584
2007	173	540	826	2,282	3,671	11,264
2008	(142)	(538)	(860)	(2,277)	(3,405)	(8,259)
2009	(147)	(600)	(978)	(2,749)	(4,256)	(10,766)
2010	192	647	974	2,451	3,608	8,546
2011	223	705	1,046	2,634	3,953	9,537
2012	190	652	1,007	2,613	3,926	10,102
2013	191	640	972	2,437	3,629	8,674

Notes: Same as Supplementary Table 3.

Supplementary Table 5. Share of assets held by each percentage (unit: %)

	Top 50%	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%
2000	97.4	64.0	48.1	22.1	16.2	9.1
2001	97.3	64.8	49.9	24.1	17.5	8.7
2002	97.7	63.7	47.2	21.9	16.2	9.1
2003	97.7	65.4	49.7	23.8	17.5	9.2
2004	97.9	63.6	48.4	25.1	19.7	12.4
2005	97.8	65.3	50.5	27.0	21.3	13.0
2006	97.9	58.8	43.5	21.8	16.7	9.4
2007	98.1	61.1	46.7	25.8	20.8	12.7
2008	(98.8)	(74.9)	(59.9)	(31.7)	(23.7)	(11.5)
2009	(98.9)	(80.8)	(65.8)	(37.0)	(28.6)	(14.5)
2010	98.7	66.6	50.2	25.2	18.6	8.8
2011	98.4	62.4	46.3	23.3	17.5	8.4
2012	98.2	67.3	52.0	27.0	20.3	10.4
2013	98.2	65.7	50.0	25.0	18.6	8.9

Notes: Same as Supplementary Table 3.