Capital in South Korea: 1966-2013

June 13, 2015

To be presented at the conference on

Social Welfare, Justice and Distribution: celebrating John Roemer's contributions to economics, political philosophy and political science

Queen Mary University of London, UK

June 19-20, 2015

Woojin Lee

Department of Economics

Korea University

woojinlee@korea.ac.kr

Younghoon Yoon

Department of Economics

Korea University

yhyoon@korea.ac.kr

Abstract

We estimate the Piketty ratios in South Korea during the period of 1966-2013 using a consistent set of data on stocks of wealth. To the extent that South Korea's capitalism in the modern sense took off only in the early 1960s, we are indeed covering the almost entire history of modern capitalism in South Korea. We find the following.

First, although there were two big humps, one in the early 1970s and another in the early 1990s, the capital-income ratio (β) has been continuously increasing from 1966 to 2013. The level of the capital-income ratio in South Korea is also high relative to other OECD countries. A part of the reasons for it is a high level of government wealth-income ratios in South Korea; the government in South Korea played an important role in capital accumulation. Another reason is that land prices in South Korea have been high relative to national income levels.

Second, the capital income share (α) has also been increasing over the last half century, and it moves largely in tandem with many inequality indices, such as the Gini coefficient, the top decile income share, and the Theil index on industrial wage inequality. This implies that worsening or improvement of income inequality in South Korea has been closely correlated with rising or declining share of capital income relative to labor income.

Third, the rate of return on capital (r) has been lower than the income growth rate until the mid-1990s; the former is bigger than the latter only after the mid-1990s. This phenomenon, due to unusually fast economic growth in South Korea, is sharply in contrast with those observed in other OECD countries, where the rate of return on capital has been much bigger than the income growth rate for a long period of time. Although g has been bigger than r in South Korea for a long period of time (30 years), however, the movement of α appears to be highly and positively correlated with the movement of r/g as Piketty predicts; these two variables move largely in tandem.

Fourth, the annual wealth growth rate in real terms during the entire period is 8.4%, which decomposes into 3.4% of the savings-induced wealth growth rate and 4.8% of the capital gains-induced wealth growth rate. Thus more than 50% of the wealth growth is due to capital gains in South Korea. In particular, the period of 1966-1979 exhibits the most significant capital gains-induced wealth growth; about 70% of the wealth growth is due to capital gains.

1. Introduction

Over the last half century, South Korea's national income has grown spectacularly. In the early 1960s, South Korea was one of the poorest countries in the world; as of 2015, it is the eleventh largest economy in the world in terms of the size of gross domestic product. Poverty has been significantly reduced during the last half century, and benefits from high growth have been enjoyed by most of the population, at least up until 1998, although they may not have always been equally distributed.

What about wealth in South Korea? How has wealth grown in South Korea over the past 50 years? Who own the wealth, how concentrated is it, and who enjoy the benefits from wealth accumulation? Have wage earners fared well relative to capital owners from the wealth accumulation? Has wealth accumulation been largely due to accumulation of savings or to capital gains? Did private savings come largely from individual hard work or from lucky gifts one receives? This paper addresses some of these questions using a newly constructed data set on stocks of wealth in South Korea.

These questions have been difficult to answer until very recently in South Korea. Although the National Income and Product Account, reporting flows of income, consumption, investment, etc., have been well developed in South Korea, the National Balance Sheet reporting stocks of wealth have not been available until May, 2014. Facing the predicament, several authors have attempted to estimate stocks of wealth in South Korea (Kim and Hong, 1997; Pyo, 1998, 2003). Their estimates are, however, largely restricted to produced non-financial assets; most of non-produced non-financial assets (such as land and natural resources) are left unestimated, which turn out to take about 65% of the total non-financial assets in 2013 in South Korea according to our new data set.

Our present work is greatly inspired by a series of recent work by Piketty and his

collaborators (Piketty, 2014; Piketty and Saez, 2014; Piketty and Zucman, 2013, 2014, 2015), which indeed opened the door to a new science of economic inequality.

In Piketty's theory, there are at least two mechanisms by which capital is the main reason for rising wealth and income inequality. The first mechanism is that the wealthy are likely to accumulate more and more wealth, as a percentage of national income, because the return they get from existing wealth is higher than the growth rate of income. Consequently, the share of annual income that accrues to the owners of capital will increase, which in turn increases the incomes of the already-wealthy owners of capital relative to the much larger portion of the population who earn income mostly from their labor. The second mechanism is that even if capital income share remains constant, the wealth and income distributions can still become more and more skewed due to capital accumulation if the rate of return on capital earned by the wealthy is an increasing function of his/her initial wealth, or if the savings rate is an increasing function of initial wealth, or both.

Both mechanisms are premised on the relationship that the rate of return to capital is higher than the income growth rate. Both mechanisms are also based on the empirically robust fact that the distribution of capital is highly skewed. Due to limitation on data, we cannot identity both mechanisms in South Korea; we only provide a partial answer to the first mechanism.

Our paper is not the first estimating the Piketty ratios using South Korean data; there have already been several, all written in Korean. None has studied the evolution of the Piketty ratios over such a long period of time with a highly consistent set of data on wealth in South Korea. Some use consistent sets of data, but the covered periods are too short. Joo (2014), for instance, estimates the Piketty ratios using the Korean National Balance Sheet, but covers only the period of 2001-2012. Others cover longer periods, but mix different sets of data that are not necessarily consistent each other. Pyo (2015), for instance, studies the evolution of the Piketty

ratios for a very long period of time, even including the colonial period (1910-1945), but employs three different sets of data that are not consistent each other.[1]

The current paper estimates the Piketty ratios in South Korea using a highly consistent set of data covering a sufficiently long period of time. Our data set fully exploits the estimates in the Korean National Balance Sheet (KNBS hereafter) for the period of 1995-2013. It then extends the data series to earlier years using Cho et al. (2014)'s estimates on land that are almost perfectly compatible with those in the Korean National Balance Sheet. Indeed, we find that estimates on land between 1995-2012 by Cho et al. (2014) match almost perfectly with those in the Korean National Balance Sheet during the same period.[2] Using some assumptions that are not so heroic, we are able to extend the coverage period down to 1966.

Our coverage period might even be called the 'entire history' of modern capitalism in South Korea. Indeed a generally accepted view among historians is that South Korean capitalism really took off in the early 1960s, when General Park Chung-Hee and his junta have overthrown the Second Republic in 1961 by a military coup, and started modern industrialization right after it.

Some economic historians might challenge this conventional view and argue that Korean capitalism started to take off in 1910, when Korea was annexed to Japan as a colony; they might say that true history of capitalism in Korea is incomplete without covering the colonial period. Pyo (2015)'s attempt at covering the colonial period seems to be a response to this argument. This is not a place for debating about when Korean capitalism truly began. We

---

[1] Pyo (2015)'s work was brought to our attention after the current manuscript is almost completed. We thank Young Sik Kim in Seoul National University for bringing Pyo's work to our attention.

[2] This is perhaps not surprising. One of the authors in Cho et al. (2014), Taehyoung Cho, is indeed a member of the Bank of Korea Statistics Department, and has led the team estimating the national wealth for the Korean National Balance Sheet. For this reason, we do not believe that serious consistency problems arise from combining Cho et al. (2014)'s data on land with those in the KNBS. We would like to thank Taehyoung Cho for sharing his data on land with us.

just do not cover this period in our study for the following reasons.

First, although there are some estimates for stocks of wealth during the colonial period, the quality of their estimates does not match with the quality of the estimates we use for our study period. It seems almost impossible to extend the data set into this period in a consistent manner while maintaining a high degree of data quality.

Second, it is debatable whether a colony can sustain a capitalist economic system independently of its colonial mother county. Leaving quality issues aside, one can still debate whether their estimates are for stocks of capital in Korea, after netting out the influence of Japan. Much of capital in Korea at that time was owned by Japanese people.

Third, after liberation, one Korea was divided into two Koreas in 1948, and the two Koreas entered into disastrous war during 1950-1953. Indeed economies in both the South and the North underwent a series of structural breaks during 1945-1953, and thus, in many respects, the economic history of the two Koreas after 1945 is no longer a simple extension of the economic history of one Korea during the colonial period.

Our goals in this paper are twofold. First, we provide time series pictures on the evolution of the Piketty ratios in South Korea during the last half century, and infer some implications on the development of South Korean capitalism from them. Second, we systematically compare the Piketty ratios in South Korea with those estimated by Piketty and Zucman (2013, 2014) for other OECD countries, and locate South Korea's place in the world capitalist economy. Table 1 shows the list of OECD countries that are compared in the current paper and the covered time period for each country.

[Table 1 about here]

The remaining part of the paper is organized as follows.

In section 2, we briefly review the essence of Piketty's theoretical framework. Piketty's theoretical framework is largely based upon the assumption that capital gains are either absent or negligible. Capital gains are not negligible in some countries, however. Following Piketty and Zucman (2013, 2014), section 2 thus introduces capital gains explicitly and reformulates Piketty's second law of capitalism accordingly. This section also briefly discusses Piketty and Zucman (2014)'s two methods of decomposing wealth growth into subcomponents.

In section 3, we estimate Piketty ratios using South Korean data, and compare the results with those for OECD countries reported in Piketty and Zucman (2013, 2014). Our main findings are the following. First, although there were two big humps, one in the early 1970s and another in the early 1990s, the capital-income ratio (β) has been continuously rising from 1966 to 2013. The level of the capital-income ratio in South Korea is also very high relative to other OECD countries, due partly to a high level of government wealth-income ratios, and partly to high land prices relative to national income levels in South Korea. Second, the capital income share (α) has also been increasing over the last half century, and it moves largely in tandem with many inequality indices, such as the Gini coefficient, the top decile income share, and the Theil index on industrial wage inequality. Third, although there are some fluctuations, the rate of return on capital, r, has been moving around at about the rate of 6%. It has been greater than the income growth rate since the late-1990s; before that, it has always been lower than the income growth rate. Also the movement of r/g follows the movement of α very closely; when r/g increases/decreases, so does α.

In section 4, we decompose the wealth growth in South Korea into three components: (1) the wealth growth due to initial wealth, (2) the wealth growth due to the accumulation of savings, and (3) the wealth growth due to capital gains. The annual wealth growth rate during the entire period is 8.4%, which decomposes into 3.4% of the savings-induced wealth growth

rate and 4.8% of the capital gains-induced wealth growth rate. Thus more than 50% of the wealth growth is due to capital gains. In particular, the period of 1966-1980 exhibits the most significant capital gains-induced wealth growth; about 70% of the wealth growth is due to capital gains. On the other hand, the period of 1980-1998 exhibits the least significant capital gains-induced wealth growth; about 48% of the wealth growth is due to capital gains.

Section 5 concludes the paper.

2. Review of Piketty's theoretical framework

In his book, *Capital in the 21st Century*, Piketty describes two fundamental laws of capitalism. The first is an identity: $\alpha = r\beta$, where α is the share of capital income in national income, r is the rate of return on capital, and β is the capital-income ratio. The second is an equilibrium statement, which holds only in the steady state: $\beta = s/g$, where s is the net savings rate and g is the annual growth rate of national income. This section briefly discusses some theoretical and conceptual issues related with these laws.

Piketty describes these laws while assuming that capital gains are either absent or negligible. The second law of capitalism, for instance, is derived from a law of motion dictating the growth of wealth from one period to another under the assumption that capital gains effects are zero. Capital gains effects are, however, non-negligible in the wealth accumulation of South Korea during the period we study. Because it is not difficult to reformulate the second law while taking the effect of capital gains on wealth accumulation into account, this paper, following Piketty and Zucman (2013, 2014), introduces capital gains explicitly, and use the second law reformulated accordingly. This section also briefly discusses Piketty and Zucman (2013, 2014)'s two methods of decomposing wealth growth into three components: (1) the

wealth growth due to initial wealth, (2) the wealth growth due to the accumulation of savings, and (3) the wealth growth due to capital gains. Piketty and Zucman (2013, 2014) call the two methods additive and multiplicative decomposition methods, respectively.

Let us start with the following identity:

$$W_{t+1} = W_t + S_t + KG_t,^{3} \tag{1}$$

where W_t and W_{t+1} are the amounts of wealth at years t and $t+1$, respectively, S_t is the saving flow (net of depreciation) between years t and $t+1$, and KG_t is the capital gains (capital losses if negative) between years t and $t+1$. All the variables in equation (1) are expressed in real terms. Equation (1) states that wealth at year $t+1$ is the sum of wealth at year t, the net saving flow between the two years, and the capital gains between the years.

Note that equation (1) is a pure accounting identity. By definition, it holds in any model, independently of the specific behavioral assumptions of economic agents. If the economy produces only one good, which works as both consumption and capital goods, there would be no capital gains; there are no relative price change. In that case, wealth accumulation would be driven only by saving flows. If the economy, however, consists of multiple sectors, some of which produce consumption goods and others of which produce capital goods, then capital gains would not be equal to zero.

Cumulating wealth over n years using equation (1), we have

$$W_{t+n} = W_t + \sum_{j=1}^{n-1} S_{t+j} + \sum_{j=1}^{n-1} KG_{t+j}. \tag{2}$$

---

[3] To be precise, the right hand side of equation (1) is $W_t + S_t + KG_t + O_t$, where O_t is other changes in wealth due, say, to natural disaster, discovery of new natural resources etc. We attribute O_t to S_t.

Dividing both sides of equation (2) by national income at year $t+n$, Y_{t+n}, yields

$$\beta_{t+n} = \beta^{ini}_{t,t+n} + \beta^{sav}_{t,t+n} + \beta^{kg}_{t,t+n}, \tag{3}$$

where $\beta^{ini}_{t,t+n} = \frac{W_t}{Y_{t+n}} = \beta_t(1+g)^n$, $\beta^{sav}_{t,t+n} = \frac{\sum_{j=1}^{n-1} S_{t+j}}{Y_{t+n}}$, and $\beta^{kg}_{t,t+n} = \frac{\sum_{j=1}^{n-1} KG_{t+j}}{Y_{t+n}}$.

Equation (3) states that the growth of β between years t and $t+n$ is decomposed into three components: (1) the growth of wealth due to initial wealth, (2) the growth of wealth due to accumulation of savings, and (3) the growth of wealth due to capital gains. This is the equation for Piketty and Zucman (2014)'s method of decomposing wealth growth additively.

Alternatively, one can rewrite equation (1) as

$$W_{t+1} = (1+q_t)(W_t + S_t), \tag{4}$$

where $q_t = \frac{KG_t}{W_t + S_t}$ is the capital gains-induced wealth growth rate. Dividing both sides of equation (4) by Y_t yields

$$\beta_{t+1}(1+g_t) = (1+q_t)(1+g_{wst})\beta_t, \tag{5}$$

from which it follows that

$$(1+g_{wt}) = (1+q_t)(1+g_{wst}), \tag{6}$$

where $1+g_t = \frac{Y_{t+1}}{Y_t}$, $1+g_{wt} = \frac{W_{t+1}}{W_t}$, and $1+g_{wst} = 1+\frac{s_t}{\beta_t} = 1+\frac{S_t}{W_t}$.

Equation (6) shows that in each period, the real wealth growth rate (g_{wt}) can be broken

down into saving-induced wealth growth rate (g_{wst}) and capital gains-induced wealth growth rate (q_t).Were there no capital gains due to increased asset prices, the real wealth growth rate (g_{wt}) would be simply equal to the saving-induced wealth growth rate (g_{ws}).

Cumulating over n years in equation (5), we get

$$\beta_{t+n} = \prod_{j=0}^{n-1} \frac{(1+q_{t+j})(1+g_{wst+j})}{(1+g_{t+j})} \beta_t = \frac{(1+q)^n (1+g_{ws})^n}{(1+g)^n} \beta_t , \tag{7}$$

where $q = \sqrt[n]{\prod_{j=0}^{n-1}(1+q_{t+j})} - 1$, $g = \sqrt[n]{\prod_{j=0}^{n-1}(1+g_{t+j})} - 1$, and $g_{ws} = \sqrt[n]{\prod_{j=0}^{n-1}(1+g_{wst+j})} - 1$.

Now β_{t+n} can be decomposed as

$$\beta_{t+n} = \beta_{t,t+n}^{ini} + \tilde{\beta}_{t,t+n}^{sav} + \tilde{\beta}_{t,t+n}^{kg} , \tag{8}$$

where $\tilde{\beta}_{t,t+n}^{sav} = (1 - \beta_{t,t+n}^{ini}) \frac{g_{ws}}{q + g_{ws}}$ and $\tilde{\beta}_{t,t+n}^{kg} = (1 - \beta_{t,t+n}^{ini}) \frac{q}{q + g_{ws}}$. This is the basic equation for Piketty and Zucman (2014)'s multiplicative decomposition method.

How is the second law modified when capital gains effects are taken into account? Assume $g_t = g$, $q_t = q$, and $s_t = s$. Then equation (5) becomes

$$\beta_{t+1} = \frac{(1+q)}{(1+g)} (\beta_t + s) , \tag{9}$$

and thus

$$\beta_t \to \beta_q^* = \frac{s(1+q)}{g-q} . \tag{10}$$

Equation (10) is the modified second law when capital gains effects are present. If $q = 0$, then $\beta_q^* = \frac{s(1+q)}{g-q}$ reduces to $\frac{s}{g}$.

3. Piketty ratios in South Korea: 1966-2013

3.1 Capital-income ratio (β)

The capital-income ratio is probably the most important variable in this paper. The denominator of this variable, national income, is relatively straightforward to define and easy to calculate. Estimating the numerator of this variable (capital) is much more complicated.

Piketty's national income is equivalent to the *net national income* in the system of national accounts, which is obtained from gross national income after subtracting consumption of fixed capital (i.e., depreciation of capital). We obtained the data on national income for the entire period from the Korean National Income and Product Accounts (KNIPA).

Table 2 calculates the real income growth rate, the population growth rate, and the savings rate of South Korea during the period, and compare them with the corresponding figures in other OECD countries.

[Table 2 about here]

During the past 50 years, South Korea's national income grew at the rate of 7.26% per annum in real terms. Population grew at the annual rate of 1.15%, which results in the 6.11% annual growth rate of real per capita income. Compared with other OECD countries, the real

income growth rate is indeed spectacular.

In Table 2, we break the entire period into three subperidods: 1966-1979, 1980-1997, and 1998-2013. The first period (1966-1979) might correspond to what Rostow (1960) calls the takeoff stage of South Korean capitalism. Export-oriented industrialization began in the early 1960s and very high income growth was sustained during this period. During the period, the real growth rate of national income was 9.37% per annum, and per capita real income grew at the rate of 7.49% per annum. The first period ends by Park Chung-Hee's being assassinated. The second period (1980-1997), which begins with the establishment of a new, short-lived, dictatorship and ends with the outbreak of the East Asian financial crisis, might correspond to what Rostow (1960) calls the stage of drive to maturity. During this period, industrial bases were diversified; multiple industries beyond textile ones, such as automobiles, ship building and electronics, expanded quickly and took root in the economy. At the same time, shifts from investment-driven capital goods towards consumer durables and domestic consumption have also started. High growth continued during this period; the real national income grew at the rate of 8.68% per annum, and real per capita income grew at the rate of 7.58% per annum. Inequality, which had been rising in the first period, has been gradually declining during this period. Political democracy has also been won in this period. The third period marks a new phase in South Korean capitalism. The outbreak of the East Asian financial crisis stopped South Korea's drive to maturity and South Korean capitalism entered into a phase with declining growth and rising inequality. During the period of 1998-2013, the real growth rate of national income in South Korea was only about 4%, and per capita income growth rate is about 3.41%. Certainly these figures are still high compared with other OECD countries, but constitute only less than half of the corresponding figures in the previous two subperiods.

In Table 2, we report not only income growth rates but also the annual private savings

rate.[4] The private savings rate is also high; it is almost 14%. Although the private savings rate has always been high during the entire period, it is particularly high (20.5%) during 1980-1997; afterwards the savings rate of South Korea approaches the savings rates of other OECD countries and moves in tandem with them. Figure 1 compares the private savings rate of South Korea with those in other OECD countries over the entire period.

[Figure 1 about here]

In Piketty's theory, β is determined by s and g in the long run. Based upon the data from more than hundred years, Piketty and Zucman (2013) argue that the long run savings rate is stable in many OECD countries. This may not be true in the short-run, however. Because we cover only about 50 years, we cannot make judgment about what would transpire for the South Korean savings rate in the long run.

Not only has the private savings rate been high in South Korea; the government savings rate has also been high. In Table 3, we calculate the private savings rate, the government savings rate, and the national savings rate. During the period of 1970-2012, the net government savings rates in other OECD countries have been either zero or negative. In contrast, the net savings rate of South Korean government has been almost 8% during the period 1966-2013 and 8.3% during 1970-2010.

[4] Note that the savings rate in current paper is different from that reported in the National Income and Product Accounts. In the current paper, it is defined as the ratio of the amount of saving flow (net of depreciation) to the amount of national income (again, net of depreciation). The savings rate reported in the National Income and Product Accounts is defined as the ratio of the amount of gross savings flow to gross national disposable income, which is obtained from gross national income after adding the amount of net foreign current transfer. Both the numerator and the denominator in the savings rate reported in the National Income and Product Accounts include the amount of capital consumption.

[Table 3 about here]

We now move on to the estimation of capital. In most economic theories, capital usually consists of produced assets, such as machinery and equipment. In Piketty's work, however, it includes not only produced assets but also non-produced assets (such as land and subsoil assets) and financial assets (net of liabilities). Piketty's notion of capital is thus much broader than those in standard economic theories, and is closer to the net worth (wealth) in the national balance sheet system. In this paper, we use capital and wealth interchangeably. The list of assets estimated by the Korean National Balance Sheet and that used in our definition of wealth, together with the estimation methods, are shown in Table A.1 in Appendix.

The official Korean National Balance Sheet, first released on May, 2014, does not provide the data on national wealth for the entire period of 1966-2013. Estimates of produced non-financial assets are given in the KNBS for the period of 1970-2013, but estimates of non-produced non-financial assets (largely land) are available only for the period of 1995-2013. Including only land for non-produced non-financial assets between 1995-2013 and using estimates on land for the previous years by Cho et al. (2014), we extend the series on non-produced non-financial assets down to 1970 in a consistent way. Although we include only land for the non-produced non-financial assets, we do not think we systematically underestimate the non-produced non-financial assets. Indeed, land is by far the most important component of the non-produced non-financial assets in South Korea. According to the KNBS, for instance, land takes about 99% of the entire non-produced non-financial assets during the period of 1995-2013. We are assuming that the portion of other non-land assets in the non-produced non-financial assets are minuscule during 1965-1994 as well.

Between 1965-1969, we relied upon the following method.

[more on this]

All the values reported in the KNBS are computed at the end of each year, whereas those in Piketty and Zucman (2014) are two year averages; for the sake of international comparison, we thus take two year averages.

Depending upon how we treat the net wealth of corporations, we can create two different measures of national wealth. The first measure, which Piketty and Zucman (2014) call the 'market value national wealth,' simply defines national wealth as the sum of the net wealth of households and government, where net wealth of each institutional unit is the sum of non-financial assets and financial assets (net of liabilities) for that unit. In this measure, the capital stock of corporations is counted in national wealth through the equity holdings of households and government. The second measure, which Piketty and Zucman (2014) call the 'book value national wealth,' defines national wealth as the sum of the market value national wealth and the net wealth of corporations. We call the market value national wealth simply by 'national wealth,' and the book value national wealth by 'national wealth B.' Private wealth is equal to net national wealth minus net government wealth. We thus have three measures of wealth:

National wealth = net wealth of households and government

National wealth B = national wealth + net wealth of corporations

Private wealth = net wealth of households.

The two measures of national wealth coincide when the net wealth of corporations is equal to zero (or equivalently, when Tobin's Q is equal to 1). Piketty and Zucman (2014) argue that net corporate wealth is close to zero in many Anglo-Saxon countries, such as the US, the UK, Canada, and Australia, but is very different from zero in other countries, such as Japan, Germany, and France. We find that net corporate wealth in South Korea cannot be considered

to be zero.

Figure 2 shows capital-income ratio in South Korea during the period of 1965-2013, where wealth is measured in three different ways.

[Figure 2 about here]

Levels of the three measures of wealth are different, but all of them show similar pattern over time. Although there are two big humps, one in the early 1970s and the other in the early 1990s, all of the three series have been continuously rising from 1966 to 2013. The national capital-income ratio has risen from 400% in 1966 to 800% in 2013, while the book-value national capital-income ratio has risen from 479% in 1966 to 954% in 2013. Finally, the private capital-income ratio has risen from 332% in 1966 to 543% in 2013. Although the general pattern is a continuous rise of capital-income ratios over the entire period, however, different subperiods exhibit different patterns in the evolution of the capital-income ratio.

To understand the main force behind the gradual rise of the capital-income ratio, we decompose the national and private wealth into several sub-categories: housing, agricultural land, other domestic capital, and net foreign capital. Other domestic capital is also broken down into three subcategories: net domestic financial capital, other domestic non-financial capital, and social overhead capital. Other domestic non-financial capital includes non-residential buildings and underlying land, facilities assets, intellectual property products, and inventories. Social overhead capital includes structures and underlying land, recreational land, and other land. Housing capital includes dwellings and underlying land. Agricultural land includes agricultural land and forest land. (See Table A.1 in Appendix for asset classification.) Figure 3 shows the composition of the national wealth.

[Figure 3 about here]

Among various categories of national capital, net foreign capital takes a relatively small (mostly negative) share and its trend is quite stable; it takes -0.8% of national wealth in 2013. See also Table 4.

[Table 4 about here]

Among categories of domestic capital, the share of net domestic financial capital has been increasing over time, but it still takes a relatively small portion (19.9%) in 2013. The share of other domestic non-financial capital is also not large, and its share has been stable over time. Housing and agricultural land, on the other hand, take a lion's share; they take 46.1% of the entire national wealth in 2013.[5] Also the movement of the ratio of housing and agricultural land over income largely determines the movement of capital-income ratio; when the former's time series shows humps, so does the latter's. Indeed the two big humps in the time series picture of β corresponds to two housing and land price bubble in South Korea.[6] It is clear that housing and agricultural land play a major role in the movement of the capital-income ratio in South Korea, regardless of how we measure wealth. Table 5 shows decomposition of domestic capital accumulation into housing capital accumulation and other domestic capital accumulation.

[5] In classifying national wealth into various forms, we classify a part of land into other domestic capital. For instance, land underlying non-residential buildings is classified into other domestic non-financial capital. Land underlying structures, recreational land, and other land are classified into social overhead capital.

[6] There were several housing and land price bubbles in South Korea. They occurred during 1965-69, 1975-1979, 1988-1991, and 2003-2009.

[Table 5 about here]

Figure 4 shows the decomposition of wealth by households (including non-profit institutions serving households), corporations, and government.

[Figure 4 about here]

Compared to other countries, is the capital-income ratio in South Korea high? In Figures 5 and 6 below, we compare the capital-income ratio of South Korea to those of other OECD countries. Figure 5 shows the ratios obtained from national wealth, while Figure 6 shows those obtained from private and government wealth separately.

Figure 5 shows that when estimated with market value national wealth, Japan and Korea have very high levels of the capital-income ratio relative to other OECD countries, although Spain has the highest level after 2004. It is interesting to observe that South Korea and Japan follow an almost identical path up until the early 1990s, reflecting the land price bubble in both countries. Japan's bubble has burst out after 1990, whereas South Korea's has not yet.

[Figure 5 about here]

Why has national capital-income ratio been so high in South Korea and Japan? It is partly because government wealth has been large in both countries. Figure 6 illustrates this point, where we plot private capital-income and government capital-income ratios separately.

[Figure 6 about here]

Recall that national wealth consists of private and government wealth. In contrast with the national capital-income ratios, the levels of the private capital-income ratios in South Korea and Japan have not been exceptionally high relative to those of other OECD countries, which implies that the main source of the difference in national capital-income ratios between these countries lies in government wealth. In most countries in our sample, the government capital-income ratios have been declined, reaching at almost zero percent of national income in 2010; in some countries, such as Italy, the government capital-income ratio is even negative. In South Korea, on the other hand, the government capital-income ratio has risen steadily, from 71% in 1966 to 264% in 2013.

There are several reasons for why government capital-income ratio in South Korea is high compared to other countries.

First, over the last 50 years South Korean government has taken an important role in capital accumulation and economic development. It owns much of social overhead capital and other domestic non-financial capital.

Second, since the 1980s, many OECD countries have accumulated a large amount of public debt, and have sold much of government assets, including public enterprises. South Korea, on the other hand, does not have much public debt yet, and privatization has not gone too far.

Third, South Korean public pensions, which started in 1988, are based upon a funded system and therefore pension funds in South Korea are counted as government assets. They grew very fast recently. In contrast, many OECD countries adopt pay-as-you-go system of public pensions, and these pensions are not recorded as government assets. (See Piketty and Zucman (2013), p.21 of Appendix.) If we adjust for this difference, then government capital-income ratio in South Korea would be a little bit reduced

That government capital-income ratio is high is only a part of the story for a high capital-income ratio in South Korea. Another one, which is perhaps more important, is that land prices in South Korea have been too high relative to national income levels.

[more on this]

3.2 Capital income share (α)

We have seen that capital-income ratio has been rising steadily since 1966. Who have benefited from such dramatic capital accumulation in South Korea? Have wage earners fared well vis-à-vis capital owners?

Rising capital-income ratio may not be a problem in itself from a distributional perspective. From a purely technical point of view, it only means that capital intensity has been increasing in production processes. To address these question, we need to look at the split of national income into labor and capital income and their evolution over time.

Recall that Piketty's national income is the net national income, which includes net production and import taxes (subtracting subsidies). Taxes go neither to workers nor to capital owners. Thus we will focus on the split of national income net of taxes into labor and capital income.

In estimating capital income, one tricky issue arises in the treatment of incomes of the self-employed. This is a group of producers that Marxists call the 'petty bourgeoisie.' They own some properties but also provide labor services. In many OECD countries, the share of the incomes of the self-employed is small, and thus how to treat their incomes does not affect the overall trend of capital income shares significantly. But in the countries where the share of the income of the self-employed is not small, like in South Korea, the overall trend of the capital income share may change drastically depending on how we treat income of the self-

employed.

There are at least two popular methods for treating the incomes of the self-employed. The first method attributes the entire income of the self-employed to capital income. The Bank of Korea, for instance, uses this method when reporting the capital income share. This method is simple but clearly overestimates capital income. The second method, on the other hand, attributes only a part of the self-employed income to capital income. It is based on the idea that a self-employed person is both a laborer and a property owner, so that his/her income should be broken down into labor and capital income properly. Piketty and Zucman (2014) and Joo and Jeon (2014), for instance, take this method. We also follow the second method.

Figure 7 shows how the two methods yield entirely different time series. The capital income share in South Korea estimated with the first method clearly exhibits a higher level than that estimated with the second method. The difference between the two estimates lies not only in the levels; the trends also differ. Capital income share estimated with the first method has been declined, from 66% in 1966 to 37% in 2013. When estimated with the second method, however, the capital income share in South Korea has been rising during 1966-1979, slightly declining during 1980-1997, and rising again after 1998.

[Figure 7 about here]

To understand why the two methods yield different time series of the capital income share, we decompose factor income shares into several sub-categories in Figure 8.

[Figure 8 about here]

Note that both non-self-employed labor and capital income shares have been increasing,

whereas the income share of the self-employed has been decreasing. The income share of the self-employed in South Korea is nearly 55% of national income in 1966 but only 12% as of 2013. Adding the entire income share of the self-employed into the non-self-employed capital income share would result in a declining capital income share, while adding the entire income share of the self-employed into the non-self-employed labor income share would result in an increasing capital income share. This explains why different methods would yield very different time series of the capital income share.

In applying the second method, we attribute not the entire income share of the self-employed but only a part of it to the labor income share. Thus the speed at which the labor and capital income share of the self-employed declines is important for determining the overall trend of the capital income share. It turns out that the speed at which the labor income share of the self-employed is decreased is much faster than the speed at which the capital income of the self-employed is decreased.

Figure 7 also compares our estimates on capital-income share with Cho et al. (2014)'s estimates. Cho et al. (2014) also assume that the self-employed income can be divided into labor and capital income, but unlike us, maintain that per capita wage of the self-employed is equal to half of the per capita income of laborers in other sectors. Nevertheless, these two estimates move very closely each other, and show very different movements from that obtained from the first method.

In Figure 9, we compare the capital income share with three inequality indices; they are the Gini coefficient estimated by Sung (2014), the top decile income share estimated by Kim and Kim (2014), and the Theil index on industrial wage inequality compiled by the University of Texas Inequality Project. All four move in tandem. This means that worsening or improvement of income inequality is closely correlated with rising or declining share of capital income relative to labor income.

[Figure 9 about here]

Is capital income share in South Korea high relative to other OECD countries? To address this question, we juxtapose the graph of capital income share of South Korea to those of other OECD countries in Figure 10. Although there are some variations over time and across countries, the capital income share has been rising over time in almost all countries. The South Korean capital income share has been one of the highest during 1975-1980, but retreats into one of the middle range groups during 1980-2009. Recently, however, it came back to one of the highest.

[Figure 10 about here]

3.3 The rate of return on private capital (r)

The rate of return on capital, r, is computed by dividing the capital income share, α, by the capital-income ratio, β. Because of the identity, $\alpha = r\beta$, we have only two degrees of freedom. Conventionally, in the System of National Accounts, the net return on government wealth is assumed to be zero; we thus compute the rate of return on capital while taking only private wealth into account.

Figure 11 shows the estimated values of the rate of return on capital in South Korea during 1966-2013, together with the plot of the income growth rate (Hodrick-Prescott filtered).

[Figure 11 about here]

Piketty (2014) argues that persistence of $r > g$ is a major force for generating long-run wealth inequality. In South Korea, the income growth rate has always been larger than the rate of return on capital, at least until the late 1990s; it is only after that the rate of return on capital has been larger than the income growth rate.

This phenomenon is sharply in contrast with those observed in other OECD countries, where the income growth rate has been much smaller than the rate of return on capital for a long period of time; see Figure 12.

[Figure 12 about here]

Although g has been bigger than r in South Korea for a long period of time (30 years), the movement of α appears to be highly positively correlated with the movement of r/g. As Figure 13 shows, these two variables move in tandem quite closely.

[Figure 13 about here]

As Piketty (2014) argues, high capital intensity, as measured by β, is not bad in itself. Piketty worries about a high ratio of β, because it usually implies very high concentration of capital among a handful of people. In linking a high ratio of β to a high level of wealth inequality, Piketty focuses on inequality $r > g$. In Piketty's model of wealth inequality, wealth inequality is an increasing function of the gap between these two variables. Piketty (2014) and Piketty and Saez (2014) argue that were savings rates stable over time, the inequality $r > g$ would be the fundamental condition for persistent wealth inequality.

The gap between r and g itself may not be important for explaining income

inequality. Consider, for instance, the following equation, which is obtained by combining Piketty's first and second laws: $\alpha = \frac{r}{g} \times s$. Even if we have $r > g$, capital income share may not increase if r/g remains constant over time. What appears to be more important to capital income share, and thus to income inequality, is the movement of r/g rather than the level of r/g.

One cannot say that the rate of return on capital in South Korea is unusually high relative to other OECD countries. Figures 14 compares the rate of return on capital across countries.

[Figure 14 about here]

Although the rate of return on capital in South Korea moves around at the rate of 6%, there are clearly fluctuations, and the movement of r is strongly negatively correlated the movement of β. Whenever β increases/decreases, r falls/rises. At the same time, the movement of α is weakly positively correlated with the movement of β. See Figures 15-17.

[Figures 15-17 about here]

That β and r are negatively correlated is not surprising; as capital becomes more abundant, it becomes cheaper. A more interesting point is that α is positively correlated with β. It means that as β rises/falls, the speed at which r falls/rises is smaller than the speed at which β rises/falls. The positive relationship between α and β is, however, not strong.

4. Decomposition of wealth accumulation in South Korea

In section 3, we have seen that thanks to high savings rate, produced non-financial assets, such as fixed assets and inventories, grew very fast over the last fifty years in South Korea. At the same time, we also have seen that housing and agricultural land play a major role in the movement of the overall capital-income ratio in South Korea, regardless of how we measure wealth. Between savings and capital gains associated with housing and land, which one plays a more important role in the capital accumulation of South Korea? This section addresses this question by employing the two decomposition methods we reviewed in section 2.

We first simulate the counterfactual capital-income ratio that could transpire in the environment without capital gains. The counterfactual wealth is obtained simply by adding saving flows to the previous year's wealth. Figure 18 show the results.

[Figure 18 about here]

The simulated counterfactual capital-income ratio moderately declines up to the mid 1980s; it rises afterwards. Also compared with the actual capital-income ratio, the counterfactual capital-income ratio reveal no humps in the early 1970s and the early 1990s. This implies that much of capital accumulation in South Korea, including booms and busts, are due to capital gains.

Table 6 presents our results on the decomposition of private wealth accumulation in South Korea for the entire period as well as for three different subperiods.

[Table 6 about here]

In contrast with other OECD countries, savings do not explain the largest part of private wealth accumulation in South Korea. Rather there usually have been much larger positive capital gains effects. Take the period of 1966-1980 as an example. Private wealth was equal to 332% of national income in 1966, and is equal to 543% of national income in 2013. Private wealth has grown at the rate of 8.4% per annum. On the basis of saving flows alone, we find that wealth would have grown at the annual rate of 3.4% only. The remaining growth rate of 4.8% is capital-gains induced. Thus, when we use the multiplicative decomposition method, new savings explain 42% while capital gains explain 58% of the accumulation of private wealth in South Korea between 1966 and 2013.

The decomposition methods we employ have one weakness; the results critically depend on the starting and ending years chosen. We thus applied the decomposition methods to three subperiods as well, to see whether the large share of capital-gains induced wealth growth is an artifact of the choice of the study period. As Table 6 shows, the results differ across different subperiods, but the fact that capital gains-induced growth takes a very large share in the accumulation of private wealth in South Korea remains true.

Table 7 shows the similar results when national wealth accumulation is decomposed into savings-induced wealth accumulation and capital-gains-induced wealth accumulation. Numbers are different, but the patterns are largely similar to those found in Table 6.

[Table 7 about here]

There is a simple way to decompose wealth accumulation using graphs. Let's take the period of 1997-2013 and see the graphs appeared in Figure 19.

[Figure 19 about here]

In Figure 19, we have drawn actual and counterfactual capital-income ratios for both national and private wealth. We also marked the level of counterfactual capital-income ratio that could be obtained with the accumulation of initial wealth alone. The difference between the actual level of β at 2013 and this mark represents the size of the wealth accumulation that could be obtained from both savings and capital gains. The difference between the counterfactual level of β at 2013 and this mark, on the other hand, represents the size of the wealth accumulation that could be obtained from savings alone.

To assess how large the capital gains-induced wealth growth is, we redo the decomposition for the period of 1970-2010, and compare the results with those for other OECD countries reported in Piketty and Zucman (2013, 2014). Tables 8 and 9 report the results when the multiplicative decomposition method is applied.

[Tables 8 and 9 about here]

As is clear from Tables 8 and 9, savings play a more important role than capital gains in most of OECD countries. The only exception is the United Kingdom, where the share of capital gains-induced wealth growth is 45% for private wealth and 58% for national wealth. South Korean case appears to be much closer to the U.K. case; the share of capital gains-induced wealth growth is 50% for private wealth and 48% for national wealth in South Korea.

How do we explain the substantial capital gains we find in South Korea? Piketty and Zucman (2013, 2014) argue that housing and stock market capital gains may be important for the countries with the largest capital gains effects, such as the U.K. and France, and Italy. Also these countries have by far the largest level of housing wealth in the sample as well. So they conjecture that part of the capital gains they measure owe to abnormally high real estate prices

in these countries. This explanation appears to hold only partially in South Korea as well.

[more on this later]

5 Concluding remark

In this paper, we estimate the Piketty ratios in South Korea during the period of 1966-2013 using a newly constructed, highly consistent set of data on stocks of wealth. The period we cover is long enough to be called the almost entire history of modern capitalism in South Korea.

Our findings are summarized as follows.

First, although there were two big humps, one around the early 1970s and another around the early 1990s, the capital-income ratio has been continuously rising during the last 50 years. The level of the capital-income ratio in South Korea is also high relative to other OECD countries. A part of the reasons for it is a high level of government wealth-income ratios in South Korea. Another reason, which is perhaps more important, is that land prices in South Korea have been high relative to national income levels.

Second, the capital income share has also been increasing over the last half century, and it moves largely in tandem with many inequality indices, such as the Gini coefficient, the top decile income share, and the Theil index on industrial wage inequality. This implies that worsening or improvement of income inequality in South Korea has been closely correlated with rising or declining share of capital income relative to labor income.

Third, the rate of return on capital has been greater than the income growth rate only after the mid-1990s; before that, it has always been lower than the income growth rate. This phenomenon, due to unusually fast economic growth in South Korea, is sharply in contrast with those observed in other OECD countries, where the income growth rate has been much smaller than the rate of return on capital for a long period of time. Although r has been smaller than g in South Korea for a long period of time (30 years), however, the movement of α appears to be highly and positively correlated with the movement of r/g ; these two

variables move largely in tandem.

Fourth, the annual private wealth growth rate during the entire period is 8.4%, which decomposes into 3.4% of the savings-induced wealth growth rate and 4.8% of the capital gains-induced wealth growth rate. Thus more than 50% of the wealth growth is due to capital gains in South Korea. In particular, the period of 1966-1980 exhibits the most significant capital gains-induced wealth growth; about 70% of the wealth growth is due to capital gains.

References

Bank of Korea (2011), *The Korean System of National Accounts Guidebook*, Seoul, Korea: The Bank of Korea. (written in Korean)

Bank of Korea (2014), *The Korean National Balance Sheet Guidebook*, Seoul, Korea: The Bank of Korea. (written in Korean)

Cho, T., J. Kim, and P. Schreyer (2014), "Measuring the evolution of Korea's material living standards 1980-2010," *Journal of Productivity Analysis,* July.

EC, IMF, OECD, UN and World Bank (2009), *System of National Accounts 2008*. New York, NY: World Bank.

Joo, S. (2015), "Applying Piketty's theory to the distribution issues in Korea," *Gyeongje Baljeon Yeongu* (*Economic Development Studies*), 21 (1), 21-76. (written in Korean)

Joo, S. and S. Jeon (2014), "Measuring labor income share for Korea," *Sahoe Gyeongje Pyeongron* (*Review of Social Economy*), 43, 31-65. (written in Korean).

Kim, K. and S. Hong (1997), *Accounting for Rapid Economic Growth in Korea, 1963-1995*, Seoul, Korea: Korea Development Institute.

Kim, N. and J. Kim (2015), "Top incomes in Korea, 1933-2010: Evidence from income tax statistics," *Hitotsubashi Journal of Economics*, 56 (1), 1-19.

Kuznets, S. (1955), "Economic growth and economic inequality," *American Economic Review*, 45 (1), 1-28.

OECD (2009), *Measuring Capital – OECD manual*, second edition, Paris: OECD.

Piketty, T. (2014), *Capital in the 21st Century*, Cambridge, MA: The Belknap Press of Harvard University Press.

Piketty, T. and E. Saez (2014), "Inequality on the long run," *Science*, 344 (6186), 838-843.

Piketty, T. and G. Zucman (2013), "Capital is back: wealth-income ratios in rich countries 1700-2010," PSE working paper.

Piketty, T. and G. Zucman (2014), "Capital is back: wealth-income ratios in rich countries 1700-2010," *Quarterly Journal of Economics*, 129 (3), 1255-1310.

Piketty, T. and G. Zucman (2015), "Wealth and inheritance in the long run," A. Atkinson and F. Bourguignon eds., *Handbook of Income Distribution*, Volume 2B, Chapter 15, 1303-1368, North-Holland.

Pyo, H. (1992), *A Synthetic Estimate of the National Wealth of Korea, 1953-1990*, Seoul, Korea: Korea Development Institute.

Pyo, H. (1998), "Estimates of fixed reproducible tangible assets in the republic of Korea, 1953-1996," KDI Working paper No. 9810.

Pyo, H. (2003), "Estimates of capital stock by industries and types of goods in Korea (1953-2000)," *Hankuk Gyungje Eu Bunsok* (*Journal of Korean Economic Analysis*), 9 (1), 203-274. (written in Korean.)

Pyo, H. (2015), "Testing Piketty hypotheses using Korean statistical data," *Hankuk Gyeongje Forum (Korean Economic Forum)*, 8(1), 45-81. (written in Korean)

Rostow, W., (1960), *The Stages of Economic Growth: A Non-Communistic Manifesto*, Cambridge: Cambridge University Press.

Rowthorn, R. (2014), "A note on Piketty's *Capital in the Twenty-First Century*," *Cambridge Journal of Economics*, 38 (5), 1275-1284.

Sung, M. (2014), "Tax and fiscal policies for income redistribution in Korea," *Eungyong Gyeongje* (*Applied Economics*), 13 (2), 31-70. (written in Korean)

Web-based databases used

Alvaredo, F., A.B. Atkinson, T. Piketty and E. Saez, The World Top Incomes Database (WTID), available at http://topincomes.parisschoolofeconomics.eu.

Bank of Korea, Economic Statistics System (ECOS), available at http://ecos.bok.or.kr.

Galbraith, J., University of Texas Inequality Project Data Sets, available at http://utip.gov.utexas.edu/data.html.

OECD, OECD Statistics, available at http://stats.oecd.org.

Statistics Korea, Korean Statistical Information Service (KOSIS), available at http://kosis.kr.

Table 1: Covered countries and period of the data set on income and wealth

	Total period covered	Annual series
South Korea	1966-2013	1966-2013
Japan	1960-2010	1960-2010
USA	1770-2010	1869-2010
UK	1700-2010	1855-2010
France	1700-2010	1896-2010
Germany	1870-2011	1870-2011
Italy	1965-2011	1965-2011
Spain	1987-2010	1987-2010

Note: In addition to the above mentioned countries, Piketty and Zucman (2014) also include Australia and Canada in their analysis. Those who are interested in the comparison of the South Korean case with the two countries should look at Piketty and Zucman (2014).

Table 2: Income growth, population growth, and private savings rate: international comparison

	Real growth rate of national income	Population growth rate	Real growth rate of per capita national income	Net private savings rate (personal + corporate) (% national income)
South Korea				
1966-2013	7.26%	1.15%	6.11%	13.9%
1966-1980	9.37%	1.87%	7.49%	13.4%
1980-1997	8.68%	1.10%	7.58%	20.5%
1997-2013	3.97%	0.56%	3.41%	11.3%
1970-2010	7.18%	1.07%	6.11%	14.2%
Japan 1970-2010	2.5%	0.5%	2.0%	14.6%
USA 1970-2010	2.8%	1.0%	1.8%	7.7%
UK 1970-2010	2.2%	0.3%	1.9%	7.3%
France 1970-2010	2.2%	0.6%	1.6%	11.1%
Germany 1970-2010	2.0%	0.2%	1.8%	12.2%
Italy 1970-2010	1.9%	0.3%	1.6%	15.0%

Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Table 3: National and private savings rates, 1970-2010 : international comparison

	Net national savings rates (private + government)	Net private savings rates (personal + corporate)	incl. personal savings	incl. corporate savings (retained earnings)	Net government savings rates
South Korea					
1966-2013	21.8%	13.9%	7.8% **56%**	6.1% **44%**	7.9%
1966-1980	17.8%	13.4%	8.6% **64%**	4.7% **36%**	4.4%
1980-1997	28.0%	20.5%	15.1% **74%**	5.4% **26%**	7.6%
1997-2013	19.7%	11.3%	4.7% **42%**	6.6% **58%**	8.4%
1970-2010	22.4%	14.2%	8.8% **62%**	5.4% **38%**	8.3%
Japan 1970-2010	14.6%	14.6%	6.8% **47%**	7.8% **53%**	0.0%
USA 1970-2010	5.2%	7.7%	4.6% **60%**	3.1% **40%**	-2.4%
UK 1970-2010	5.3%	7.3%	2.8% **38%**	4.6% **62%**	-2.0%
France 1970-2010	9.2%	11.1%	9.0% **81%**	2.1% **19%**	-1.9%
Germany 1970-2010	10.2%	12.2%	9.4% **76%**	2.9% **24%**	-2.1%
Italy 1970-2010	8.5%	15.0%	14.6% **97%**	0.4% **3%**	-6.5%

Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Table 4: National wealth accumulation (domestic capital versus foreign capital), 1970-2010: international comparison

	National wealth-income ratio (1970)		National wealth-income ratio (2010)		1970-2010 rise in national wealth-income ratio	
	Incl. domestic capital	Incl. foreign capital	Incl. domestic capital	Incl. foreign capital	Incl. domestic capital	Incl. foreign capital
South Korea	594%		751%		158%	
	615%	-21%	765%	-13%	150%	8%
Japan	359%		616%		256%	
	356%	3%	548%	67%	192%	64%
USA	404%		431%		27%	
	399%	4%	456%	-25%	57%	-30%
UK	365%		527%		163%	
	359%	6%	548%	-20%	189%	-26%
France	351%		605%		254%	
	340%	11%	618%	-13%	278%	-24%
Germany	313%		416%		102%	
	305%	8%	377%	39%	71%	31%
Italy	259%		609%		350%	
	247%	12%	640%	-31%	392%	-42%

Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Table 5: Domestic capital accumulation (housing versus all other domestic capital), 1970-2010: international comparison

	Domestic capital-income ratio (1970)		Domestic capital-income ratio (2010)		1970-2010 rise in domestic capital-income ratio	
	Incl. housing	Incl. other domestic capital	Incl. housing	Incl. other domestic capital	Incl. housing	Incl. other domestic capital
South Korea	615%		765%		150%	
	232%	383%	245%	520%	14%	136%
Japan	356%		548%		192%	
	131%	225%	220%	328%	89%	103%
USA	399%		456%		57%	
	142%	257%	182%	274%	41%	17%
UK	359%		548%		189%	
	98%	261%	300%	248%	202%	-13%
France	340%		618%		278%	
	104%	236%	371%	247%	267%	11%
Germany	305%		377%		71%	
	129%	177%	241%	136%	112%	-41%
Italy	247%		640%		392%	
	107%	141%	386%	254%	279%	113%

Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Note: Housing capital includes housing and underlying land. Other domestic capital includes all other domestic capital than the housing capital. (See Table A.1 in Appendix for asset classification.)

Table 6: Decomposition of private wealth growth in South Korea, 1966-2013

	Wealth-income ratio		Income growth rate (g)	Decomposition of wealth growth rate			Share of total wealth accumulation coming from		
	β_t	β_{t+n}		Real growth rate of wealth (g_w)	Savings-induced wealth growth rate (g_{ws})	Capital gains-induced wealth growth rate (q)	Initial wealth	savings	Capital gains
1966-2013	332%	543%	7.3%	8.4%	3.4%	4.8%	Multiplicative 2% **42%**	41% **42%**	57% **58%**
							Additive 2% **47%**	46% **47%**	52% **53%**
1966-1980	332%	380%	9.4%	10.4%	3.0%	7.2%	Multiplicative 25% **30%**	22% **30%**	53% **70%**
							Additive 25% **39%**	29% **39%**	46% **61%**
1980-1997	380%	420%	8.7%	9.3%	4.7%	4.4%	Multiplicative 22% **52%**	40% **52%**	38% **48%**
							Additive 22% **57%**	45% **57%**	33% **43%**
1997-2013	420%	543%	4.0%	5.6%	2.4%	3.1%	Multiplicative 42% **44%**	26% **44%**	33% **56%**
							Additive 42% **42%**	25% **42%**	34% **58%**

Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Table 7: Decomposition of national wealth growth in South Korea, 1966-2013

	Wealth-income ratio		Income growth rate (g)	Decomposition of wealth growth rate			Share of total wealth accumulation coming from		
	β_t	β_{t+n}		Real growth rate of wealth (g_w)	Savings-induced wealth growth rate (g_{ws})	Capital gains-induced wealth growth rate (q)	Initial wealth	savings	Capital gains
1966-2013	400%	800%	7.3%	8.9%	3.8%	4.9%		Multiplicative	
							2%	43%	55%
								44%	**56%**
								Additive	
							2%	49%	49%
								50%	**50%**
1966-1980	400%	472%	9.4%	10.7%	3.4%	7.0%		Multiplicative	
							24%	25%	51%
								32%	**68%**
								Additive	
							24%	31%	44%
								41%	**59%**
1980-1997	472%	584%	8.7%	10.0%	4.9%	5.0%		Multiplicative	
							20%	40%	41%
								50%	**50%**
								Additive	
							20%	44%	36%
								55%	**45%**
1997-2013	584%	800%	4.0%	6.0%	3.0%	2.9%		Multiplicative	
							39%	31%	30%
								51%	**49%**
								Additive	
							39%	29%	32%
								48%	**52%**

Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Table 8: Multiplicative decomposition of private wealth growth, 1970-2010: international comparison

	Wealth-income ratio (β)			Income growth rate (g)	Decomposition of wealth growth rate			Share of total wealth accumulation coming from		
	1966	1970	2010		Real growth rate of wealth (g_w)	Savings-induced wealth growth rate (g_{ws})	Capital gains-induced wealth growth rate (q)	Initial wealth	savings	Capital gains
South Korea	322%	474%	515%	7.2%	7.4%	3.6% **50%**	3.6% **50%**	6%	47%	47%
Japan	-	299%	601%	2.5%	4.3%	3.4% **78%**	0.9% **22%**	18%	64%	18%
USA	348%	342%	410%	2.8%	3.3%	3.0% **90%**	0.3% **10%**	28%	65%	7%
UK	311%	306%	522%	2.2%	3.6%	1.9% **55%**	1.6% **45%**	25%	41%	34%
France	287%	310%	575%	2.2%	3.8%	3.4% **90%**	0.4% **10%**	23%	70%	8%
Germany	216%	225%	412%	2.0%	3.5%	4.3% **121%**	-0.8% **-21%**	25%	91%	-16%
Italy	222%	239%	676%	1.9%	4.6%	4.2% **92%**	0.4% **8%**	17%	76%	7%

Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

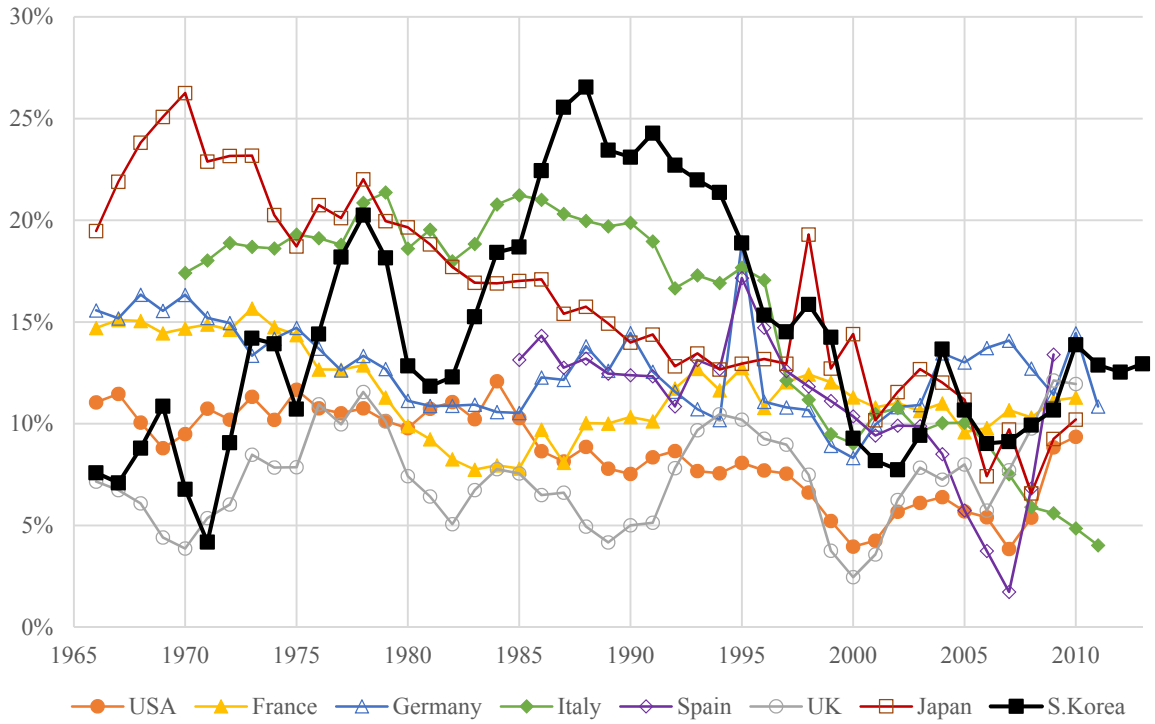
Table 9: Multiplicative decomposition of national wealth growth, 1970-2010: international comparison

	Wealth-income ratio (β)			Income growth rate (g)	Decomposition of wealth growth rate			Share of total wealth accumulation coming from		
	1966	1970	2010		Real growth rate of wealth (g_w)	Savings-induced wealth growth rate (g_{ws})	Capital gains-induced wealth growth rate (q)	Initial wealth	savings	Capital gains
South Korea	400%	594%	751%	7.2%	7.8%	4.0% **52%**	3.7% **48%**	5%	49%	46%
Japan	-	359%	616%	2.5%	3.9%	3.1% **78%**	0.8% **22%**	21%	61%	17%
USA	397%	404%	431%	2.8%	3.0%	2.1% **71%**	0.8% **29%**	31%	49%	20%
UK	332%	365%	527%	2.2%	3.1%	1.3% **42%**	1.8% **58%**	29%	30%	41%
France	366%	351%	605%	2.2%	3.6%	2.7% **75%**	0.9% **25%**	24%	57%	19%
Germany	304%	313%	416%	2.0%	2.7%	3.1% **114%**	-0.4% **-14%**	35%	75%	-9%
Italy	246%	259%	609%	1.9%	4.1%	2.6% **63%**	1.5% **37%**	20%	51%	29%

Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Note: The numbers for UK in Table 4 of Piketty and Zucman (2014) are slightly different those in Table 5. We take the latter.

Figure 1: The private savings rates, 1966-2013: international comparison

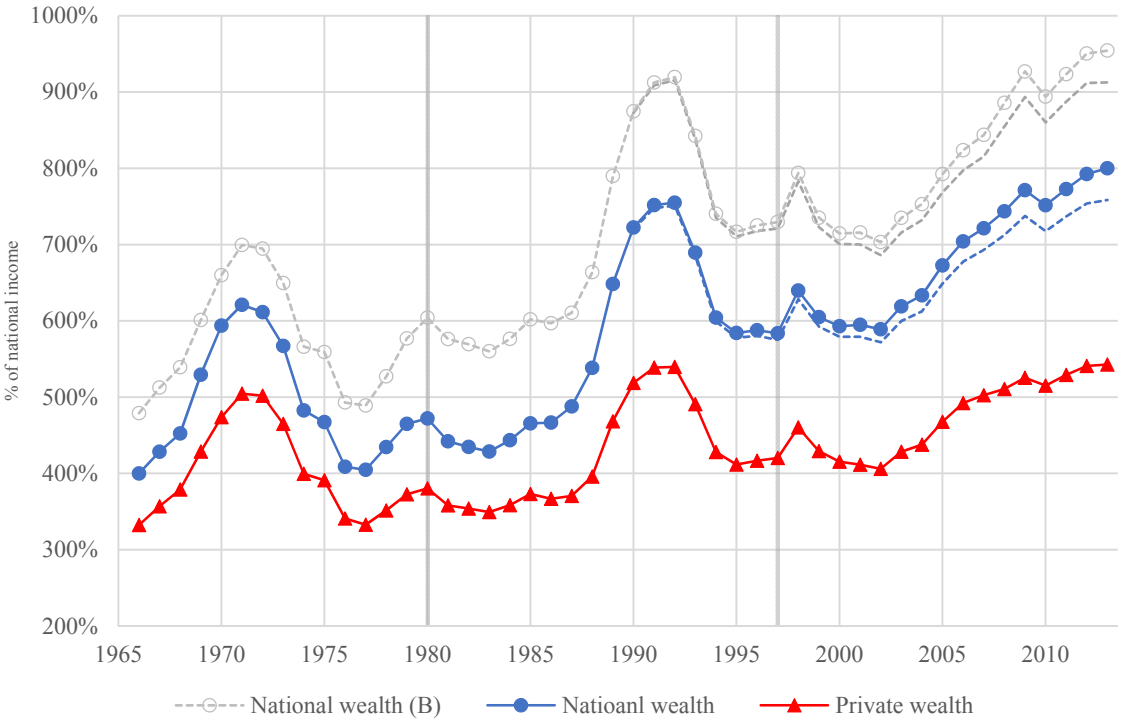


Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Notes:

(1) The private saving rate = (total savings of private sector – capital depreciation of private sector) / national income.

Figure 2: Capital-income ratio (β) in South Korea, 1966-2013



Source: Authors' estimation

Notes:

(1) Private wealth = non-financial assets + net financial assets (including households/NPISHs only).

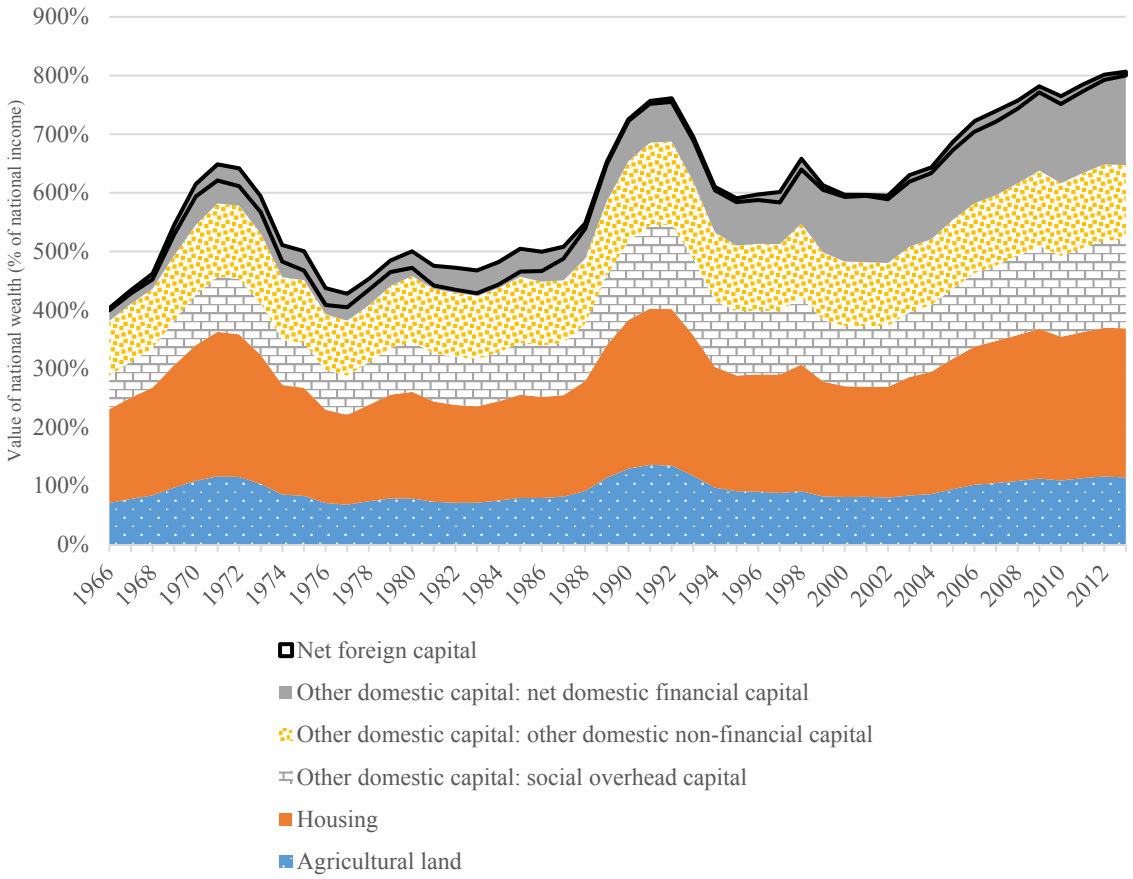
(2) National wealth = non-financial assets + net financial assets (including households/NPISHs and government).

(3) National wealth (B) = national wealth + net wealth of the corporate sector.

(4) Dotted lines: the capital-income ratios when public pensions are taken out from the net financial asset of government.

* NPISH-Non-profit institutions serving households

Figure 3: Composition of national wealth in South Korea, 1966-2013



Source: Authors' estimation

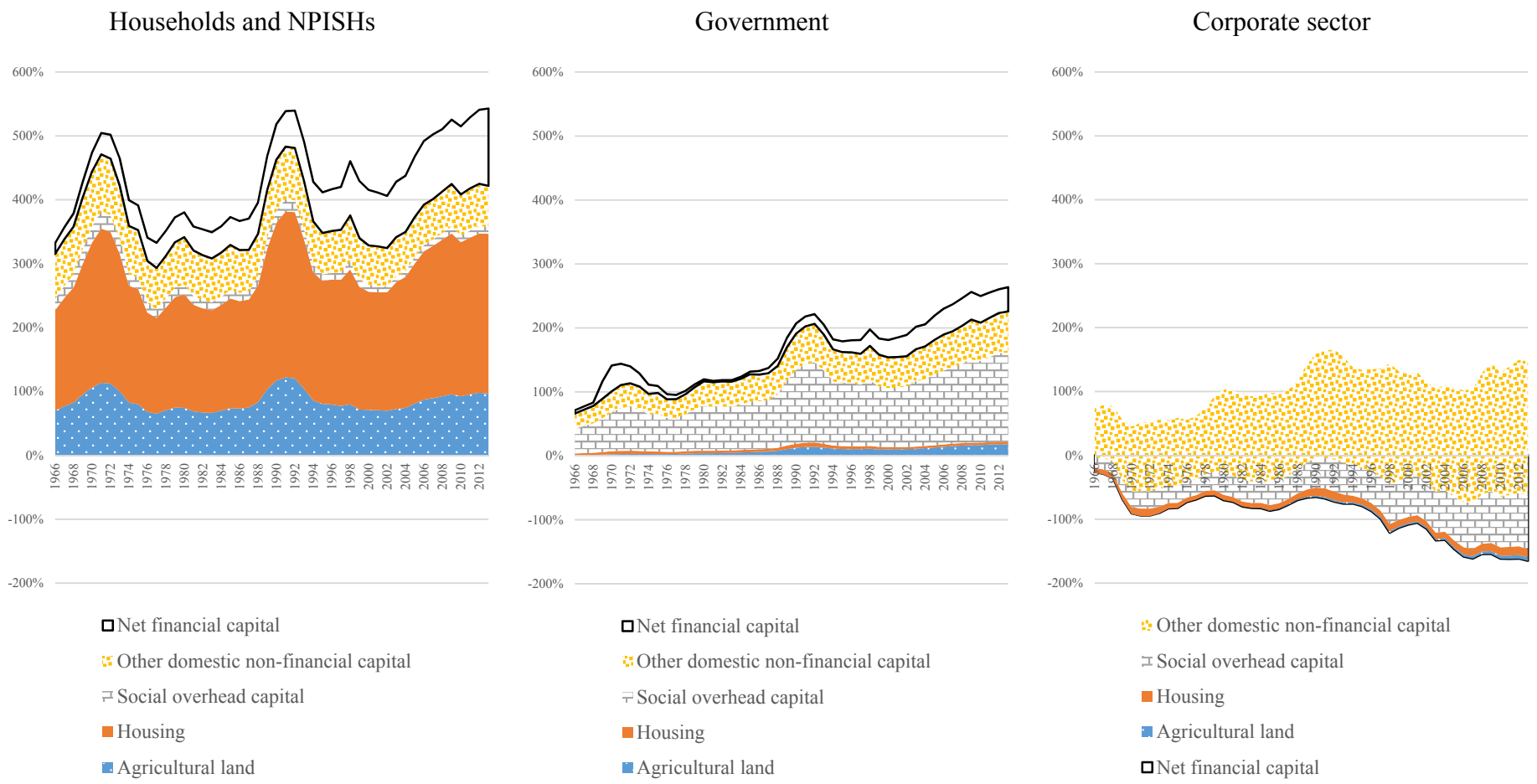
Notes:

(1) National wealth = non-financial assets + net financial assets (including households/NPISHs and government).

(2) Other domestic non-financial capital includes non-residential buildings and underlying land, facilities assets, intellectual property products, and inventories; Social overhead capital includes structures and underlying land, recreational land, and other land; Housing includes dwellings and underlying land; Agricultural land includes agricultural land and forest land. (See Table A.1 in Appendix for asset classification.)

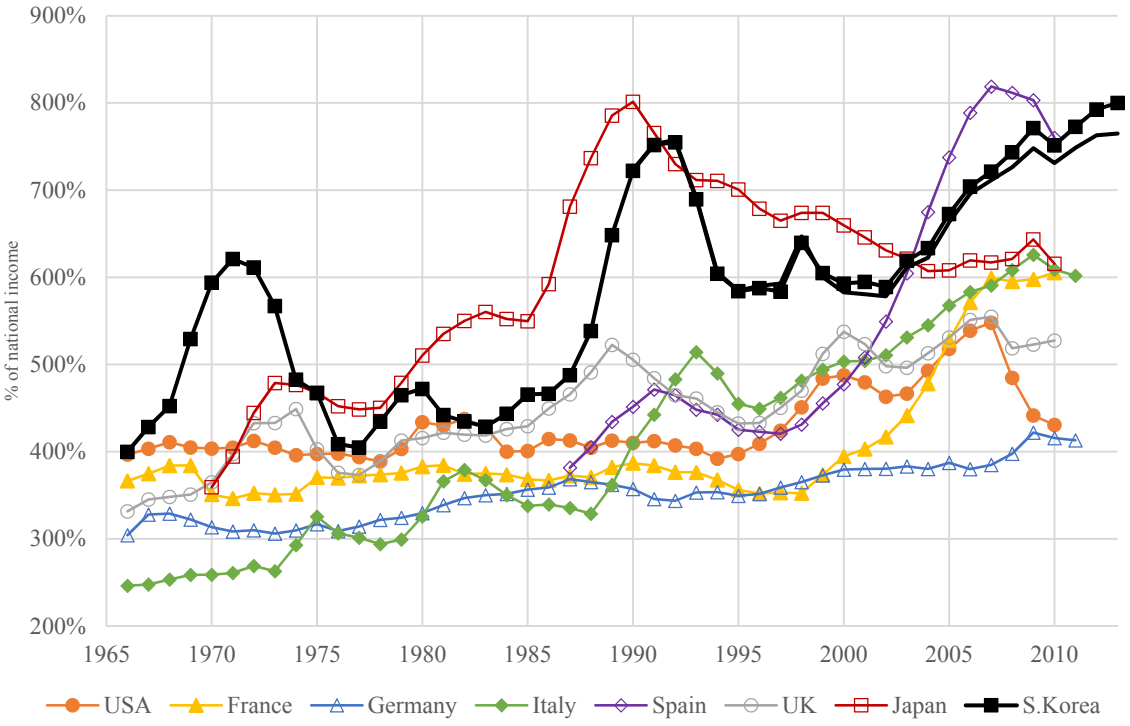
* NPISH-Non-profit institutions serving households

Figure 4: Composition of each institutional sector's capital-income ratio, 1966-2013



Source: Authors' estimation

Figure 5: Capital-income ratio (β), 1966-2013 (national wealth): international comparison



Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries

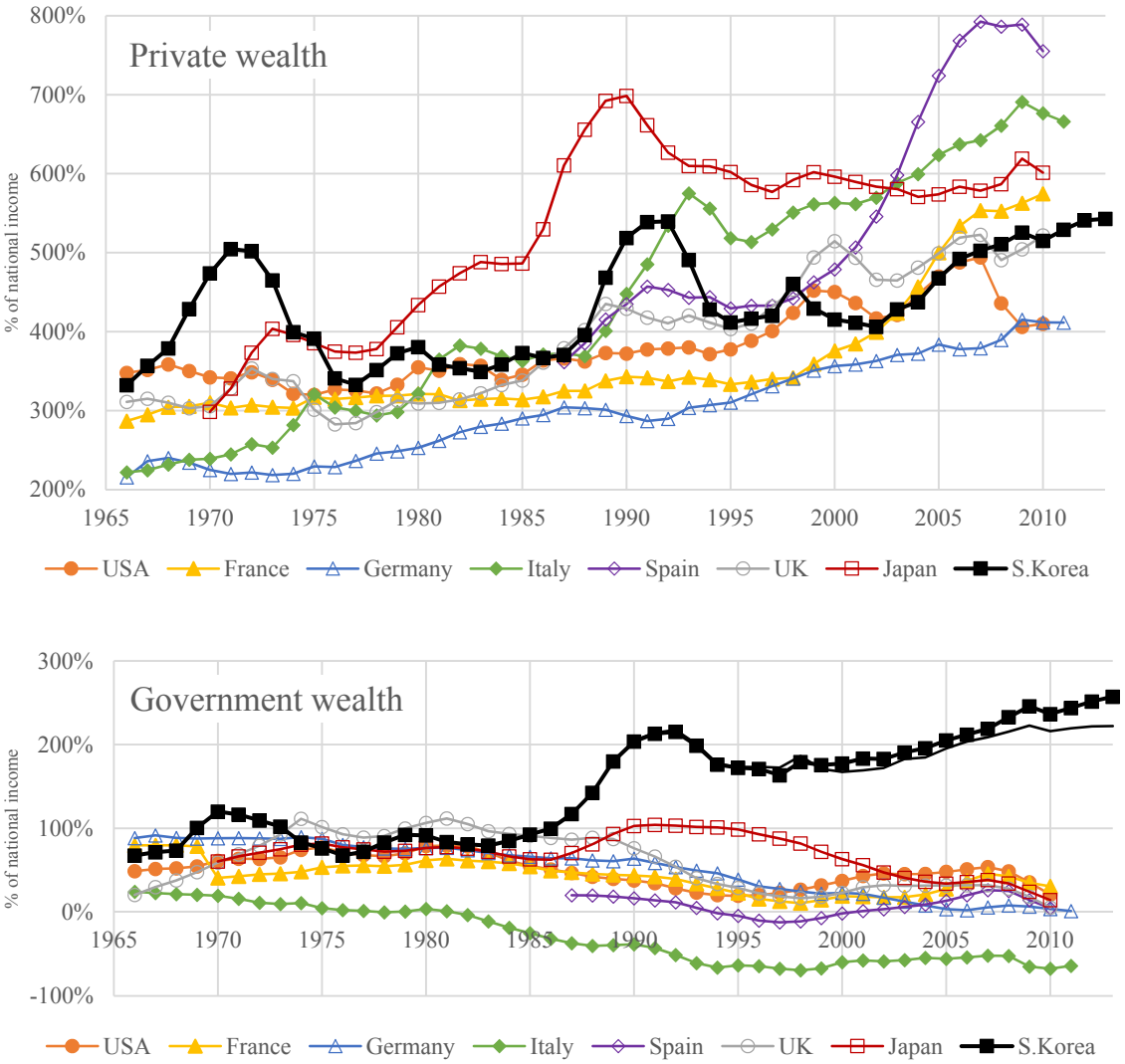
Notes:

(1) National wealth = non-financial assets + net financial assets (including households/NPISHs and government).

(2) The thin line (with no mark) for South Korea represents the capital-income ratio obtained when public pensions are taken out from the net financial asset of government.

* NPISH-Non-profit institutions serving households

Figure 6: Capital-income ratio (β), 1966-2013 (private and government wealth): international comparison



Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries

Notes:

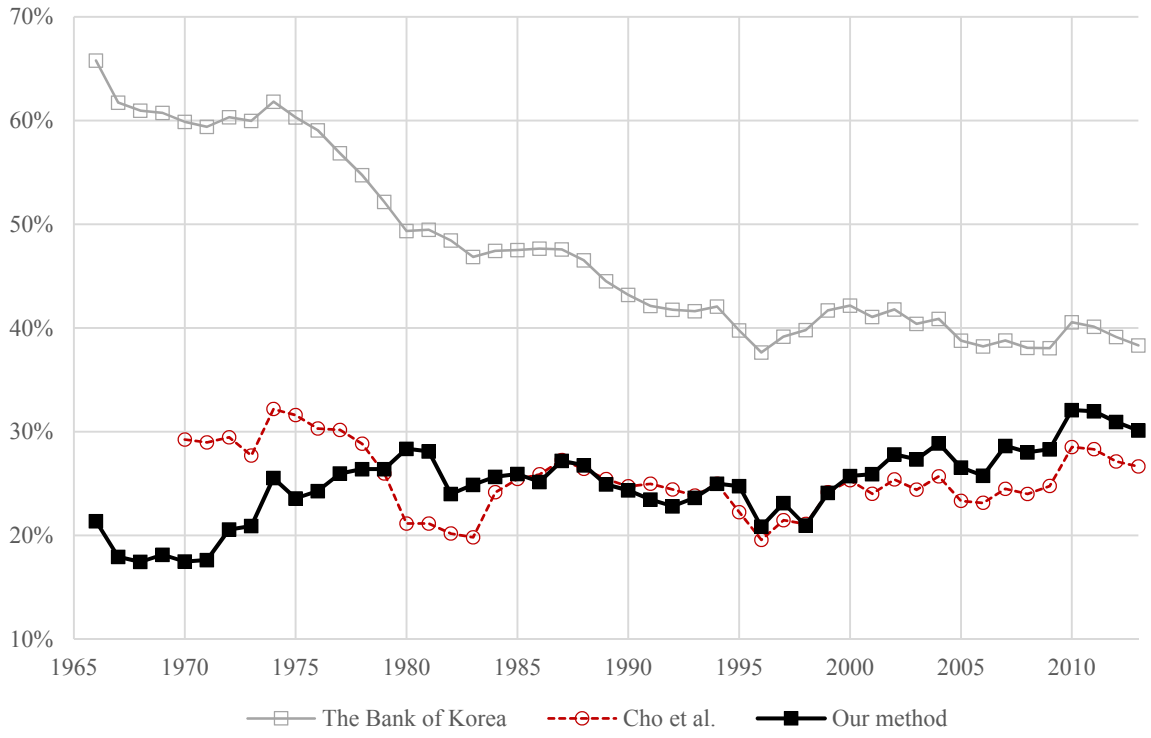
(1) Private wealth = non-financial assets + net financial assets (including households/NPISHs only).

(2) National wealth = non-financial assets + net financial assets (including households/NPISHs and government).

(3) Government wealth = non-financial assets + net financial assets (including government).

(4) The thin line (with no mark) for South Korea: the capital-income ratio when public pensions are taken out from the net financial asset of government..

Figure 7: Capital income share (α) in South Korea, 1966-2013

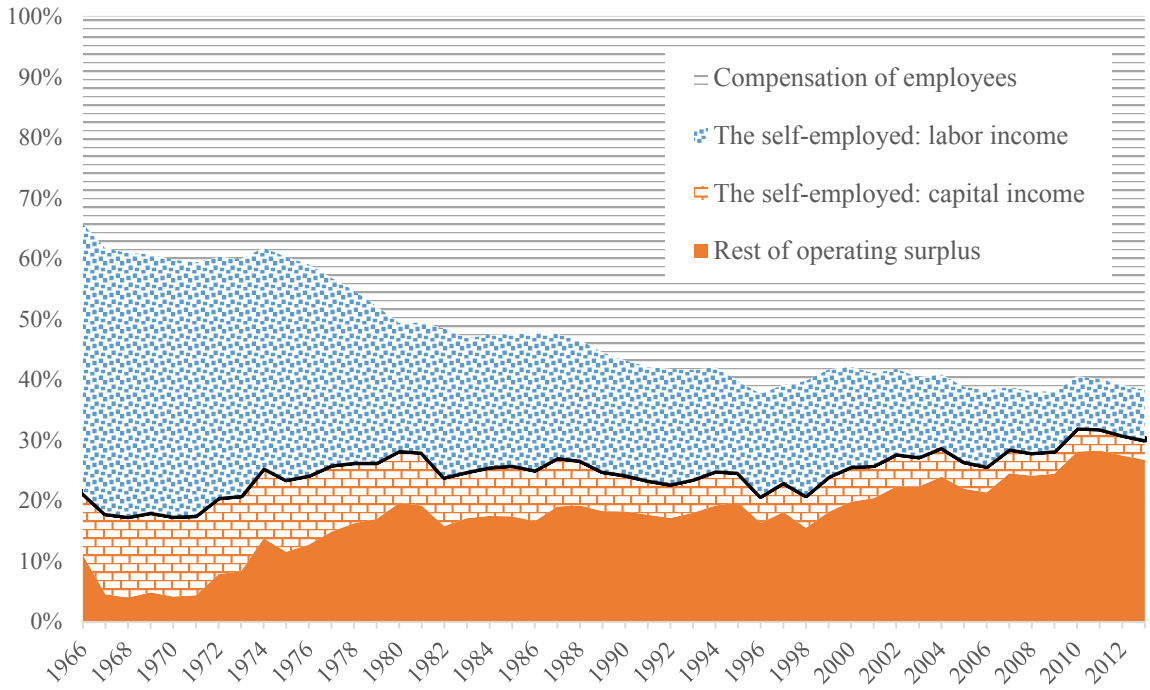


Source: Authors' estimation

Notes:

(1) In estimating the capital income share, the Bank of Korea takes all of the self-employed income as capital income, while we take only a part of it as capital income after dividing the self-employed income into labor and capital incomes according to the proportion that the compensation of the employee and the operating surplus take in the rest of the economy. Cho et al. (2014) also assume that the self-employed income can be divided into labor and capital income while maintaining that per capita wage of the self-employed is equal to half of the per capita income of laborers in other sectors.

Figure 8: Composition of factor income shares in South Korea, 1966-2013

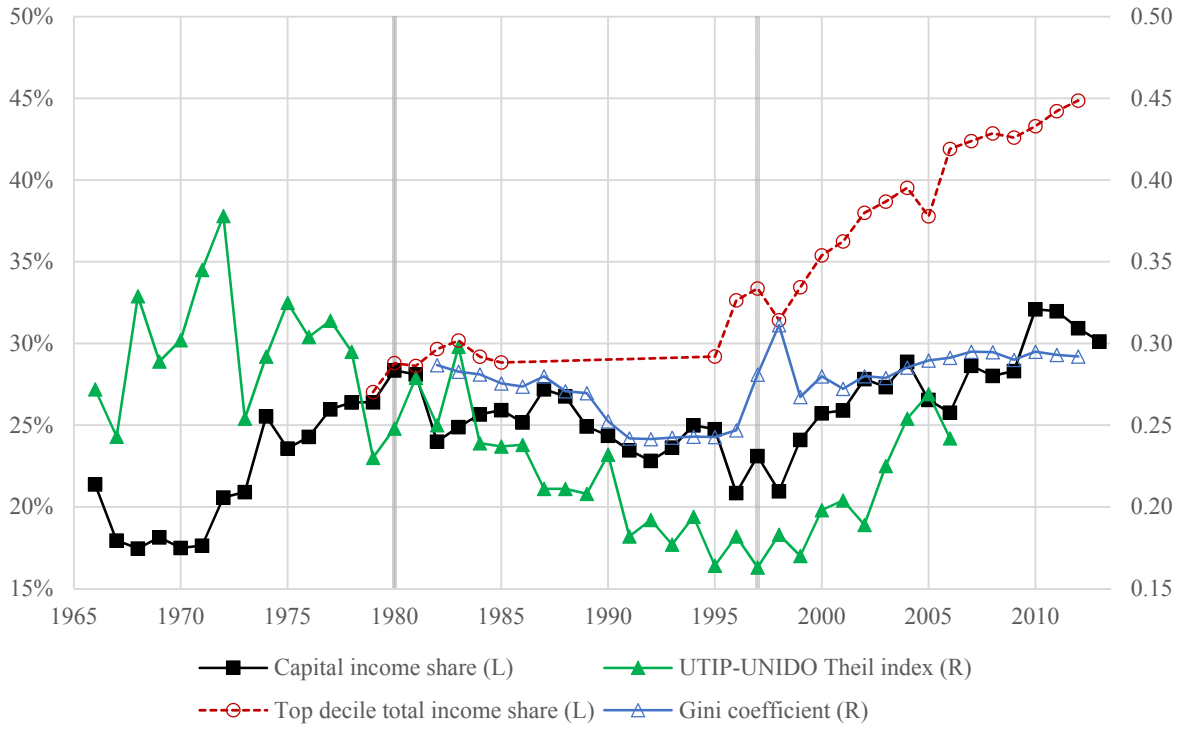


Source: Authors' estimation

Notes:

(1) In splitting the income of the self-employed into labor and capital income, we assume the proportion of labor and capital income of the self-employed is the same as the proportion in the rest of the economy.

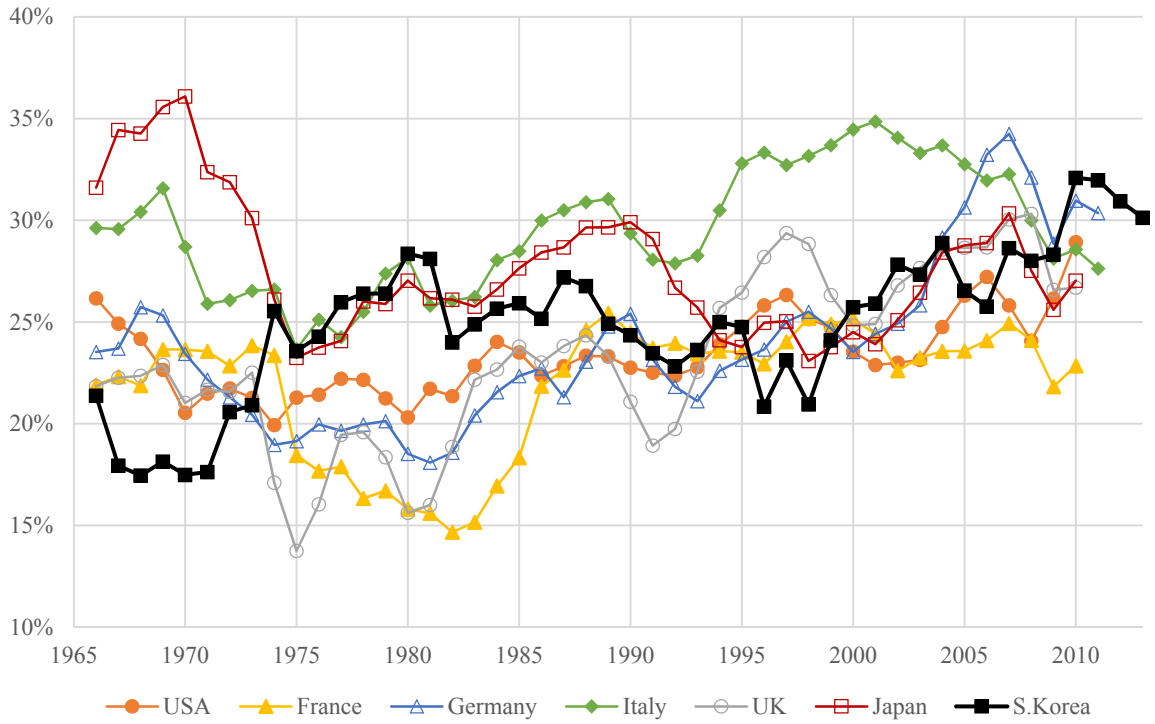
Figure 9: Capital income share (α), UTIP-UNIDO Theil index, top decile income share, and Gini coefficient in South Korea, 1966-2013



Source: Authors' estimation for capital income share, University of Texas Inequality Project Database for UTIP-UNIDO Theil index, Kim and Kim (2014) for top decile income share, and Sung (2014) for Gini coefficient.

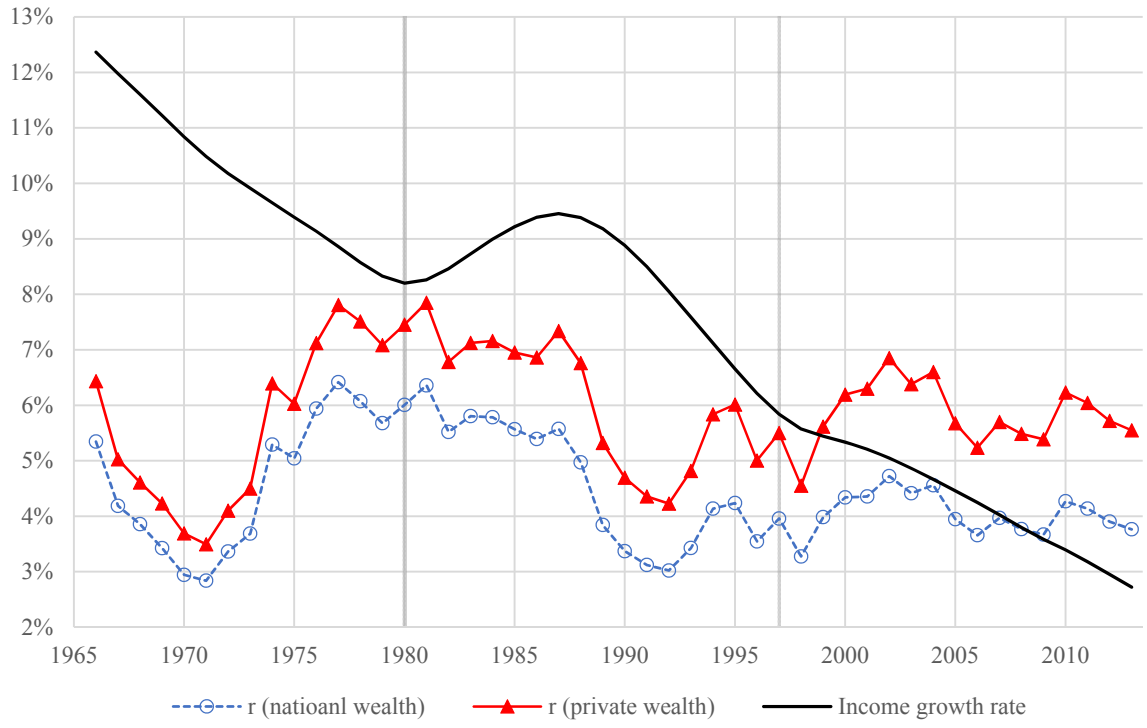
Note: We multiply 10 to the original UTIP-UNIDO Theil index.

Figure 10: Capital income share (α), 1966-2013: international comparison



Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Figure 11: The rate of return on capital versus the income growth rate in South Korea, 1966-2013



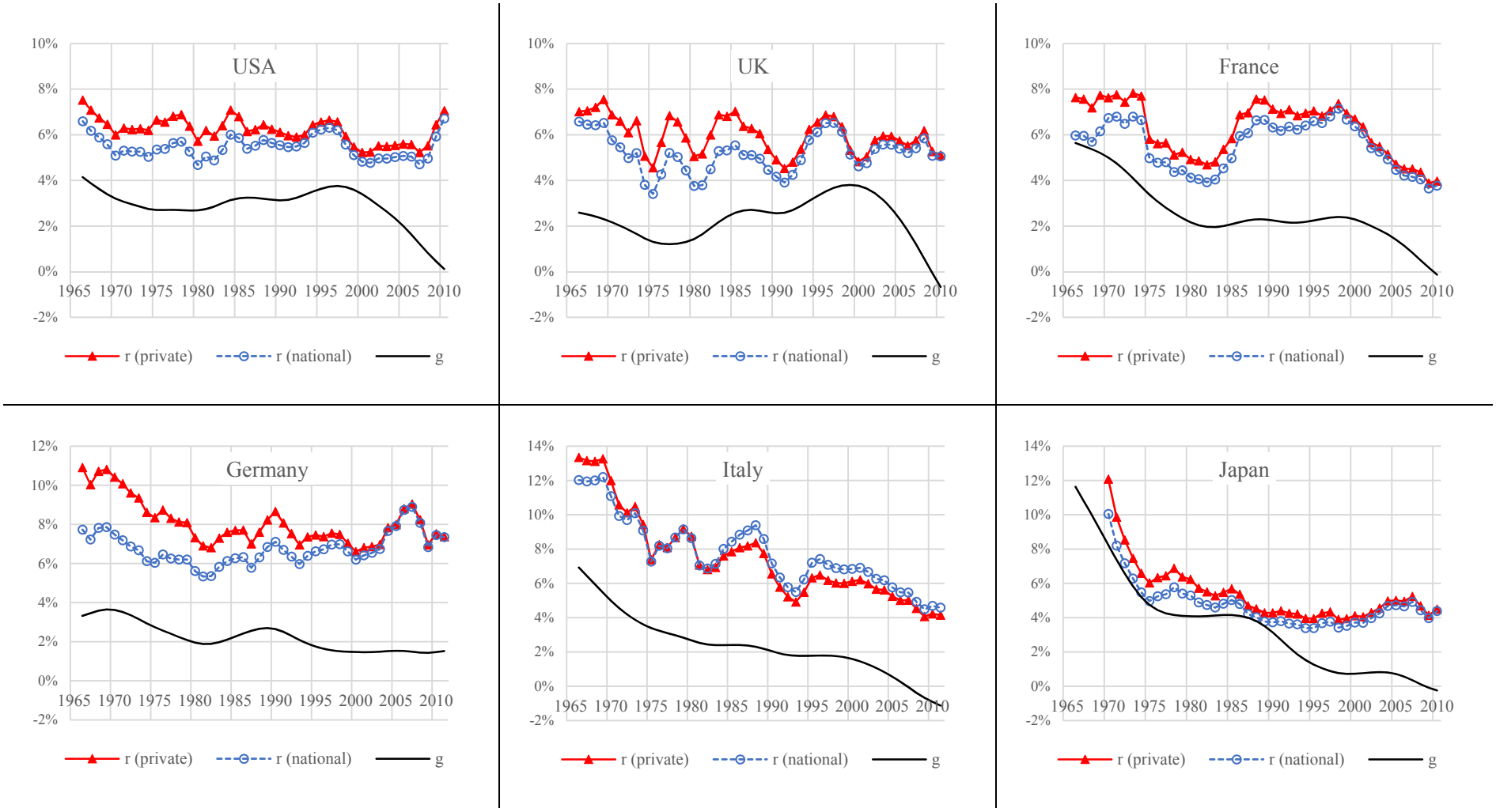
Source: Authors' estimation

Notes:

(1) The rate of return on capital is defined as capital income ratio divided by capital-income ratio ($r = \alpha/\beta$), thus is computed by capital income divided by wealth.

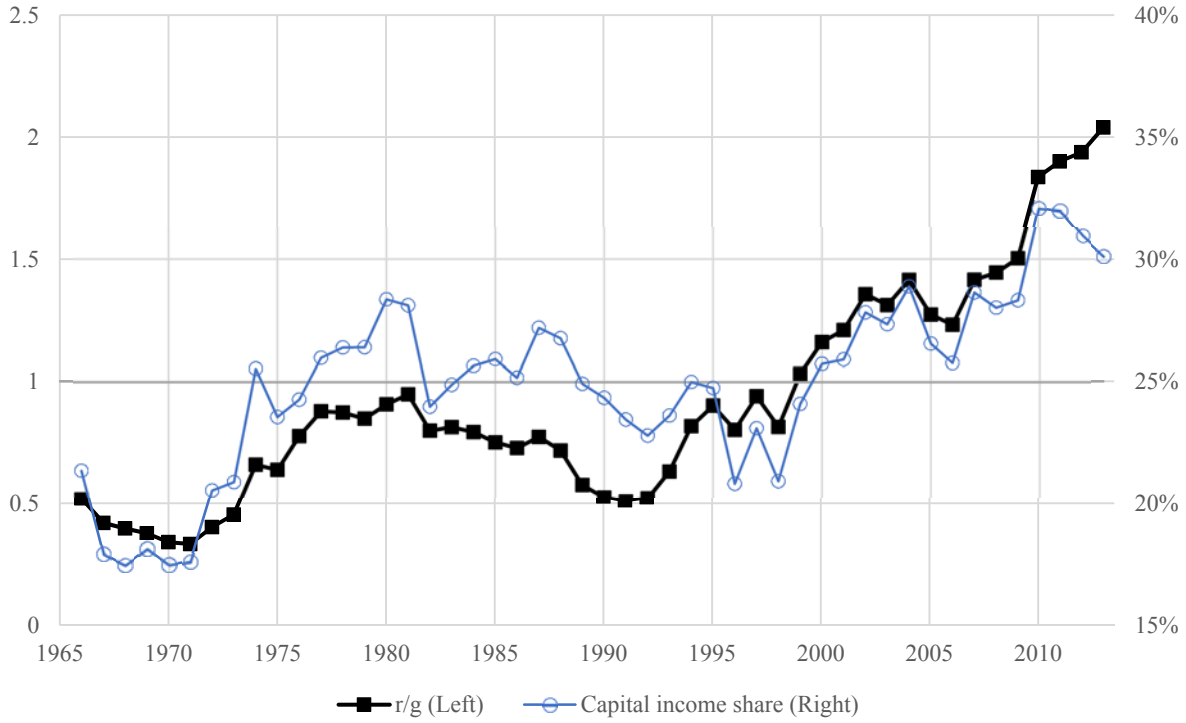
(2) The income growth rate is Hodrick-Prescott filtered value, because we want to compare the rate of return on capital with long-run trend of the income growth rate.

Figure 12: The rate of return on capital versus the income growth rate in other OECD Countries, 1966-2011



Source: Piketty and Zucman (2014) for the rate of return on capital and income growth rate (Hodrick-Prescott filtered).

Figure 13: Capital income share (α) versus r/g in South Korea, 1966-2013

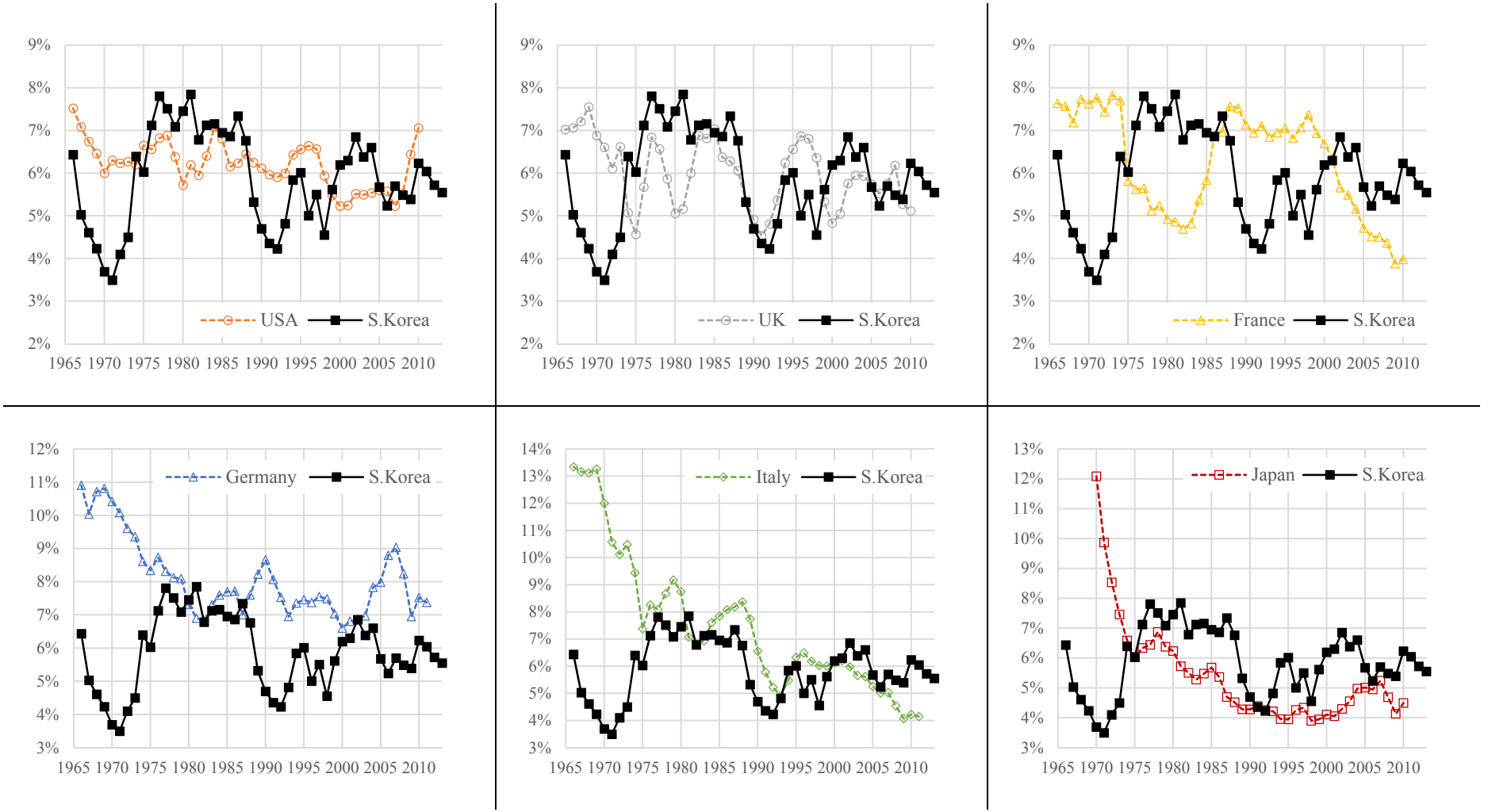


Source: Authors' estimation

Notes:

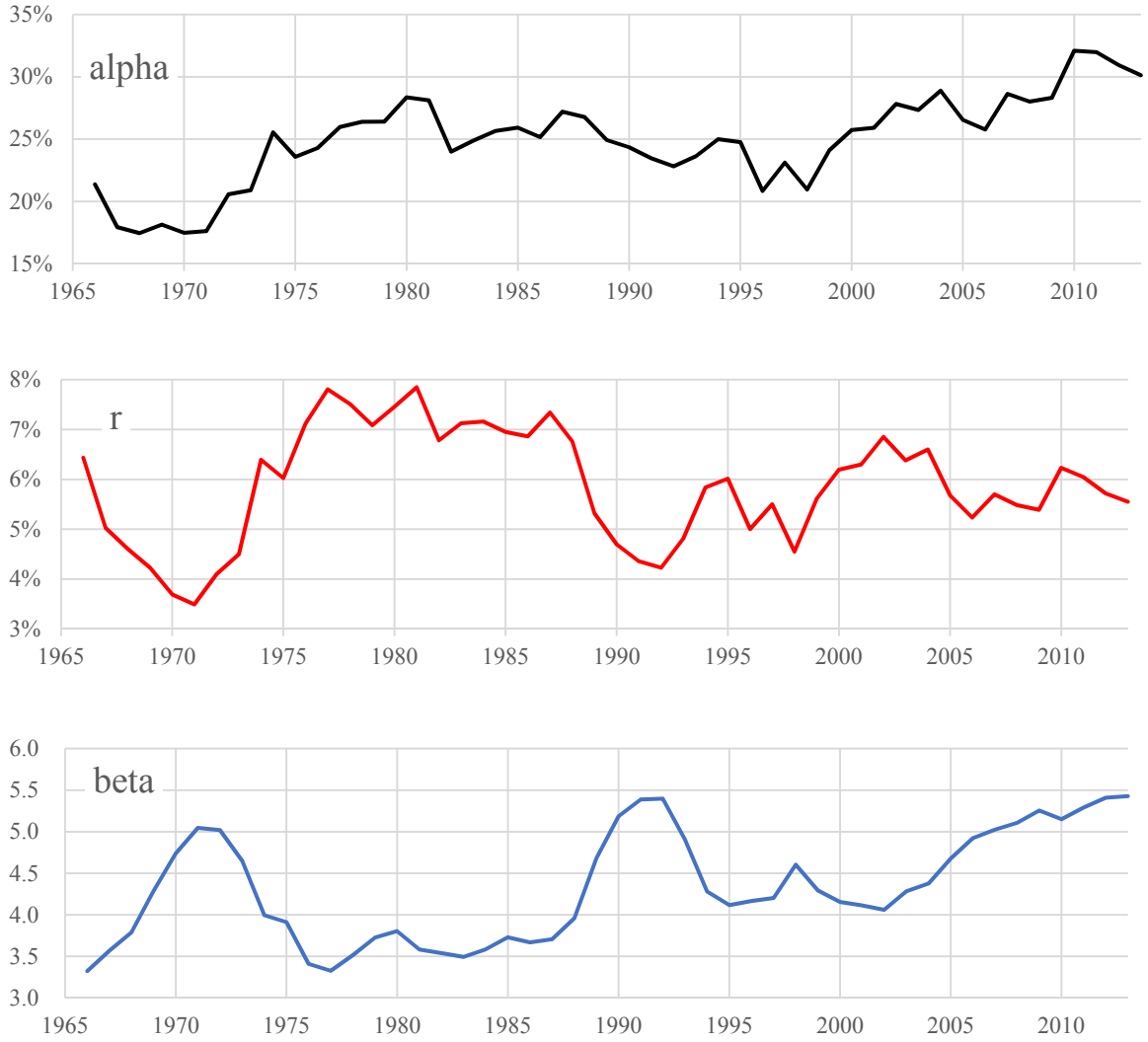
(1) The income growth rate (g) in the computation is Hodrick-Prescott filtered value.

Figure 14: The rate of return on capital, 1966-2013: South Korea versus a selected OECD country



Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

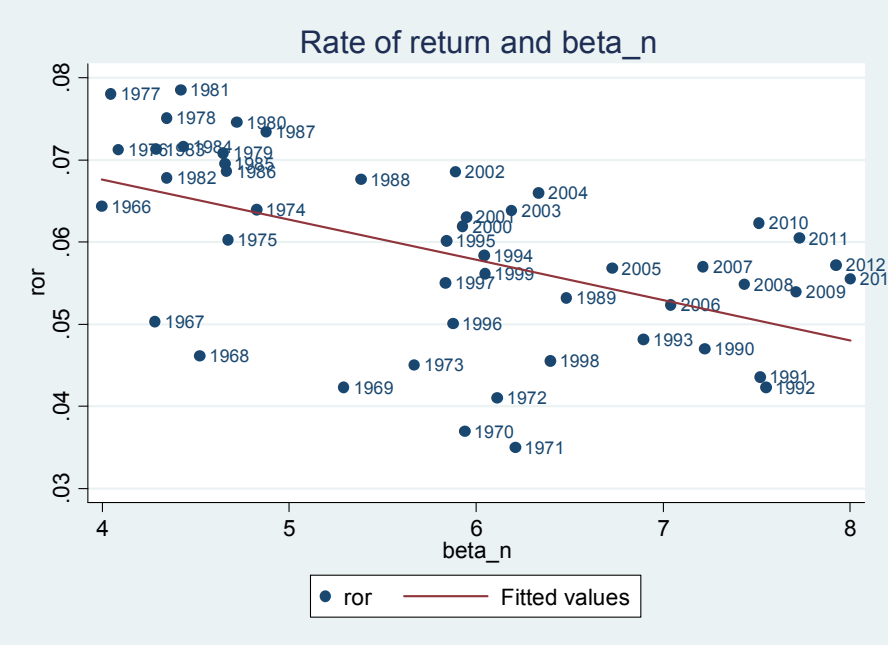
Figure 15: Capital income share, the rate of return on private capital, and private capital-income ratio in South Korea, 1966-2013



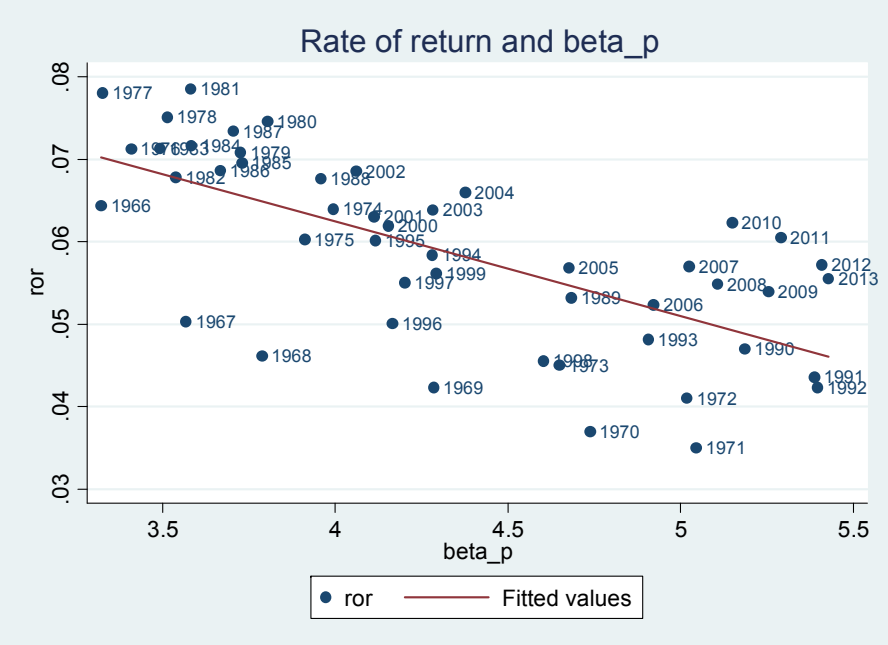
Source: Authors' computations using the KNBS (2014), Cho et al. (2014), and the KNIPA (each year).

Figure 16: The correlation between the rate of return on capital and capital-income ratio in South Korea, 1966-2013

National wealth



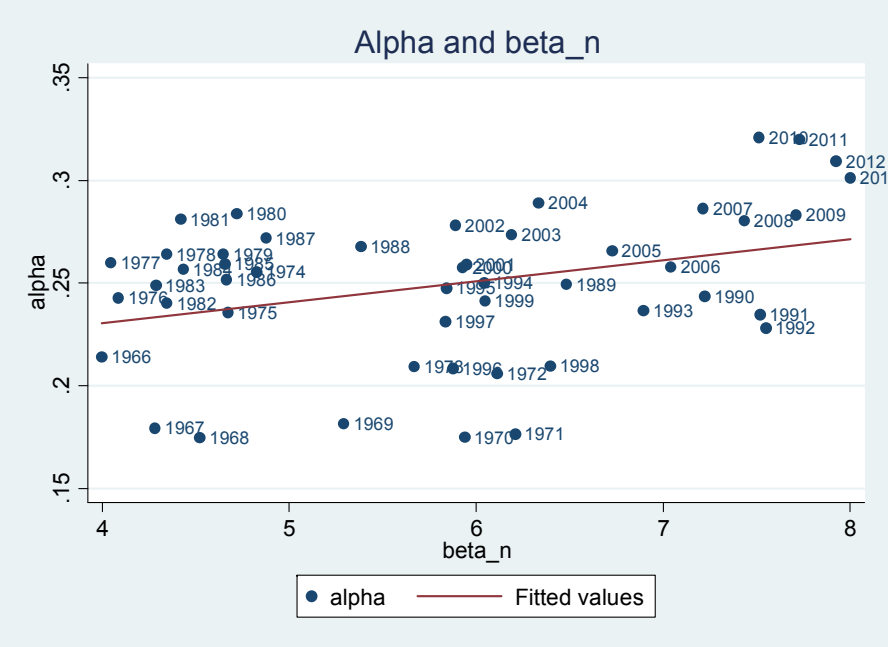
Private wealth



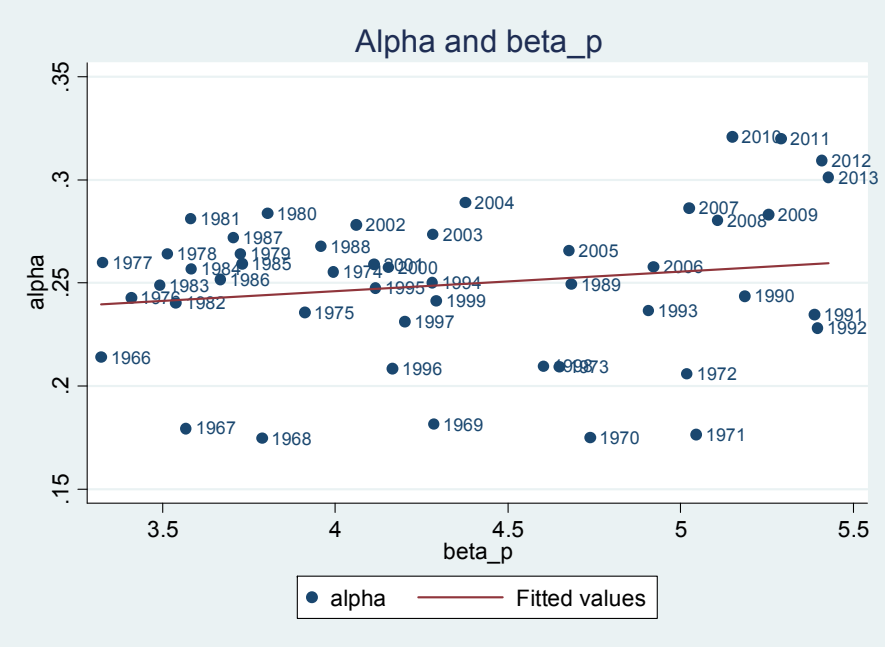
Source: Authors' estimation

Figure 17: The correlation between the capital income share and capital-income ratio in South Korea, 1966-2013

National wealth

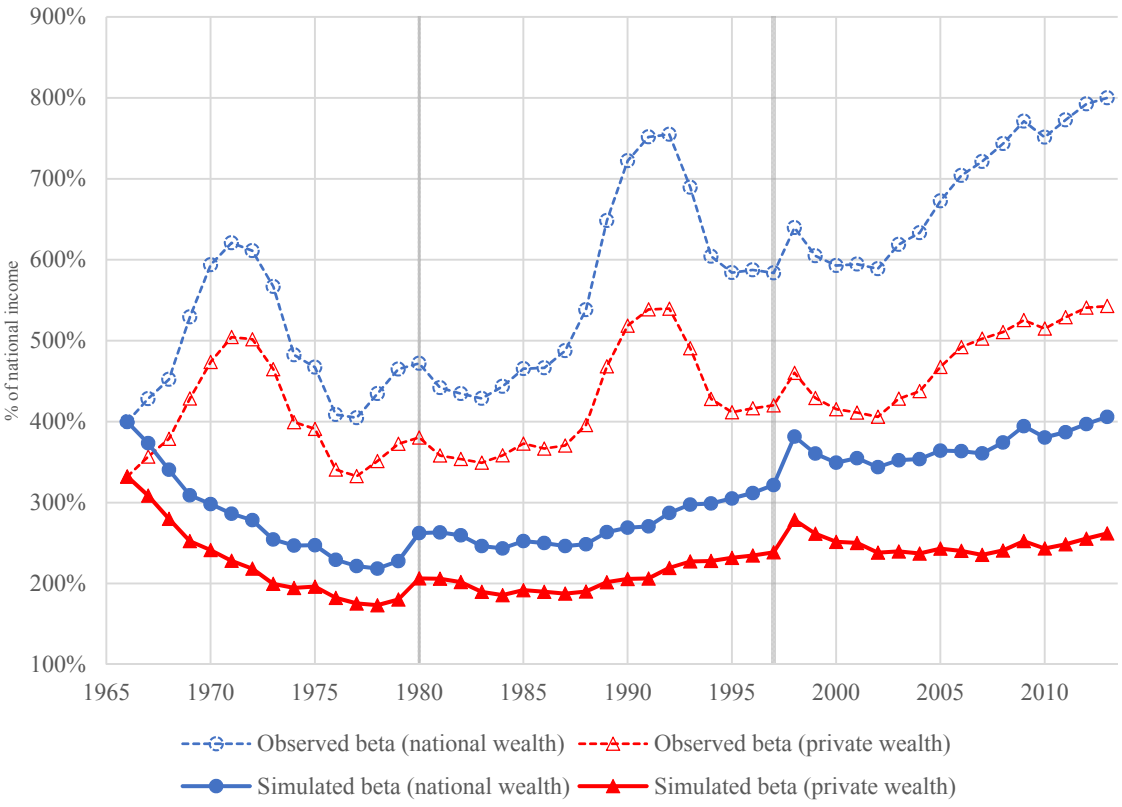


Private wealth



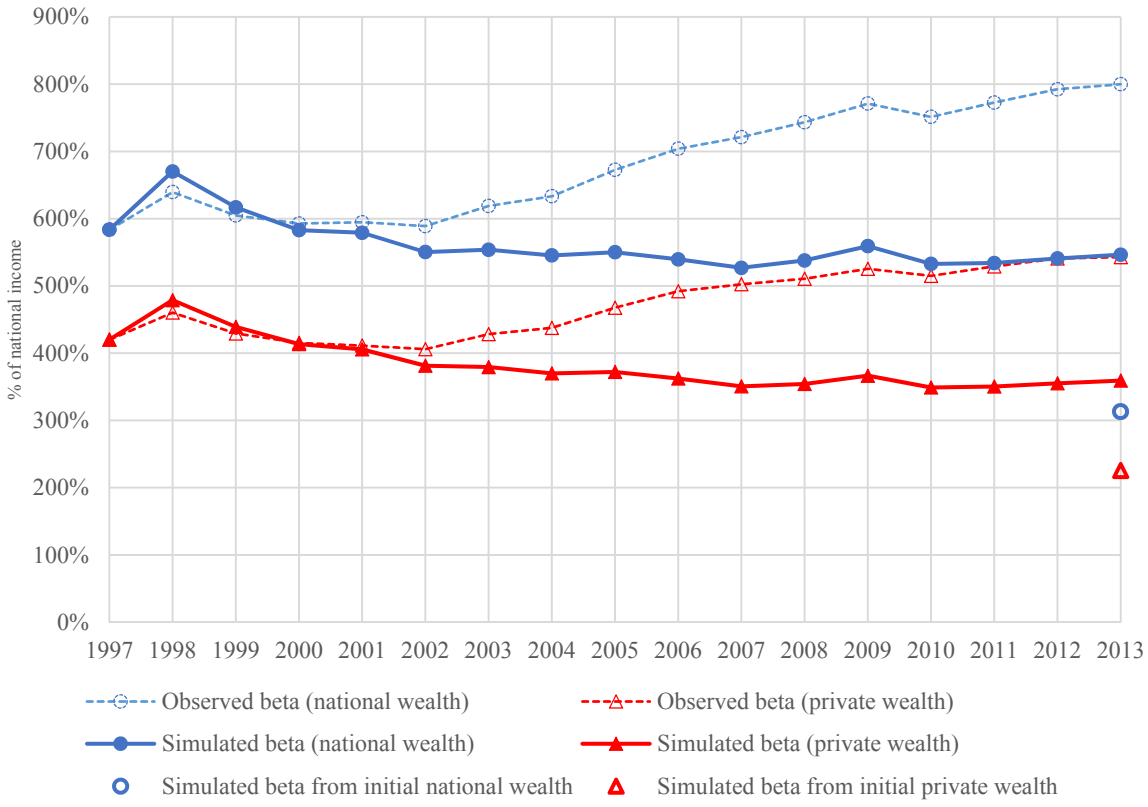
Source: Authors' estimation

Figure 18: Simulated capital-income ratios without capital gains in South Korea, 1966-2013



Source: Authors' estimation

Figure 19: Simulated capital-income ratios without capital gains in South Korea, 1997-2013



Source: Authors' estimation

Appendix: Miscellaneous tables and figures

Table A1: Assets comprising national wealth in the Korean National Balance Sheet and in the current paper

<table>
<tr><td rowspan="13">Non-financial assets</td><td rowspan="11">Produced non-financial assets</td><td rowspan="9">Fixed assets</td><td rowspan="3">Construction assets</td><td>Dwellings (Residential buildings) a)</td></tr>
<tr><td>Other buildings (Non-residential buildings) a)</td></tr>
<tr><td>Structures (Other construction) a)</td></tr>
<tr><td rowspan="3">Facilities assets</td><td>Transport equipment a)</td></tr>
<tr><td>Machinery (including weapon system) a)</td></tr>
<tr><td>Cultivated biological resources b)</td></tr>
<tr><td rowspan="2">Intellectual property products</td><td>R & D expenditure a)</td></tr>
<tr><td>Other intellectual property products a)</td></tr>
<tr><td colspan="2">Inventories (excluding those in the military) c)</td></tr>
<tr><td colspan="2">Valuables *</td></tr>
<tr><td rowspan="5">Non-produced non-financial assets</td><td rowspan="4">Natural resources</td><td>Land b) -- Land underlying dwellings, Land underlying other buildings, Land underlying structures, Agricultural land, Forest land, Recreational land, Other land</td></tr>
<tr><td>Subsoil assets (Mineral and energy reserves) *</td></tr>
<tr><td>Forests (Standing timber assets) *</td></tr>
<tr><td>Water resources *</td></tr>
<tr><td colspan="2">Contracts, leases and licenses *</td></tr>
<tr><td colspan="2">Goodwill and marketing assets *</td></tr>
<tr><td colspan="2">Financial assets/liabilities</td><td colspan="2">Monetary gold and SDRs
Currency and deposits
Debt securities, Loans
Equity and investment fund shares
Insurance, pension and standardized guarantee schemes
Financial derivatives and employee stock options
Other accounts receivable/payable</td></tr>
</table>

* Starred items are not included in our definition of wealth, although the KNBS provides estimates for some of them (such as subsoil assets and forests).

a) The KNBS uses the perpetual inventory method in the estimation.

b) The KNBS uses the quantity-times-price method in the estimation.

c) The KNBS uses the estimates at the industry level.

Source: Bank of Korea (2014), p. 33

Figure A1: Composition of national wealth: international comparison

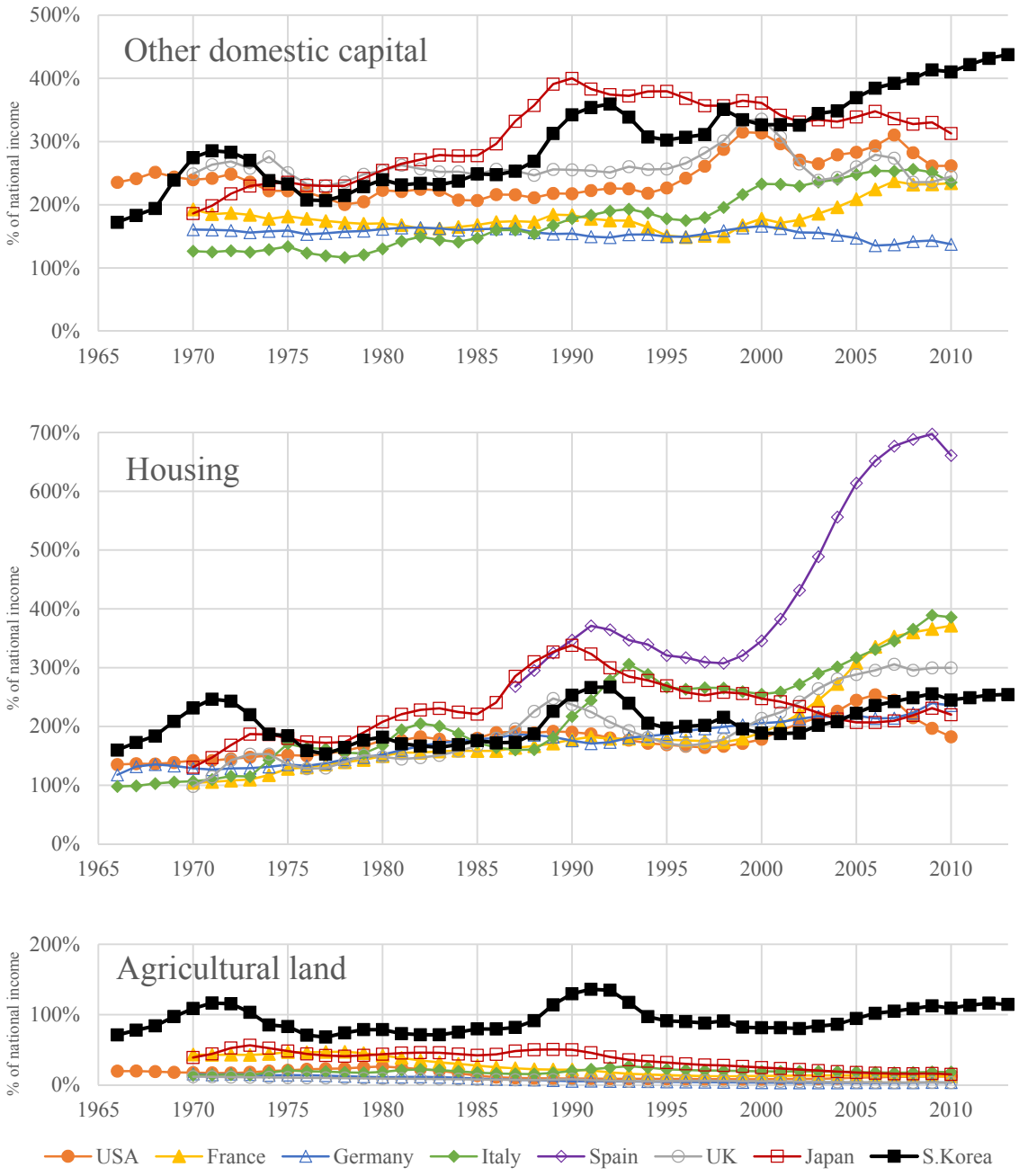
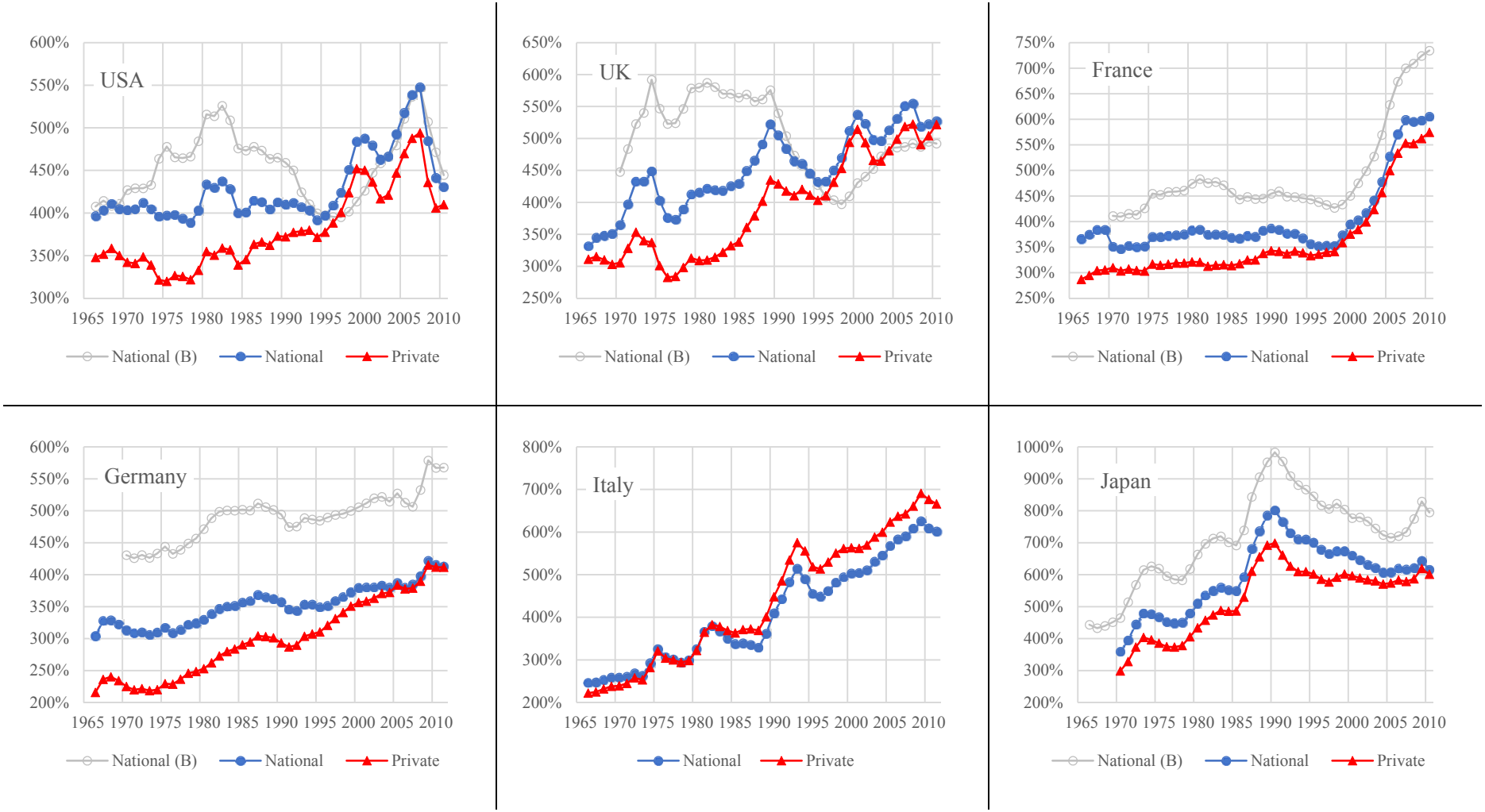
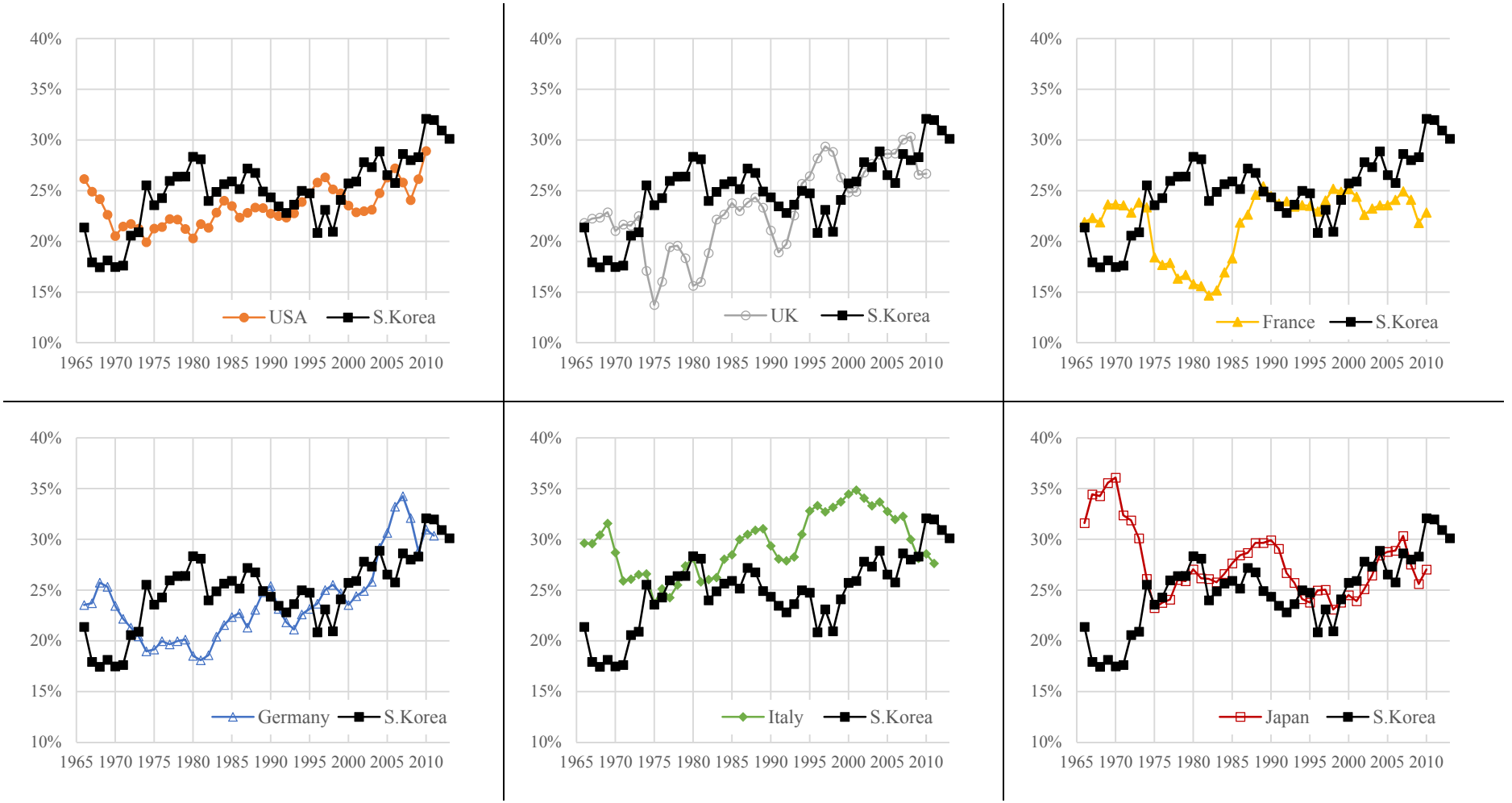


Figure A2: Capital-income ratio (β) in other OECD countries, 1966-2011



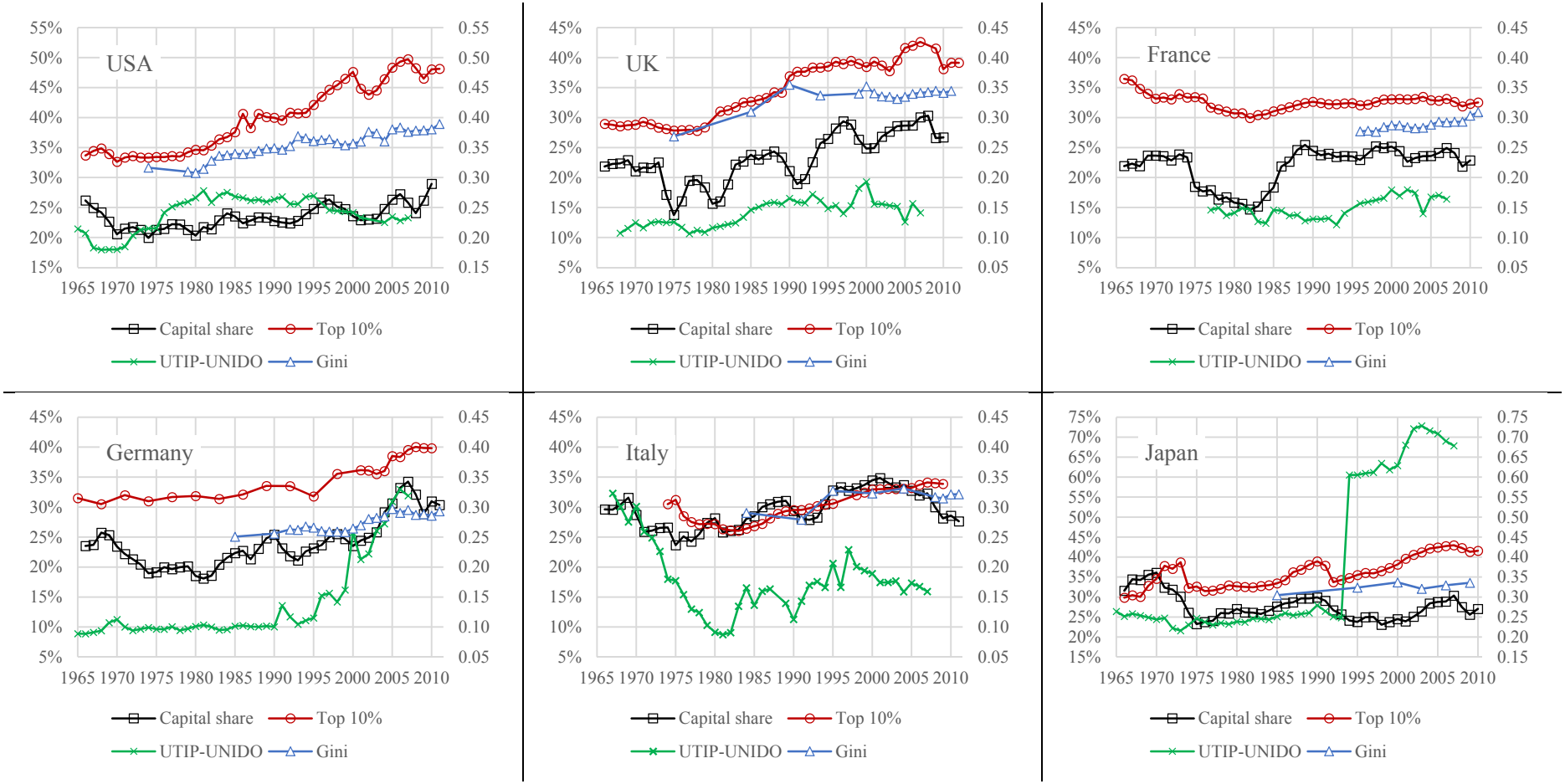
Source: The data appendix of Piketty and Zucman (2014).

Figure A3: Capital income share (α), 1966-2013: Korea versus a selected OECD country



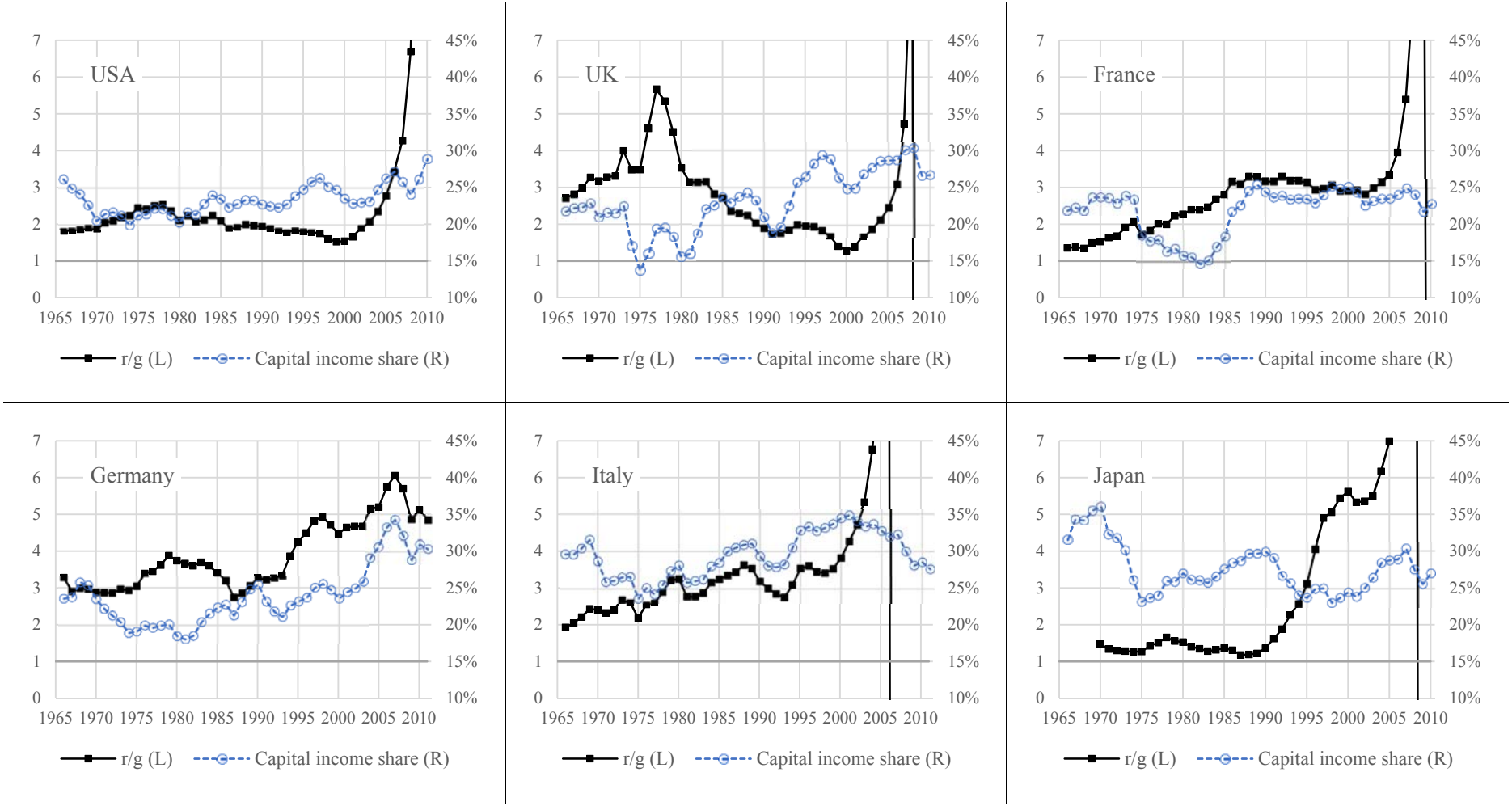
Source: Authors' estimation for South Korea and Piketty and Zucman (2014) for other OECD countries.

Figure A4: Capital income share (α), UTIP-UNIDO Theil index top, decile income share, and Gini coefficient in other OECD countries, 1966-2012



Source: Piketty and Zucman (2013) for capital income shares, University of Texas Inequality Project Database for UTIP-UNIDO Theil index, World Top Incomes Database for top decile income shares, and OECD statistics for Gini coefficients.

Figure A5: Capital income share (α) versus r/g in other OECD countries, 1966-2011



Source: Piketty and Zucman (2014)