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Equity in the Taxation of Labor and Asset Income

Jeon, Byung Mok and Chul-In Lee*

I. Background

The taxation of asset income[1] has been the subject of extensive academic inquiry, and in particular, conflicts between the concepts of efficiency and equity. For equity in taxation, the ideal is to apply progressive tax rates to people's comprehensive income, regardless of the income source and form, be it from labor or other assets. This form of taxation would not affect an individual's choice of income-earning activities. For efficiency in taxation, the ideal is to minimize the distortion of economic behaviors by the imposition of taxes, because the degree of distortion determines the excess burden imposed by taxes. It would be more efficient to apply lower (higher) tax rates to tax bases having greater (lesser) effect on taxpayers' behaviors.

In this study, we analyze the equity in taxation between labor income and asset income, as well as between income from different types of assets. And we estimate redistribution effect of differential taxation on asset incomes. This report consists of the following chapters. First,

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1 For the purpose of this study, asset income has the same meaning as capital income. The term "asset income" allows for the consideration of specific forms of assets that generate income. The term "capital income" is used as the opposite of labor income, and comprehensively refers to income from numerous assets. In this study, we mainly use the former term because our analysis includes equity in taxation among income from different assets.

we review previous literature that proposes theories on the taxation of asset income, and identify their implications. We also examine how these theories are reflected in both international practices as well as in Korea's taxation of labor income and asset income.

Next, we analyze how the effect of redistribution of labor/asset income taxation varies depending on the composition of household income, and identify the implications of key findings with regards to income tax policies.

II. Previous Literature

Recent literature supports the taxation of capital for practical reasons. Traditionally, proponents of optimal asset taxation were against the idea of imposing taxes on capital, on the grounds that the accumulation of capital is the fastest way to improve individuals' welfare. In other words, according to their theory, sufficient accumulation of capital raises the value of labor, which in turn raises the level of income and consumption and subsequently contributes to maximizing welfare on both the individual and social level (Chamley, 1986; Chari and Kehoe, 1994; Jones et al., 1997; Judd, 1999, and others). However, proponents of the dynamic optimal asset taxation theory present findings that support the positive taxation of capital (Golosov and Tsyvinski, 2007; Kopczuk, 2013, and others). Their rationale is that redistributing income solely through progressive taxation results in an excessive efficiency cost. A progressive tax regime distorts the labor supply, especially among highly skilled workers. It allows individuals to rapidly accumulate capital in their early years, and to then stop working to live on income generated by the capital. To address this issue and increase the labor supply of high-skilled workers, the dynamic optimal taxation theory proposes making the tax regime less progressive in order to create incentives for the labor supply, and to then make up any lost tax revenue with capital taxation. This approach is aimed at changing the incentive structure in order to encourage people to value present consumption over future consumption, such that they may faithfully disclose their earning power in each period. Proponents maintain that welfare can be maximized by encouraging people to work more and accumulate less capital.

When analyzed in the context of an optimal tax, under normal assumptions, the optimal asset choice theory proposes tax neutrality among financial instruments. Despite gaps in the yield rates and risk variances of these risky assets, if the assets are uncorrelated with the labor supply, applying a uniform tax rate to all risky assets would maximize social welfare. If taxation

creates discrepancy in yield rates between assets, it results in an unnecessary capital flow among assets, thus causing inefficiency. Therefore, setting a uniform tax rate for typical financial activities helps in improving efficiency.

Previous literature in optimal taxation proposes the following considerations for tax policies. First, policymakers need to consider restrictions that inherently exist in an open economy. Other than the efficiency and equity of taxes on capital income, macro-economic stability should also be considered by tax policy makers.

As Korea has not joined any multinational economic bloc, tax policies on asset income should consider macro-economic vulnerabilities, such as the flow of capital to and from overseas. One key alternative worth considering pertains to dual income taxation in Nordic countries, which experienced similar financial crises. Dual income taxation taxes on capital income at the lower end rate of labor income tax rates to achieve macro-economic stability.

It is also crucial to narrow the gap among the tax rates of different asset incomes, and bring them as close as possible to a single rate. By having asset income tax rates approach the withholding tax rate for financial income, we can attain neutrality of tax system on the asset structure. At the same time, to prevent asset income from creating excessive income gaps, the progressive tax rate structure needs to be maintained within a limited scope. Examples in Korea include the global income taxation of interest and dividends and comprehensive real estate holding tax; the scope of these taxes needs to be adjusted in order to make them compatible with existing theories.

III. Tax Equity between Labor Income and Asset Income

1. International Comparison

Assets are taxed in various ways within and across different countries, depending on the type of income and their relationship with labor income. The most prominent examples include classical taxation and separate taxation. The two most widely observed types of asset income are dividend income and interest income; these two types of assets are taxed in different. In many countries, dividend income is summed up with labor income and taxed under the personal income tax rate, although differences exist in terms of how the corporate tax burden is adjusted. Ways to adjust corporate tax burden at the individual level include imputation[2] and separate taxation.[3] Some countries have also adopted a final withholding

system,[4] which applies a different tax rate on dividend income from that of labor income. On the other hand, other than a few countries in which interest income is taxed under the same income tax regime as labor income, most countries tax interest income via a form of final withholding system.

It is possible to analyze the burden and equity of capital income taxation based on income levels. However, in this study we compare the highest tax rates in different countries, on the account of limitations in data collection from individual countries. In Korea, the highest tax rate applied to dividend income was 51.0% in 2016. In this regard, among the 33 countries analyzed in this study, Korea was only surpassed by six countries (the United States, Switzerland, the Netherlands, Ireland, France, and Canada). The top income tax rates in 2017 and 2018 were 40% and 42%, respectively (38% in 2016), and the top corporate tax rate was raised to 25% in 2019 (22% in 2016). These changes raised the highest tax on dividend income to 56.7%,[5] which is higher than the rates for all other countries save for Ireland.[6] This finding suggests that, in Korea, capital owners are less motivated to invest in businesses as shareholders than other countries. Such a high tax burden is not conducive to either boosting business activities or maintaining growth over the long term.

The tax burden on dividend income is typically higher than the tax burden on interest income. In many cases, the corporate tax burden is not completely removed from personal taxes on dividend income. This raises the dividend income tax burden relative to the interest income, because interest income is taxed only on the individual level. The only exception is South Africa (ZAF). In South Africa, dividend income tax obligations are fulfilled via a final withholding (15%). Thus, the combined tax rate including the burden on the corporate level is 38.8%; however, interest income is added up with other income types for purpose of personal income taxation. Since the top income tax rate is 41%, the highest tax rate on interest income is higher than the rate applied to dividend income. A larger gap between dividend income tax rate and the interest income tax rate does not seem to be ideal for the purpose of tax neutrality; an excessive taxation gap between the two income types may distort investment

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2 The tax payable on dividends is reduced by a tax credit that offsets the corporate tax paid.

3 Dividends are partially taxed to account for the corporate tax burden at the shareholder level.

4 Tax obligations are fulfilled by withholding taxes.

5 Dividend income tax burden rate = corporate tax rate + (1 – corporate tax rate) × (1 + gross-up rate) × highest income tax rate – (1 – corporate tax rate) × gross-up rate

6 The highest income tax rate is scheduled for an increase to 45% (or 49.5%, when including the local tax) in 2021. This will raise the tax burden rate of the top (highest rate) taxpayers to 59.4%.

choice of capital suppliers.

Some countries have implemented policies to remove the debt-attracting tax structure afforded to equity capital and debt capital. For example, Belgium, Italy, and Turkey provide allowances for corporate equity (ACE) to maintain tax neutrality between equity and debt capital. Other countries have applied the ACE system to only new shares, to alleviate possible revenue loss caused by applying the system to all capital at the same time. This approach, which has been used by Italy and Turkey, removes tax advantage in debt financing over equity financing in new projects.

Table 1_Statutory Tax Rates on Dividend Income and Interest Income Applicable to Top Earners (as of 2016)

(Unit: %)

Country	Dividend income tax				(Deposit) interest income tax			
	Method	Corporate income tax (CIT)	Personal income tax (PIT)	Total	Method	FW	Personal income tax (PIT)	Combined
Australia (AUS)	IM	30.0	49.0	49.0	FI	-	49.0	49.0
Austria (AUT)	FW	25.0	(27.5)	45.6	FW	25.0	-	25.0
Belgium (BEL)	ACE(FW)	34.0	(27.0)	44.8	FW	27.0	-	27.0
Canada (CAN)	IM*	26.8	53.5	55.6	FI	-	53.5	53.5
Chile (CHL)	IM	24.0	40.0	40.0	PI^	-	40.0	40.0
Costa Rica (CRI)	FW	30.0	(5.0)	33.5	NT	-	-	-
Czech Republic (CZE)	FW	19.0	(15.0)	31.2	FW	15.0	-	15.0
Estonia (EST)	DD	20.0	-	20.0	NT	-	-	-
Finland (FIN)	PI	20.0	34.0	43.1	FW	30.0	-	30.0
France (FRA)	PI	34.4	45.0	53.2	CL	(39.5)	45.0	45.0
Greece (GRC)	FW	29.0	(10.0)	36.1	FW	15.0	-	15.0
Hungary (HUN)	FW	19.0	(15.0)	31.2	FW	15.0	-	15.0
Iceland (ISL)	CL	20.0	20.0	36.0	FI	(20.0)	-	20.0
Ireland (IRL)	CL	12.5	51.0	57.1	FW	41.0	-	41.0
Israel (ISR)	CL	25.0	27.0	45.3	CL	-	27.0	27.0
Italy (ITA)	FW	31.3	(26.0)	49.2	FW	26.0	-	26.0
Italy New Provinces (ITAnew)	ACE (FW)	31.3	(26.0)	26.0	-	-	-	-
Luxemburg (LUX)	PI	29.2	40.0	43.4	FW	10.0	-	10.0
Mexico (MEX)	FW	30.0	(10.0)	37.0	PI^	(0.5)	35.0	35.0
Netherlands (NLD)	PR	25.0	30.0	55.0	PR	-	30.0	30.0
New Zealand (NZL)	IM	28.0	33.0	33.0	FI	(33.0)	33.0	33.0

Table 1_Statutory Tax Rates on Dividend Income and Interest Income Applicable to Top Earners (as of 2016)(continued)

(Unit: %)

Country	Dividend income tax				(Deposit) interest income tax			
	Method	Corporate income tax (CIT)	Personal income tax (PIT)	Total	Method	FW	Personal income tax (PIT)	Combined
Norway (NOR)	RRA	25.0	28.8	42.3	FI	-	25.0	25.0
Poland (POL)	FW	19.0	(19.0)	34.4	FW	19.0	-	19.0
Portugal (PRT)	FW	29.5	(28.0)	49.2	FW	28.0	-	28.0
Singapore (SGP)	NT	17.0	-	17.0	NT	-	-	-
Slovakia (SVK)	CL^	22.0	14.0	32.9	FW	19.0	-	19.0
Slovenia (SVN)	FW	17.0	(25.0)	37.8	CL	-	25.0	25.0
South Africa (ZAF)	FW	28.0	(15.0)	38.8	FI	-	41.0	41.0
Spain (ESP)	CL	25.0	23.0	42.3	FI	(19.0)	23.0	23.0
Sweden (SWE)	CL	22.0	30.0	45.4	CL	-	30.0	30.0
Switzerland (CHE)	CL	21.1	41.3	53.7	FI	(19.0)	41.3	41.3
Turkey (TUR)	PI	20.0	35.0	34.0	FW	15.0	-	15.0
Turkey New Provinces (TURnew)	ACE(PI)	20.0	35.0	17.5	-	-	-	-
United Kingdom (GBR)	CL	20.0	38.1	50.5	FI	(20.0)	45.0	45.0
United States (USA)	CL^	38.9	28.5	56.3	FI	-	47.3	47.3
Korea (KOR)	IM^	24.2	41.8	51.0	FI	(15.4)	-	41.8

Notes: 1. Numbers in parentheses in the dividend income column are the final withholding tax rates, and numbers in parentheses in the interest income column are the preliminary withholding tax rates.
2. ACE (Allowance for corporate equity), CL (Classical), CL^ (Modified classical), DD (Tax on distributed dividends), FI (Full inclusion), FW (Final withholding), IM (Full imputation), IM* (Imputation with gross-up factor), IM^ (Partial imputation), NT (No taxation), PI (Partial inclusion), PI^ (Partial inclusion with inflation adjustment), PR (Presumptive return), RRA (Rate of return allowance).

Source: Harding and Marten (2018); Korean data added by the author.

Return on investment in shares can take the form of a capital gain. When a company holds a part of its profit without distributing it as dividends, it affects the price of the company's shares. Some countries apply different tax rates depending on the holding period, while others do not. The former countries apply a relatively low tax rate to shares held for a long time in order to account for the time it takes to generate income and the effect of inflation.

To decrease tax burden on capital gains of long-term holding shares, countries have used non-taxation or lower tax rates on the shareholder level. Belgium, Costa Rica, New Zealand, Singapore, and Switzerland do not impose taxes on capital gains of long-term share holdings. Chile, the Czech Republic, Hungary, Luxemburg, Slovenia, and Turkey grant non-taxation

after verifying the holding period. Australia, Finland, France, and the United States lower tax rates after verifying the holding period.

The threshold for long-term holding varies depending on the country. The most common threshold is one year, as in Australia, Chile, Turkey, and the United States. Other countries require longer periods, such as Slovenia (20 years), Finland (10 years), France (8 years), and Hungary (5 years). Luxemburg has the shortest holding period requirement, at a half year. Korea imposes different rates on capital gains of shares depending on the holding period and whether the taxpayer is a major shareholder. Capital gains are taxed separately from other income types, only if earned by major shareholders.[7] The threshold for long-term holding in Korea is one year. That is, high tax rates apply to shares (other than small and medium enterprise shares) held by a major shareholder for less than a year.

The combined tax rate on capital gains on long-term share holdings is 40.9% in Korea, which stands at around the middle compared to other countries. The tax rates are higher in developed countries such as Australia, Austria, Canada, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, and the United States. On the other hand, Belgium, New Zealand, Switzerland, and Eastern European countries impose lower rates than Korea. Korea raised the tax rate applicable to major shareholders to 25% in 2018. Coupled with the increase of the highest corporate tax rate (22% → 25%), the combined tax rate increased to 47.4%. In this regard, Korea is only surpassed by France, the United States, and the Netherlands. The taxation structure is highly progressive, because capital gains are not taxed if earned by non-major shareholders. This structure is designed to favorably treat diversified investors and classes having smaller asset sizes. However, this tax structure can potentially distort the asset distribution of investors.

7 The Korean government proposed an amendment to the tax law in 2020, which provides for the taxation of all share transfer gains starting in 2023.

Table 2_Taxation of Share Transfer Gains (based on highest tax rates in 2016)

(Unit: %)

Country	Long-term holding				Short-term holding			
	Method	Corporate income tax (CIT)	Personal income tax (PIT)	Total	Method	Corporate income tax (CIT)	Personal income tax (PIT)	Combined
Australia (AUS)	PI*	30.0	49.0	47.2	CL	30.0	49.0	64.3
Austria (AUT)	FW	25.0	(27.5)	45.6	-	-	-	-
Belgium (BEL)	ACE (NT)	34.0	-	24.4	ACE (FW)	34.0	(33.0)	49.3
Canada (CAN)	PI	26.8	53.5	46.4	-	-	-	-
Chile (CHL)	NT*	24.0	-	24.0	IM	24.0	16.0	40.0
Costa Rica (CRI)	NT	30.0	-	30.0	-	-	-	-
Czech Republic (CZE)	NT*	19.0	-	19.0	CL	19.0	15.0	31.2
Estonia (EST)	CL	20.0	20.0	36.0	-	-	-	-
Finland (FIN)	FI*	20.0	34.0	47.2	-	-	-	-
France (FRA)	FI*	34.4	32.8	55.9	CL	34.4	62.0	75.1
Greece (GRC)	ST	29.0	15.2	39.8	-	-		-
Hungary (HUN)	NT*	19.0	-	19.0	ST	19.0	15.0	31.2
Iceland (ISL)	ST	20.0	20.0	36.0	-	-	-	-
Ireland (IRL)	ST	12.5	33.0	41.4	-	-	-	-
Israel (ISR)	ST (PI^)	25.0	27.0	45.3	-	-	-	-
Italy (ITA)	ST	31.3	26.0	49.2	-	-	-	-
New Provinces (ITAnew)	ACE(ST)	31.3	26.0	26.0	-	-	-	-
Luxemburg (LUX)	NT*	29.2	-	29.2	CL	29.2	44.1	60.4
Mexico (MEX)	ST (PI^)	30.0	10.0	37.0	-	-	-	-
Netherlands (NLD)	PR	25.0	30.0	55.0	-	-	-	-
New Zealand (NZL)	NT	28.0	-	28.0	-	-	-	-
Norway (NOR)	RRA	25.0	28.8	42.3	-	-	-	-
Poland (POL)	ST	19.0	19.0	34.4	-	-	-	-
Portugal (PRT)	FW	29.5	(28.0)	49.2	-	-	-	-
Singapore (SGP)	NT	17.0	-	17.0	-	-	-	-
Slovakia (SVK)	CL	22.0	(19.0)	36.8	-	-	-	-
Slovenia (SVN)	NT*	17.0	-	17.0	ST	17.0	25.0	37.8
South Africa (ZAF)	PI	28.0	41.0	39.8	-	-	-	-
Spain (ESP)	ST	25.0	23.0	42.3	-	-	-	-
Sweden (SWE)	CL	22.0	30.0	45.4	-	-	-	-
Switzerland (CHE)	NT	21.1	-	21.1	-	-	-	-
Turkey (TUR)	NT*	20.0	-	20.0	-	-	-	-
New Provinces (TURnew)	ACE (NT*)	20.0	-	0.0	-	-	-	-
United Kingdom (GBR)	ST	20.0	20.0	36.0	-	-	-	-
United States (USA)	ST*	38.9	28.3	56.2	ST*	38.9	47.1	67.7
Korea (KOR)	ST* (NT)	24.2	22.0	40.9	ST*	24.2	33	49.2

Notes: 1. Numbers in parentheses are final withholding tax rates.

2. ACE (Allowance for corporate equity), CL (Classical), FI(Full inclusion), FW (Final withholding), NT (No taxation), NT* (No taxation after holding period), PI (Partial inclusion), PI^ (Partial inclusion with inflation adjustment), RRA (Rate of return allowance), ST (Separate taxation), ST* (Separate taxation after holding period).

Source: Harding and Marten (2018); Korean data added by the author.

Each country applies different taxation systems to deal with capital gains of immovable properties. As with share capital gains, countries apply lower tax rates to capital gains on immovable properties held for a long time. In fact, many do not impose taxes on the capital gains of immovable, especially housing, properties. For example, Singapore, Switzerland, and Costa Rica do not tax capital gains on immovable properties. Belgium, the Czech Republic, France, Hungary, Italy, New Zealand, Poland, Slovakia, Slovenia, and Turkey do not tax long-term capital gains of immovable properties.

Korea does not tax the capital gains on a housing unit owned by a single-house household.[8] Even when taxing capital gains on housing properties, the tax rate is lower than for capital gains on share. This discrepancy reflects the corporate tax burden embedded in share.

Table 3_Taxation of Immovable Property Capital Gains (based on highest tax rates in 2016)

(Unit: year, %)

Country	Method	Long-term holding threshold	Percentage of taxed income	Personal income tax (PIT)	Total
Australia (AUS)	PI*	1	50.0	49.0	24.5
Austria (AUT)	FW	-	100.0	30.0	30.0
Belgium (BEL)	NT*	5	-	-	-
Canada (CAN)	PI		50.0	53.5	26.8
Chile (CHL)	PI^	1	100.0	40.0	40.0
Costa Rica (CRI)	NT	-	-	-	-
Czech Republic (CZE)	NT*	5	-	-	-
Estonia (EST)	FI	-	100.0	20.0	20.0
Finland (FIN)	FI*	10	100.0	34.0	34.0
France (FRA)	NT*	30	100.0	-	-
Greece (GRC)	ST(PI^)	26	100.0	15.0	15.0
Hungary (HUN)	NT*	15	-	-	-
Iceland (ISL)	ST	-	100.0	20.0	20.0
Ireland (IRL)	ST	-	100.0	33.0	33.0
Israel (ISR)	ST(PI^)	-	100.0	27.0	27.0
Italy (ITA)	NT*	5	100.0	-	-
Luxemburg (LUX)	FI*	2	100.0	20.0	20.0
Mexico (MEX)	PI^	-	100.0	35.0	35.0
Netherlands (NLD)	PR	-	100.0	30.0	30.0
New Zealand (NZL)	NT*	2	-	-	-
Norway (NOR)	FI	-	100.0	25.0	25.0
Poland (POL)	NT*	5	-	-	-
Portugal (PRT)	PI^	-	50.0	56.5	28.3
Singapore (SGP)	NT	-	-	-	-

8 If the transaction price is KRW 900 million or lower.

Table 3_Taxation of Immovable Property Capital Gains (based on highest tax rates in 2016) (continued)

(Unit: year, %)

Country	Method	Long-term holding threshold	Percentage of taxed income	Personal income tax (PIT)	Total
Slovakia (SVK)	NT*	5	100.0	-	-
Slovenia (SVN)	NT*	20	-	-	-
South Africa (ZAF)	PI	-	40.0	41.0	16.4
Spain (ESP)	ST	-	100.0	23.0	23.0
Sweden (SWE)	PI	-	90.0	30.0	27.0
Switzerland (CHE)	NT	-	-	-	-
Turkey (TUR)	NT*	5	100.0	-	-
United Kingdom (GBR)	ST	5	100.0	28.0	28.0
United States (USA)	ST*	*	*	*	*
Korea (KOR)	ST(NT)	2	-	41.8	41.8

Notes: 1. Numbers in parentheses are final withholding tax rates.
2. FI (Full inclusion), FW (Final withholding), IM (Full imputation), NT (No taxation), NT* (No taxation after holding period), PI (Partial inclusion), PI^ (Partial inclusion with inflation adjustment), PR (Presumptive return), ST (Separate taxation), ST* (Separate taxation after holding period).
Source: Harding and Marten (2018); Korean data added by the author.

Table 4_Tax Rates on Capital Gains on Long-term Asset Holdings (2016)

(Unit: %, %p, year)

	Transfer gains on long-term share holdings		Transfer gains on long-term immovable property holdings		Tax rate difference (A–B)
	Highest rate (A)	Holding period	Highest rate (B)	Holding period	
Australia (AUS)	47.2	1	24.5	1	22.7
Belgium (BEL)	24.4	-	0.0	5	24.4
Chile (CHL)	24.0	1	40.0	1	-16.0
Czech Republic (CZE)	19.0	3	0.0	5	19.0
Finland (FIN)	47.2	10	34.0	10	13.2
France (FRA)	55.9	8	0.0	30	55.9
Greece (GRC)	39.8	-	15.0	26	24.8
Hungary (HUN)	19.0	5	0.0	15	19.0
Italy (ITA)	49.2	-	0.0	5	49.2
Luxemburg (LUX)	29.2	0.5	20.0	2	9.2
New Zealand (NZL)	28.0	-	0.0	2	28.0
Poland (POL)	34.4	-	0.0	5	34.4
Slovakia (SVK)	36.8	-	0.0	5	36.8
Slovenia (SVN)	17.0	20	0.0	20	17.0
Turkey (TUR)	20.0	-	0.0	5	20.0
United Kingdom (GBR)	36.0	-	28.0	5	8.0
United States (USA)	56.2	1	-	-	-
Korea (KOR)	40.9	1	41.8(0.0)	2	-0.9(40.9)

Notes: 1. The boxes with no holding period represent cases where the same rate applies regardless of long-term/short-term holdings.
2. Numbers in parentheses represent transfer income tax rates on housing units owned for living (a single housing unit owned by a single-house household, KRW 900 million or lower).
Source: Harding and Marten (2018); Korean data added by the author.

A comparison of the tax rates of different assets (based on the highest tax rates) shows that the variation is not as great in Korea as in other countries. Korea seems to be faring better in terms of tax neutrality. Across different asset types, the highest tax rates on asset income stand between 40.9% (share capital gain) and 51.0% (dividend income). Excluding the highest tax rate on dividend income (51.0%), the tax rate on share capital gain is 40.9%, and the rates for interest income (bonds and deposits) and immovable property capital gain are 41.8%. The narrow gap between tax rates for different assets indicates that the taxes do not seriously distort taxpayers' asset choice. However, the tax rates on assets are tied with, or exceed, the highest tax rate on labor income (41.8%). The rates seem to be somewhat high, given the mobility of capital and the theoretical justification of capital income taxation. We need to consider tax rate adjustments in order to reflect previous literature's implications.

Table 5_Top Income Tax Rates by Investment Assets (as of 2016)

(Unit: %)

Country	Labor income	Dividend income	Transfer income (shares)	Interest income (bonds)	Interest income (deposits)	Transfer income (immovable properties)
Australia (AUS)	49.0	49.0	47.2	49.0	49.0	24.5
Austria (AUT)	55.0	45.6	45.6	27.5	25.0	30.0
Belgium (BEL)	53.3	44.8	24.4	27.0	27.0	0.0
Canada (CAN)	53.5	55.6	46.4	53.5	53.5	26.8
Chile (CHL)	40.0	40.0	24.0	40.0	40.0	40.0
Costa Rica (CRI)	-	33.5	30.0	8.0	0.0	0.0
Czech Republic (CZE)	15.0	31.2	19.0	15.0	15.0	0.0
Estonia (EST)	20.0	20.0	36.0	20.0	20.0	0.0
Finland (FIN)	34.0	43.1	47.2	30.0	30.0	34.0
France (FRA)	45.0	53.2	55.9	45.0	45.0	0.0
Greece (GRC)	55.0	36.1	39.8	15.0	15.0	15.0
Hungary (HUN)	15.0	31.2	19.0	15.0	15.0	0.0
Iceland (ISL)	31.8	36.0	36.0	20.0	20.0	20.0
Ireland (IRL)	51.0	57.1	41.4	51.0	41.0	33.0
Israel (ISR)	27.0	45.3	45.3	27.0	27.0	27.0
Italy (ITA)	46.3	49.2	49.2	26.0	26.0	0.0
Italy New Provinces	46.3	26.0	26.0	26.0	26.0	0.0
Luxemburg (LUX)	40.0	43.4	29.2	10.0	10.0	20.0
Mexico (MEX)	35.0	37.0	37.0	35.0	35.0	35.0
Netherlands (NLD)	52.0	55.0	55.0	30.0	30.0	30.0
New Zealand (NZL)	33.0	33.0	28.0	33.0	33.0	0.0
Norway (NOR)	38.7	42.3	42.3	25.0	25.0	25.0
Poland (POL)	32.0	34.4	34.4	19.0	19.0	0.0

Table 5_Highest Income Tax Rates by Investment Assets (as of 2016)(continued)

(Unit: %)

Country	Labor income	Dividend income	Transfer income (shares)	Interest income (bonds)	Interest income (deposits)	Transfer income (immovable properties)
Portugal (PRT)	48.0	49.2	49.2	28.0	28.0	28.3
Singapore (SGP)	-	17.0	17.0	0.0	0.0	0.0
Slovakia (SVK)	25.0	32.9	36.8	19.0	19.0	0.0
Slovenia (SVN)	50.0	37.8	17.0	25.0	25.0	0.0
South Africa (ZAF)	-	38.8	39.8	41.0	41.0	16.4
Spain (ESP)	45.0	42.3	42.3	23.0	23.0	23.0
Sweden (SWE)	57.1	45.4	45.4	30.0	30.0	27.0
Switzerland (CHE)	41.3	53.7	21.1	41.3	41.3	0.0
Turkey (TUR)	35.0	34.0	20.0	10.0	15.0	0.0
Turkey New Provinces	35.0	17.5	0.0	10.0	15.0	0.0
United Kingdom (GBR)	45.0	50.5	36.0	45.0	45.0	28.0
United States (USA)	46.3	56.3	56.2	47.4	47.3	-*
Korea (KOR)	41.8	51.0	40.9	41.8	41.8	41.8

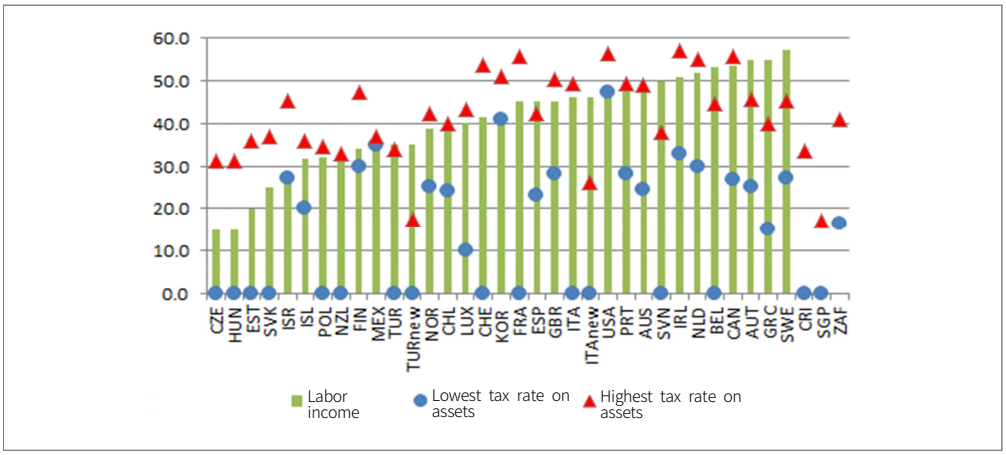
Note: Rates in the United States cannot be represented in a single table, as they greatly vary depending on multiple factors.
Source: Harding and Marten (2018); Korean data added by the author.

The distribution of the highest tax rates for labor income and asset income in 2016 shows that Korea applies relatively high tax rates relative to the other countries, and that the highest rates do not vary greatly across income types. Taxes on asset income are similar to, or higher than, top tax rate for labor income; the highest tax rates applicable to asset income in Korea are high relative to other countries. Korea reported a 51.0% tax rate on dividend income. Only the United States, Canada, the Netherlands, Ireland, and Switzerland reported higher tax rates. The lowest of the highest tax rates on asset income types in Korea was also higher than for many other countries. The lowest tax rates on investment options for the highest taxpayers was 40.9% (share capital gain), which was only surpassed by the 47.3% in the United States (deposit interest income). Many other countries do not impose taxes on the capital gains of immovable(housing) properties, and even offer investment options with significantly lower tax rates than top tax rate for labor income. Only Israel, Mexico, and the United States reported taxes on asset income that are similar to, or higher than, top tax rate for labor income.

In some countries, the highest tax rates on asset income are much lower than the top tax rates for labor income, considering macroeconomic stability. These countries include Sweden, Greece, Austria, and Belgium. Northern European countries operate similar taxation systems, including dual income taxation. Under this system, the highest tax rates for asset income are lower than the top tax rate for labor income.

Figure 1_Distribution of Top Tax Rates on Labor Income and Asset Income

(Unit: %)



Note: The highest tax rate and lowest tax rate on assets refer to the highest and lowest top tax rates applicable to different asset types.
Source: Harding and Marten (2018); Korean data added by the author.

The differences between tax burdens for labor income and asset income indicate each society's perspective to the relative importance of efficiency and equity. The comprehensive income taxation proposed by Haig-Simons may be ideal for equity, because it imposes taxes on the sum of labor income and asset income. Thus, such a tax does not distort taxpayers' choice of income-earning activities because similar highest tax rates apply to income regardless of sources. Korea and the United States impose taxes in this way. However, taxation of comprehensive income hinders the accumulation of capital and limits the growth of long-term labor productivity.

On the other hand, optimal taxation theories propose keeping the tax burdens on assets or capital income lower than the burdens on labor income. Taxation of asset or capital income may cause capital to relocate, and hinder the intertemporal movement of income. In the long run, low tax burden on asset income reduces distortion by taxation, promotes capital accumulation, improves labor productivity, thus increases social welfare eventually.

2. Asset Taxation in Korea

We analyzed equity in taxation of asset income in Korea by looking into taxes on interest income, dividend income, share capital gain, and housing capital gain. We then compared the

effective tax rates of different asset types, to determine the degree of equity in taxation for the different types of assets. We also compared the taxation of immovable property (housing) capital gain with the taxation of pension savings, as well as with labor income taxes. For these taxes, we analyzed equity in taxation based on the marginal tax rates for investments across income levels.

A. Interest and Dividend Income

Korea adjusts the taxation of dividend income at the shareholder level in order to partially offset tax burdens at the corporation level. In other words, Korea offers a tax credit for 10% of corporate income, which is the lowest rate in the corporate income tax schedule. Specifically, 11%[9] of the distributed amount is grossed-up with other income to calculate the income tax amount, and the grossed-up amount is deducted from the tax amount. The tax rate at the corporate level is assumed to be 25%, which is the top corporate tax rate.[10] We also looked into the tax rate on labor income, as a criterion for a comparison with tax rates on interest and dividend income. The labor income tax rate was calculated for a single-member household by applying wage and salary income deduction, basic exemption, wage and salary tax credit, and standard tax credit. For business owners capable of determining whether to distribute dividends, the taxation of business income is also an important factor in the determination of income types. Therefore, we calculated the effective tax rates on business income as well; we assumed 70.7% of business income is reported in tax filing process, as estimated by Ahn (2019).[11]

The analysis of effective tax rates showed that the tax burdens on interest and dividend

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9 11% of dividends is equal to 10% of pre-dividend income, which is the lowest tax rate under the corporate tax rate structure.

10 It would be ideal to apply the effective tax rates on the corporation distributing the dividends. However, due to difficulties with selecting representative cases, we applied the highest tax rate given the fact that large-sized enterprises pay the majority of corporate taxes.

11 Ahn Jong-seok, "Factors Affecting Income Tax Revenue and their Policy Implications," Korea Institute of Public Finance, 2019.
To estimate the identification of business income, he compared the income tax filing data at the Korean National Tax Service and the national account data at the Bank of Korea. As reported business income, he included the self-reported business income and business income in year-end tax adjustment data for withholding. He compared the data with the business income data from the national account, which includes household operation surplus, property income, withdrawal of quasi-corporation income, and rent. He showed 70.7% (2017) of business income is reported in tax filing process.

income from deposits, bonds, and shares were higher than the tax burdens on labor income. The gap further increased in high-income brackets. In general, the data indicates a higher effective tax rate on asset income from deposits and shares.[12] These higher effective tax rates may negatively affect capital accumulation of low-income earners and youths.

The effective tax rate for interest income up to KRW 20 million (the threshold for separate taxation) is as high as the tax rate for KRW 110 million of wage and salary income. Dividend income recorded the highest effective tax rate, which was far higher than the rate for wage and salary income and higher than the rate for other asset incomes. As a result, taxpayers have low incentive to invest in stock market. The tax on dividend income at the shareholder level is lower than the wage and salary income in income brackets above KRW 100 million, as the dividend tax credit partially offsets corporate tax burden. The current structure offers myopic individuals who cannot consider implicit burdens with opportunities to choose shares as their assets.

Tax burdens on wage and salary income are not notably different from the tax burdens on business income. Due to tax credits and the business income tax-filing ratio, tax burdens on business income are higher than the tax burdens on wage and salary income at lower income brackets, and decreases for higher income brackets. As the business income tax-filing ratio was set at 70.7% (2017), the taxable income share is relatively small compared to that of wage and salary income because deductions for wage and salary income have their ceilings. The effective tax rate on wage and salary income approaches the effective tax rate on business income at the income level of around KRW 60 million. This finding indicates the importance of tax revenue source management that targets business income earners in the middle- and high-income brackets.[13] The Korean income tax regime considers differences in income transparency between wage and salary income and business income. One common approach is to restrict the tax credits applicable to business income earners. However, this approach penalizes business income earners who honestly report their income.

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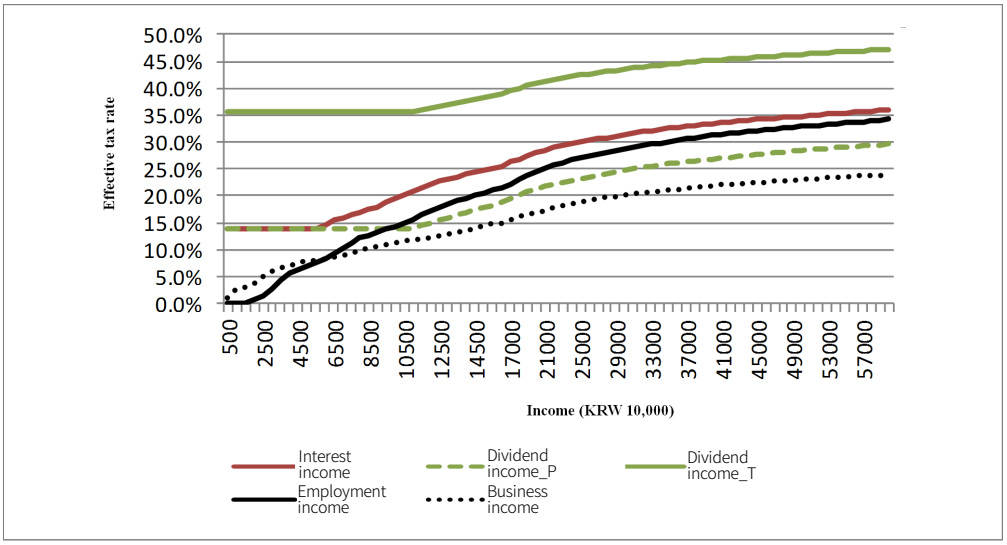
12 Based on 100% dividend rate.

13 A different implication may be obtained if the income identification rate varies depending on the income level.

Figure 2_Effective Tax Rates on Interest and Dividend Income (2019)

(Unit: %)



Notes: 1. Dividend income_P represents income tax at the personal shareholder level, and Dividend income_T represents the total income tax at the corporate level and the personal level.
2. Tax on employment income and business income represent tax on single persons. The 70.7% identification rate applies to business income.

Source: Present study

B. Capital gains income

As for the taxation of capital gains income, we analyzed the capital gains income of shares and immovable properties (housing). When analyzing the taxation of share capital gains income, it is important to also analyze the taxation of dividend income. When a corporation distributes its profit as dividends, shareholders have to pay income tax on the dividend income. When a corporation holds its profits, shareholders have to pay capital gains tax on share capital gains. In other words, the tax rate of share-related income varies depending on a corporation's dividend policy.

Currently, share capital gains income taxes are imposed only on major shareholders. A major shareholder is defined by the number[14] or the value of shares owned by the shareholder,

14 1% or more than 1% of total shares.

the value threshold of which is scheduled to be lowered to KRW 300 million by 2021.[15] Income from shareholding consists of dividend income and capital gains. Here, we assumed the ratio of the two to be 50:50, for a holding period of two years.[16] We also separately calculated the share-related income tax burdens on minor shareholders and major shareholders.

Tax burden of shareholding varies depending on the type of income (dividend/capital gain) and the position of the shareholder (major/minor shareholder). Supposing that a corporation distributes 50% of its profit as dividends, tax burden is lower than the case in which the corporation distributes 100% of its profit as dividends, because the effective tax rate on dividend income is very high. A higher share of capital gains income, which comes at lower tax burdens, lowers the overall effective tax rate. However, the effective tax rate is still higher than the rate on wage and salary income across all income levels. Remember that minor shareholders do not pay taxes on capital gains income. Therefore, at a lower dividend share, the tax burden gap between two types of shareholders are even bigger. At some income levels, the tax rate on shareholders may be lower than the effective tax rate on wage and salary income. However, major shareholders can greatly influence the corporation's dividends decision. In addition, lowering a corporation's dividend payout ratio is not easy, considering the current administration's policies towards encouraging dividend income.[17] For this reason, the overall effective tax rate for share-related income is higher than the rate for wage and salary income.

The effective tax rate for major shareholders is higher than the rate for minor shareholders, as the former group pays taxes on share capital gains income. The gap between the two groups remains steady at around 7.5%p. It is worth noting that, in lower income levels, the effective tax rate is higher when the ratio between the dividend and capital gains income is 50:50, relative to when the profit is fully distributed as dividends. This finding can be attributed to the low personal income tax rate compared to the marginal tax rate applied to the capital gains income earned by major shareholders (20% or 25%, applicable to tax base exceeding KRW 300 million). In other words, in lower income levels, the tax on major shareholders' dividend income is lower than the tax on their capital gains income.

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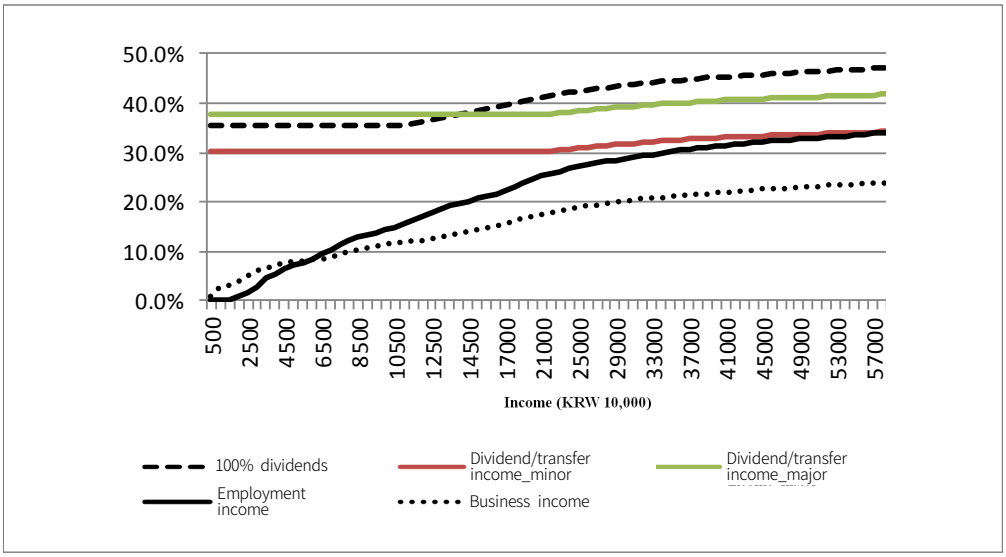
15 The government's 2020 proposal for tax law amendment provides for the taxation of all share capital gains income starting in 2023.

16 We did not consider the effect of inflation during the two-year holding period.

17 As of 2018, the dividend payout ratio of companies listed in the securities market stands at around 24.8% (*Seoul Economic Daily*, "Korea's dividend ratio surpasses the G7 average ... Pressuring Enterprises with the "Stewardship Code." August 28, 2019).

Figure 3_Effective Tax Rates by Percentage of Dividends in Share-Related Income (2019)

(Unit: %)



Note: 100% dividend refers to tax on dividends only. Dividend/capital gains income refers to cases in which a corporation's profit equally distributed by dividends and withheld profit. "Minor" refers to minor shareholders, and "Major" refers to major shareholders who pay taxes on share capital gains income. The amounts of tax on wage and salary income and business income represent the tax burdens of single income earner. The business income tax-filing ratio is 70.7%.

Source: Present study

Capital gains tax on housing is highly complicated. A household owning a single housing unit is not taxed for his/her capital gains. However, if the sale price exceeds KRW 900 million, a tax can be imposed on the excess. To benefit from the real property capital gains income, a taxpayer is required to pay a large amount of taxes during the holding period, which includes the Property Tax (local tax) and the comprehensive real estate holding tax (national tax). We calculated the tax on capital gains income by considering these two taxes on housing units.

To calculate the tax on housing capital gains income, we assumed the following: the holding period is 20 years, the return on investment during the period is 3% per year, and the inflation rate is 1% per year. The taxes imposed during the holding period are the Property Tax (including property taxes in urban areas and Local Education Taxes), and the comprehensive real estate holding tax.

The capital gains on a housing unit is realized when selling the housing unit. For this reason, we compared tax rates by calculating the marginal tax rate at the time of making an investment decision. Due to separate taxation, the marginal tax rates represent the tax burdens separately

imposed on a taxpayer regardless of the level of global income. To calculate the marginal tax rates, we assumed that the taxpayer purchases a housing unit at KRW 300, 500, or 700 million, and sells it after 20 years. We also considered the tax burdens on households having two housing units, and assumed that 50% of the purchase prices are financed by loans. For the calculation of marginal tax rates, we considered the Registration Tax that is paid when obtaining a housing unit,[18] the Property Tax during the holding period (including the property tax in urban areas and the Local Education Tax),[19] and the comprehensive real estate holding tax,[20] along with the interest costs. During the holding period, the prices of immovable properties were assumed to increase at a rate that combines the return on investment rate (3%) and the inflation rate (1%). We also assumed that the current system that is based on nominal amounts fixed, with regard to the immovable property taxes (Property Tax and comprehensive real estate holding tax).

We also calculated the marginal tax rate on pension savings, as a comparison with a similar type of long-term asset investment. For the sake of convenience, we calculated the marginal tax rate of first contribution in pension savings. In Korea, pension savings are taxed using the exempt-exempt-tax (EET) method. In other words, taxes are only imposed at the time of receiving the pension benefits, without contributions and the operating income of the savings. Pension income is taxed as a part of a taxpayer's global income. Therefore, the marginal tax rate is determined by the taxpayer's income level at the time of receiving the pension benefits.

Our analysis showed that, in the case of investing in a housing unit owned for living, the marginal tax rate on capital gains income has a negative value, which indicates tax incentives on the housing investment. For a household that becomes a single-house household by purchasing a housing unit worth KRW 300 million, the marginal tax rate is -8.4%. For a housing unit worth KRW 500 million, the rate is -4.9%. These results are attributable to the government policy that does not impose taxes on capital gains income if the sale price is under KRW 900 million. However, a household that becomes a single-house household by

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18 Registration Tax rate: 0.8%

19 For the Property Tax, progressive rates apply to 60% of the fair price of the properties (0.1% if KRW 60 million or lower; 0.15% if KRW 150 million or lower; 0.25% if KRW 300 million or lower; and 0.4% if above KRW 300 million). The Property Tax rate in urban areas was assumed to be 0.14%, and the Local Education Tax was assumed to be 20% of the Property Tax.

20 Progressive rates apply to 85% of the fair price of the properties (0.5% if KRW 300 million or lower; 0.7% if KRW 600 million or lower; 1.0% if KRW 1.2 billion million or lower; 1.4% if KRW 5 billion or lower; 2.0% if KRW 9.4 billion or lower; and 2.7% if above KRW 9.4 billion).

purchasing a housing unit worth KRW 700 million is subject to a 2.2% marginal tax rate since the sale price exceeds KRW 900 million. Supposing a 20-year holding period, as the housing price increases the percentage of tax-exempt capital gains income decreases, whereas the amount of Property Tax and the comprehensive real estate holding tax would increase. Overall, a single-house household is subject to a marginal tax rate that is lower than the other types of asset income.[21] The current policy has an effect of encouraging the acquisition of housing units.

On the other hand, a taxpayer who becomes a two-house household by purchasing a housing unit worth KRW 500 million[22] was subject to a 37.8% marginal tax rate on the purchase of the second housing unit. This rate is similar to the marginal tax rate applied to labor income tax base of over KRW 150 million (38.5%). The government encourages purchasing a housing unit for the purpose of living in it. However, taxation on the purchase of any additional housing units is designed to discourage taxpayers from purchasing them.

As mentioned above, we compared housing units with pension savings. The government grants tax incentives to pension savings, so that taxpayers can use them to secure income after their retirement. Assuming a 20-year contribution period (same as the 20-year holding period for housing units), we can calculate the marginal tax rate on pension savings by the income level at the time of receiving the pension benefits. For taxpayers who do not have other incomes at the time of receiving their pension, the marginal tax rate on pension savings is -14.1%, indicating a high level of tax incentives. The level of tax support declines as taxpayers earn more income. For a taxpayer whose marginal income tax rate is 6% at the time of receiving their pension (tax base: less than KRW 12 million), the marginal tax rate on pension savings is -3.4%. The rate significantly increases for higher income groups, reaching 33.3% among taxpayers whose marginal income tax rate is 24% (tax base: KRW 46 million ~ 88 million).[23] This tax rate structure indicates favorable treatment of pensioners who have a lower post-retirement income.

In addition, our findings show that for all taxpayers who do not own a housing unit, investing in a housing unit is more beneficial than investing in any other type of asset. An investment in a housing unit is a highly profitable option on any income level. This incentive

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21 The marginal tax rate declines even further when considering the income deduction for interest paid by the taxpayer.

22 The other housing unit is also assumed to be worth KRW 500 million.

23 The marginal tax rate declines further when taking into accounts the tax credit (15%) on pension saving contributions.

structure does not significantly change unless the housing price exceeds a certain level. However, such an incentive is not granted for the purchase of any additional housing unit, in which case a significantly higher tax rate applies. This policy thus exerts a significant impact on deterring demand for additional housing.

The marginal tax rate on pension savings is considered to be relatively low. However, the low marginal tax rate on pension savings is allowed to low-income earners. Pension savings have a consumption smoothing effect over a person's lifetime, by transferring income from a high-income period to a low-income (post-retirement) period. The government needs to increase such income smoothing over life-cycle by incentivizing pension savings. In fact, in a country where public pension coverage is still low, it makes all the more sense to help its people secure post-retirement income through pension savings.

The marginal tax rates on pension savings and housing investments are typically lower than the rates on labor income, but higher if the taxpayer purchases a second housing unit or their tax base reaches KRW 88 million or higher. Theoretically, taxes on asset income are recommended to be lower than taxes on labor income. The tax rates on pension savings need to be lower than the rates on labor income, in accordance with the theoretical implications. However, the high tax rates on housing investments can be justified by the special nature of the housing market.

Despite the differences in the marginal tax rate structure, the actual asset mix of a household varies depending on the expected return on each asset, as each taxpayer can move their capital toward certain assets expected to return higher yields. In Korea, real properties take up the majority of household assets. The high percentage stems from the low tax rate on single-house households and the higher expected return for real properties.

Table 6_Marginal Rates on Housing Transfer Income and Pension Savings (2019)

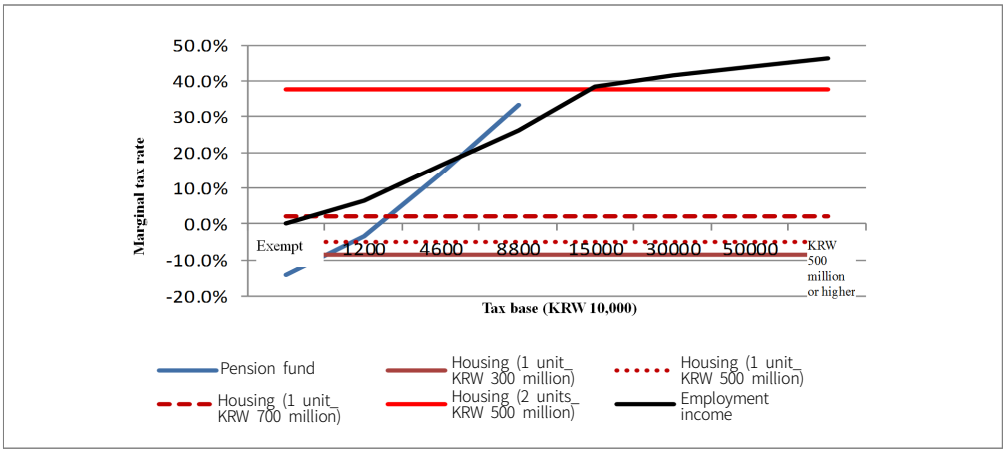
(Unit: %)

	Exempt	6%	15%	24%
Pension savings	-14.1	-3.4	14.0	33.3
Housing (1 unit_KRW 300 million)	-8.4	-8.4	-8.4	-8.4
Housing (1 unit_KRW 500 million)	-4.9	-4.9	-4.9	-4.9
Housing (1 unit_KRW 700 million)	2.2	2.2	2.2	2.2
Housing (2 units_KRW 500 million)	37.8	37.8	37.8	37.8

Note: 50% of the price is assumed to be covered by loans; marginal rates represent the marginal income tax rates at the time of receiving pensions.
Source: Present study

Figure 4_Marginal Rates on Housing Transfer Income and Pension Savings (2019)

(Unit: %)



Note: The horizontal axis represents the tax base; 50% of the housing price is assumed to be covered by loans.
Source: Present study

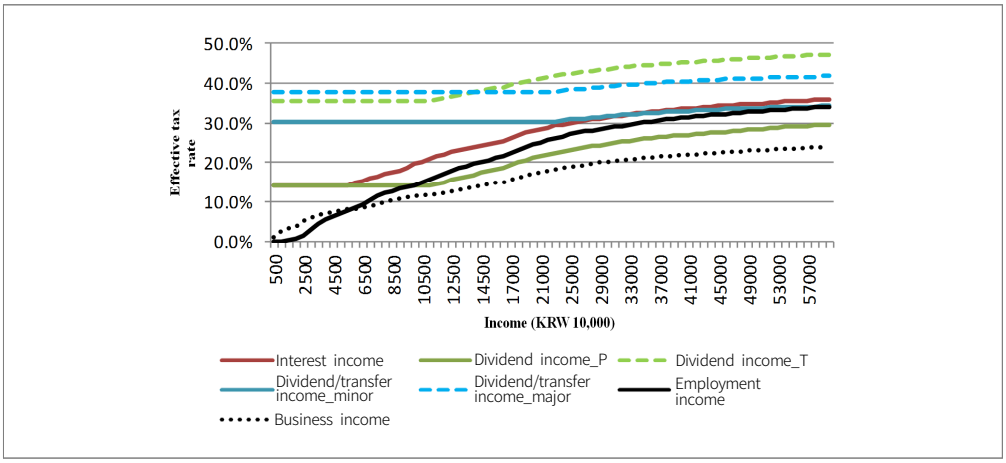
IV. Equity in Taxation of Asset Income and Labor Income

Our analysis showed that the effective tax rates on asset income are higher than the rates on labor income. Among the asset types, dividend income is taxed at the highest effective rate. This high effective rate can be attributed to the fact that the taxes on dividend income do not fully reflect the corporate taxes paid at the corporate level, despite the low tax rate at the shareholder level (separately taxed at 14% if dividend income is KRW 20 million or lower) or the application of the same marginal tax rate as the labor income (if dividend income is above KRW 20 million). In other words, the total effective tax rates at the shareholder level are higher than the effective tax rates of the income of other assets. If a corporation withholds part of its profit, its shareholders enjoy capital gains instead of dividends. In this case, as the tax rate for the capital gains is lower than the rate on dividend income, the total effective tax rate is lower than the effective tax rate on dividend income. The effective tax rate is even lower for minor shareholders, because they do not pay any tax for their share capital gains. In contrast, major shareholders pay taxes on their capital gains, and their effective tax rate declines by a lesser degree—even if the share of capital gains income increases. In the case of a major shareholder having a low labor income,[24] the tax rate for the capital gains income (20%) is

lower than the rate for dividend income (14%), which may actually raise the total effective tax rate when the share of dividend in the corporation's profit decreases. The tax rate of interest income is also higher than that of labor income.

Figure 5_Effective Tax Rates on Labor Income and Asset Income (2019)

(Unit: %)



Notes: 1. Dividend income_P represents income tax burdens at the personal shareholder level, and Dividend income_T represents the total of income tax burdens at the corporate level and the personal level.
2. The business income tax-filing ratio is 70.7%.

Source: Present study

Our analysis of the marginal tax rates on long-term investment assets indicates that tax incentives are provided to housing units (real properties) and pension savings. Long-term savings also receive favorable treatment, but differ in the size of incentives. The government provides tax incentive for pension savings to help taxpayers secure income sources after their retirement. Pension subscribers are not taxed when they deposit pension savings, and only pay taxes when they receive their pension benefits. As a result, the tax rates on pension savings vary depending on the taxpayer's income level at the time of receiving the pension benefits. Tax subsidy (a negative marginal tax rate) is provided to income earners whose marginal income tax rate is 15% or lower (tax base KRW 12 million or lower). However, the marginal tax rate steeply increases for higher-income earners, reaching a level similar to the marginal tax rate

24 If the shareholder's total income does not exceed KRW 120 million.

for labor income. These findings indicate that the tax regime is well designed to help low-income earners secure post-retirement income sources, given the fact that low-income earners are less motivated to engage in long-term savings. The regime also contributes to enhancing public welfare in general, by encouraging taxpayers to transfer their income to cover their lifetime.

For housing units, extensive tax incentive is provided across all income levels. Single-house households benefit from tax subsidies or low marginal tax rates, although the level of support varies depending on the housing price. For this reason, housing units represent a more attractive investment option than other assets. In addition, by repeatedly selling and buying a housing unit at relatively short intervals, a household can continuously enjoy the tax benefits provided to single-house households. The low (or even negative) effective tax rates across all income levels may be a key factor that moves household assets toward real properties. However, in the case of purchasing a second house, the marginal tax rate goes up to around 38%, which is higher than the rates on both the other assets as well as labor income. Although not supported by the aforementioned theories, the government seems to have considered the effect on housing prices and the high dependence on real properties in household assets.

To improve equity in taxation with the other asset types, the government needs to adjust the marginal tax rate on housing investments by reducing the scope of tax-exempt capital gains income or lowering the special tax credit for long-term holdings. If the government intends to help households accumulate assets, for example by supporting households with the purchase of their first housing unit, the government can achieve it without sacrificing equity in taxation by granting tax benefits to only first housing units or housing units owned as a primary residence. These policies will allow the government to ensure residential security or assist with asset building, while achieving equity in taxation between housing (other than first housing units or housing units owned as a primary residence) and other types of assets.

To analyze the specific effects of the policies, we carried out a simulation. For the lowering the income deduction for long-term holdings, we simulated the effect of lowering the income deduction rate applicable to a capital gains from selling a housing unit exceeding KRW 900 million in market value from 80% to 60%. Supposing a 20-year holding period, lowering the deduction rate increased the marginal tax rate on a housing unit purchased at KRW 500 million from -4.9% to -3.8%, reducing the tax benefits provided. Capital gains income is tax exempted if the selling price is KRW 900 million or lower. Therefore, if a housing unit was purchased for KRW 300 million, the marginal tax rate remains the same at -8.4%.

In the case of abolishing the non-taxation of capital gains income for single-house

households and replacing it with an 80% tax credit for long-term holdings, the marginal tax rate increased to a level similar to other types of assets. A household that purchased a housing unit for KRW 300 million would still enjoy tax benefits, but the marginal tax rate would be only -2.1%. In the case of a household that purchased a housing unit for KRW 500 million, the marginal tax rate would be as high as 3.4%, which would reduce the marginal tax rate gap with other asset types. By mitigating the gaps, these policy changes may reduce distortion in the asset portfolio of households. Another option worth considering is adjusting the capital gains income from long-term holding assets for inflation, achieved by imposing taxes based on real capital gains rather than nominal capital gains incomes. Such an approach would separate the policy instrument for ensuring the real value of a housing unit, from the instrument for adjusting tax burdens of income from long-term investments and income from annual investments.

Table 7_Marginal Tax Rates for Tax Reform Scenario of Single-House Households (2019)

(Unit: %)

Scenario	Current structure	Taxation scenario	
		Lower exemption rate (80% → 60%)	Non-taxation to exemption (tax credit rate 80%)
Acquisition price: KRW 500 million Held for 20 years; 50% covered by loan	-4.9	-3.8	3.4
Acquisition price: KRW 300 million Held for 20 years; 50% covered by loan	-8.4	-8.4	-2.1

Note: The first scenario lowers the capital gains income tax credit rate applied to housing worth more than KRW 900 million held by single-house households. The second scenario abolishes the non-taxation of capital gains income from housing units worth KRW 900 million or lower, and applies an 80% tax credit rate to all capital gains.

Source: Present study

V. Redistribution Effect of Labor-Asset Income Taxation

In this chapter, we analyze the combined effect of labor and asset income taxation at the household level, using the National Survey of Tax and Benefits (NaSTaB) data. We look into how the differences in the taxation of these two types of income, and the composition of assets, affect the redistribution function.

1. Data and Calculation

We used the 10th year data of the NaSTaB (2016 data, surveyed in 2017). The NaSTaB

data consists of data collected from 5,014 households in 2008 and 620 households in 2009, as well as the tracking data of the households that split from the original households in later years. The 2017 survey was conducted on 4,236 households, which accounts for 75.2% of the original 5,632 households. It also included 517 of the 562 split-off households (Korea Institute of Public Finance, *Basic Analysis Report on 10th Year* NaSTaB *Data*, 2018).

The analysis was conducted at the household level, as it is suitable for understanding the effects of income redistribution. To analyze the effect by income of households, household incomes have been rescaled based on household size; here, the household income was adjusted by dividing it with the square of the household size.

The household income is the sum of all the income earned by the householder and other member in the house. Income consists of labor income and asset income, and labor income consists of wage and salary income and business income.[25] Asset income consists of interest income (deposits, savings, bonds, funds, etc.), dividend income (shares), interest income (pension, etc.), and (implicit) rent income (from real property assets). We also included the income from other assets such as memberships (golf courses, resorts, etc.), agricultural machines and livestock, and jewelry. For asset income, we used the income estimated from the value of the assets, rather than actually surveyed the interest and dividends, because the NaSTaB provides a household's interest/dividend income only when it exceeds KRW 1 million. We also needed to estimate the implicit income from housing units owned for living and lumpsum deposit[26] for housing service. In this way, we used the income estimated based on the assets owned by each household. We used the three-year average return rate of corporate bonds (AA-) to estimate the asset income; the rate stands at 2.651% as of 2018.[27] This rate was applied to all assets.

We used both estimated and surveyed income to distribute asset income among the household members. We identified the asset income of individual household members except head of household using the actually surveyed interest income, dividend income, and rental income. The asset income of a head of household was calculated by subtracting the other household members' asset income from the household's total asset income, estimated based on its assets. This approach allowed us to consider the asset ownership behavior within each

25 Technically, business income consists of labor income and capital income. However, for the purpose of this study, it is classified as labor income.

26 So-called "Chun-sae", which does not require monthly rent.

27 Bank of Korea, Economic Statistics System (accessed on August 26, 2019).

household. The implicit income from housing units owned for living and lumpsum deposits were classified as the head of household's asset income.

To understand the income redistribution effect at the household level, we applied the income tax rates to individuals' specific incomes. The reference year for the analysis was 2018. The micro-data were collected in 2016. However, without significant changes to their distribution, we could use the data to analyze the effect of the system in 2018.

We applied the Wage and Salary Income Deduction and the Personal Deduction when calculating the income tax base. Then we applied the Wage and Salary Income Tax Credit and the Standard Tax Credit when calculating the amount of taxes. We applied the Standard Tax Credit because it is difficult to obtain the data required for calculating the optional Special Tax Credit items. For the Personal Deduction, we considered members with no income as the head of household's dependents. We applied only the Personal Deduction to business income earners. We excluded the burden of social insurance contributions, because the National Health Insurance contributions of non-wage workers are based on their wealth, which makes it difficult to identify the exact levels of contributions paid by non-wage workers.

We applied the 14% separate taxation rate to income tax on interest income (from deposits, savings, funds, and bonds). For the income from shares, we applied different tax rates to the actual dividend income and capital gains income generated by the profit withheld by corporations. The dividend payout ratio of Korean listed companies stands at around 24.8%.[28] Therefore, we assumed that 25% of a company's profit was paid out in dividends, and the other 75% was recovered as capital gains. The tax burdens on dividend income were generated in two stages. First, corporations pay corporate taxes on their profits. For convenience's sake, we assumed the corporate tax rate to be 22%.[29] Second, individual shareholders also pay income taxes on their dividend income. The dividend income taxes at the individual level (14%)[30] and the income taxes on capital gains income are as follows.

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28 *Seoul Economics Daily,* "Korea's Payout Ratio Exceeds the GT Average...," August 28, 2019, https://www.sedaily.com/NewsView/1VN5A0RSJA, accessed on September 23, 2019.

29 Applied the medium rate (22%) in the 4-stage progressive rate structure (10%/20%/22%/25%).

30 Applied the separate taxation rate because few taxpayers pay general income tax on dividend income.

□ Tax on shares = Corporate tax + Tax on dividends + Tax on capital gains income

- Corporate tax = Asset profit × Corporate tax rate (22%)
- Tax on dividends = Asset profit × (1 – Corporate tax rate) × Dividend payout ratio (25%) × Tax rate (14%)
- Tax on capital gains income = Asset profit × (1 – Corporate tax rate) × Withheld profit (75%) × Tax rate (0%)

The tax on asset income from insurance and long-term savings for housing purchase were assumed to be a 14% withholding tax. The amounts loaned by taxpayers to others were assumed to be non-taxed, as the amounts represent transactions between individuals. However, for income from private pension that does not exceed KRW 12 million, a taxpayer can choose between either a 5% withholding tax or global taxation. We applied the 5% withholding tax rate, as we did not have information on individuals' income after their retirement. However, pension savings become pension income after the contribution period. Assuming an average contribution period of 10 years, the effective tax rate was around 80% of the 5% withholding tax rate,[31] that is, around 4%.

For the taxation of real properties, taxpayers only pay taxes on rent earned from their properties. As of 2018, the government only taxes rental income exceeding KRW 20 million. Rental income exceeding KRW 20 million is added to the income for global income taxation.[32] We assumed that a household earns rent from housing units and other real properties (land and buildings). We also included implicit income from the housing unit owned for living because even though the household does not earn any rent, it utilizes services associated with the housing unit that are equivalent to rent. However, no income tax was imposed on such implicit income. Households earn implicit income from housing lease deposits and non-housing lease deposits, neither of which are taxed.

Memberships, agricultural machines, livestock, and jewelry also generate implicit income. However, such income is not taxed; therefore, a 0% income tax rate applies to income from these assets.

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31 Assuming an inflation rate of 2%, the present value of the 5% withholding tax after 10 years is around 4%. 1/(1.02^10)=0.82.

32 Applied a 60% expense ratio; From 2019, all real property rental income will be taxed

2. Basic Statistics and Findings

The average income of the head of household of the 4,790 households was KRW 37,660,000. The average income of the first decile was the lowest at KRW 3,110,000. The average income of the tenth decile was 35.4 times higher at KRW 109,940,000. The percentage of age 65 or older head of household was higher in the lower income deciles, and lower in the higher income deciles. The average age of the head of household in the first three income deciles was close to the retirement age, and the average age of the head of household in the top five deciles was between 47 and 49, which indicates that these head of household were economically active. The income of all household members shows similar patterns. When adding the income of the other adult household members, the household income in the first decile increased by 6.4% to KRW 3,310,000. On the other hand, the household income in the tenth decile increased by 32.0% to KRW 145,110,000, which is 43.8 times higher than the household income in the first decile.

As the percentage of elderly household members was higher in the low-income households, there exists a limit to reducing the household income gaps through economic activities of household members.

Table 8_Income Mix of the head of household

(Unit: no. people, years-old, KRW 10,000)

Items	1st decile[1)]	2nd decile	3rd decile	4th decile	5th decile	6th decile
No. of samples	479	479	479	480	478	479
Age of the head of household	73	66	58	53	51	48
Percentage of 65 or older	85.0	66.4	43.4	30.2	22.4	13.2
Wage & Salary salary income	37	201	639	1,196	1,560	2,165
Business income	26	136	324	422	682	691
Imputed interest income[2)]	20	50	52	52	56	61
Imputed dividend income[3)]	1	2	3	3	4	3
Imputed real property income[4)]	109	307	378	412	489	537
Imputed other financial income[5)]	0	3	3	5	6	6
Imputed other asset income[6)]	0	1	2	2	3	6
Personal income transfer[7)]	74	123	98	95	89	37
Public income transfer[8)]	43	69	39	34	54	51
Total	311	893	1,539	2,220	2,944	3,556

Table 8_Income Mix of Home Owners(continued)

(Unit: no. people, years-old, KRW 10,000)

Items	7th decile	8th decile	9th decile	10th decile	All
No. of samples	480	478	479	479	4,790
Age of the head of household	48	47	49	48	54
Percentage of 65 or older	10.0	8.0	6.7	6.1	17.3
Wage & Salary salary income	2,562	3,358	4,450	6,954	2,245
Business income	989	921	905	1,893	685
Imputed interest income[2)]	57	82	115	199	73
Imputed dividend income[3)]	5	5	11	34	7
Imputed real property income[4)]	629	677	1,070	1,758	622
Imputed other financial income[5)]	16	15	28	80	16
Imputed other asset income[6)]	3	8	8	25	6
Personal income transfer[7)]	64	50	32	19	69
Public income transfer[8)]	50	36	31	31	44
Total	4,376	5,152	6,651	10,994	3,766

Notes: 1) The income decile was divided based on income adjusted for household size, i.e., household income/.
2) Imputed interest income represents the expected return calculated by multiplying the amount of deposits at financial institutions, funds, and bonds with 2.651% (rate of return of corporate bonds in 2018 (3 years, AA-)).
3) Imputed dividend income represents the expected return calculated by multiplying the amount of shares with 2.651%.
4) Imputed real property income represents the expected return calculated by multiplying the total value of housing units owned for living, housing units owned for other purposes, other real properties (land and buildings), and housing lease deposits with 2.651%.
5) Imputed other financial income represents the expected return calculated by multiplying the amount of pension savings, savings insurance, pension insurances, money deposited in long-term savings/funds for housing purchase, money loaned to others, and other financial assets with 2.651%.
6) Imputed other asset income represents the expected return calculated by multiplying the amount of memberships (golf courses, resorts, etc.), agricultural machines, livestock, jewelry, and other assets with 2.651%.
7) Income transfer from other households.
8) National Basic Living Security Benefits, Child Support Grants (childcare expenses, educational expenses, meal expenses, multi-children grants, others), and other in-kind subsidies.

Source: Present study, based on NaSTaB (KIPF, 2018)

Table 9_Income Mix of Households (Head of Household and Other Members)

(Unit: no. people, years-old, KRW 10,000)

Items	1st decile[1)]	2nd decile	3rd decile	4th decile	5th decile	6th decile
No. of samples	479	479	479	480	478	479
Age of the head of household	73	66	58	53	51	48
Percentage of 65 or older	85.0	66.4	43.4	30.2	22.4	13.2
Wage & Salary salary income	43	282	861	1,568	2,072	2,880
Business income	30	153	376	483	797	826
Imputed interest income[2)]	20	51	54	52	58	63
Imputed dividend income[3)]	1	2	3	3	6	3
Imputed real property income[4)]	109	312	403	430	500	544
Imputed other financial income[5)]	0	3	3	5	6	6
Imputed other asset income[6)]	0	1	2	2	3	6
Personal income transfer[7)]	83	142	119	117	97	46
Public income transfer[8)]	44	72	40	37	58	55
Total	331	1,017	1,863	2,696	3,597	4,428

Items	7th decile	8th decile	9th decile	10th decile	All
No. of samples	480	478	479	479	4,790
Age of the head of household	48	47	49	48	54
Percentage of 65 or older	10.0	8.0	6.7	6.1	17.3
Wage & Salary salary income	3,465	4,574	6,073	9,236	3,015
Business income	1,214	1,108	1,243	2,798	881
Imputed interest income[2)]	58	84	118	213	75
Imputed dividend income[3)]	5	5	11	36	7
Imputed real property income[4)]	652	693	1,129	2,067	666
Imputed other financial income[5)]	16	15	28	80	16
Imputed other asset income[6)]	3	8	8	25	6
Personal income transfer[7)]	69	67	38	23	81
Public income transfer[8)]	61	40	34	33	48
Total	5,542	6,593	8,683	14,511	4,795

Notes: 1) The income decile was divided based on income adjusted for household size, i.e., household income/.
2) Imputed interest income represents the expected return calculated by multiplying the amount of deposits at financial institutions, funds, and bonds with 2.651% (rate of return of corporate bonds in 2018 (3 years, AA-)).
3) Imputed dividend income represents the expected return calculated by multiplying the amount of shares with 2.651%.
4) Imputed real property income represents the expected return calculated by multiplying the total value of housing units owned for living, housing units owned for other purposes, other real properties (land and buildings), and housing lease deposits with 2.651%.
5) Imputed other financial income represents the expected return calculated by multiplying the amount of pension savings, savings insurance, pension insurances, money deposited in long-term savings/funds for housing purchase, money loaned to others, and other financial assets with 2.651%.
6) Imputed other asset income represents the expected return calculated by multiplying the amount of memberships (golf courses, resorts, etc.), agricultural machines, livestock, jewelry, and other assets with 2.651%.
7) Income transfer from other households.
8) National Basic Living Security Benefits, Child Support Grants (childcare expenses, educational expenses, meal expenses, multi -children grants, others), and other in-kind subsidies.

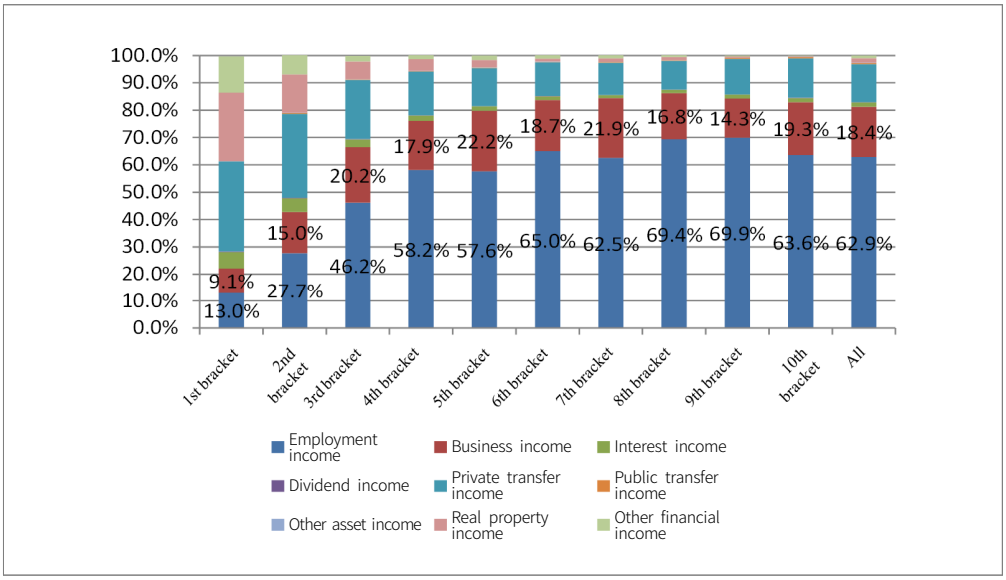
Source: Present study, based on NaSTaB (KIPF, 2018)

By income type, wage and salary income (62.9%) and business income (18.4%) comprise more than 80% of the total household income. The high percentage of labor income (wage and salary income and business income) indicates the importance of labor supply for income distribution. The percentage of asset incomes (interest, dividends, real properties, and other financial and asset income) was fairly low. Among asset types, (Implicit) real property income comprises the largest percentage, due to the high share of real properties in the household asset.

Specifically, the average percentage of real property income stands at an average of 13.9%. The percentage increased in lower income classes, reaching 32.9% in the first bracket. The same percentage was only 14.2% in the tenth bracket. The reliance on real property assets was more prominent among low-income households.

Figure 6_Household Income Mix by Income Decile

(Unit: %)



Note: The income decile was divided based on income adjusted for household size, i.e., household income/.
Source: Present study, based on NaSTaB (KIPF, 2018)

As expected, the share of income transfer was also higher among the lower income deciles. Private income transfer comprises a larger percentage than public income transfer, which indicates the significant role of income transfer between households in the income of

lower-income households. In the first decile, private income transfer accounts for 25.1% of the household income, which is higher than the share of public income transfer (13.3%).

To analyze the redistribution effect of taxes, we analyzed the income tax burdens pertaining to labor income and asset income. For housing units, we also considered the burden from real property taxes. We used two indicators to analyze the income tax burdens. One indicator is the share of each income tax in the total income. This indicator allows us to identify the role of each income tax relative to the total income and income tax burden. However, the indicator cannot be used to compare effective tax rates among different income sources, because different income sources take up different shares in the total income. The other indicator is the effective tax rate on each income source. This indicator is suitable for analyzing the tax equity among income sources. By analyzing the gaps in effective tax rates among the income sources, we were able to estimate the effect of taxes on income-earning activities.

Our findings as to the percentage of each income tax in the total income are as follows. The average income tax rate was 4.74% (including housing units holding taxes). The rates show a progressive structure across income deciles. The tax rate was 2.75% in the first decile, dropping to 2.2% in the third decile, and then increasing in the higher deciles until reaching 12.01% in the tenth decile. The second to fourth deciles reported lower income tax burdens (including housing units holding taxes) than the first decile, due to the high percentage of financial income tax in the first decile. For interest income from deposits and other financial assets not exceeding KRW 20 million, a household fulfills its tax obligations by paying a 14% separate tax.

Among low-income households, a higher share of interest income raised the total income tax burden. Households in the first decile had an almost 0% effective tax rate applied to their wage & salary and business income, though the 14% rate was still applied to their financial income. As a result, a higher share of financial income raised the overall effective tax rate. Among households in the first decile, interest income (14% tax rate) comprised 6.0% of their total income, which was higher than the 5.0%, 2.9%, and 1.9% of the second, third, and fourth deciles, respectively. As a result, the total income tax rate in the first decile was slightly higher than the second to fourth deciles.[33]

We included the housing holding taxes because even though they are not income taxes,

33 The finding is partially attributable to the fact that we did not consider the effect of non-taxation/low-taxation programs. The effect of these programs cannot be readily separated because there is no information on financial instruments eligible for non-taxation/low-taxation in each household.

they are imposed on the use of local public resources and the implicit income from the housing units owned. The housing holding taxes did not significantly vary depending on the income decile—the effective tax rate actually decreased in the higher income deciles. The housing holding tax rate was 1.02% in the first decile, but dropped to 0.4%~0.5% in the fifth and higher income deciles. This discrepancy may be the result of low-income gaps among the income deciles being relative to gaps in housing assets. Specifically, in cases in which the lower-income and older households have sizable housing assets relative to their income levels, their effective housing holding tax rate may be higher than the other income groups.

The income tax rate on labor income (wage & salary income and business income) shows a progressive structure. The effective tax rate on labor income was 0.01% in the first decile, and increased to 10.79% in the tenth bracket. This progressive structure was caused by the higher share of labor income in higher income deciles, and the progressive tax structure on labor income.

The effective tax rate on asset income from real properties was relatively low, which was partially due to the fact that Korea does not strictly tax income from leasing real properties. As of 2018, the government did not impose a tax on real property lease income not exceeding KRW 20 million.[34] Thus the government does not have accurate information regarding lease income. The government also does not impose taxes on implicit income from housing units owned as a primary residence.

34 Taxes will be imposed from 2019 (14% separate taxation or global taxation).

Table 10_Effect of Income Tax at the Household Level

(Unit: KRW 10,000, %)

Items		1st decile[1]	2nd decile	3rd decile	4th decile	5th decile	6th decile
(Pre-tax) gross income		331	1,017	1,863	2,696	3,597	4,428
Income tax (wage & salary + business)		0	3	17	43	94	155
Assets	Taxes on income from financial assets[2]	3	9	10	9	11	11
	Taxes on housing holding[3]	4	12	15	16	19	20
	Taxes on income from real properties[4]	0	0	0	0	0	1
	Taxes on income from other assets[5]	0	0	0	0	0	0
	Total asset income tax	7	20	25	25	30	32
Post-tax income		324	995	1,821	2,628	3,472	4,240
Effective tax rate[6]	wage & salary + business	0.01	0.24	0.83	1.45	2.47	3.37
	Financial assets	1.72	0.89	0.57	0.36	0.33	0.27
	Housing Holding taxes	1.02	1.15	0.85	0.61	0.54	0.45
	Real property assets	0.00	0.00	0.00	0.00	0.01	0.03
	Asset income	2.74	2.05	1.42	0.98	0.88	0.75
	wage & salary + business + asset income	2.75	2.28	2.25	2.43	3.35	4.12

Items		7th decile	8th decile	9th decile	10th decile	Average
(Pre-tax) gross income		5,542	6,593	8,683	14,511	4,795
Income tax (wage & salary + business)		255	375	621	1,848	323
Assets	Taxes on income from financial assets	12	16	24	51	15
	Taxes on housing holding	23	27	44	73	25
	Taxes on income from real properties	2	2	9	80	9
	Taxes on income from other assets	0	0	0	0	0
	Total asset income tax	37	44	77	204	49
Post-tax income		5,250	6,174	7,985	12,459	4,423
Effective tax rate	wage & salary + business	4.49	5.52	6.90	10.79	3.51
	Financial assets	0.22	0.26	0.29	0.35	0.52
	Housing Holding taxes	0.41	0.40	0.52	0.53	0.65
	Real property assets	0.05	0.02	0.12	0.34	0.05
	Asset income	0.68	0.68	0.92	1.22	1.23
	wage & salary + business + asset income	5.17	6.20	7.82	12.01	4.74

Notes: 1) The income decile was divided based on household income/.
2) Taxes on income from financial assets: taxes on interest income (deposits/savings in financial institutions, funds, bonds, pension savings, insurances, long-term savings for housing purchase, and interest on other financial assets) and dividend income
3) Housing holding tax: Housing holding tax on housing units owned for living and housing units owned for other purposes.
4) Taxes on income from real properties taxes on rent obtained from housing units owned for other purposes and real properties other than housing (lands and buildings).
5) 0% tax on membership (golf courses, resorts), agricultural machines, livestock, jewelry, and other assets.
6) All effective tax rates are the rates applied to pre-tax gross income.

Source: Present study, based on NaSTaB (KIPF, 2018)

We analyzed the effective tax rates on different income sources to assess tax equity among the sources. The effective housing holding taxes was 4.85%, which was higher than the 4.79% on wage & salary income and business income. The housing holding taxes showed a progressive structure across different levels of income. The effective housing holding tax rate was 4.45% in the first decile, which was far higher than the effective tax rate on other asset incomes in the same decile. Therefore, the housing holding taxes represent a significant burden for low-income households. Unlike the housing holding taxes, the effective tax rates on financial income and income from real properties are very low. Low-income households pay little to no income tax on real property assets, and this rate does not significantly increase in high-income deciles. The effective tax rate on income from real property assets (1) was only 0.81% in the tenth decile. As such, income taxes on real properties need to be adjusted for the purpose of income redistribution. To this end, the expansion of tax bases holds greater importance than tax rate increases. Indeed, starting in 2019, the government has imposed taxes on real property lease income not exceeding KRW 20 million. For the time being, however, the government needs to make efforts to collect this information. Raising the housing holding taxes does not seem to have a significant effect on improving the income distribution.

Table 11_Effective Tax Rates per Household Level by Income Type

(Unit: KRW 10,000, %)

Items		1st decile[1)]	2nd decile	3rd decile	4th decile	5th decile	6th decile
Effective tax rate[2)]	Wage & salary + business income	0.03	0.49	1.21	1.84	3.07	4.02
	Financial asset income	15.43	15.42	15.49	15.38	15.41	15.28
	Housing holding taxes	4.45	4.58	4.69	4.73	4.78	4.78
	Real property asset income 1	0.00	0.00	0.00	0.00	0.02	0.04
	Real property asset income 2	0.00	0.00	0.00	0.00	0.01	0.73
	All asset income	5.63	5.19	5.02	5.35	5.40	5.25

Items		7th decile	8th decile	9th decile	10th decile	Average
Effective tax rate	Wage & salary + business income	5.28	6.34	8.08	12.65	4.79
	Financial asset income	15.03	15.29	14.44	14.83	15.18
	Housing holding taxes	4.82	4.91	5.09	5.36	4.85
	Real property asset income 1	0.07	0.07	0.22	0.81	0.12
	Real property asset income 2	0.38	0.25	1.07	19.00	1.96
	All asset income	5.50	6.12	5.78	6.74	5.59

Notes: 1) The income decile was divided based on household income/.
2) Effective tax rates:
- Wage & salary + Business income = (Wage & salary + Business) Income tax /(Housing holding taxes + Business) Income
Financial asset income = Financial asset income tax/Imputed financial asset income
Housing holding taxes = Housing holding taxes/ Imputed housing asset income
Real property asset income 1 = Income tax on real property assets/ Imputed real property income
Real property assets income 2 = Income tax on real property assets/(Imputed real property income – Imputed housing income)
- Total asset income = Asset income tax/ Imputed asset income

Source: Present study, based on NaSTaB (KIPF, 2018)

We analyzed the Gini coefficients to examine the overall income redistribution effect. The Gini coefficient for the pre-tax total income was 0.4591, which was lower than the 0.4695 Gini coefficient based on the head of household's income. This difference stems from the fact that income gaps among the households decreased due to income from other household members. The Gini coefficient for post-tax income (after paying the labor income tax) was 0.4402, which represents a slight improvement by 4.1%. In contrast, the taxation of income from financial assets raised the Gini coefficient to 0.4405, slightly exacerbating the income distribution. This finding is attributable to the high percentage of financial income in lower income deciles. The regressive effect of income tax on financial assets may have been exaggerated by the fact that we did not consider households' financial instruments eligible for non-taxation or low-taxation. The actual figure is expected to be lower than the estimates.[35]

The taxation of income from real property assets had a progressive redistribution effect. The Gini coefficient after imposition of income tax on real property assets was 0.4399, indicating an improvement from the pre-tax coefficient. However, the rate of improvement is minimal at 0.1%, because the distribution of real properties starkly differs from income distribution. The redistribution effect of income tax on real properties was the most conspicuous in the tenth decile. When taking account of income tax on real properties, the Gini coefficient for the tenth decile decreased from 0.223 to 0.220. However, little to no improvement was observed in the other deciles. Therefore, imposition of income tax on real properties can effectively increase tax on households in the top income decile.

Table 12_Gini Coefficients of Households

Items	1st bracket	2nd bracket	3rd bracket	4th bracket	5th bracket	6th bracket	7th bracket	8th bracket	9th bracket	10th bracket	All
Pre-tax gross income	0.339	0.189	0.159	0.150	0.141	0.149	0.131	0.147	0.121	0.248	0.4591
Pre-tax gross income – Labor income tax	0.339	0.189	0.157	0.147	0.138	0.147	0.129	0.144	0.116	0.223	0.4402
Pre-tax gross income – Labor income tax – Financial asset income tax	0.340	0.190	0.158	0.148	0.139	0.148	0.129	0.144	0.117	0.223	0.4405
Pre-tax gross income – Labor income tax – Financial asset income tax – Housing holding taxes – Real property income tax	0.340	0.190	0.159	0.149	0.139	0.148	0.130	0.144	0.117	0.220	0.4399

Source: Present study, based on NaSTaB (KIPF, 2018)

35 We assumed that lower-income groups have better access to non-taxable savings.

The redistribution effect is not significantly affected by changes in rates of return on assets. When the rate of return on assets was adjusted from 2.651% to 3.50%, it did not reveal a significant impact on the redistribution effect of income tax. In fact, the change slightly improved the distribution of total income, because the percentage of asset income was higher among low-income earners than for high-income earners. In other words, even when the return on capital investment increased, the effect of income redistribution due to stricter asset income taxation would be limited.[36]

Table 13_Household Gini Coefficients (assuming high rate of return on assets)

Items	1st bracket	2nd bracket	3rd bracket	4th bracket	5th bracket	6th bracket	7th bracket	8th bracket	9th bracket	10th bracket	All
Pre-tax gross income	0.337	0.189	0.158	0.157	0.146	0.144	0.134	0.135	0.119	0.250	0.456
Pre-tax gross income – Labor income tax	0.337	0.189	0.157	0.155	0.144	0.142	0.132	0.132	0.115	0.227	0.438
Pre-tax gross income – Labor income tax – Financial asset income tax	0.338	0.190	0.158	0.156	0.145	0.143	0.133	0.133	0.115	0.227	0.438
Pre-tax gross income – Labor income tax – Financial asset income tax – Housing ownership tax – Real property income tax	0.338	0.190	0.159	0.156	0.146	0.143	0.133	0.133	0.116	0.223	0.437

Note: Effect of income redistribution for individual income taxes when the rate of return is assumed to be 3.50%.
Source: Present study, based on NaSTaB (KIPF, 2018)

VI. Conclusions and Policy Implications

In this study, we analyzed equity in taxation between labor income and asset income. First, we overviewed previous research and its implications. We also examined how these theories are reflected in international practices, as well as in Korea's taxation of labor income and asset income. We then analyzed how the effect of redistributing labor/asset income taxation varies at the household level. We analyzed the taxation of labor/asset income from two perspectives: theories and investment alternatives. We also attempted a comprehensive analysis at the household level and identified the findings' implications for income tax policies.

36 Further analysis is required to determine whether the same conclusion holds when return rates vary depending on the asset type. However, as gaps in return rates on assets relies on gaps in risk levels, it is expected that the rates will approach an equilibrium in the long term, resulting in a similar conclusion.

Optimal taxation theories proposed the following considerations for tax policies. First, policymakers need to consider restrictions that exist in an open economy. Other than the efficiency and equity of taxes pertaining to capital income, macro-economic stability should be considered by tax policy makers. As Korea has not joined any international economic bloc, tax policies on asset income should consider macro-economic vulnerabilities, including the flow of capital to and from overseas. In this regard, Korea can learn from the experiences of Nordic countries, especially with regards to their dual income taxation policies. Dual income taxation policies impose taxes on capital income. However, to achieve macro-economic stability, they apply rates that are around the low end of progressive labor income tax rates.

It is also crucial to narrow the gap among the income tax rates of different assets, and bring them as close as possible to a single rate. By having asset income tax rates around the current withholding tax rate (14%) for financial income, we can expect to mitigate the distortion on the asset choice. At the same time, to prevent asset income from creating excessive income gaps, the progressive tax rate structure needs to be maintained within a limited scope. Examples in Korea include the global income taxation for financial income when it exceeds KRW 20 million and the Comprehensive Real Estate Holding Tax. The scope of these taxes needs to be adjusted to make them compatible with existing theories.

We then analyzed relevant experiences in Korea and other countries, to understand how the implications of theories on tax equity are reflected in actual policies. For overseas experiences, we looked into how the highest tax rates are applied to different income types related to the international capital flow, because high income earners have the ability and motive to move capital across national borders. In terms of the highest tax rates applied to labor income and asset income, Korea is placed in the middle compared to the other countries. Taxes on asset income are similar to, or higher than, taxes on labor income. Korea reported a 51.0% tax rate on dividend income. Only the United States, Canada, the Netherlands, Ireland, and Switzerland reported higher tax rates. The lowest tax rates on asset income were also relatively high in Korea. The lowest among the highest tax rates on investment options for high taxpayers was 40.9% (share capital gains income), which was only surpassed by the 47.3% rate in the United States (deposit interest income). Many countries do not impose taxes on the capital gains of immovable properties, with the lowest tax rate on asset income being 0% in many cases. In fact, among different countries, the tax rates on investment options are fairly low compared to the rates for labor income. Only Israel, Mexico, and the United States reported taxes on asset income that are similar to, or higher than, labor income taxes. In contrast, Sweden, Greece, Austria, and Belgium impose fairly low taxes on asset income

compared to the taxes on labor income, for the sake of efficiency given the mobility of capital.

Our analysis showed that the effective tax rates on asset income are higher than the rates on labor income. Among the asset types, dividend income was taxed at the highest effective rate. The high effective rate can be attributed to the fact that the taxation on dividend income do not fully reflect the corporate taxes paid at the corporate level, despite the low tax rate at the shareholder level (for dividend income of KRW 20 million or lower) or the application of the same marginal tax rate as labor income (for dividend income above KRW 20 million). In other words, the sum of taxes at the shareholder level and those at the corporate level are higher than the taxes on the income of other assets. If a corporation does not fully distribute its profit in dividends and shareholders get capital gains, a lower tax rate applies, resulting in an overall effective tax rate that is lower than the rate applied to dividend income. The effective tax rate was even lower for minor shareholders, because they do not pay any tax for their capital gains income. Conversely, major shareholders pay taxes on their capital gains income, and their effective tax rate declines by a lesser degree even if their share of capital gains income increases. In the case of a major shareholder with a low income,[37] the tax rate for capital gains income (20%) is lower than the rate on dividend income (14%), which may actually raise the total effective tax rate when the percentage of dividend decreases. The tax rate of interest income is also higher than labor income.

As for long-term investment options, Pension income is taxed at the lower marginal than the labor income, if the tax base does not exceed KRW 46 million (15%), though it is higher than the labor income if it exceeds this threshold. The high marginal tax rates applied to high-income earners do not seem to be an issue, because the income level declines after retirement. The housing unit (real properties) is another long-term investment asset for which tax benefits are provided. However, the amount of tax benefits varies depending on the purpose of the policies. The government grants tax support for pension savings to help taxpayers secure their retirement income. Pension contribution is not taxed at the time of saving, but pension benefits are subject to income taxation at their withdrawal. As a result, the tax rate on pension savings varies depending on the taxpayer's income level at the time of receiving the pension. Tax support (a negative marginal tax rate) is provided to income earners whose marginal income tax rate is 15% or lower (tax base KRW 12 million or lower). The marginal tax rate steeply increases for higher-income earners, until reaching a level similar to the marginal tax rate on labor income. These findings indicate that the tax regime is well

37 Assuming the major shareholder does not earn income from any other sources.

designed to help low-income earners secure retirement income, given the fact that low-income earners are less motivated or able to engage in long-term savings. The regime contributes to enhancing public welfare in general, by encouraging taxpayers to move their income over their lifetime.

For housing units, extensive tax support has been provided across all income levels. Specifically, a household with a single housing unit enjoys benefits including subsidies or low marginal tax rates, although the level of support varies depending on the housing price. In addition, by repeatedly selling and buying a housing unit at relatively short intervals, a household can continuously benefit from the tax benefits provided to households with a single housing unit. The low (or even negative) effective tax rates across all income levels may be a key factor that increases the share of real properties in household assets. However, in the case of purchasing a second house, the marginal tax rate goes up to around 38%, which is higher than the rates on either other assets or labor income.

Lastly, we analyzed the effect of taxation of labor and asset income using NaSTaB data. The overall income tax rate at the household level was fairly low at 4.74% (including a 0.65% housing holding taxes). The labor income tax comprised the largest portion of the income tax, at 3.51% since labor income accounts for the highest percentage of household income (81.3%). The tax on asset income is quite limited. The financial income (interest and dividend income) accounts for a mere 1.7% of the total income, resulting in a low tax rate (financial income tax/total income) at 0.52%. The tax rate on real properties is even lower at 0.03%. On the other hand, housing holding taxes are a significant burden as they account for around 0.65% of the total income. As for the effective tax rates across income sources, financial income recorded the highest rate, followed by labor income. The effective tax rates on real properties are very low, on account of difficulties with identifying specific incomes and the non-taxation of implicit income from housing units owned as a primary residence.

We analyzed the effect of the redistribution of income taxes using Gini coefficients. The progressive taxation of labor income recorded the highest redistribution effect. The taxation of financial income is close to neutral or slightly regressive in terms of income distribution, and the taxation of income from real properties showed a progressive structure. In particular, for a household that used its savings from years of employment to purchase a real property (housing unit), it will experience high housing holding tax burden after retirement. So, the taxes, including holding taxes, are not deemed highly progressive. The neutrality or slight regressivity of taxation of financial income is the result of the higher percentage of financial income among low-income households.

These results suggest following policy implications. First, in accordance with the theories, and the purpose of macroeconomic stability, the tax on asset income should be lower than the tax on labor income. Therefore, the high rates applied to dividend income needs to be adjusted by, for example, reducing double taxation.

Secondly, the current structure of tax support pertaining to long-term investment on housing may seriously undermine equity in taxation relative other asset types. We need to streamline tax benefits given to housing.

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A Study on Improving Tax Fairness in Energy Use in South Korea

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I. Introduction

A country's environmental and energy tax regime take up a significant percentage of its tax revenue, and plays a pivotal role in determining the country's energy consumption structure. In addition, compared to other tax items, environmental and energy taxes play a highly distinctive corrective role; the government can use these taxes to reflect external costs of energy consumption (e.g., pollution and traffic congestion) into fuel prices, thereby achieving balanced consumption at a socially desirable level.

However, the Korean tax regime fails to effectively correct market failures because its environmental and energy taxes do not sufficiently reflect the external effects of energy consumption. In addition, under the Korean environmental and energy tax regime, taxes are imposed on only some energy sources. Such gaps in taxation undermine horizontal equity among tax revenue sources. Environmental and energy taxes in Korea are mostly imposed on petroleum. In contrast, taxes on energy sources for power generation fail to reflect external costs. For example, little to no taxes are imposed on nuclear power used for power generation, and taxes on flaming coal were only introduced in recent years. Given the fact that electricity

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is used in multiple sectors, including both heating (electric heaters) and transportation (electric vehicles), the excessive use of electricity may occur when the prices of other energy sources (e.g., kerosene oil and gasoline) are higher than that of electricity. Therefore, the balance of tax rates among different sectors is key to achieving an efficient energy consumption plan. The tax rate structure needs to account for the relative tax rates among different energy sources. Another factor worth considering is that, given the need to take decisive actions against issues pertaining to fine particulate matter in Korea and address carbon reduction obligations under the Convention on Climate Change, environmental taxes will be inevitably raised during the proposal of corrective purposes.

Therefore, in this study, we seek to examine different sectors within the environmental and energy tax regime to determine how tax rates reflect external costs, and then to explore how we can reform the tax regime in a way that ensures the normal operation of corrective functions and prevent the distortion of relative prices. Specifically, we focus on two sectors: power generation and heating. First, we need to understand what the environmental and energy tax rates in different sectors entail and their policy goals. In other words, we examine how much external costs are reflected in environmental energy taxes in different areas: transportation, heating, industrial processes, and power generation. We also analyze the relative percentages of tax burdens. Previous research covered the effective and relative tax rates in specific sectors such as transportation and power generation. However, discussions on balanced tax burdens among these different sectors are scarce. In addition, assessment of tax rates should also cover price reversal and social costs. Specifically, we assess tax burdens in different sectors by analyzing the current status of the tax regime and then comparing Korean taxes with similar taxes in other countries. We review tax rates and prices of energy sources in different sectors, and determine whether those rates and prices are appropriate in terms of energy consumption and social costs. Our comparison of the Korean tax regime with that in other countries focuses on understanding the level of equity in tax burdens among different sectors.

We look into energy balances and tax rates/prices of energy sources in OECD member states based on available data, to assess the level of tax balance among different sectors within the Korean environmental and energy tax regime. We then quantify the relative tax burdens among different sectors, and develop tax reform scenarios in which the percentages of external costs reflected in taxes on power generation and heating are raised to increase the tax burden. Other than power generation and heating, the transportation sector also shows signs of insufficient reflection of external costs. However, we develop reform scenarios focusing

on fuels used for power generation and heating—flaming coal and LNG—to find ways to prevent a rapid tax burden increase for households while achieving tax burden balance among the sectors. To identify social costs, we used the findings from a research project on transportation and power generation fuel co-implemented by various ministries and research centers in 2017 and 2018.

In the next chapter, we focus on the need to increase the external costs reflected in taxes on energy sources used for power generation and heating, in keeping with the high percentage of external costs reflected in transportation energy sources, and analyze the tax reform scenarios in order to determine possible tax rate targets in each sector. In addition, to understand how improvements in tax rate balance among different sectors will change the relative price structure and affect households, we use a microsimulation method to assess the tax burden on households, fees paid by households, and their ratio against income (effective tax rates and effective burden ratios).

External costs need to be aptly reflected in environmental and energy tax rates in order to ensure their corrective function. However, given considerations including tax burdens on households and the competitiveness of the relevant industries, it would be desirable to at least maintain the current level of the corrective function. Therefore, in this study, we seek to analyze the effect of tax rate adjustments in the power generation and heating sectors on households. Previous research on environmental and energy tax rates mostly proposed increasing corrective functions in the respective sectors. However, through this study, we hope to propose approaches for tax reforms in different sectors to consider tax equity among different types of fuels.

The discussions in this report proceed as follows. Chapter II examines the current status of the environmental and energy tax regime in Korea. Chapter III compares the environmental and energy tax rates across countries. Chapter IV analyzes the effect on household tax burdens. Chapter V concludes the report by suggesting policy implications.

II. Current Status of Korean Environmental and Energy Tax Regime

1. Overview and Tax Reform Status

A. Current Status of Korean Energy Tax Regime

Korea imposes various taxes and charges on petroleum (gasoline, diesel, heavy oil,

kerosene, and byproduct fuel oil) and petroleum gas (propane and butane), natural gas, flaming coal, and other energy sources, including: transportation/energy/environmental taxes, excise taxes, education tax, local mileage tax, value-added tax (VAT), tariffs, surcharges on imports and sales, and safety management charges. (See Table 1).

Table 1_Environmental and Energy Taxes (as of October 2019)

(Unit: KRW, %)

Energy source	Unit	Tariff (%)		Excise tax		Transportation / energy / environmental tax		Education tax[7]	Mileage tax[8]	VAT (%)
		Basic	Quota	Basic	Elastic	Basic	Elastic			
Gasoline	liter	3	-	475	-	475	529	79.35	137.54	10
Diesel	liter	3	-	340	-	340	375	56.25	97.5	10
Butane	kg	3	2[1]	252	275	-	-	41.25	-	10
Propane	kg	3	2[1]	20	143[3]	-	-	-	-	10
LNG	kg	3	2[1]	12/60[2]	8.4/42[4]	-	-	-	-	10
Flaming coal	kg	Zero rate	-	46[5]	49/43[6]	-	-	-	-	10
Kerosene	liter	3	-	90	63	-	-	9.45	-	10
Anthracite	kg	Zero rate	-	-	-	-	-	-	-	Exempted
Heavy oil	liter	3	-	17	-	-	-	2.55	-	10
Byproduct fuel	liter	3	-	90	63	-	-	9.45	-	10
Electricity	kWh	-	-	-	-	-	-	-	-	10

Notes: 1) Quota tariff applied to liquified petroleum gas (LPG) and LNG prior to December 31, 2019 (for LNG, limited to winter times).
2) KRW 60/kg applied to LNG not used for power generation
3) Elastic excise tax rates for propane only applied to commercial use and use at home
4) Reduced elastic rate of KRW 8.4/kg applied to LNG used for cogeneration (collective energy projects), fuel cells (new and renewable energy development projects), self-generation (self-generation equipment); KRW 42/kg applied to other LNG used for power generation
5) Excise tax exemption granted to flaming coal used only for purposes other than power generation business, pursuant to Article 18 of the Individual Consumption Tax Act and Article 32 of the Enforcement Decree of the same Act
6) KRW 49/kg applied to products with net calorific value of 5,500 kcal/kg or higher, and KRW 43/kg applied to products with net calorific value below 5,500 kcal/kg
7) Education tax: 15% of elastic taxes (gasoline and diesel: elastic transportation tax; butane, kerosene, and byproduct fuel oil: elastic excise tax)
8) Mileage tax: 26% of elastic transportation/energy/environmental taxes

Source: National Law Information Center (http://www.law.go.kr/, accessed on October 25, 2019); Lee and Kim (2016), p. 27, Table 1, updated based on the latest tax rates

2. Tax Regime Status by Sector

A. Transportation Energy

In the transportation sector, two energy tax reforms in the 2000s reduced the price gap

between gasoline, diesel, butane, and other automobile fuels, and mitigated substitution among different types of oil. The first reform was motivated by the transportation tax and education tax raise immediately prior to 2000, distortion of the price structure of transportation fuel, and the resulting transition from LNG to LPG.

To address the shortage of LPG and filling stations, and prevent a further decline in tax revenues, the government implemented a reform that focused on raising the relative prices of diesel and LPG. The government also raised the tax rate for kerosene, as the fuel can be used as a substitute for diesel. To adjust the relative price ratios of gasoline, diesel, LPG, kerosene, and heavy oil from 100:47:26:40:22 to 100:75:60:55:23, the government fixed the tax rate on gasoline from July 2001 to July 2006, and gradually raised the rates on the other fuels over the six-year period.

The ban on the sale of diesel passenger cars was lifted in 2005, and the demand for these vehicles rapidly increased due to their high fuel efficiency. However, out of the concern about fine particulates and air pollution, the government readjusted the relative price ratios among transportation fuels. The second energy tax reform involved adjusting the relative price ratios of gasoline, diesel, and LPG to 100:85:50 by July 2007. Since May 2009 to the present, the transportation/energy/environmental tax rates on gasoline (KRW 529/liter) and diesel (KRW 375/liter) have remained constant. The excise tax rate on LPG (KRW 275/liter) has not changed since January 2009. Apart from a temporary tax rate reduction for gasoline and diesel during periods of high oil prices in 2008, the tax rates have remained near the OECD average since 2009.

The two energy tax reforms imposed taxes on transportation fuels that reflect the external costs from environmental pollution. The taxes and charges currently imposed on transportation fuels (gasoline, diesel, and LPG) internalize 34.2%, 20.1%, and 14.9% of the external costs, as estimated by the Korea Institute of Public Finance (KIPF) and others in a 2017 research project (See Table 2).

However, the two energy tax reforms were aimed at preventing revenue loss caused by the increased reliance on substitutional transportation fuels, rather than reflecting social costs from energy use. Granted, it should be noted that the second reform changed tax rates by taking into account the air pollution caused by diesel. However, the tax rates were adjusted without changing the tax rates on gasoline, thereby failing to sufficiently internalize the social costs. It should also be noted that, to protect the transportation industry, the government provided oil price subsidies to make up for the increased taxes on diesel. The subsidies negated the price effect on the demand for the fuel, and resulted in excessive expenditures.

Table 2_Taxes and Charges on Transportation Energy Sources

(Unit: KRW/liter, %)

	Gasoline	Diesel	LPG
Transportation/energy/environmental tax or excise tax	529	375	160.82
Education tax	79.35	56.25	24.12
Mileage tax	137.54	97.50	-
Sales surcharge	-	-	36.42
Taxes and charges total	745.89	528.75	221.36
Social costs	2,178.6	2,636.0	1,489.6
Percentages of internalized external costs	34.2	20.1	14.9

Notes: 1. In this report, we cover the transportation/energy/environmental taxes, excise taxes, education taxes, mileage taxes, and sales surcharges on transportation fuels, and exclude tariffs, VATs, and import surcharges, because the former taxes serve as criteria for the calculation of oil price subsidies

2. Taxes on LPG are imposed per kilogram (KRW/kg). However, to match the units used for other fuels, the amounts have been converted using the liter-kilogram conversion coefficient (0.5848)

Source: Present study, based on Korea Institute of Public Finance et al. (2017), Table VI-1 and Korea Institute of Public Finance et al. (2018), Table I-1

B. Power Generation Energy Sources

Energy sources used for power generation are subject to a wide range of taxes and charges. However, compared to transportation fuels, a consensus on the definition of external costs and details of the cost items is relatively lacking. Specifically, apart from national taxes such as excise taxes, tariffs, and VATs, power generation energy sources are subject to local and similar taxes, such as taxes on local resource facilities, import/sales surcharges on oil and oil substitutes, quality inspection fees and safety management charges, and power infrastructure funds. However, the specific items vary greatly depending on the fuel, and as such the purpose of the imposition and basis for the tax rate calculation can be unclear. In addition to equity among different sectors, discrepancy in taxes imposed on different fuels within the power generation sector has been an ongoing issue. For example, fuels for thermal power generation are subject to all taxes and charges, whereas nuclear power is exempt from tariffs and all national taxes.

LNG used for power generation is subject to various taxes and charges. In contrast, taxation on flaming coal began only recently, which resulted in simpler taxes and levies imposed on the fuel. Currently, LNG is subject to national taxes including excise tax, tariffs, and VATs, and local taxes on local resource facilities. As of 2018, the excise tax rate on LNG for power generation is KRW 60/kg, which is KRW 18 higher than LNG used for other purposes (KRW 42/kg). In addition, the government imposes import surcharges on LNG to

stabilize petroleum supply and price. The collected surcharges are distributed to special accounts for energy and resource projects. On the other hand, flaming coal was only subject to VATs until the adoption of the excise tax on the fuel in 2014; flaming coal is not subject to any tariff or charge. However, flaming coal is subject to the tax on local resource facilities, which is imposed based on power produced through thermal generation.

Table 3_Taxes and Charges on LNG and Flaming Coal (as of May 2018)

(unit: KRW/kg, %)

Item		LNG	Flaming coal
National tax	Excise tax	KRW 60/kg (KRW 42/kg)[1]	KRW 36/kg (KRW 39/kg, KRW 33/kg)[2]
	Tariff	3%(2%)[3]	No tax
	VAT	10	10
Local tax	Local resource facility tax	KRW 0.3 per kWh produced by thermal generation	
Charges	Safety management charge	KRW 4.8/kg(not applied to fuel used for power generation)	-
	Import surcharge	KRW 24.2/kg	-

Notes: 1. Fuels not used for power generation are subject to elastic rates
2. Elastic rates based on net calorific value: 5,500 kcal/kg or higher: KRW 39/kg; Below 5,000 kcal/kg: KRW 33/kg
3. Natural gases are subject to quota tariffs based on the volume imported during the January~March, 2018 period and the October ~December, 2018 period

Source: Excerpted from Korea Institute of Public Finance et al. (2018), Table 1

To summarize, the total amount of taxes and levies on energy sources used for power generation in 2018 was KRW 36/kg for flaming coal, and KRW 91.4/kg for LNG. The total taxes and levies per kWh produced was KRW 13.7 for flaming coal and KRW 12.8 for LNG. At the base tax rate, flaming coal was subject to excise tax at KRW 36/kg, along with a ±KRW 3/kg elastic rate depending on the net calorific value. LNG was subject to excise tax at KRW 60/kg, import surcharge at KRW 24.2/kg, and tariff at 2 to 3%. Tariffs are determined based on fuel prices, and the tax rates vary from season to season. Therefore, in this study, we set the tariff rate at KRW 7.2/kg, based on Korea Gas Corporation (KOGAS) data regarding power generation fees in December 2017. Overall, 10% VATs are imposed on all power generation sources except for anthracite, though VATs are refunded for fuels used in power generation. For this reason, we did not include VATs in the taxes and levies imposed on power generation fuels.

Compared with transportation fuels, the taxes and levies on flaming coal and LNG used for power generation do not adequately reflect the external costs incurred by pollution. The taxes and levies on flaming coal reflect only a fifth of the estimated external costs (See Table 4). The fact that the taxes and levies are smaller than the social costs means that the amount of fuel consumption will exceed the level appropriate for society.

In addition, the external costs internalized in the taxes and levies on power generation fuels do not correctly reflect the impact of different fuels. For instance, LNG is subject to higher tax rates, despite the fact that it produces significantly less air pollutants. This discrepancy seems to come from the fact that tax rates are mainly determined based on calorie value, not external costs. As of 2018, the calorie value of LNG was more than two times the calorie value of flaming coal for power generation (flaming coal: 5,920 kcal/kg; LNG: 13,060 kcal/kg). The tax rate on LNG (KRW/kg) was also 1.67 times higher. As such, even though external costs of flaming coal are far higher than those of LNG, the amount of taxes and levies are similar between the two fuels.

The discrepancy between the relative size of external costs and the relative size of taxes and levies is also found in the two-rate taxation on flaming coal. High-calorie coal is subject to a higher tax rate (KRW 39/kg) than low-calorie coal (KRW 33/kg). When the relative size of taxes and levies does not correctly reflect the relative sizes of external costs, it results in increased use of fuels that should be used less in general society, and a decreased use of fuels that people should be encouraged to use more.

Table 4_Taxes and Levies on Power Generation Fuels and External Cost Estimates (as of 2018)

(unit: KRW/kg, KRW/kWh, %)

	Flaming coal	LNG
Based on fuel weight (unit: KRW/kg)		
Total taxes and levies	**36.0**	**91.4**
External cost estimates	176.3	165.4
Percentage	20.4	55.3
Based on power production (unit: KRW/kWh)		
Total taxes and levies	13.7	12.8
External cost estimates	68.8	21.0
Percentage	19.9	61.0

Source: Adapted from Korea Institute of Public Finance et al. (2018), Table 8

After the two energy tax reforms mentioned above, one of the most noteworthy changes in the reform of the Korean environmental and energy tax regime was the imposition of more

taxes on flaming coal used for the power generation sector. To reflect external costs in fuel prices, the government lowered the excise tax and import surcharge on LNG and raised the basic excise tax rate on flaming coal based such that it was now based on the estimated external costs (Korea Institute of Public Finance et al., 2018). Specifically, in 2018 and 2019, flaming coal was subject to tax rates more than twice as high as the rate imposed in July 2014, when the taxation on the fuel began (rate on medium calorie coal: KRW 19/kg in July 2014 → KRW 36/kg in April 2018 → KRW 46/kg in April 2019). In particular, the 2018 revision to tax laws (enforced as of April 1, 2019) greatly lowered the excise tax and import surcharge on LNG, and raised the basic excise tax rate on flaming coal from KRW 36/kg to KRW 46/kg, reversing the ratio between taxes and levies on flaming coal and LNG to around 2:1. In terms of power production, the total taxes and levies on LNG and flaming coal used for power generation are KRW 2.24/kWh and KRW 17.43/kWh, respectively.

III. International Comparison of Environmental and Energy Tax Rates Between Sectors

In this chapter, we assess the levels of tax burdens across different sectors by analyzing the current status and comparing the rates in different countries. Specifically, we review the tax rates and prices of energy sources in different sectors, and determine whether those rates and prices are appropriate in terms of energy consumption and social costs. We use data regarding the energy balance and effective tax rates by sector and fuel in OECD member states to understand the relative levels of tax burden across different sectors in Korea and other countries, and determine the percentage of each sector in terms of the total environmental and energy tax burden.

1. International Comparison of Tax Burden by Sector

A. Appropriate Relative Tax Rate by Sector

The OECD defines environmental tax as the tax imposed on the byproducts of consumption that adversely impact the environment. For example, a carbon tax is imposed on the emission of carbon dioxide. In the past, when products using gasoline were expensive, gasoline users were deemed to be able to bear taxes. Therefore, taxes on the energy source

were not so much environmental taxes as they were luxury taxes (e.g., a fuel tax). However, with the widespread use of automobiles and the increased interest in air quality and climate change in the 2000s, fuel taxes as environmental taxes came to outshine fuel taxes as luxury taxes. At present, the internalization of external costs is a key consideration for the taxation on energy.

The OECD (2018), while discussing the appropriate benchmark for an environmental tax, states that the environmental tax should internalize the marginal external costs of energy use, that is, direct environmental costs and other damage caused by energy use. In particular, as the size of the environmental tax is to be determined in proportion to external costs, the environmental tax is regarded as less likely to cause tax distortion than the income tax. Therefore, the environmental tax is encouraged as a useful means of increasing tax revenue while not undermining economic efficiency (OECD 2018). However, it is difficult to estimate and identify the exact size of marginal external costs. In addition, there exists no assurance that estimates accurately reflect the scale of the external diseconomy; the optimal environmental tax cannot be determined based on external costs alone. According to the OECD, the environmental tax should be determined taking account of the purpose of the tax, that is, the competitiveness of the industry mainly using the relevant energy source, and the horizontal equity in the use of the fuel. For this reason, effective tax rates of specific sectors and fuels vary among OECD members (OECD 2018).

Based on this information, a comparison of effective tax rates across different countries requires comparable tax bases that consider differences in taxation systems (unit taxes and ad valorem taxes) and the main fuels used in each sector. The OECD determines effective tax rates by converting the energy use of different energy sources in different sectors into Joules or carbon emissions (tCO_2). The use of carbon emissions is primarily aimed at calculating effective tax rates against marginal external costs.

The OECD sets the external costs from CO_2 emissions as the lower bound for marginal external costs. Therefore, based on previous estimates on the cost of climate change, the OECD has set the lower bound for external costs as EUR 30/tCO_2, which is an appropriate carbon charge on energy use.

Specifically, the OECD uses carbon emissions as the tax base, and defines the effective carbon rate as the effective tax rate corresponding to the tax base. The OECD calculates the total of three items—excise taxes on fossil fuels, carbon taxes, and certified emission reduction (CER) prices—for sectors including transportation, power generation, heating, and industrial processes.[1] Then, the OECD estimates the carbon pricing gap in order to examine

whether an environmental tax regime is environment-friendly, and then appropriately imposes the costs of carbon emission caused by the energy used. Based on EUR 30/tCO_2, which is the most conservative estimate for the scale of the external diseconomy caused by carbon emissions, each country and sector is assessed for its distance from EUR 30. As a result, the carbon pricing gap represents the extent to which a polluter does not pay for the damage caused by its carbon emission. A polluter having a low pricing gap is understood as having paid for a larger portion of the carbon emission costs through taxes and CERs.

Granted, it would not be appropriate to simply view the average of major OECD countries as being optimal. However, the OECD average can at least help us understand what the tax rates in different sectors internalize, and whether the corrective functions are working normally. In addition, a balanced taxation among sectors does not have to mean equal tax burdens across all sectors in are in proportion to external costs. However, excessive taxation on a certain sector is likely to produce adverse side effects. Therefore, in this chapter, we strive to identify the extent of imbalances among different sectors.

Specifically, we use data that provides the effective tax rates of different sectors and fuels in major OECD countries in 2009 (OECD, 2012) to compare the effective tax rates against energy use. We understand that 2009 data may seem outdated. However, given the fact that there has not been significant changes in tax rates between 2009 and the imposition of environment-friendly taxes on power generation fuels, this data should be sufficient to understand the extent of imbalance among relevant sectors in Korea.

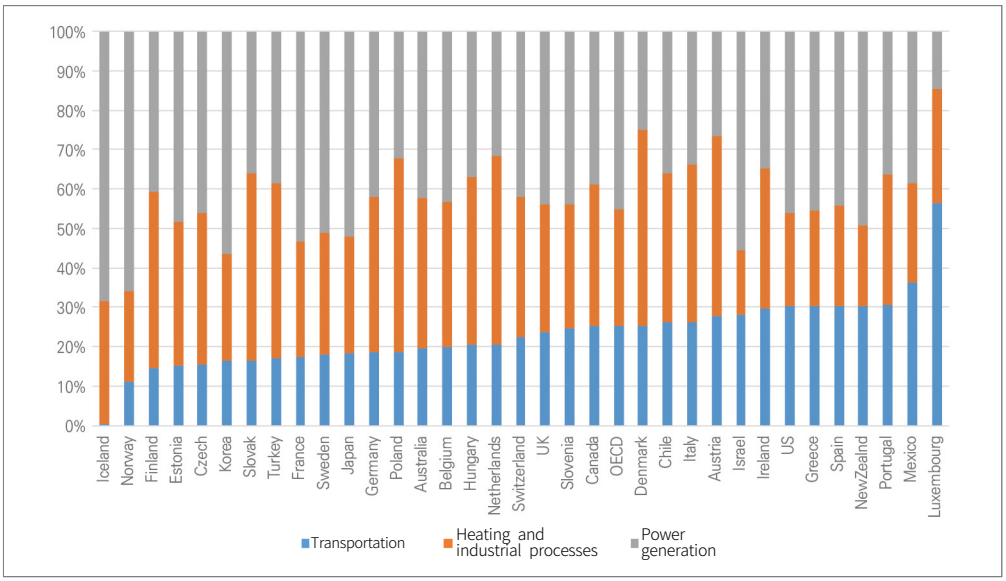
B. Equity Analysis Based on Energy Use by Sector

As shown in Figure 1, the transportation sector comprised between 17% and 28% of the total energy use, while the heating and industrial processes sectors comprised 29% to 40%, and the power generation sector comprised 36% to 48%. However, sector-specific energy use greatly varies among OECD countries on the account of differences in energy supply and industrial structures.

1 Sectors are categorized based on their classification in OECD Taxing Energy Use 2012.

Figure 1_Energy Use by Sector in Major OECD Countries

(unit: %)



Source: Present study, based on OECD (2013) and IEA (2012)

Table 5 compares the percentage of energy use by sector and fuel with regards to the weighted averages of major OECD countries. In Korea, the percentages for transportation, heating and industrial processes, and power generation sectors for total energy use are 16.3%, 27.2%, and 56.5%, respectively. The sector-specific percentages in energy use show similar patterns as for other OECD countries, with the highest percentage taken up by power generation, followed by heating and industrial processes, and then transportation. However, the percentage for power generation for other OECD countries is smaller than for Korea, whereas the percentages for transportation, heating, and industrial processes are similar.

By energy source, most (96%) of the energy consumption in the Korean transportation sector comes from petroleum. The OECD average also shows that most transportation activities use petroleum as the energy source. In the heating and industrial processes sector, 21.3% and 33.5% of the energy used in the sector in Korea came from coal and petroleum; the percentages are lower for the same sector in other OECD countries. This gap mostly comes from differences in the use of LNG (39.7% versus 53.0%). In the power generation sector, compared with the OECD average, the majority of primary energy input in Korea comes from coal and nuclear power. The relative percentage of coal is slightly higher in Korea.

Table 5_Percentages in Energy Use by Sector and Energy Source

(Unit: %)

Energy sources and sectors	Transportation		Heating and industrial processes		Power generation	
	Korea	OECD	Korea	OECD	Korea	OECD
Coal	0.0	0.0	5.8	3.2	26.6	17.4
Petroleum	15.7	24.5	9.1	7.2	2.2	1.4
LNG	0.5	0.5	10.8	15.7	5.8	8.5
New and renewable energy and nuclear power	0.0	0.0	0.0	0.2	21.8	16.1
Others	0.1	0.8	1.5	3.3	0.1	1.3
Total	16.3	25.8	27.2	29.6	56.5	44.6

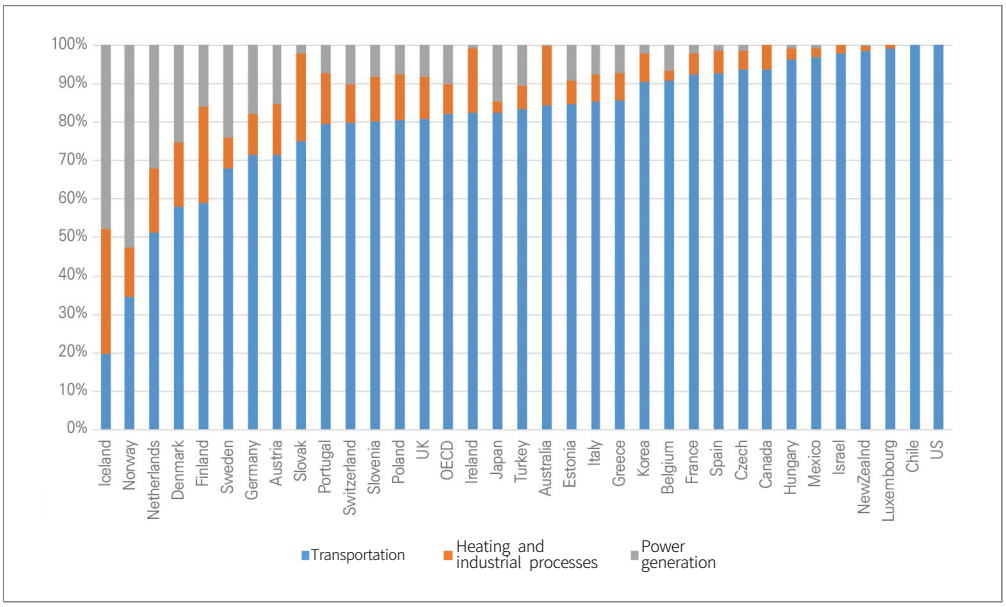
Note: Used 2009 data to calculate percentages in total taxation; Korea not included in IEA (2011) and OECD (2013)
Source: Present study, based on 2009 IEA data

Given the percentages of energy use by sector and energy, power generation using coal (26.6%), power generation using new and renewable energy and nuclear power (21.8%), and transportation using petroleum (15.7%) comprise the largest percentages of energy use in Korea. Across the OECD countries, transportation using petroleum comprises the largest percentage (24.5%), followed by power generation using coal (17.4%), and power generation using new and renewable energy and nuclear power (16.1%).

Figure 2 presents the effective tax rates across the sectors in major OECD countries, using the energy use shown in Figure 1 as the tax bases. One of the most marked differences from Figure 1 is that the percentage of the transportation sector in the total tax burden is much higher than in other sectors, which contrasts with the relatively even distribution of energy use. Of the 34 countries, Iceland and Norway are the only two countries in which the percentage of the transportation sector in the total tax burden is below 50%. Within the interquartile range, the transportation sector comprises around 75% to 94% of the total tax burden. In other words, the majority of tax revenue comes from the transportation sector. In addition, within the interquartile range, the heating and industrial processes sector and the power generation sector comprise between 3% and 13%, and between 1% and 15%, respectively. The tax burden on power generation is more widely distributed than for the heating and industrial processes sector. Most countries impose higher effective tax rates on the transportation sector, both in terms of energy use and carbon emissions. This practice results from the government's goal of expanding fiscal revenue, as well as the relatively high external diseconomy estimates for the transportation sector (OECD, 2018).

Figure 2_Energy Tax Burdens by Sector

(Unit: %)



Source: Present study, based on OECD (2013) and IEA (2012)

Table 6 compares the percentage of taxes imposed on each sector and fuel, and then compares them with the weighted averages of major OECD countries. First, the percentages comprised by the transportation sector, the heating and industrial processes sector, and the power generation sector in terms of the total tax burden are 90.5%, 7.3%, and 2.2%, respectively. The majority of energy taxes in Korea are imposed on energy sources used for transportation, despite the fact that the sector accounts for only 16.3% of the total energy use. In contrast, despite the high percentage of the power generation sector in energy use (56.5%), the sector comprises only 2.2% of the total tax burden. Before the introduction of taxes on flaming coal, the transportation sector bore most of the environmental and energy taxes.

Likewise, other OECD countries collect most of their environmental and energy taxes from the transportation sector (81.6%). However, the extent of the imbalance is higher in Korea, where the tax burden on the transportation sector exceeds those in other countries by around 9%p. The gap can mostly be attributed to the relatively low tax burden on the power generation sector (2.2% versus 10.6%).

Table 6_Percentages of Taxes by Energy Source and Sector

(Unit: %)

Energy sources and sectors	Transportation		Heating and industrial processes		Power generation	
	Korea	OECD	Korea	OECD	Korea	OECD
Coal	0.0	0.0	0.0	0.5	0.0	2.8
Petroleum	90.3	79.3	3.5	3.9	0.2	0.3
LNG	0.2	0.0	3.8	3.5	2.1	3.2
New and renewable energy and nuclear power	0.0	0.0	0.0	0.0	0.0	3.8
Others	0.0	2.3	0.0	0.0	0.0	0.5
Total	90.5	81.6	7.3	7.9	2.2	10.6

Note: Used 2009 data to calculate percentages in total taxation; Korea not included in IEA (2011) and OECD (2013)
Source: Present study, based on 2009 IEA data

By energy source, most environmental and energy tax revenue comes from petroleum (gasoline and diesel) used for transportation in both Korea (90.3%) and other OECD countries (79.3%), though the percentage of petroleum used for transportation is much higher in Korea. In the heating and industrial processes sector, Korea and other OECD countries report similar percentages by energy source. Also, the data indicates that most of the gap in tax burden on transportation petroleum between Korea and other OECD countries comes from non-taxation on coal, new and renewable energy, and nuclear power used for power generation. As previously mentioned, unlike other OECD countries, the primary energy sources used for power production in Korea mostly consist of coal and nuclear power. However, no tax was imposed on these two energy sources before the taxation on flaming coal in 2009.

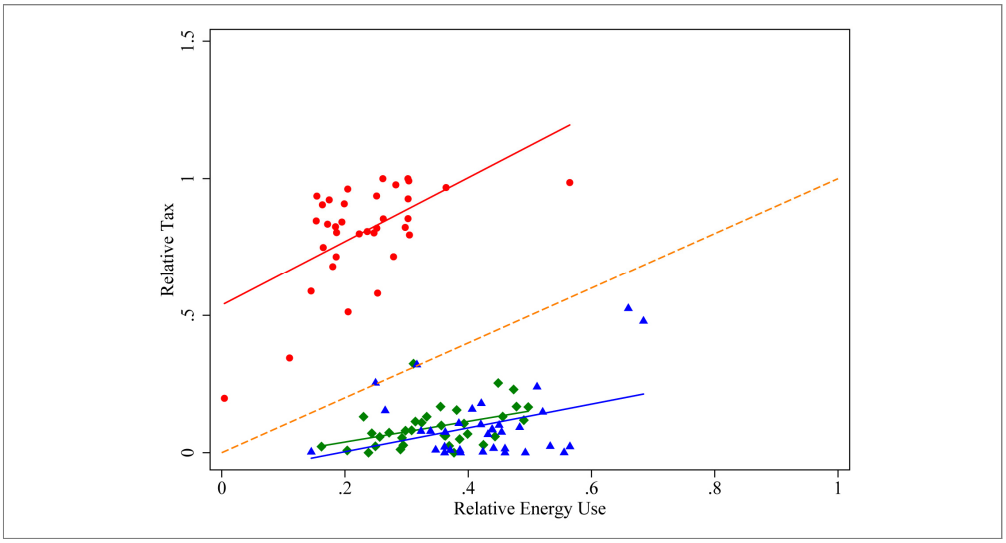
The following paragraphs compare the percentages of each sector in terms of energy use and taxation for each sector across the countries. As has been repeatedly pointed out, the tax burdens are imbalanced among the different sectors in Korea, more so than other OECD countries. However, none of the previous research has analyzed the extent of the imbalance, or the sectors bearing higher taxes compared with the same sectors in other major countries.

To analyze tax burden percentages based on energy use in each country, we used the data on effective tax rates by sector and energy source in *Taxing Energy Use,* an OECD report published in 2013. In addition, we used the IEA's energy balance table. We then compared the data on energy use by sector and energy source to identify the energy use and taxation by sector in each OECD country. While the data may seem outdated since it was produced in 2009, it can shed light on trends between 2009 and 2014, the time Korea began to impose taxes on

energy sources used for power generation. We expect the data to help us examine the taxation status in each sector, propose new ways for tax reform, and understand how the recent tax regime reforms contribute to balanced taxation among different sectors.

In Figure 3, the horizontal axis represents the relative energy use of the three sectors in each country, and the vertical axis represents the relative taxation of the sectors. The markers indicate specific percentages. Each marker is placed at the point at which the relative energy use (horizontal axis) crosses the relative taxation (vertical axis). Along with markers representing the percentages in different countries, we included 45° and linear regression lines to highlight the relative percentages of different sectors. Granted, sector-specific percentages in tax burden do not have to be positively correlated with percentages in energy use at a 1:1 ratio. However, we included these lines to compare trends in the environmental and energy taxation across major OECD countries. Specifically, Figure 3 shows percentages in tax burden relative to percentages in energy use (whether a marker is placed above or below the 45° line), and how percentages in energy use are correlated with percentages in tax burden in each sector (by comparing the inclination of the linear regression line for each sector with the 45° line).

Figure 3_Percentages in Energy Use Relative to Percentages in Tax Burden in Major OECD Countries



Notes: 1. Each marker is placed at the point at which the relative energy use (horizontal axis) crosses the relative taxation (vertical axis).
2. Red dots represent the transportation sector, blue triangles represent the heating and industrial processes sector, and green diamonds represent the power generation.

Source: Present study, based on OECD (2013) and IEA (2012)

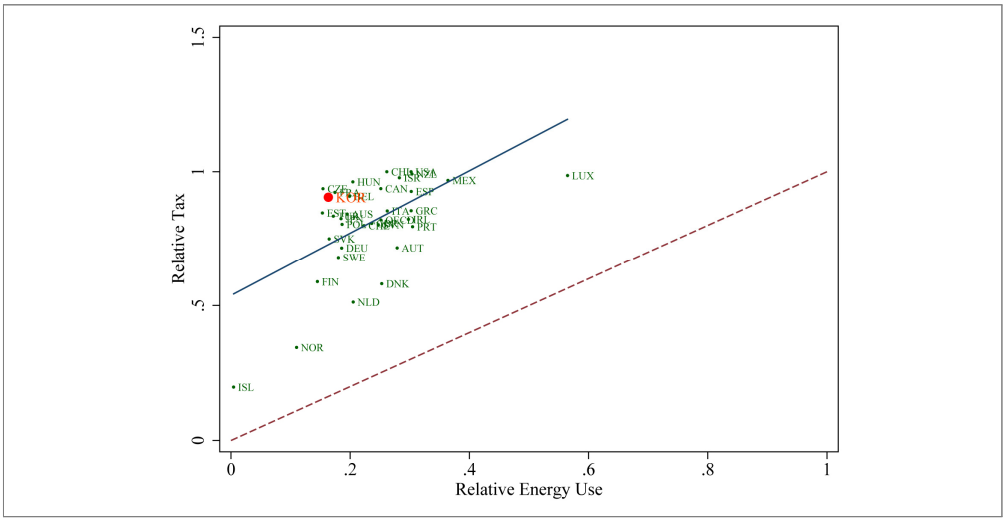
As shown in Figure 3, most OECD countries impose high taxes on the transportation sector, compared to the sector's percentage in the total energy use (markers placed on the left side, above the 45° line). In most countries, while the transportation sector takes up around 20% of the total energy use, it pays more than 50% of the total tax burden. In contrast, save for a few countries, markers for the heating and industrial processes sector and the power generation sector are placed below the 45° line, indicating a high percentage in the tax revenue relative to their percentages in the total energy used. In other words, in most countries, the effective tax rates on energy sources used for heating and industrial processes are lower than those for energy sources used for transportation. In the figure, markers representing the first two sectors are distributed wider along the horizontal axis than the transportation sector, indicating larger gaps in the energy use percentages of the two sectors among different countries. In practice, differences in the tax rates are often the results of policy decisions aimed at improving industrial competitiveness and addressing income distribution issues. The differences may also be attributed to the energy mix of the two sectors, which is far more diverse than the energy mix of the transportation sector (OECD 2015).

In the following paragraphs, we look into the degree of taxation on three sectors in Korea. If the markers for a country are placed near the regression lines for the respective sectors, the country can be understood to impose average taxes on the sectors relative to the sectors' percentages in total energy use. However, if the markers for a country are placed far above or below the regression lines, the country imposes too much or too little tax on the sectors, as compared with the average tax burden corresponding to their percentages in energy use.

In Figure 4, the red marker representing Korea's transportation sector is placed on the top left side of the regression line. The location indicates that Korea's transportation sector pays high taxes considering its percentage in the total energy used, and the majority of the country's tax revenue comes from the transportation sector. In addition, given the significant distance from the regression line, Korea imposes higher taxes on the sector compared to other countries having a similar energy use: Slovakia, Germany, and Sweden. The Czech Republic, Belgium, and France report levels of taxation on the transportation sector that are closer to that of Korea.

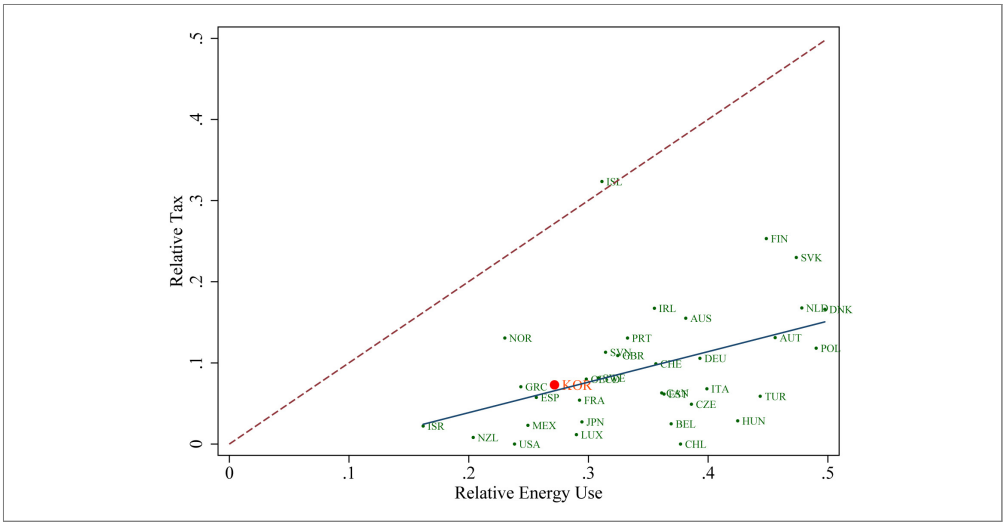
As the percentages are determined relative to the other sectors, if a certain sector is heavily taxed compared to its percentage in total energy used, it indicates a relatively low taxation rate. Figure 5 shows the same graph as Figure 4, this time for the heating and industrial processes sector. In this sector, Korea's marker is placed near the regression line, indicating a similar level of taxation to other countries, when compared with the sector's percentage in total energy use.

Figure 4_Percentage of Taxation on Transportation Sector Compared with Percentage of Energy Use



Note: Each marker is placed at the point at which the relative energy use (horizontal axis) crosses the relative taxation (vertical axis).
Source: Present study, based on OECD (2013) and IEA (2012)

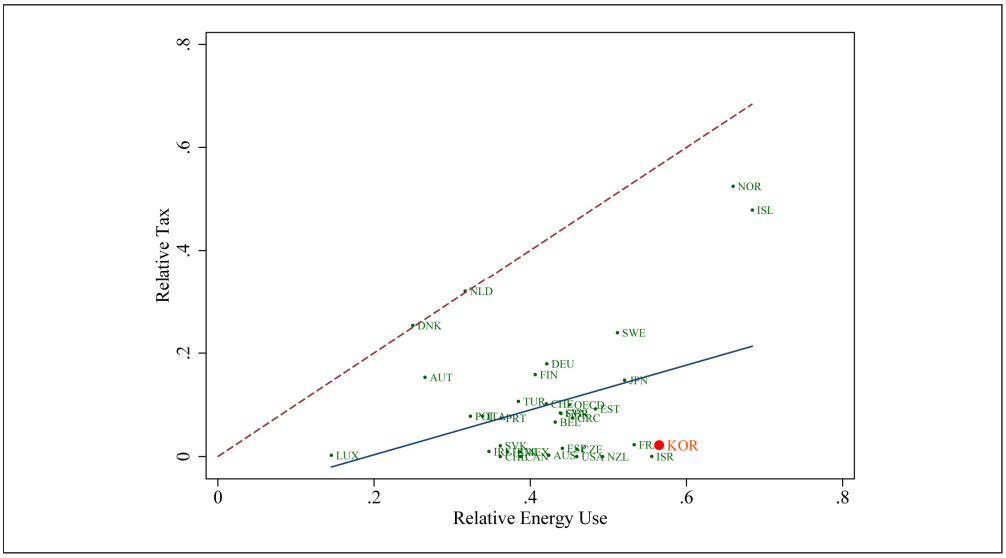
Figure 5_Percentage of Taxation on Heating and Industrial Processes Sector Compared with Percentage of Energy Use



Note: Each marker is placed at the point at which the relative energy use (horizontal axis) crosses the relative taxation (vertical axis).
Source: Present study, based on OECD (2013) and IEA (2012)

As can be seen from Figure 6, the excessive tax burden on the transportation can be attributed to the low tax burden on the power generation sector. As of 2009, the tax burden on the power generation sector was close to 0, compared with the overall energy use in the sector. Even though the Korean power generation sector takes up a relatively high percentage in total energy use (marker placed toward the right end of the vertical axis), its percentage in the total tax burden is close to 0. The marker for the sector is placed quite far from the regression line. Overall, the Korean transportation sector is seen to bear an excessive level of tax burden compared to other countries. This discrepancy can mostly be attributed to the particularly low tax burden on the power generation sector compared to the sector's percentage in total energy use.

Figure 6_Percentage of Taxation on Power Generation Sector Compared with Percentage Energy Use



Note: Each marker is placed at the point at which the relative energy use (horizontal axis) crosses the relative taxation (vertical axis).
Source: Present study, based on OECD (2013) and IEA (2012)

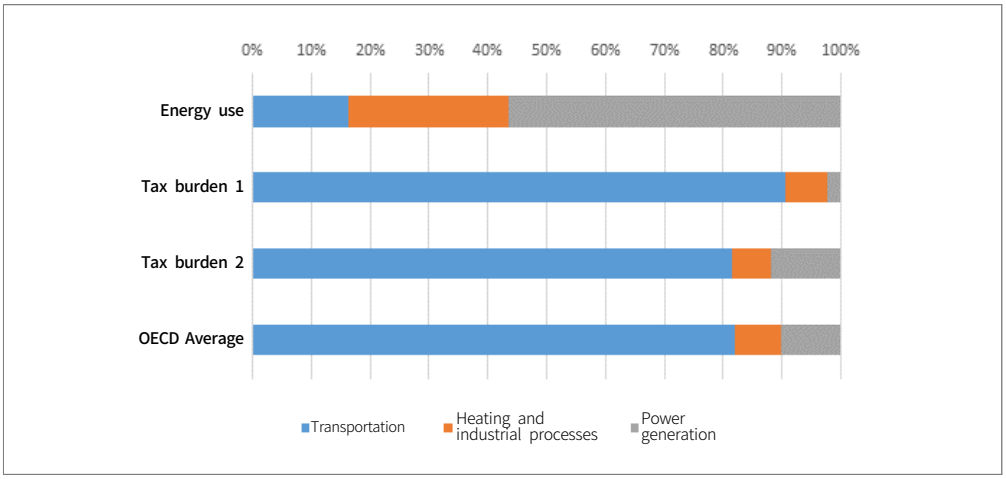
C. Balance of Relative Tax Rates After Tax Reform

The recent tax raise on flaming coal used for power generation in Korea has improved the equity of energy tax burden. In 2009, Korea's power generation sector accounted for only 2.2% of the total tax burden (tax burden 1 in Figure 7). However, applying the base rate in

2018 (KRW 36/kg) raises the percentage of the power generation sector in total tax burden to 11.9%, which is close to the OECD average (10.2%). That is, raising the tax rate somewhat mitigates the relatively excessive taxation on the transportation sector compared with countries showing similar levels of energy use imbalance.

Figure 7_Energy Use and Tax Burden by Sector

(Unit: %)



Notes: 1. Tax burden 1: No tax on flaming coal used for power generation, and KRW 60/kg on LNG used for power generation
2. Tax burden 2: 2018 base rate (KRW 36/kg) applied to flaming coal used for power generation
Source: Present study, based on OECD (2013) and IEA (2012)

2. Tax Reform

As previously mentioned, we developed different tax reform scenarios in which tax burdens on the power generation and heating sectors are increased by raising the percentages of external costs reflected in the taxes. From the tax reform in 2018, the taxes and levies on LNG and flaming coal in 2019 internalized a large part of the external costs. However, in this study, we developed further scenarios based on the 2018 tax rates, by considering the fact that the currently available data are from 2018, and the new tax regime took effect in April 2019. We also consider the purpose of this study, which is to achieve balance among sectors without undermining the corrective function of energy taxation. The use of the 2018 data is also justified by the fact that, though taxes are imposed on the amount of declared imports, the declared imports do not match the actual fuel used for power generation.

To focus on balance among sectors, instead of calculating social costs, we used scenarios from the Korea Institute of Public Finance et al. (2018), which provides estimates of external costs for power generation fuels and considers their effect on electricity fees. In addition, as proposing a final retail price for electricity lies outside the purview of this study, we analyze the effect on each sector by assuming that the price increase estimated by the Korea Institute of Public Finance et al. (2018) is transferred to the retail sector.

As for the power generation sector, we used emissions from each power generation source and the calculation of environmental costs from the Korea Institute of Public Finance et al. (2018) to calculate the environmental costs per fuel use for each power generation source. First, when calculating the harm to human bodies caused by air pollutants and greenhouse gases from the burning of power generation fuels (e.g., flaming coal and LNG) and the resulting social costs, the total external costs of flaming coal and LNG are KRW 176.3/kg and KRW 165.4/kg, respectively. The ratio between the external costs of the two fuels is 1.07:1. However, the calculation is based on energy use, and does not consider the relative efficiency of each fuel. It should subsequently be noted that a direct comparison is not available due to differences in fuel characteristics. For reference, if we exclude greenhouse gases from the calculation, the ratio between the environmental costs of flaming coal and LNG is estimated to be around 2:1, which is attributable to the higher emission of ultrafine particulates ($PM_{2.5}$) and antecedents (sulfur oxide and nitrogen oxide) from flaming coal compared to LNG.

Table 7_Environmental Costs by Power Generation Source (based on energy use)

(Unit: KRW/kg)

Power generation source	Sulfur oxide	Nitrogen oxide	Particulate ($PM_{2.5}$)	Carbon dioxide	Total environmental costs	
					Carbon dioxide included	Carbon dioxide not included
LNG	3.3	35.9	3.4	122.9	165.4	42.5
Flaming coal	40.3	42.5	2.0	91.4	176.3	84.9

Note: The Korea Institute of Public Finance et al. (2018) calculates the statistical value of life in Korea using income elasticity, in which a 1% change in substantive wage translates into a 0.8% change in mortality rate

Source: Adapted from the Korea Institute of Public Finance et al. (2018), Table 8

Based on the environmental cost estimates, we developed two scenarios for adjusting taxes and levies on the power generation sector. Granted, considering the purpose of the environmental tax, it would be ideal to reflect all external costs into the taxes and levies.

However, in developing the scenarios, we considered the fact that internalizing all external costs would excessively increase the amount of taxes and levies. Also, in addition to adjusting the relative tax rates for flaming coal and LNG to be in alignment with their relative external costs, we consider a revenue-neutral scenario in which the total of taxes and levies on the power generation sector remains the same as for the 2018 tax rates. However, as this study is aimed at achieving balance among sectors, we do not consider a neutral scenario.

In Scenario 1, the taxes and levies on LNG for power generation in 2018 remains the same, and the taxes and levies on flaming coal are raised in accordance with the external cost ratio, including carbon dioxide (1.07:1). This scenario only raises the taxes and levies on flaming coal without adjusting the taxes and levies on LNG, based on the fact that the current taxes and levies on LNG do not sufficiently internalize the external costs. When adjusting the ratio between the taxes and levies on the two fuels to be in alignment with the external cost ratio, the taxes and levies on flaming coal is KRW 97.4/kg, which internalizes around 55% of the external costs of flaming coal. In addition, given the fact that the 2018 revision to the tax law introduced a tax-neutral adjustment of the ratio between the taxes and levies on flaming coal and LNG, Scenario 1 provides a meaningful way to enhance the corrective function of the environmental tax in the future.

Scenario 2 internalizes the environmental costs excluding carbon dioxide into the taxes and levies. When excluding carbon dioxide, the external cost ratio between flaming coal and LNG is 2:1. This scenario internalizes 100% of the external costs of pollutants other than carbon dioxide. The exclusion of carbon dioxide presupposes that carbon dioxide emissions are sufficiently controlled by non-tax policy instruments including CER trading. This scenario offers a way to prevent the burden from taxation on carbon dioxide from overlapping with the burden from CER trading.

We then analyzed the effect on electricity fees in each scenario using the electricity purchase price of the Korea Electric Power Corporation estimated in the Korea Institute of Public Finance et al. (2018), based on the corporation's unit price for each power generation source in 2017.[2]

We estimated the total price paid for each source by multiplying the estimated power production under each scenario by changes to the taxes and levies and the unit price for each source, adjusted for changes in the system marginal prices. The analysis of changes in the unit

2 For the unit price, we used estimates developed by the Korea Energy Economics Institute during a research project from the Korea Institute of Public Finance et al. (2018).

price under each scenario estimated a 12.2% increase for Scenario 1, and a 6.6% increase for Scenario 2.

Finally, the tax reform scenarios consider adjustments to taxes on LNG used for heating. Though kerosene and propane are also used for heating, given the widespread use of LNG for individual and collective heating, and the growing replacement of kerosene and propane heaters by electric heaters, we assumed that LNG will be the main source of heating fuel. For the LNG used in heating, we assumed the same external costs are incurred by burning and gas emissions in order to eliminate the gap between taxes and levies on LNG used for power generation and other LNGs. When calculated using the emission coefficient of LNG used for power generation and heating under the 2014 Clean Air Policy Support System (CAPSS), the external costs of heating with LNG is 0.3% lower than for power generation using LNG. Therefore, it can be reasonably assumed that there exists a minimal gap in environmental costs between the two. Scenarios 3 and 4 involve adjusting the taxes and levies on LNG used for heating to bring them to the same level as the adjustment to LNG used for power generation under Scenarios 1 and 2. The following table summarizes the four scenarios.

Table 8_Tax and Levy Rates By Scenario

(Unit: KRW/kg, KRW/kWh, %)

Scenario	Taxes on LNG used for power generation					Taxes on LNG used for heating		
	Flaming coal Taxes and charges	LNG Taxes and charges	Electricity unit price			Taxes and levies (%)	Change	Rate of change (%)
			Unit price	Change	Rate of change			
Base	36	91.4	85	-	-	78.4	-	-
S1	97.4	91.4	95.3	10.3	12.2	78.4	-	-
S2	84.9	42.5	91.6	6.6	7.8	78.4	-	-
S3	97.4	91.4	95.3	10.3	12.2	91.4	13.0	16.6
S4	84.9	42.5	91.6	6.6	7.8	42.5	-35.9	-45.8

Notes: 1. The tax rate on LNG used for power generation (KRW 91.4/kg) consists of the following.
"Total taxes and levies (KRW 91.4/kg) = Excise tax (KRW 60/kg) + Import surcharge (KRW 24.2/kg) + Tariff (KRW 7.2/kg)"
The tariff value was calculated based on KOGA data on monthly fee for power generation in December 2017.
2. In Scenario 1, the 2018 tax rate on LNG is not adjusted.
3. In Scenario 2, the taxes and levies internalize 100% of the environmental costs, excluding carbon dioxide.
4. Scenarios 3 and 4 adjust the tax rate on LNG without distinguishing between LNG used for power generation and LNG used for heating, based on the assumption that the environmental costs of LNG used for other purposes are the same as those of LNG used for power generation.
The unit price (KRW/kWh) was calculated by dividing the total price payment by 521,738 GWh.

Source: Present study

IV. Effect of Environmental and Energy Taxes on Household Tax Burden

1. Estimation of Household Tax Burden

A. Data

To analyze the tax burden on households, we examined data from the latest 2018 (11th) issue of the *Fiscal Panel*. The sample for 2018 consists of 4,816 households, of which 153 households were excluded due to a lack of information on their total income. We identified income brackets and calculated the tax burden ratios (tax-to-income ratios) of the remaining 4,663 households.[3]

B. Analysis

In this report, we used the microsimulation method to track the tax burden on households, fees paid by households and their ratio against income (effective tax rates and effective burden ratios). The energy sources analyzed in this study include: electricity, city gas, heating fuel for home, LPG for home, and gasoline, diesel, and LPG butane used for cars. The excise taxes on energy sources are unit taxes. Therefore, if we have information on the use of each energy source by households, we can calculate the amount of tax burden by multiplying the usage with the unit tax rate. We calculated the energy taxes and fees borne by households as follows:

- Electricity fee: We used responses to the question on household electricity fees in *Fiscal Panel*.
- Energy tax on city gas: Assuming that the city gas fee includes the energy tax on city gas (the energy tax on LNG is wholly transferred to consumers), we calculated the energy tax as follows:
  1. We converted the consumer price of city gas in Seoul provided in the *Yearbook of Energy Statistics* and *Monthly Energy Statistics* into KRW/kg. As the statistics indicate the prices in KRW/MJ, MJ (thermal energy unit) needs to be converted to kg (weight

3 Total income is the sum of market income and transfer incomes (Sung et al., 2010, p. 18). It represents the total income of a household before taxation.

unit). Therefore, we assumed that city gas only consists of methane, and calculated the weight using the relation between methane volume, weight, and thermal energy.[4]

2. We regarded answers to the question on household fee in the *Fiscal Panel* as indicative of the amount of household gas used.
3. Using the converted values from 1, we calculated the household city gas usage (kg), and multiplied the usage with the excise tax rate on LNG not used for power generation (KRW 42) in order to calculate the tax burden.

- Energy tax on heating fuel for home: The *Fiscal Panel* only includes questions on heating fuel costs, and does not specifically define the heating fuels used. However, as kerosene is a typical heating fuel, we calculated the energy tax assuming that heating fuel means kerosene oil. Similar to the calculations in 2 and 3, we calculated heating fuel usage by dividing the heating fuel expenses by the average kerosene price in the year in question (data provided by Opinet), and multiplied the usage with the tax rate on kerosene in order to calculate the tax burden.
- Energy tax on LPG for homes: The *Fiscal Panel* includes a question on LPG expenses. LPG can be either propane or butane. However, we regarded LPG as propane because most households use propane LPG. We calculated the usage using the average propane price (data provided by Opinet), and multiplied the usage with the tax rate on propane in order to calculate the tax burden.
- Energy tax on gasoline: The *Fiscal Panel* includes a question on monthly fuel expenses for gasoline vehicles. Gasoline vehicles are categorized into privately owned vehicles and commercial vehicles. The panel includes a separate question for motorcycles. In this study, we calculated the sum of gasoline expenses for privately owned cars and motorcycles. Then, we divided the total expenses by the average price to estimate usage, and multiplied the usage with the unit tax rate to calculate the tax burden.
- Energy tax on automotive diesel and automotive butane: Similarly, to calculate the energy tax on automotive diesel and butane, we used responses to the question on monthly average fuel expenses for privately-owned LPG vehicles. Motorcycles were not considered, as they are only included in questions regarding gasoline use.

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4 Methane satisfies the following relation. 1 Nm^3=0.714 kg, 1 Nm^3=43.1 MJ (conversion ratio based on the 7th Energy-Calorie Conversion Ratio provided in Article 5 (1) of the Enforcement Rules of the Energy Act revised on December 28, 2017).

For reference, the *Fiscal Panel* provides data on monthly average fuel expenses. We multiplied the values by 12 to calculate the yearly usage. In addition, the energy tax for each fuel type includes the excise tax, transportation/energy/environmental taxes, education taxes, and mileage taxes. VATs and tariffs were excluded because they are imposed on all items.[5] In terms of income bracket division, rather than dividing the sample households in equal parts based on their income, we used the cross-section weights provided in the *Fiscal Panel* to identify ten income brackets. As a result, as can be seen in Table 10 and others, the number of households varies depending on the bracket.

2. Changes in Tax Burdens in Each Scenario

A. Scenario Description

Table 9 presents details of the scenarios used in this study. The developed scenarios reflect our understanding that the Korean environmental and energy taxes are excessively heavy in the transportation sector, and the contribution from the power generation sector is relatively low. Based on this understanding, we seek to examine the effects of adjustments, aimed at internalizing the environmental costs of power generation into the tax rates.

As estimating the overall environmental costs lies outside the scope of this study, we used the findings from the Korea Institute of Public Finance et al. (2018).

However, it should be noted that the Korea Institute of Public Finance et al. (2019) determined the tax rates by considering all taxes and levies on fuels. In this chapter, we restricted the scope of energy taxes analyzed to national taxes and local taxes, excluding VATs and tariffs. Therefore, we assume that the VATs and various charges and surcharges provided in the Korea Institute of Public Finance et al. (2018) do not change, and that the energy tax rates are adjusted for differences between the total taxes and levies under each scenario and the total taxes and levies in 2018 (KRW 78.4/kg). For example, in Scenario 3, the total rate of taxes and levies on LNG not used for power generation should be raised from KRW 78.4/kg to KRW 91.4/kg. In other words, the LNG tax rate should be adjusted for the difference (KRW 13/kg) by increasing it from KRW 42/kg to KRW 55/kg. Likewise, in Scenario 4, the

5 To sum, the energy tax rates used for microsimulation are as follows: KRW 42/kg for city gas (LNG); KRW 72.45/kg for kerosene; KRW 14/kg for propane; KRW 745.89/liter for gasoline; KRW 528.75/liter for diesel; and KRW 316.25/kg for automotive butane.

Table 9_Scenario Summary

Scenario	Description	Assumptions on taxes and levies and fees
S1	The 2018 LNG tax rate is maintained, while increasing the tax rate on flaming coal used for power generation in accordance with the percentage in total environmental costs	[Taxes and levies] Raise the excise tax rate on flaming coal used for power generation to KRW 97.4/kg [Fees] Raise the electricity fee by 12.2%
S2	Tax rates on power generation fuels determined based on environmental expenses, excluding carbon dioxide	[Taxes and levies] Flaming coal used for power generation: Raise to KRW 84.9/kg LNG used for power generation: Lower to KRW 42.5/kg [Fees] Raise electricity fee by 7.8%
S3	The same as Scenario 1 for the power generation sector; match the tax rate on LNG not used for power generation sector with the rate on LNG used for power generation sector	[Taxes and levies] Flaming coal used for power generation: Raise to KRW 97.4/kg LNG not used for power generation: Raise by 16.58% to KRW 91.4/kg ⇒ Tax rate on LNG not used for power generation is raised by KRW 13/kg [Fees] Raise the electricity fee by 12.2%; raise the city gas fee by 1.45%
S4	The same as Scenario 2 for the power generation sector; match the tax rate on LNG not used for power generation sector with the rate on LNG used for power generation sector	[Taxes and levies] Flaming coal used for power generation: Raise to KRW 84.9/kg All LNG: Lower to KRW 42.5/kg ⇒ Tax rate on LNG not used for power generation is raised by KRW 35.9/kg [Fees] Raise the electricity fee by 12.2%; lower the city gas fee by 3.93%

Source: Present study

total rate of taxes and levies on LNG not used for power generation should be lowered to KRW 42.5/kg, that is, the LNG tax rate should be adjusted for the difference (KRW 35.9/kg) by lowering it to KRW 6.1/kg.

The scenarios vary in terms of whether carbon dioxide is included, and whether the same tax rate applies to all LNG. Environmental costs consist of the cost of damage caused by air pollutant emission, and the cost of damage caused by greenhouse gas emissions. Note that the emissions of greenhouse gases including carbon dioxide are currently being internalized into the market through CER trading. Indeed, CER trading is gaining significance in the power generation sector. Paid distribution partially began in 2019, during the second phase of CER trading in Korea (2018~2020).[6] The four scenarios proposed here can be divided into two

6 See the following news article for further details: *Seoul Shinmun,* "3% Paid Distribution: The Ministry of Enviro

groups: Scenarios 1 and 3 and Scenarios 2 and 4, depending on whether carbon dioxide is included. Scenarios 1 and 3 reflect carbon dioxide expenses into the environmental and energy taxes, whereas Scenarios 2 and 4 exclude carbon dioxide on the assumption that these expenses can be sufficiently internalized through CER trading.

The scenarios can be also divided in terms of whether the same rate applies to all LNGs. Currently, different rates apply to LNG used for power generation and other LNGs. Therefore, this issue reflects our question as to whether the application of different rates to different LNGs is environmentally appropriate. Scenarios 1 and 2 apply different rates to LNG used for power generation and other LNGs, and Scenarios 3 and 4 apply the same rate to all LNGs regardless of use.

B. Tax Burden Estimation By Scenario

For unit taxes, tax burdens can be expressed as a multiplication of tax rates and consumption. Therefore, changes the tax burden (TB in the following equations) can be further divided into changes in tax rates and changes in consumption. Changes in consumption (ΔQ) can be expressed in terms of price elasticity (ε_i) and price change ($\Delta P_i/P_i$).

$$TB = t \cdot Q$$

$$TB + \Delta TB = (t + \Delta t) \cdot (Q + \Delta Q)$$

$$\Rightarrow TB + \Delta TB = t \cdot Q \cdot (1 + \frac{\Delta t}{t})(1 + \sum_{i=1}^{I} \frac{\Delta P_i}{P_i}\varepsilon_i) \; where$$

$$\varepsilon_i = \frac{\Delta Q/Q}{\Delta P_i/P_i}$$

where ΔTB is the change to tax rates in each scenario, Δt is the change to tax rates in each scenario, ΔQ is the change to consumption (demand) for energy sources in each scenario, and ΔP is the change to energy source prices in each scenario. Note that i was added to price elasticity and price values, because we considered possible changes to the prices of

nment to Act on the Rapid Increase in CER Auction Price," March 28, 2019, http://www.seoul.co.kr/news/newsView.php?id=20190328005013&wlog_tag3=naver, accessed on July 8, 2019.

energy sources. As mentioned in Chapter V, we estimated the price elasticity and cross elasticity of five energy sources (electricity, town gas, heating fuel, gasoline, and diesel). Therefore, the findings reflect changes in the demand for a certain energy source caused by price fluctuations of the other energy sources.

Therefore, in the above equation, changes to the demand for a certain source represent changes to the demand caused by changes in the price of the energy source as well as changes in the prices of the other energy sources.[7]

Changes in tax rates ($\Delta t/t$) and changes in energy source prices ($\Delta P/P$) vary depending on the scenario. The scenarios vary only in terms of the tax rates and prices of electricity and LNG. Overall, electricity fees are raised by 12.2% in Scenarios 1 and 3, and by 7.8% in Scenarios 2 and 4. This is the result of applying the changes in unit prices estimated by the Korea Institute of Public Finance et al. (2018) to the electricity fees in this study. As for LNG, Scenarios 1 and 2 apply the rates currently applied to the energy source, and therefore do not directly change tax the burdens on LNG. On the other hand, Scenarios 3 and 4 apply the same total rate of taxes and levies to LNG used for power generation and other LNGs. As a result, the tax rate for LNG used at home is raised by KRW 13/kg in Scenario 3, and by KRW 35.9/kg in Scenario 4. As the energy tax rate on LNG not used for power generation is KRW 42/kg, the tax rate on LNG changes by 30.95% in Scenario 3, and -85.48% in Scenario 4. In addition, for the ease of estimation, if we assume that changes in the LNG tax rates are transferred to the tax rate price, the price does not change in Scenarios 1 and 2, but changes by 1.43% and -3.95% in Scenarios 3 and 4, respectively.

Changes in demand (ΔQ) were calculated using the price elasticity of the key energy sources. Tables 10 to 13 represent the changes in tax burdens (fee burdens) that reflect price elasticity and changes in tax rates (fees). LPG for home is excluded from the tables, because its tax rate does not change in any of the scenarios, and thus its price elasticity was not separately calculated.

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7 Due to data restrictions and other reasons, we excluded LPG for home and automotive butane from the price elasticity analysis. Previously, we analyzed the tax burden on seven energy sources (electricity, city gas, heating fuel, LPG for home, gasoline, diesel, and automotive butane). However, for the scenario analysis, we analyzed the taxes and fees for five energy sources excluding LPG for home and automotive butane. Therefore, $i = 1, \ldots, 5$, $I = 5$.

Table 10_Changes in Taxes and Fees Imposed for Key Energy Sources By Income Bracket (S1)

(Unit: %)

	Electricity fee	Gasoline tax	Diesel tax	Heating fuel tax	City gas tax
First bracket	104.52	98.69	94.95	99.38	100.01
Second bracket	104.52	98.69	94.95	99.38	100.01
Third bracket	104.52	98.69	94.95	99.38	100.01
Fourth bracket	104.52	98.69	94.95	99.38	100.01
Fifth bracket	102.80	99.07	96.40	99.56	100.01
Sixth bracket	102.56	99.12	96.60	99.58	100.01
Seventh bracket	102.39	99.16	96.74	99.60	100.01
Eighth bracket	102.33	99.17	96.79	99.61	100.01
Ninth bracket	102.21	99.20	96.89	99.62	100.01
Tenth bracket	102.04	99.23	97.03	99.64	100.01

Note: % values refer to the ratio against the existing tax (fee) amount. 100% indicates no change, and 90% indicates 90% of the existing amount.
Source: Present study

Table 11_Changes in Taxes and Fees Imposed for Key Energy Sources By Income Bracket (S2)

(Unit: %)

	Electricity fee	Gasoline tax	Diesel tax	Heating fuel tax	City gas tax
First bracket	103.08	99.16	96.77	99.60	100.01
Second bracket	103.08	99.16	96.77	99.60	100.01
Third bracket	103.08	99.16	96.77	99.60	100.01
Fourth bracket	103.08	99.16	96.77	99.60	100.01
Fifth bracket	102.02	99.40	97.70	99.72	100.01
Sixth bracket	101.88	99.44	97.82	99.73	100.01
Seventh bracket	101.77	99.46	97.92	99.74	100.01
Eighth bracket	101.74	99.47	97.95	99.75	100.01
Ninth bracket	101.66	99.49	98.01	99.76	100.01
Tenth bracket	101.56	99.51	98.10	99.77	100.01

Note: % values refers to the ratio against the existing tax (fee) amount. 100% indicates no change, and 90% indicates 90% of the existing amount.
Source: Present study

Table 12_Changes in Taxes and Fees Imposed for Key Energy Sources By Income Bracket (S3)

(Unit: %)

	Electricity fee	Gasoline tax	Diesel tax	Heating fuel tax	City gas tax
First bracket	104.38	98.46	94.07	99.27	129.08
Second bracket	104.38	98.46	94.07	99.27	129.08
Third bracket	104.38	98.46	94.07	99.27	129.08
Fourth bracket	104.38	98.46	94.07	99.27	129.08
Fifth bracket	102.69	98.89	95.70	99.47	129.07
Sixth bracket	102.46	98.96	95.96	99.50	129.08
Seventh bracket	102.28	98.99	96.08	99.52	129.07
Eighth bracket	102.23	99.01	96.16	99.53	129.07
Ninth bracket	102.12	99.04	96.31	99.55	129.08
Tenth bracket	101.96	99.10	96.51	99.57	129.08

Note: % values refer to the ratio against the existing tax (fee) amount. 100% indicates no change, and 90% indicates 90% of the existing amount.
Source: Present study

Table 13_Changes in Taxes and Fees Imposed for Key Energy Sources By Income Bracket (S4)

(Unit: %)

	Electricity fee	Gasoline tax	Diesel tax	Heating fuel tax	City gas tax
First bracket	103.45	99.80	99.22	99.90	15.11
Second bracket	103.45	99.80	99.22	99.90	15.11
Third bracket	103.45	99.80	99.22	99.90	15.11
Fourth bracket	103.45	99.80	99.22	99.90	15.11
Fifth bracket	102.32	99.90	99.62	99.95	15.10
Sixth bracket	102.14	99.89	99.57	99.95	15.10
Seventh bracket	102.05	99.93	99.75	99.97	15.10
Eighth bracket	102.00	99.92	99.68	99.96	15.10
Ninth bracket	101.91	99.90	99.63	99.95	15.10
Tenth bracket	101.78	99.89	99.56	99.95	15.10

Note: % values refers to the ratio against the existing tax (fee) amount. 100% indicates no change, and 90% indicates 90% of the existing amount.
Source: present study

Tables 14 to 18 summarize the changes in effective tax rates and effective burden ratios for each energy source when the changes in Tables 10 to 13 are applied under each scenario.[8] In each table, the effective tax rates on home heating fuel (kerosene) do not vary depending on the scenario. The energy source with the largest gap between the scenarios is city gas.

Table 14_Changes to Effective Electricity Fee Rate by Income Bracket

(Unit: %)

	Base	S1	S2	S3	S4
First bracket	5.860	6.125	6.041	6.117	6.062
Second bracket	3.555	3.716	3.665	3.665	3.678
Third bracket	2.174	2.272	2.241	2.241	2.249
Fourth bracket	1.653	1.728	1.704	1.704	1.710
Fifth bracket	1.513	1.555	1.544	1.544	1.548
Sixth bracket	1.328	1.362	1.353	1.353	1.356
Seventh bracket	1.024	1.048	1.042	1.042	1.045
Eighth bracket	0.864	0.884	0.879	0.879	0.881
Ninth bracket	0.730	0.746	0.742	0.742	0.744
Tenth bracket	0.522	0.533	0.530	0.530	0.531
Total	1.921	1.997	1.974	1.982	1.980

Source: Present study

8 In this chapter, the effective burden ratio refers to the ratio of fees to total income (%), and the effective tax rate refers to the ratio of tax burden to total income (%).

Table 15_Changes in Effective Tax Rate on LNG by Income Bracket

(Unit: %)

	Base	S1	S2	S3	S4
First bracket	0.234	0.234	0.234	0.302	0.035
Second bracket	0.143	0.143	0.143	0.185	0.022
Third bracket	0.117	0.117	0.117	0.152	0.018
Fourth bracket	0.087	0.087	0.087	0.112	0.013
Fifth bracket	0.079	0.079	0.079	0.102	0.012
Sixth bracket	0.067	0.067	0.067	0.086	0.010
Seventh bracket	0.056	0.056	0.056	0.073	0.008
Eighth bracket	0.046	0.046	0.046	0.059	0.007
Ninth bracket	0.037	0.037	0.037	0.047	0.006
Tenth bracket	0.025	0.025	0.025	0.033	0.004
Total	0.089	0.089	0.089	0.115	0.013

Source: Present study

Table 16_Changes in Effective Tax Rate on Heating Fuel for Home by Income Bracket

(Unit: %)

	Base	S1	S2	S3	S4
First bracket	0.206	0.205	0.205	0.204	0.206
Second bracket	0.109	0.108	0.108	0.108	0.109
Third bracket	0.055	0.055	0.055	0.055	0.055
Fourth bracket	0.040	0.040	0.040	0.040	0.040
Fifth bracket	0.022	0.022	0.022	0.022	0.022
Sixth bracket	0.020	0.020	0.020	0.020	0.020
Seventh bracket	0.011	0.011	0.011	0.011	0.011
Eighth bracket	0.009	0.009	0.009	0.009	0.009
Ninth bracket	0.005	0.005	0.005	0.005	0.005
Tenth bracket	0.004	0.004	0.004	0.004	0.004
Total	0.048	0.048	0.048	0.048	0.048

Source: Present study

Table 17_Changes to Effective Tax Rate on Gasoline by Income Bracket

(Unit: %)

	Base	S1	S2	S3	S4
First bracket	1.238	1.222	1.228	1.219	1.236
Second bracket	0.659	0.651	0.654	0.654	0.658
Third bracket	1.148	1.133	1.138	1.138	1.145
Fourth bracket	1.094	1.080	1.085	1.085	1.092
Fifth bracket	1.433	1.419	1.424	1.424	1.431
Sixth bracket	1.221	1.210	1.214	1.214	1.220
Seventh bracket	1.327	1.316	1.320	1.320	1.326
Eighth bracket	1.095	1.086	1.089	1.089	1.094
Ninth bracket	1.055	1.047	1.050	1.050	1.054
Tenth bracket	0.833	0.826	0.829	0.829	0.832
Total	1.110	1.099	1.103	1.102	1.109

Source: Present study

Table 18_Changes in Effective Tax Rate on Diesel by Income Bracket

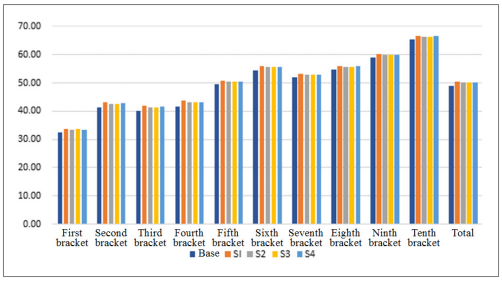
(Unit: %)

	Base	S1	S2	S3	S4
First bracket	0.975	0.926	0.944	0.918	0.968
Second bracket	0.698	0.663	0.675	0.675	0.693
Third bracket	0.745	0.707	0.721	0.721	0.739
Fourth bracket	0.678	0.644	0.656	0.656	0.673
Fifth bracket	0.729	0.703	0.712	0.712	0.727
Sixth bracket	0.687	0.664	0.672	0.672	0.684
Seventh bracket	0.588	0.569	0.576	0.576	0.587
Eighth bracket	0.613	0.593	0.600	0.600	0.611
Ninth bracket	0.436	0.423	0.428	0.428	0.435
Tenth bracket	0.356	0.346	0.350	0.350	0.355
Total	0.651	0.624	0.634	0.631	0.647

Source: Present study

Figure 8_Electricity Fee Estimate by Income Bracket

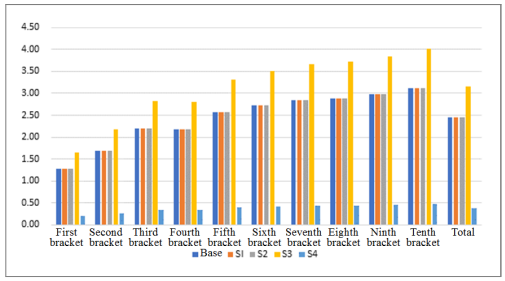
(Unit: KRW 10,000)



Source: Present study

Figure 9_LNG Fee Estimate by Income Bracket

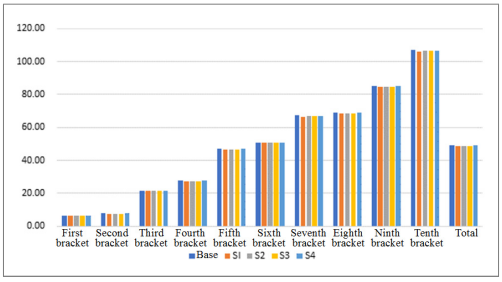
(Unit: KRW 10,000)



Source: Present study

Figure 10_Gasoline Tax Estimation By Income Bracket

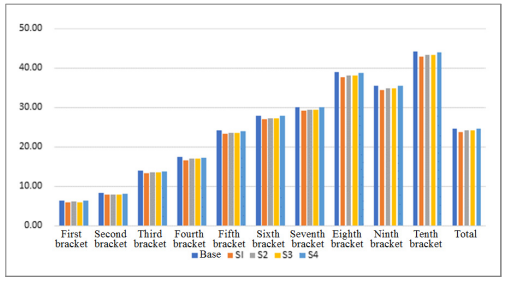
(Unit: KRW 10,000)



Source: Present study

Figure 11_Diesel Tax Estimation By Income Bracket

(Unit: KRW 10,000)



Source: Present study

Figures 8 to 11 represent the estimation of fees and tax burdens for each energy source in each scenario. Notably, Figure 8 indicates that raising taxes on the energy used for power generation would not result in a significant increase in electricity fees. Across all brackets, the electricity fee is expected to increase by between KRW 10,000 and KRW 15,000. Granted, this finding can be interpreted as reverse-progressive because the same increase is observed in both the low and high income brackets. However, the size of the increase would not be highly significant, as the average monthly rate of increase stands at around KRW 1,000.

The implications of the microsimulation scenario analysis are as follows. First, even if the government imposes heavier taxes on power generation fuels in order to enhance the corrective function of energy taxes, it would not significantly increase the burden on households. The electricity fee will increase by around 10%—even with the tax increase on social cost—or less than 5% when considering the price elasticity. These findings indicate there exists sufficient room for adjusting the tax burden balance among the different sectors.

In addition, if the government applies the same tax rates to the LNG used for power generation sector and other LNGs, it may result in marked changes in the tax burden on city gas. This finding shows the extent of the gap between the rates applied to the LNG used for power generation sector and the LNG used in other sectors. This gap may be a sensitive issue for a range of energy business entities. The latest revision to the tax laws, which took effect in April 2019, applies the tax rate for power generation fuel to LNG, and the tax rate for non-power generation fuels to flaming coal. Applying different rates to the same business depending on fuel type does not stand to reason. In addition, the government reduced the taxes on LNG by an additional 30%. While it is understandable that the government has attempted to minimize tax rates to promote industry, the current rates need to be adjusted for the sake of consistency.

V. Conclusions and Policy Implications

The energy taxes and fuel prices in Korea have not been consistent in terms of 'polluters pay principle' with regards to external costs of air pollution and greenhouse gas emissions. In addition, it has been repeatedly identified that the government imposes excessive taxes on certain energy sources, while not imposing any tax on other sectors and fuels. These findings show that, though taxes are imposed on petroleum used for transportation in other OECD members, the degree of imbalance is much higher in Korea. If the current trend continues, it will undermine the efficient consumption of energy sources and result in failure to control

environmental costs through price mechanisms.

In light of the above, in this study, we analyzed the extent of balance among different sectors in terms of environmental and energy tax rates, proposed ways to improve the taxation balance and prevent the distortion of relative prices, and predicted the effects of those improvements. We analyzed the relative tax burden for each sector by comparing the energy balance and effective tax rates across OECD countries. We found that the excessive tax burden on the transportation sector is attributable to a failure to reflect external costs in power generation fuel. In particular, before the taxation on flaming coal, the tax burden imbalance in Korea was significantly more excessive than in other major OECD members, both in relative and absolute terms. This imbalance was found to be wholly attributable to a failure to reflect the social cost in the power generation sector.

Based on these findings, we developed four tax reform scenarios in which the tax burdens for the power generation and heating sectors are increased by raising the percentages of external costs reflected in the taxes, and estimated the electricity and heating fees and taxes to be borne by households. The scenarios show that the electricity fee would increase by around 10%, even with the tax increase on power generation fuel, or less than 5% when considering price elasticity. These findings indicate there exists sufficient room for adjusting the tax burden balance among different sectors. However, supposing the same degree of adjustment of tax rates LNG used for power generation sector and LNG not used for power generation sector, the tax burden on LNG significantly changes. This finding suggests a marked gap between the tax rates applicable to the power generation sector and the other sectors, despite the minimal difference in external costs depending on the use of city gas. In this sense, the findings of this study suggest the need for further tax rate adjustments in the future.

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Wealth Inequality in Korea: Causes and Potential Responses

Jung, Dawoon and Kang, Dong-ik*

I. Introduction

Inequality in income and assets within a population always exists, albeit at varying degrees. In addition to the inequality that exists between developed and developing countries, there will always be unequal distribution of income and assets within a country. Economic growth has reduced the percentage of people living in absolute poverty across the world. However, it has also exacerbated the wealth inequality. Gaps in income and assets are potentially negative, as they may cause issues that undermine social stability. In fact, the current exacerbation of inequality has the potential to adversely affect ongoing economic and political stability initiatives (Piketty, 2014; Hubmer et al., 2016). In cases where the income and asset gaps in the parent generation disrupt the economic mobility of the next generation, inequality within a cohort consolidates inequality within the next cohort, thus restricting social mobility. Inequality in the income and assets of a parent generation does in fact cause inequality in economic opportunities among their children, significantly affecting their income and asset inequality (Perez-Arce et al., 2016). For this reason, we need to examine inequality in income and assets, and analyze its causes.

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Income inequality is an issue extensively discussed in a litany of literature. However, the amount of literature on asset inequality is relatively small, both in and outside of Korea. The number of papers on asset and wealth inequality in Korea is particularly small. There are two main reasons for this discrepancy. First, despite the heightened interest in assets inequality in the recent years, the level of interest in asset inequality in Korea has been lower than the level of interest in income inequality. Relative to other developed countries and member states of the Organisation for Economic Co-operation and Development (OECD), the degree of asset inequality in Korea is not high. Koreans have had less time to accumulate assets than people in developed countries (Lee, 2019), which has resulted in a lower level of inequality. On the other hard, the level of income inequality in Korea is similar to other OECD member states, which may explain the discrepancy between the interest in asset inequality and the interest in income inequality. However, the Korean Financial Crisis in 1998 amplified regional differences in the rates of real estate price increase, which subsequently elevated the level of asset differences and public interest in the causes and solutions of asset inequality. The second, and a more practical reason, is the difficulty in identifying the assets of individual economic actors; it is more difficult to measure one's income than one's assets. Collecting data on assets is also more difficult than collecting income data (Fagereng et al., 2016; Zucman, 2019).

A similar problem exists in collecting asset information through surveys. The collection of asset information is more likely to be affected by reporting errors and measurement errors than information on income. Obtaining accurate information from high-asset holders is particularly difficult, a key reason being the possibility of under-reporting. For example, the asset sizes identified through household surveys have been found to significantly differ from the asset sizes in the national balance sheet (Ju, 2015). To address this issue, Saez and Zucman (2016) proposed an asset estimation method using capital income identified from tax data. However, this approach requires an assumption that the return on assets remains constant regardless of asset size. These are some of the reasons for the relative lack of discussion pertaining to asset inequality in Korea.

Despite these restrictions, in this study, we examine the current status of asset inequality in Korea, investigate the causes of asset inequality, and estimate changes in asset levels under different policies. Asset inequality stems from a multitude of reasons, including: income inequality, inequality in economic opportunities, differences in response to economic and natural crises (wars, natural disasters, etc.), differences in tax burdens (income tax, property tax, inheritance/gift tax, etc.), regulation of the real estate market, education, health, and others. We approach the subject matter of this report in two ways: a microscopic review of

the influence of household income, home owners' educational attainment, and inheritance on asset size; and using a general equilibrium model, a macroscopic estimation of the influence of potential elements affecting asset gaps on asset levels.

II. Causes of Asset Gaps: Microscopic Analysis

In this chapter, we analyze the microscopic causes of asset gaps in Korea. Asset gaps can be caused by various reasons, with primary examples being socioeconomic factors such as income, health, and education. Income levels have been found to highly correlate with health and education (Cutler et al., 2011). It would thus be reasonable to think that income differences contributed to the formation of assets in Korea. However, given that education and health differences cause gaps in income levels, income level alone does not sufficiently explain asset gaps. In addition, income alone does not explain how differences in the formation of real property assets through inheritance and gift results in asset gaps.

We used the Fiscal Panel data to analyze the correlation between income and assets. Table 1 presents simple income correlations by year. The correlation coefficient between Year 1 income and Year 2 income is 0.76. The correlation between different years weakens when the two years are farther apart. The correlation between Year 1 income and Year 11 income is only 0.52. However, the positive correlation between Year 1 and Year 11 indicates the permanency of income. A household with higher Year 1 income is more likely to experience high household income in the following years. This permanency may result in income inequality.

The same can be said about assets. Table 2 presents the correlation coefficients between household assets in different years. The correlation coefficient between household assets in Year 1 and Year 2 was very high, at 0.83. The correlation coefficient between Year 1 household assets and Year 11 household assets was 0.62, which is lower, but positive nonetheless. The permanency of household assets is even more evident than that of household income. A household with larger household assets is more likely to hold larger assets in the following years. On account of these characteristics, asset inequality may be higher than asset inequality. For this reason, over time, asset inequality is likely to increase as households build their assets.

Table 1_Yearly Total Household Income By Year

Yearly household income	Year 1 2008	Year 2 2009	Year 3 2010	Year 4 2011	Year 5 2012	Year 6 2013	Year 7 2014	Year 8 2015	Year 9 2016	Year 10 2017	Year 11 2018
2008	1	-	-	-	-	-	-	-	-	-	-
2009	0.76	1	-	-	-	-	-	-	-	-	-
2010	0.72	0.78	1	-	-	-	-	-	-	-	-
2011	0.68	0.71	0.78	1	-	-	-	-	-	-	-
2012	0.67	0.69	0.74	0.78	1	-	-	-	-	-	-
2013	0.64	0.65	0.70	0.70	0.75	1	-	-	-	-	-
2014	0.63	0.65	0.69	0.71	0.75	0.77	1	-	-	-	-
2015	0.59	0.60	0.65	0.65	0.71	0.71	0.78	1	-	-	-
2016	0.58	0.57	0.63	0.61	0.67	0.68	0.72	0.75	1	-	-
2017	0.56	0.56	0.58	0.58	0.62	0.65	0.68	0.68	0.77	1	-
2018	0.52	0.52	0.53	0.52	0.60	0.58	0.62	0.66	0.68	0.73	1

Source: Present study

Table 2_Yearly Total Household Assets By Year

Household assets	Year 1 2008	Year 2 2009	Year 3 2010	Year 4 2011	Year 5 2012	Year 6 2013	Year 7 2014	Year 8 2015	Year 9 2016	Year 10 2017	Year 11 2018
Year 1	1	-	-	-	-	-	-	-	-	-	-
Year 2	0.83	1	-	-	-	-	-	-	-	-	-
Year 3	0.66	0.71	1	-	-	-	-	-	-	-	-
Year 4	0.65	0.70	0.77	1	-	-	-	-	-	-	-
Year 5	0.69	0.73	0.67	0.73	1	-	-	-	-	-	-
Year 6	0.69	0.73	0.69	0.75	0.84	1	-	-	-	-	-
Year 7	0.62	0.65	0.59	0.68	0.77	0.80	1	-	-	-	-
Year 8	0.63	0.66	0.62	0.69	0.75	0.83	0.84	1	-	-	-
Year 9	0.59	0.60	0.55	0.66	0.66	0.75	0.77	0.87	1	-	-
Year 10	0.55	0.55	0.46	0.54	0.61	0.63	0.64	0.65	0.65	1	-
Year 11	0.62	0.66	0.57	0.64	0.69	0.75	0.73	0.79	0.82	0.72	1

Source: Present study

In the following paragraphs, we examine microscopic factors causing asset gaps between households. Factors suggested in previous researches include educational attainment, income inequality, factors related to inheritance and savings, saving ratio difference, and difference in return on capital. In this chapter, we focus on educational attainment, income level, and inheritance as causes of asset gaps, and examine if these factors can explain asset gaps in Korea.

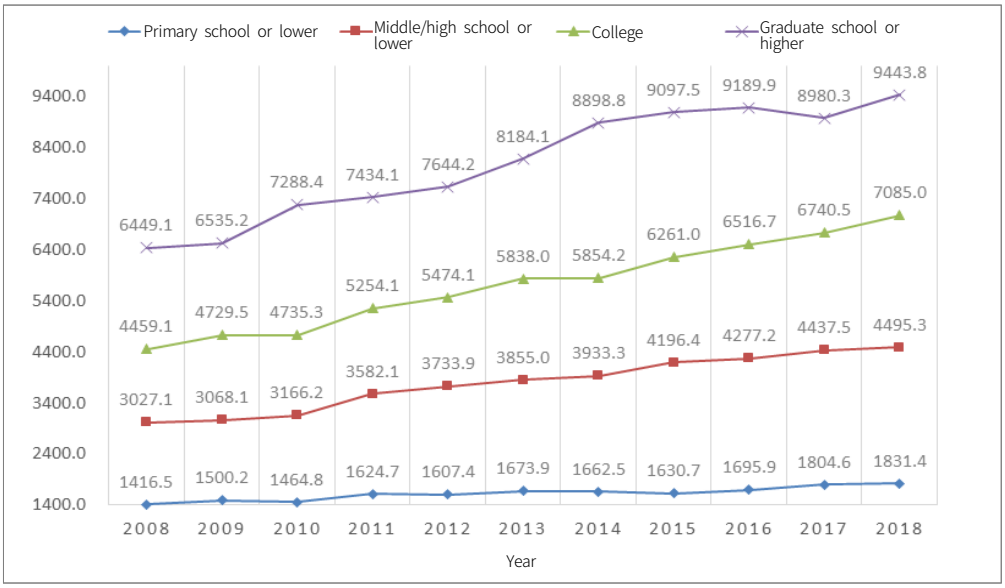
1. Education, Income and Assets

The educational attainment and economic activities of individuals and home owners greatly affect their economic activities and social environment. Theoretically, education boosts income, and this increased income can be used to accumulate assets. Therefore, differences in educational attainment may result in differences in income levels and asset levels. However, before examining the effect of educational attainment on asset gaps, we must first examine its effect on income levels.

Figure 1 shows the correlation between home owners' educational attainment and household income levels. Assuming that the home owners completed regular education courses, we divided the households into four groups based on the home owners' educational attainment in Year 1 of the Fiscal Panel survey (2008). The four groups were divided based on the educational attainment of the home owner: primary school graduate or lower, middle/high school graduate, college graduate, graduate school or higher. In the figure, the yearly household income is seen to greatly vary depending on the level of educational attainment, and this difference persists until 2018, ten years after the first survey year.

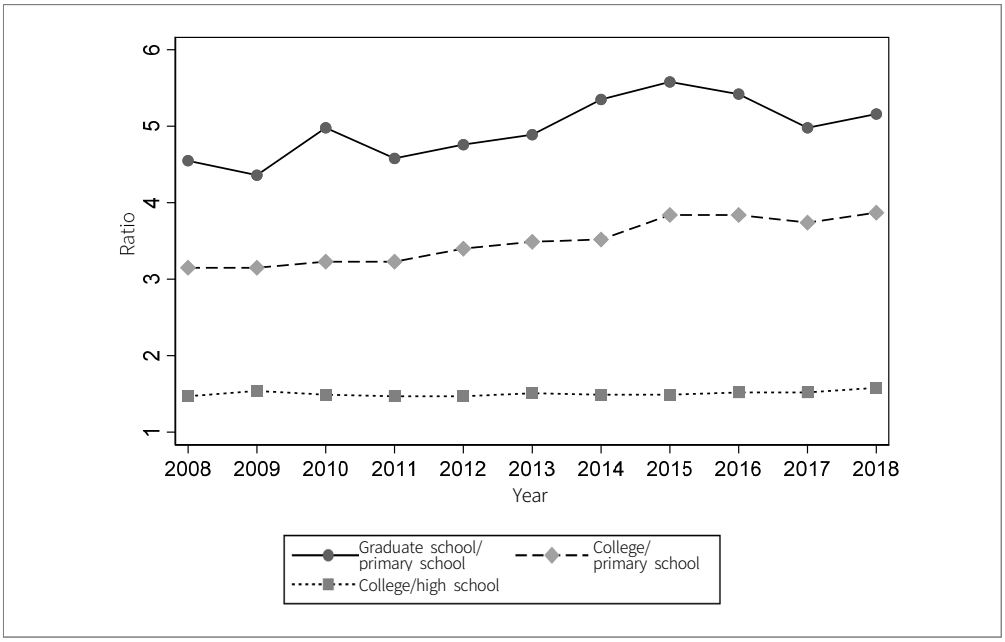
Figure 1_Income Effect of Educational Attainment of Home Owners

(Unit: KRW 10,000)



Source: Present study

Figure 2_Income Ratios Across Educational Attainment Levels of Home Owners By Year



Source: Present study

One noteworthy characteristic is the rate of growth. A simple comparison of household income between 2008 and 2018 shows that household income increased by 46% if the home owner graduated from a graduate school or a higher educational institution, by 58% if the home owner's highest educational attainment is a college diploma, by 48% if the home owner's highest educational attainment is a high school diploma or lower, and by 29% if the home owner only graduated from a primary school. Figure 2 presents income ratios between different groups. The first line represents the ratio between the household income of home owners with graduate school diplomas and home owners who are primary school graduates. The second line shows the ratio between the household income of home owners with college diplomas and home owners who are primary school graduates. The last line shows the ratio between the household income of home owners with college diplomas and home owners with high school diploma. The graphs indicate an increase in the income ratio between graduate school graduates and primary school graduates, and the income ratio between college graduates, and primary school graduates. On the other hand, the income ratio between college

graduates and high school graduates remains steady at around 1.5:1. The figure indicates that the income gap between home owners with very low educational attainment and those with medium or higher educational attainment is likely to continue to increase, possibly resulting in social inequality and asset inequality.

In the following sections, we examine the distribution of assets across different levels of home owners' educational attainment. Figure 3 shows the distribution of assets using a similar method as above. In 2008, households with home owners who are primary school graduates reported average assets of KRW 92.64 million, and the average household assets of home owners who are college graduates were KRW 322,94 million.

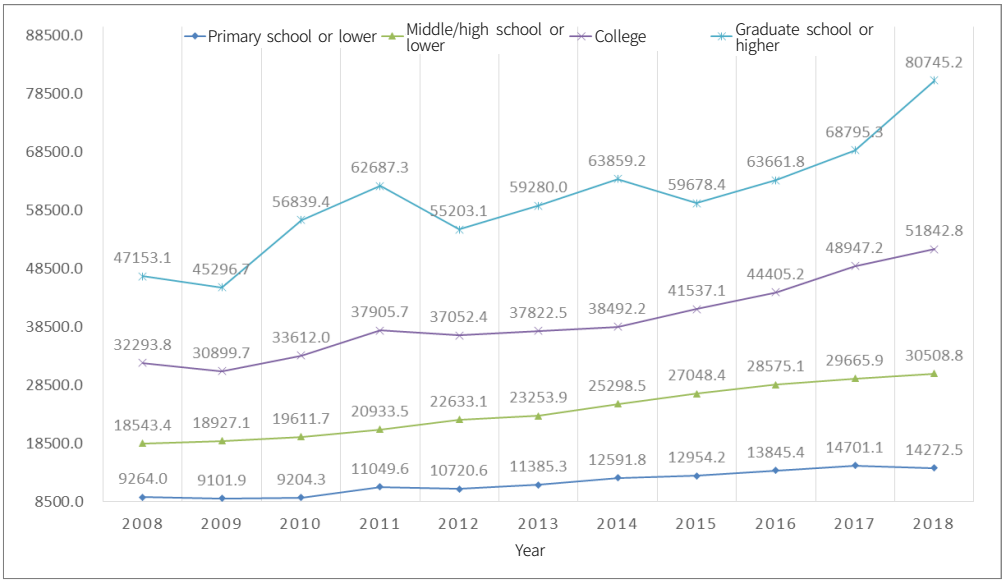
This difference persists in 2018, ten years from the first year the data was collected. The size of the difference also increased. As of 2018, the average household assets of home owners with college diplomas was KRW 518,32 million, whereas home owners who are primary school graduates reported only an average of KRW 142,72 million in household assets. The asset ratios between home owners having different levels of educational attainment are shown in Figure 4. The graphs show trends similar to the income ratios across different educational attainment levels, although the asset gaps do not increase over time as markedly as the income gaps across educational attainment levels. However, the sizes of the asset differences are larger than for the income differences.

In conclusion, the income gaps across different levels of home owners' educational attainment increase over time. On the other hand, the asset gaps across different educational attainment levels do not improve or exacerbate as markedly as for the income gaps. The changes in the asset gap sizes indicate the effect of educational attainment on asset inequality. However, educational attainment alone does not fully explain the persistence and exacerbation of the inequality.

As mentioned above, education affects the accumulation of assets through multiple routes. As such, a comprehensive review of the effect of educational differences on asset gaps requires further study as to how variables mediating the effect of education on assets affect asset gaps.

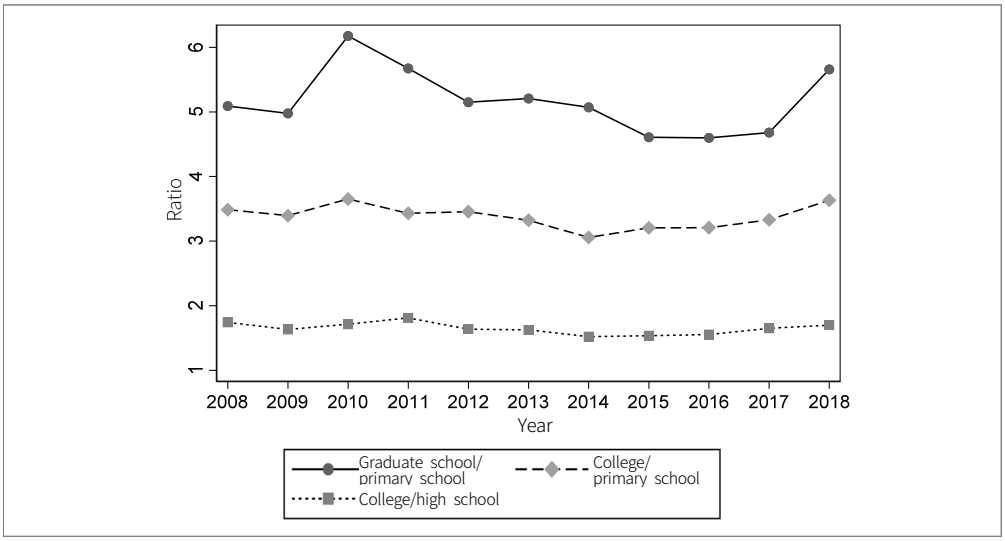
Figure 3_Effect on Assets Across Educational Attainment Levels of Home Owners

(Unit: KRW 10,000)



Source: Present study

Figure 4_Asset Ratios Across Educational Attainment Levels of Home Owners By Year

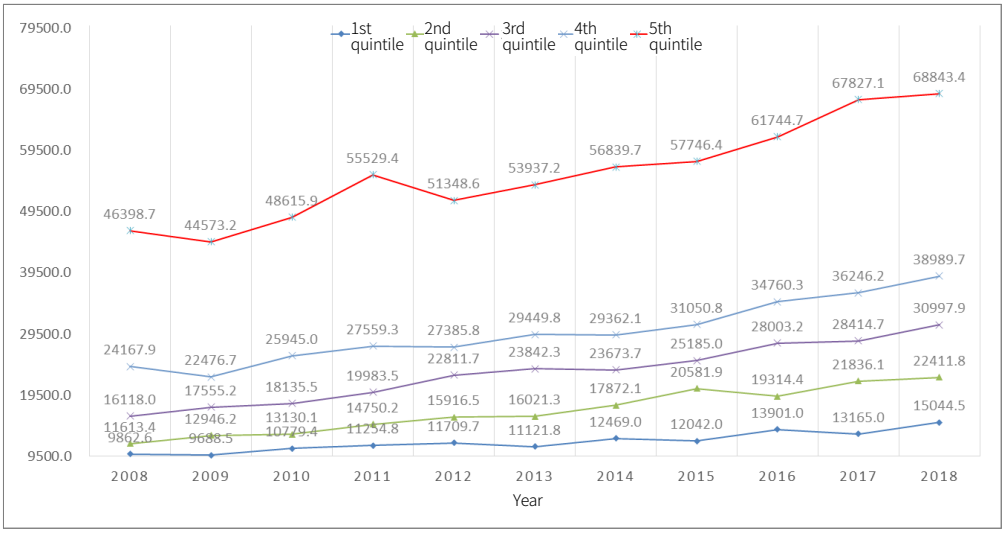


Source: Present study

Therefore, for a comprehensive review, it would be meaningful to examine the effect of income differences on asset gaps. Figure 5 shows the distribution of assets across income quintiles by year. For example, in 2008, an average household in the first income quintile held KRW 98.53 million in assets. In contrast, an average household in the fifth income quintile held KRW 463.98 million in assets. These gaps persisted until 2018. Figure 6 presents the trends of asset ratios across income quintiles. The ratios are between the household assets of the first, second, third, and fourth quintiles and those of the fifth income quintile. In the figure, the ratios between the second, third, and fourth quintiles and the fifth income quintile are seen to slightly decline over time. On the other hand, the ratio between the first and the fifth income quintiles remain relatively steady, with only slight fluctuations. The graphs show a growing gap between the assets of the first income quintile and those of the other income quintiles. Not surprisingly, a lower yearly income results in a lower accumulation of assets, which may increase the asset gaps between income groups. However, this correlation alone does not fully explain the concentration of assets in the top asset groups.[1]

Figure 5_Asset Distribution Across Income Quintiles By Year

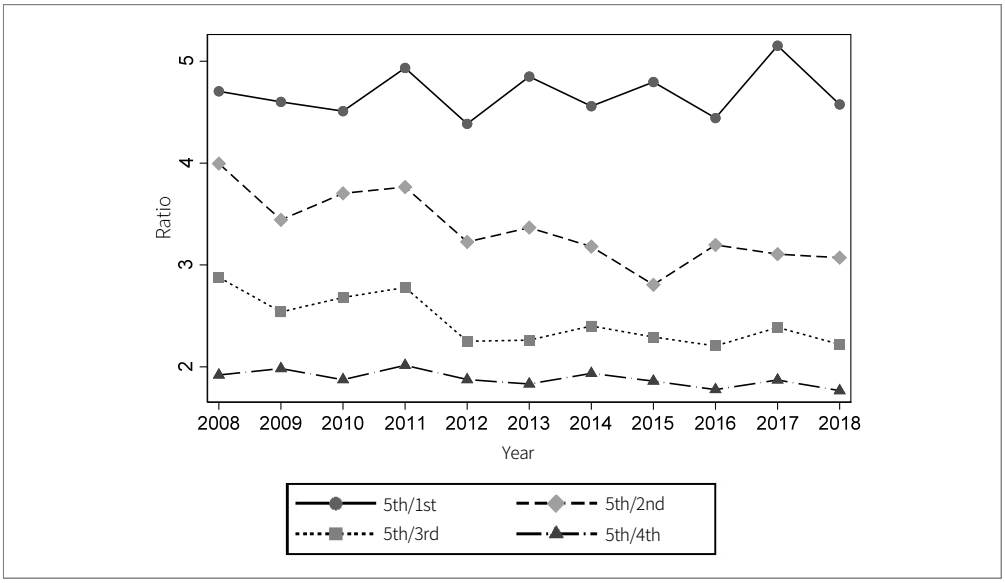
(Unit: KRW 10,000)



Source: Present study

1 The Fiscal Panel also includes data regarding the distribution in the top 1% or 0.1% percent. However, we did not include this data in our discussion on account of the extremely small sample size.

Figure 6_Asset Gaps Across Income Quintiles By Year

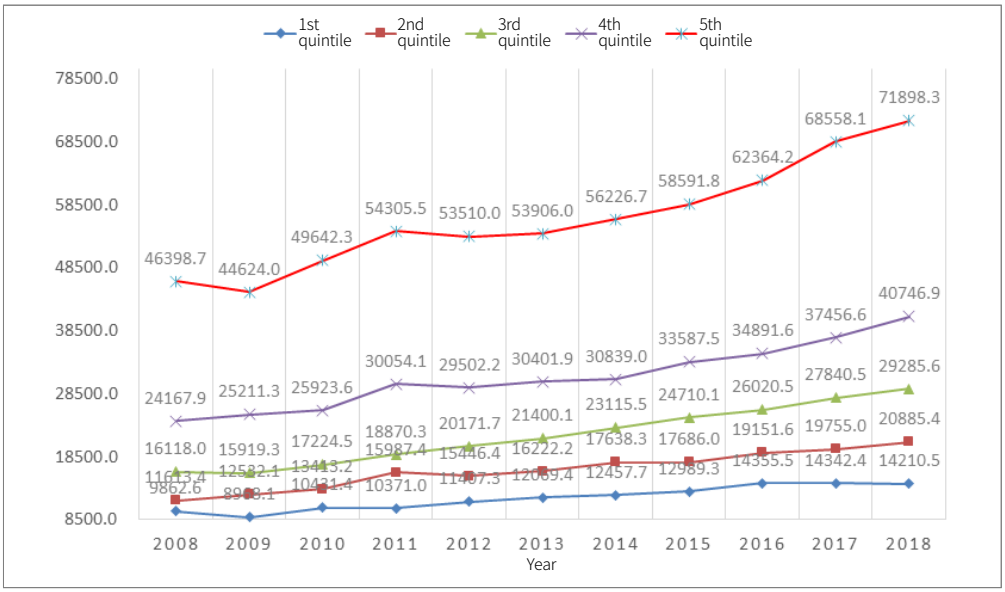


Source: Present study

To understand the long-term effect of income distribution on asset gaps, we analyzed the asset distribution based on 2008 income. Note that the Fiscal Panel does not provide data specific to households' initial income, that is, income earned when a household first began to earn income. For this reason, we decided to analyze household income from 2008. As mentioned above, we assumed the permanency of income and examined changes in the asset distribution over a ten-year period across the income quintiles (See Figure 7). The average assets of households in the first 2008 quintile were KRW 98.62 million and KRW 142.10 million in 2018, reporting an increase of 44%. On the other hand, the average household assets of the fifth quintile in 2008 were KRW 463.98 million and KRW 718.98 in 2018, for an increase of 55%. Figure 8 shows the asset gap ratios across different income quintiles(See Figure 7). The asset gaps display trends similar to the gaps represented in Figure 6. The first and the fifth income quintiles initially fluctuated somewhat, before increasing in recent years. The differences with the other quintiles were found to decrease.

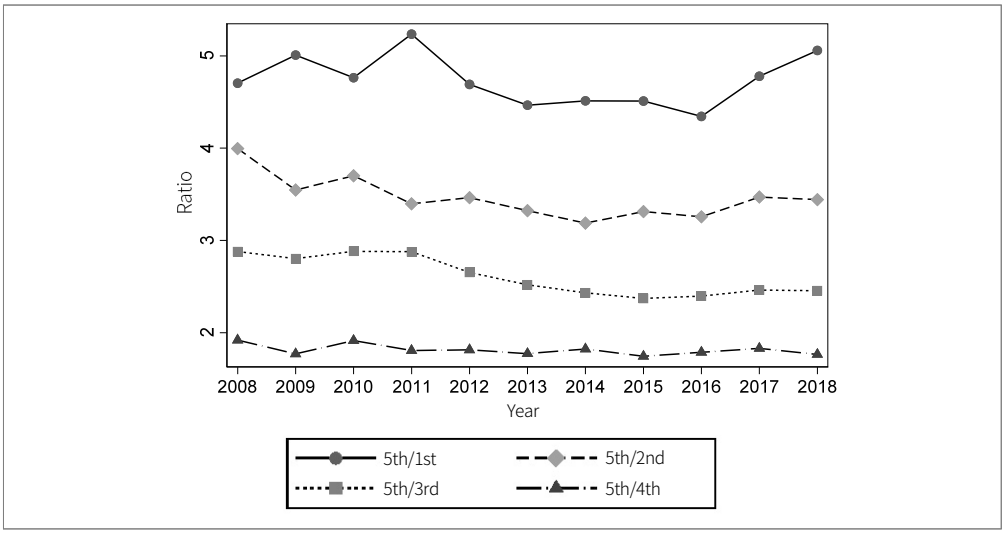
Figure 7_Asset Distribution Across 2018 Income Quintiles

(Unit: KRW 10,000)



Source: Present study

Figure 8_Asset Gaps Across 2018 Income Quintiles

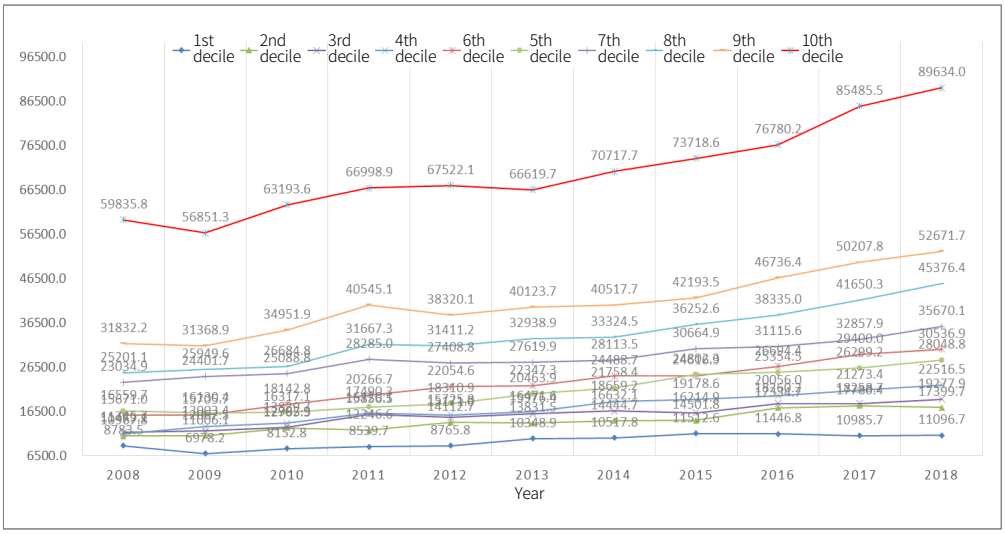


Source: Present study

Figure 9 shows the same analysis based on income deciles. In 2008, the tenth decile reported higher assets than the other deciles, and the gap between the tenth and the other deciles did not decline. In the same year, the first decile reported KRW 87.83 million in average household assets, whereas the fifth and tenth deciles reported KRW 165.59 million and KRW 598.35 million, respectively. In 2018, the first decile reported KRW 110.97 million in average household assets, whereas the fifth and tenth deciles reported KRW 280.49 million and KRW 896.34 million, respectively. Figure 10 shows the trends of asset gaps across the income deciles. In 2008, the household assets of the households in the tenth income decile were 6.8 times as large as those of the households in the first income decile. This ratio increased to 8.1 times by 2018. The asset gap between the two deciles fluctuated during the last 10 years, but began to increase in 2013. The graphs also show the asset ratios between the second, third, seventh, and ninth decile and the tenth decile based on 2018 income, which remain at somewhat constant levels. For example, the household assets of the households in the tenth income decile in 2008 were 5.1 times as large as those of households in the seventh income decile. The ratio slightly decreased to 4.6 times by 2018.

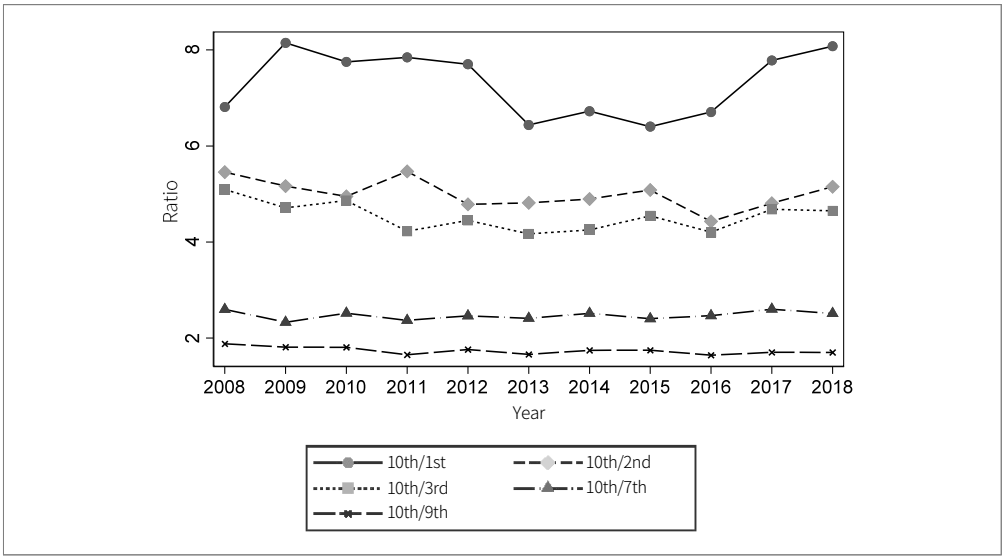
Figure 9_Asset Distribution Across 2018 Income Deciles

(Unit: KRW 10,000)



Source: Present study

Figure 10_Asset Gaps Across 2018 Income Deciles



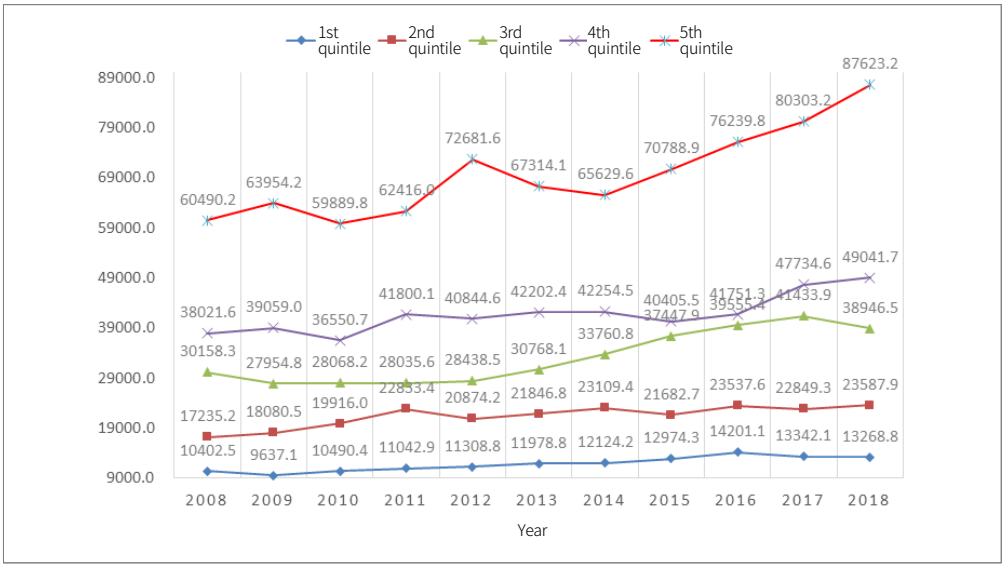
Source: Present study

Another consideration is that the effect of income on asset gap may vary depending on the age group. People aged 50 or older have worked for a longer period of time, giving them sufficient time to accumulate assets, which is not the case for younger generations. To verify this possibility, we examined how asset gaps across income quintiles in 2008 vary depending on the home owner's age. Figures 11 and 12 show the asset distribution across 2008 income quintiles in households for home owners 60 and older, that is, born in 1948 or earlier. The findings are similar to those discussed above. Households in the fifth and tenth deciles accumulated more assets relative to the other quintiles and deciles. These trends are observed across all household age groups.[2] In particular, the households in the tenth income decile in 2008 reported an increase in assets after the 2009 Global Financial Crisis, across all age groups. This finding indicates an increase in asset inequality similar to the trend during the 1997 Financial Crisis. Members of a higher-income household are more likely to have better jobs, and be less affected by financial crises. Indeed, these differences may have created the differences in assets between high and low income households.

2 See Jeong, Kang, and Choi (2020) for discussions on the fifth quintile in other age groups.

Figure 11_Asset Gaps Across 2018 Income Quintiles for Home Owners Born in 1948 or Earlier

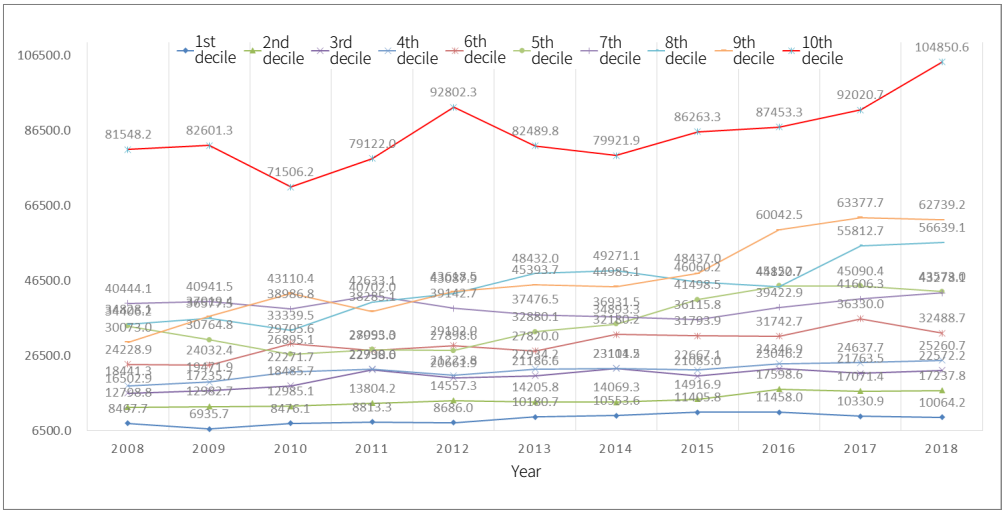
(Unit: KRW 10,000)



Source: Present study

Figure 12_Asset Gaps Across 2018 Income Deciles for Home Owners Born in 1948 or Earlier

(Unit: KRW 10,000)



Source: Present study

Table 3 compares the asset gaps in each year across different age groups. For home owners aged 60 or older in 2008 (born in 1948 or earlier), the household assets of the tenth income decile in 2018 were 9.6 times larger than those of the first income decile. By 2018, the ratio between the tenth and first deciles increased to 10.4. Similar trends can be found in previous research. Elderly households report a far greater effect of income inequality on asset inequality than any other age group (Poterba et al., 2018). For elderly households, their income at the time of retirement is highly correlated with their asset accumulation in the following years.

For home owners aged between 50 and 59 in 2008 (born between 1949 and 1958), the household assets of the tenth income decile in 2018 was 6.2 times larger than for the first income decile. The ratio increased to 9.4 in 2018, displaying a similar trend as the former group. These findings once again confirm the effect of income at the time of retirement on asset inequality.

Conversely, for age groups under 50 as of 2008, the asset gap between the tenth and the first income decile declined between 2008 and 2018. That is, for younger age groups, income inequality alone does not sufficiently explain asset inequality after ten years. In the Introduction, we mentioned that inequality did not significantly change, or was only slightly exacerbated, during the 2000s. If we analyze these statistics in connection with the relationship between income and asset inequality among age groups under 50, we come to the conclusion that their asset inequality may have actually been affected by factors other than income.

Table 3_Asset Gaps Across Income Decile By Home Owner Age

2008 2018	10th/1st	10th/2nd	10th/3rd	10th/4th	10th/5th	10th/6th	10th/7th	10th/8th	10th/9th
1948 or earlier	9.6	6.4	4.9	4.4	2.4	3.4	2.0	2.3	2.7
	10.4	6.1	4.6	4.2	2.4	3.3	2.4	1.9	1.7
1949~1958	6.2	7.2	6.8	4.2	3.3	3.2	3.1	2.5	2.1
	9.4	7.4	5.4	3.5	2.9	3.4	2.9	2.3	1.9
1959~1968	5.7	8.6	5.0	7.2	5.5	4.7	2.9	2.2	1.6
	3.7	4.6	3.7	4.2	4.3	2.8	2.3	1.5	1.4
1969 or after	4.8	8.4	8.9	8.1	5.3	3.9	2.5	2.3	1.5
	4.3	3.3	7.4	4.6	4.1	2.7	2.5	2.5	1.8

Source: Present study

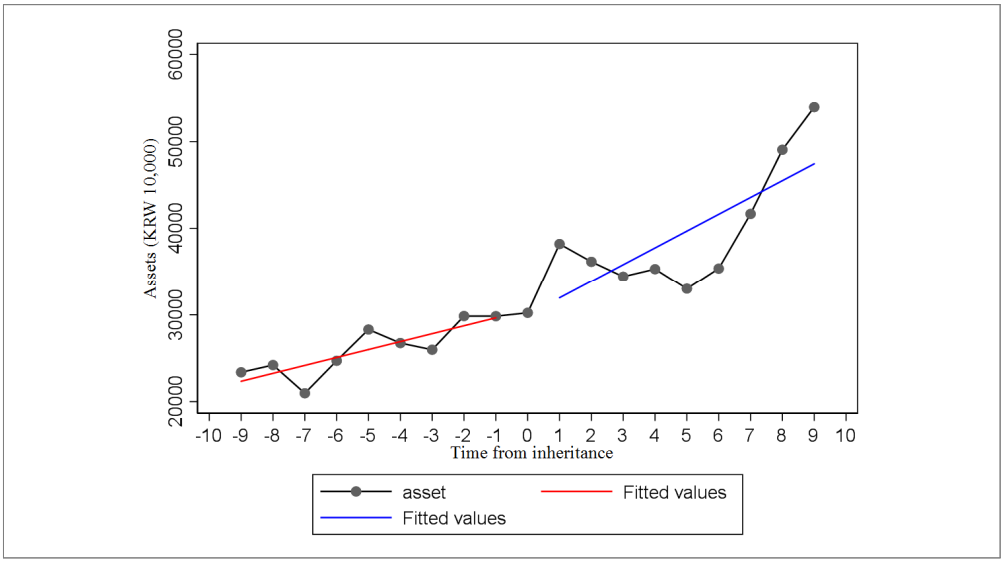
In other words, the causes of asset gaps may be heterogeneous across different age groups. As discussed thus far, income inequality can be correlated with asset gaps, with households having older home owners reporting a higher correlation between income inequality and asset inequality. However, across all age groups, income inequality alone does not fully explain the full extent of asset inequality, which warrants a more comprehensive review of potential factors.

2. Inheritance and Asset Gaps

Other than income level, inheritance should also be considered a key potential factor. In this chapter, we analyze the Fiscal Panel survey data to identify changes in household assets after inheritance. This analysis will allow us to confirm the effect of inheritance on asset gaps. Specifically, we analyze the assets of households that received inheritance between 2008 and 2018, after adjusting the values for each year's price index. The Fiscal Panel survey collects information regarding inheritance status and the amount of inheritance. We used this data in our analysis.

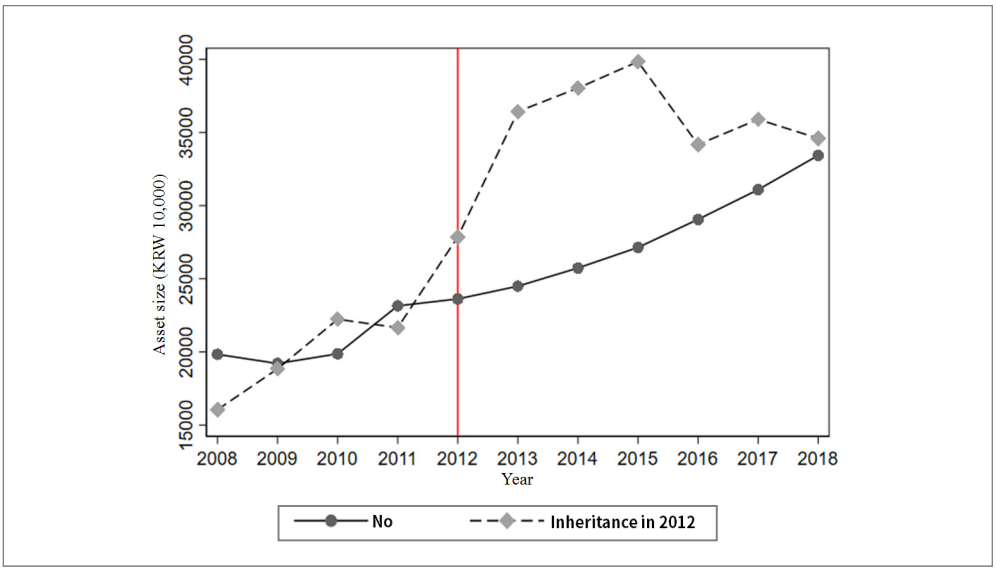
Figure 13 shows the changes in asset sizes before and after inheritance, where the time point 0 indicates the time of inheritance. An average household reported a KRW 100 million increase in assets a year after receiving inheritance. The average asset size slightly declined thereafter, and recorded a steep increase in the long run. It is immediately understandable that a household's asset size increased after inheritance. Notably, the rate of asset increase changed before and after inheritance. The asset size increased faster after inheritance, which can be linked to the findings of previous research that changes in return on assets may vary depending on the asset size. In other words, inheritance increased the asset size. The increased asset size then increased the return on assets and resulted in a further accumulation of assets, ultimately exacerbating asset inequality. An average household with no inheritance would hold smaller assets than a household with inheritance. If the return on assets differed between two households at the time of inheritance, the difference would result in a wider asset gap. Therefore, we need to further examine the differences between households receiving inheritance and those that do not.

Figure 13_Changes in Assets Before and After Inheritance



Source: Present study

Figure 14_Comparison of Households Receiving and Not Receiving Inheritance (2012)



Source: Present study

Figure 14 compares the assets of households receiving and not receiving inheritance. An average household receiving inheritance holds more assets than an average household not receiving inheritance, even when excluding the inherited assets. To analyze the effect of inheritance on asset gaps, we subsequently compared the treatment group consisting of households receiving inheritance with the control group consisting of households not receiving inheritance. Households inherit assets at different points of time. Therefore, as shown in Figure 14, we analyzed the households that inherited assets as of 2012. An accurate comparison between the two groups requires similar asset trends between the households receiving inheritance and the households not receiving inheritance before the time of inheritance. In other words, the analysis needs to satisfy the difference-in-difference assumptions; otherwise, caution is needed when interpreting the findings. An analysis of the graphs shows that the asset size of the households receiving inheritance rapidly increased in 2013, immediately after the year of inheritance. Their assets also increased at a faster rate than for households not receiving inheritance. These findings seem to indicate that asset gaps can be explained by inheritance and return on assets. In particular, the asset size and rate of growth immediately following inheritance supports the hypothesis.

III. Policy Changes and Asset Gaps: Macroscopic Analysis

1. Models

In this chapter, we use models to examine various factors causing asset gaps and the effect of various tax policies. To this end, we develop a general equilibrium model that consists of heterogeneous individuals with different characteristics. Each individual included in the analysis model is different in many respects. They vary in terms of labor productivity and return on capital, as well as their time discount rate, that is, how they perceive their future. These differences translate into different choices, which in turn results in differences in income and assets.

We used the overlapping generation model proposed by Blanchard. It is also known as the perpetual youth model in the relevant literature. In the model, each economic agent makes decisions based on the premise that their life is finite. At the same time, it is as easy to build and interpret as the infinite horizon model.

Each household under the model has the following utility function, where the utility

function of consumption can be separated from the utility function of labor.

$$u(c_t, l_t) = \frac{c_t^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} - B\frac{l_t^{1+\frac{1}{\eta}}}{1+\frac{1}{\eta}}$$

Individual households make consumption (C_t) and labor supply(l_t) choices that maximize the discounted sum of utilities in each period, by considering the budget constraint equation. Each household faces the following issues.

$$\begin{aligned} &\max\ E_0 \sum_{t=0}^{\infty} \left(\prod_{s=0}^{t} \beta_s\right) \overline{\beta}^{\,t} u(c_t, l_t) \\ &s.t.\quad c_t + a_{t+1} = (1-\tau_l)(w_t e_t l_t + r_t z_t a_t) + (1-\tau_a) a_t \\ &a_t \geqq a_{\min} \end{aligned}$$

When making a decision, each household accepts the wage (W_t) and the average return on capital (r_t) as given. A household's labor productivity (e_t), individual return on capital (z_t), and time discount rate (β_t) can then change in each period. Labor productivity changes in accordance with the following equation, with the impact of labor productivity displaying a log-normal distribution.

$$\ln e_t = \rho_e \ln e_{t-1} + \varepsilon_t^{\,e}, \qquad \varepsilon_t^{\,e} \sim N(0, \sigma_e^{\,2})$$

In addition, a household's individual return on capital can be stochastically determined based on the following process

$$\ln z_t = \rho_z \ln z_{t-1} + \varepsilon_t^{\,z}, \qquad \varepsilon_t^{\,z} \sim N(0, \sigma_z^{\,2})$$

Lastly, the time discount rate changes as follows.

$$\ln \beta_t = \rho_\beta \ln \beta_{t-1} + \varepsilon_t^{\,\beta}, \qquad \varepsilon_t^{\,\beta} \sim N(0, \sigma_\beta^{\,2})$$

In the above equation, the labor productivity and individual return on capital of a

household converges to 1, and the individual time discount rate also converges to 1. The overall time discount rate of each period converges to $\overline{\beta}$.

In addition, the home owner of each household has a chance π to die. When a home owner dies, their children inherit from the home owner. The children also inherit the home owner's labor productivity, return on capital, and time discount rate, in addition to the home owner's assets. However, children are required to pay taxes on their inheritance. Home owners love their children, and want their children to inherit what they have. For this reason, they put similar values on their children's utility as their own utility. However, the children's utility is discounted by an additional β_d.

In the economy for this model, the government imposes three taxes: income tax (τ_l), property tax (τ_a), and inheritance tax (τ_b). The income tax and the inheritance tax have progressive tax rate structures that consider income and assets. On the other hand, the property tax is fixed. In the following paragraphs, we will examine how the distribution of assets affected by changes in these three policy variables.

The following equation presents a recursive form of the issues faced by individual households.

$$
\begin{aligned}
&V(a;e,z,\beta)\\
&\qquad = \max_{a',l}\{u(c,l)+E[(1-\pi)\beta\overline{\beta}\,V(a';e',z',\beta')+\pi\beta\overline{\beta}\,V\\
&\qquad\quad ((1-\tau_b)a';e',z',\beta')\,|\,e,z,\beta]\}\\
&where \qquad c=(1-\tau_l)(wel+rza)+(1-\tau_a)a-a'
\end{aligned}
$$

In the economy for this model, let a single representative company produces goods use the following production function.

$$Y_t = K_t^{\alpha} L_t^{1-\alpha}$$

The company hires workers and borrows capital to produce goods in each period. Where the variable $k_t = \frac{K_t}{L_t}$ is the labor-capital ratio, the wages paid by a company in a complete competitive market are determined by the marginal productivity of labor, and the return on capital is determined by the marginal productivity of capital.

$$W_t = (1-\alpha){k_t}^{\alpha}$$

$$r_t = \alpha {k_t}^{\alpha-1} - \delta$$

The closing conditions of the labor market and the capital market are as follows. The total labor supply is determined by the sum of multiplications between the labor supply and the productivity of individual households. The total capital is determined by the sum of multiplications between the assets and the individual return on capital of individual households.

$$L_t = \int_0^1 e_t(i) l_t(i) di$$

$$K_t = \int_0^1 z_t(i) a_t(i) di$$

Lastly, the government in this model spends all tax revenues as government expenditures.[3]

$$G_t = \int_0^1 \tau_l(i)[w_t e_t(i) l_t(i) + r_t z_t(i) a_t(i)] + \tau_a(i) a_t(i) + \tau_b a_t(i) X$$

where variable G_t represents the total government expenditure, and X is the indicator variable that has a value of 1 if a home owner dies, and 0 if a home owner lives.

3 In this model, government expenditure does not contribute to consumers' utility. Nor is it returned to households. Some may think that, in this model, the government dumps people's taxes in the ocean. However, transfer payments to households are already considered in the model by excluding the transfer payments from the net income tax rate, and the government expenditures do not affect the labor supply or total production, even when considering it in a separable form.

2. Parameter Values

To analyze the causes of asset gaps and the effect of tax policies on the Korean economy using this model, we first need to set parameter values based on Korean data. However, parameter setting can be difficult because we intend to replicate the formation of asset gaps caused by long-term changes as the model's steady state. Another issue is whether to use the parameter values applicable to the Korean economy, or use the long-term average values from the past. For the purpose of this chapter, we set the parameter values based on the current Korean economy. This choice seems to be suitable for the purpose of this study, which is to analyze current asset gaps. We also considered the difficulty with obtaining past data and statistics.

The elasticity of substitution between different periods γ was set at 0.5, and the value of parameter η, which is the Frisch labor elasticity, was set at 1. These values have been typically used in relevant research. The average retirement age in Korea is 57 (Son, 2010), and their average age of entry into the labor market is around 28, given the average age of new recruits.[4] In the model, the inclusion of new home owners and the death of existing home owners should be interpreted as entry and exit from the labor market. Therefore, we set the life expectancy of agents in the model at 30. As a result, we set the probability of individuals' death π_{death} at 0.033.

In addition, we set the value of parameter α, which determines the percentages of labor and capital income in the model, at 0.35. This value represents a labor income distribution ratio of 65%, which is similar to the values used by Lee et al. (2014). Values for the depreciation rate δ and average time discount rate $\overline{\beta}$ were set at 0.1 and 0.96, respectively. We set the values of the continuity and variation of productivity, which determine individuals' labor productivity (ρ_e and σ_e) at 0.80 and 0.354, respectively, as estimated by Kim and Jang (2008).

The remaining parameters include: disutility of labor supply, household borrowing limit, preference for individual return on capital, continuity and variation of individual return on capital, and parameters affecting the continuity and variation of individual return on capital (B, $a_{\min}$, ρ_z, σ_z, ρ_β, and σ_β). However, it is not readily clear how the values of the six parameters can be estimated from microdata. For this reason, we set the values of these six parameters in alignment with the six macroscopic statistical values: real return on capital, asset

4 2016 Average Age of New Recruits survey by Job Portal Saramin, http://mobile.newsis.com/view.html?ar_id=NISX20161121_0014531043#imadnews

continuity, asset variation, Gini coefficient on assets, Gini coefficient on wages, and income quintile share ratio. For the average real return on capital, we used 2.25%, which is the average interest rate between 2000 and October 2019 for three-year AA- treasury bonds disclosed by the Bank of Korea, less the consumer price inflation (2.39%).

The target values of asset continuity and asset variation were calculated as follows. Using the 2012~2017 Survey of Household Finances and Living Conditions data, we estimated the following regression analysis (Equation (1)) based on individuals' net assets. Then, we set the value of the AR(1) coefficient of individual assets ρ_a as the value of asset continuity, and set the standard deviation value of error term ϵ_{it}^a as the value of asset variation.

$$lna_{it} = \alpha + \rho_a lna_{it-1} + \epsilon_{it}^a, \qquad \epsilon_{it}^a \sim N(0, \sigma_a^2) \tag{1}$$

Then, using a simulation, we generated panel data similar to the Survey of Household Finances and Living Conditions data, to create an estimate using the same equation, and set the parameter values such that the coefficient values were similar to those from the Survey of Household Finances and Living Conditions. For the Gini coefficient on income, Gini coefficient on assets, and income quantile share ratio, we used the 2017 data from the Survey of Household Finances and Living Conditions.

In the model, the inheritance tax and the income tax have progressive tax rate structures, and the property tax rate is fixed. To account for the progressive income/inheritance tax rate structures, we used the Heathcote-Storesletten-Violante (HSV) tax equation proposed by Heathcote et al. (2017). The HSV tax equation determines post-tax disposable income as follows.

$$D(y_i) = \lambda_l {y_i}^{1-\tau_l} \tag{2}$$

Variable y_i in Equation (2) represents the individuals' market income. Parameter λ_l determines the average tax rate, and Parameter τ_l determines the progressivity. Then, the amount of the income tax paid by each individual and the marginal income tax rate are determined as follows.

$$\text{Income tax paid: } T(y_i) = y_i - \lambda_l {y_i}^{1-\tau_l}$$

$$\text{Marginal income tax rate: } \frac{dT(y_i)}{dy_i} = 1 - (1-\tau_l)\lambda_l y^{1-\tau_l}$$

The income tax imposed upon a home owner's death is also determined by the HSV tax equation. The post-tax inherited assets are as follows.

$$D(a_i) = \begin{cases} a_i & if \quad a_i \leqq K_b \\ K_b + \lambda_b (a_i - K_b)^{1-\tau_b} & if \quad a_i > K_b \end{cases}$$

If the inherited amount is K_b or higher, the amount and marginal tax rate of the inheritance tax are determined as follows.

$$\text{Inheritance tax paid: } T(a_i) = a_i - K_b - \lambda_b (a_i - K_b)^{1-\tau_b}$$

$$\text{Marginal inheritance tax rate: } \frac{dT(a_i)}{da_i} = 1 - (1-\tau_b)\lambda_b (a_i - K_b)^{-\tau_b}$$

As for the property tax, the model used a fixed rate.

Parameter λ_l, which determines the income tax level, was given a value that matches the average income tax rate (3.75%), as estimated by Chang et al. (2015) based on the 2010 Household Income and Expenditure Survey data. Parameter τ_l, which determines the progressivity of the income tax, was given a value of 0.1371, as estimated by Chang et al. (2015) based on 2006~2013 data. Parameter λ_b, which determines the inheritance tax level, was given a value that sets the average inheritance tax rate of the model at 18%. This value is based on the average Inheritance Tax and Gift Tax rates in the 2017 Statistical Yearbook of National Tax, which are 17.73% and 19.41%, respectively, represented by the inheritance tax in this model. The progressivity of the inheritance tax τ_b was set at 0.121, as estimated using the HSV tax equation based on the real marginal inheritance tax rate. Parameter K_b, which determines the scope of the inheritance tax exemption, was set at 0.84, which is the average ratio between the Income Tax revenue and the sum of the total Inheritance Tax and Gift Tax from 2013 to 2017 in the Statistical Yearbook of National Tax. Lastly, the property tax rate was set at 0.022, which is the average ratio between the Income Tax revenues and the General Real Property Tax, a national tax represented by the income tax in the model from 2013 to 2017 in the Statistical Yearbook of National Tax.

Table 4 highlights the target values and statistics, in addition to the values and statistics used in the model. From the table, the parameters were defined to bring the statistics used in the

model quite close to the target values based on the data. Table 5 shows the parameter values used in the model. To match the target statistics, we set the value of return on capital continuity and return on capital variation at 0.90 and 0.50, respectively. The variation of return on capital required for matching the asset distribution and other variables turned out to be very high. In addition, the continuity of the time discount rate was surprisingly low, whereas the variation was very high. These findings imply the importance of diversity in preferences and the impact of consumption experienced by individual households in explaining the distribution of assets and income in Korea. The income tax exemption threshold was quite high, at 5.6. In the economy for this model, the average amount of assets and the median value of assets were only 2.22 and 1.23, respectively. Therefore, it would appear that most households in the economy did not pay any inheritance tax.

Table 4_Target Statistics

Target Statistics	Target	Models	Description
Real return on capital	2.25%	2.18%	Difference between treasury bonds (3 years, AA-) interest rate (4.65%) and consumer price inflation (2.39%)
Asset continuity	0.92	0.92	-
Asset variation	0.67	0.64	-
Asset Gini coefficient	0.58	0.58	Survey of Household Finances and Living Conditions (2017)
Market income Gini coefficient	0.41	0.36	Survey of Household Finances and Living Conditions (2017)
Fifth asset quintile ratio	101	99	Survey of Household Finances and Living Conditions (2017)
Average income tax rate	3.75%	3.96%	Chang et al. (2015)
Average inheritance tax rate	18%	18.01%	Statistical Yearbook of National Tax (2017)
$\frac{\text{Total inheritance+Gift Tax revenue}}{\text{Income Tax revenue}}$	0.84	0.94	Statistical Yearbook of National Tax (2017)
$\frac{\text{General Real Property Tax revenue}}{\text{Income Tax revenue}}$	0.022	0.024	Statistical Yearbook of National Tax (2017)

Table 5_Parameter Values of the Reference Economy

Item	Parameter	Value	Description
Preferred system	γ	0.5	Elasticity of substitution
	η	1	Frisch labor elasticity
	B	0.8	Disutility of labor supply
	$\overline{\beta}$	0.96	Average time discount rate
Household environment	π_{death}	0.033	Probability of death in each period
	$a_{\min}$	-0.0005	Borrowing limit
Production function	α	0.35	Capital income ratio
	δ	0.1	Depreciation rate
Exogenous process	ρ_e	0.80	Continuity of labor productivity Chang and Kim (2008)
	σ_e	0.354	Variation of labor productivity
	ρ_z	0.90	Continuity of return on capital
	σ_z	0.50	Variation of return on capital
	ρ_β	0.60	Continuity of time discount rate
	σ_β	0.25	Variation of time discount rate
Taxes	λ_l	1.03	Average income tax rate
	τ_l	0.137	Income tax rate progressivity
	λ_b	0.50	Average inheritance tax rate
	τ_b	0.121	Inheritance tax rate progressivity
	K_b	5.6	$\frac{\text{Total inheritance+Gift Tax revenue}}{\text{Income Tax revenue}} = 0.084$
	τ_a	0.0006	$\frac{\text{General Real Property Tax revenue}}{\text{Income Tax revenue}} = 0.022$

Source: Present study

3. Changes in Asset and Income Distribution Caused by Policy Changes

Tax policies play a crucial role in determining an economy's long-term production and income/asset distribution. Unlike endogenous factors such as the labor productivity, return on capital, and time discount rate, the time discount rate can be changed by policymakers' decisions. This rate can be used as a policy instrument aimed at improving macroeconomic

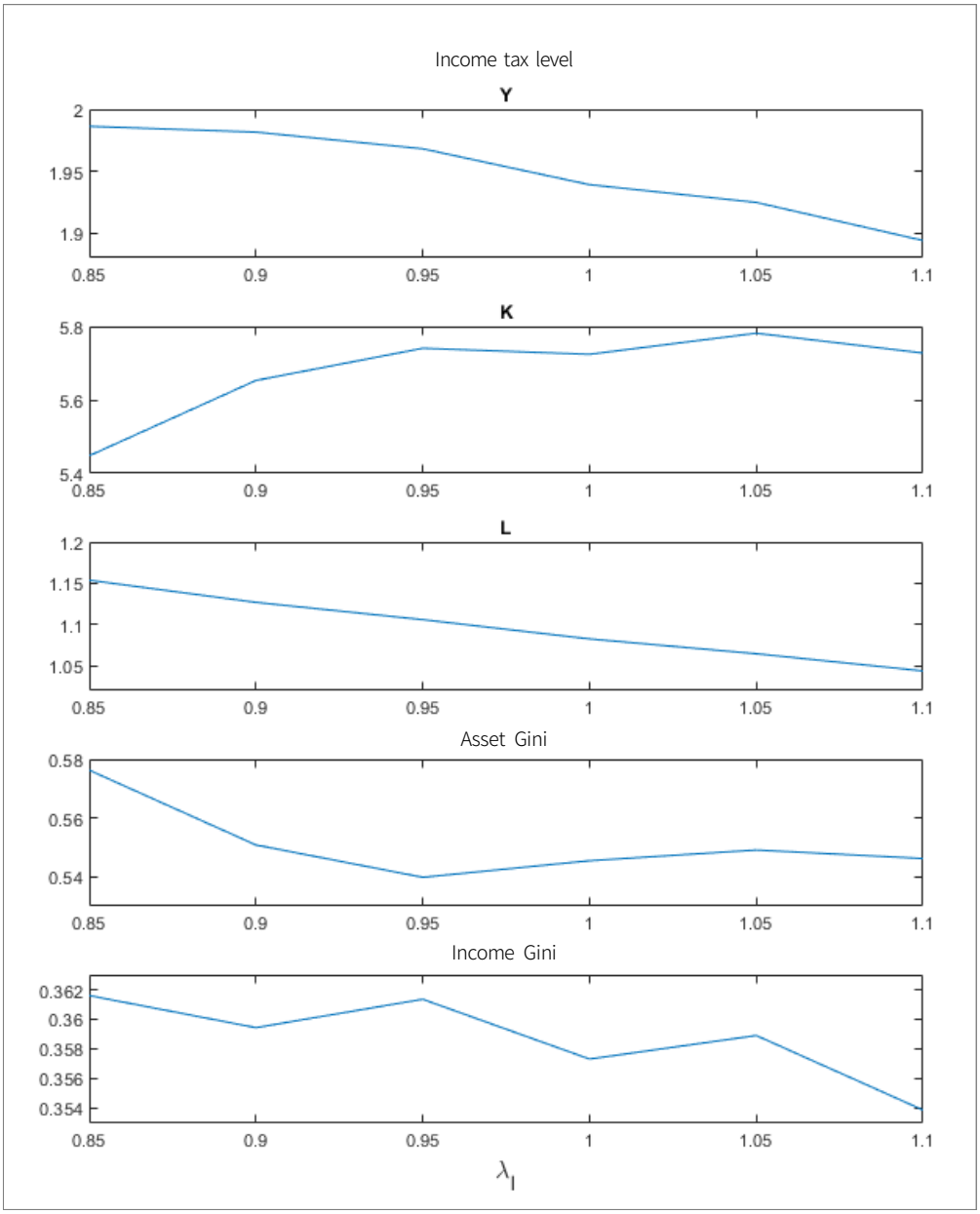
indicators and inequalities. In this section, we analyze how various changes in tax policies affect the total production, total capital, total labor supply, asset inequality, and income inequality in the model's reference economy.

Specifically, we examine economic changes caused by changes in the income tax/inheritance tax/property tax burden levels, the progressivity of the tax rate structures, and the scope of the inheritance tax exemption.

Figure 15 shows changes in the total production, total capital, total labor supply, Gini coefficient on assets, and Gini coefficient on income caused by changes in income tax rates. Variable λ_l on the horizontal axis is positively correlated with the income tax burden. An analysis of the simulation showed that a higher income tax burden raised the total production of the economy, as the total labor supply increased along with the income tax burden. When the income tax burden increased, it decreased the post-tax wages received by labor-supplying households, thus discouraging them from working and thereby decreasing the overall labor supply. However, it also decreased the overall income of each household (income effect), encouraging them to increase the labor supply. The findings showed that, when the income tax burden is high, the income effect overwhelms the other factor and raises the labor supply. On the other hand, when the income tax burden increases, the total capital declines albeit with some fluctuations. These findings are attributable to a decline in the post-tax return on capital caused by the higher income tax burden. Inequality in assets and income represented by the respective Gini coefficients did not show monotonous changes across different levels of the income tax burden. However, when considered as a whole, when the income tax burden increases, income and asset inequality records repeated fluctuations, with the overall level of inequality being lower at lower income tax burden levels.

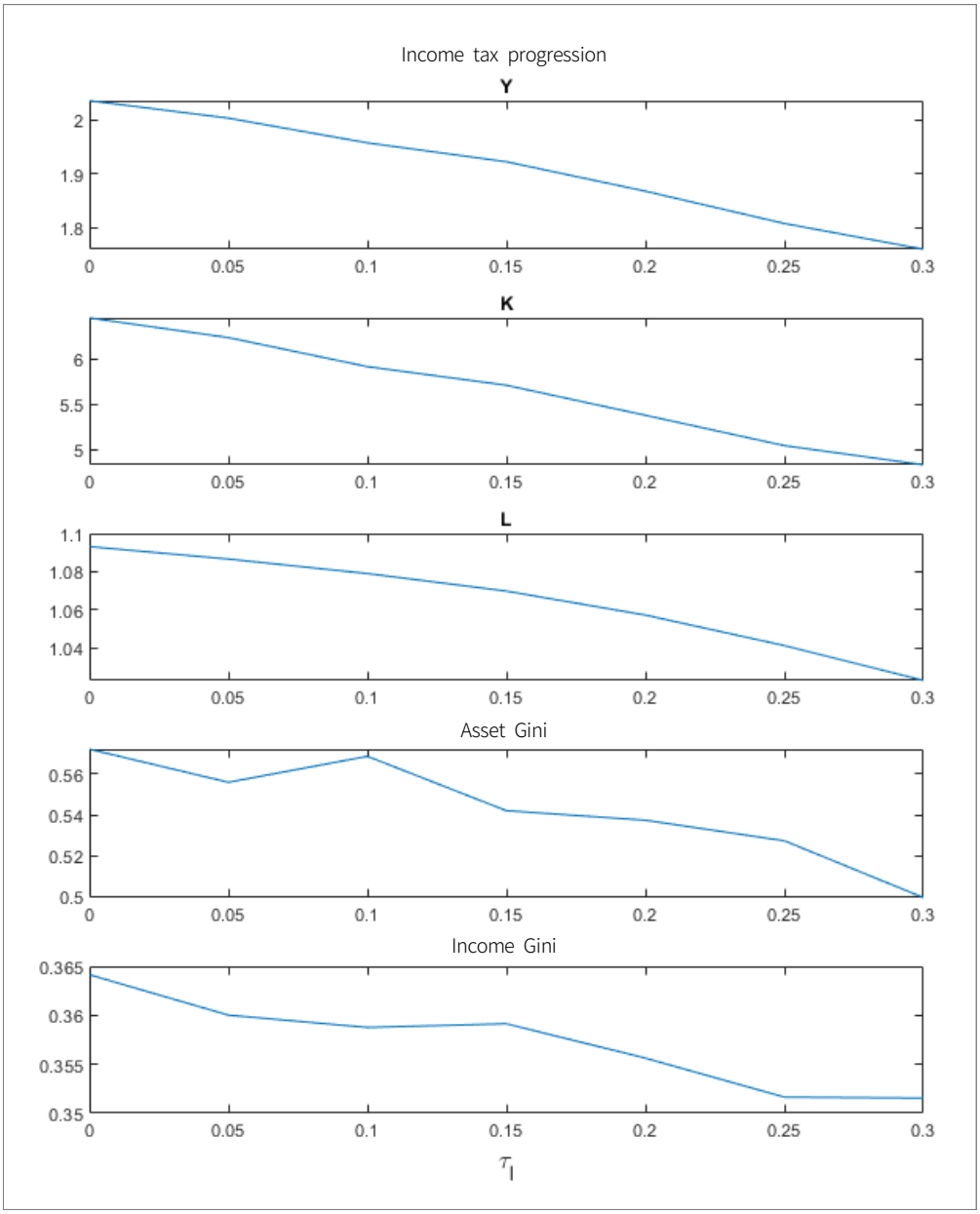
Figure 16 presents economic changes caused by changes in the income tax progressivity. As variable τ_l on the horizontal axis decreases, the progressivity approaches 0, which represents a flat tax rate. A higher τ_l value is correlated with a higher level of progressivity. As can be expected, a higher level of progressivity greatly decreases the total production, total capital, and total labor of the economy. When higher tax rates are imposed on highly productive households, they will reduce their labor supply and savings. Given the fact that these households take up the vast majority of production and investments in the economy, their reduction in activity could inevitably bring down the economy's macroeconomic indicators. When the progressivity of income tax increases, it discourages high-asset and high-income households from accumulating capital, which results in decreased equality in assets and income.

Figure 15_Changes in Economy Across Income Tax Levels



Source: Present study

Figure 16_Changes in Economy Across Income Tax Progressivity Levels



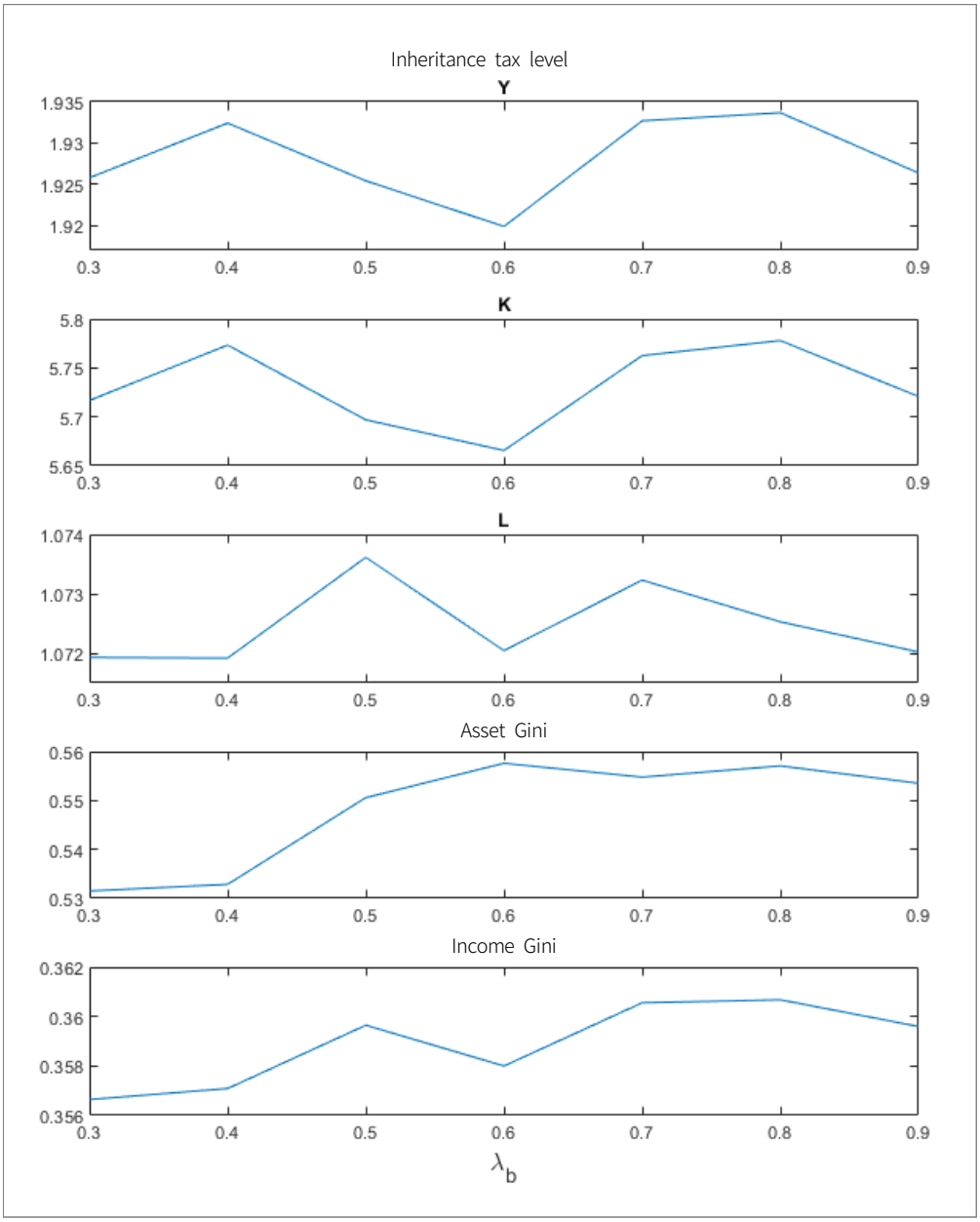
Source: Present study

Figure 17 shows changes in the economy caused by changes in inheritance tax levels. Variable λ_b on the horizontal axis is positively correlated with the overall inheritance tax rate. The findings do not indicate any consistent relationship between inheritance tax levels and total production, total capital, and labor supply. The Gini coefficients on assets and income decline as the inheritance tax level increases. A possible explanation for this finding is that a higher inheritance tax makes it difficult for households to accumulate large assets, which lowers the level of asset concentration, and also mitigates inequality in capital income earned from those assets.

Figure 18 shows changes in the economy caused by inheritance tax progressivity. Variable τ_b on the horizontal axis is positively correlated with the progressivity of the inheritance tax. The findings do not indicate any consistent relationship between inheritance tax progressivity or any other variables used in the model. There can be two reasons for this finding. First, the progressivity of the inheritance tax rate contributes relatively little to the progressivity of inheritance tax burden, because of the wide range of tax exemptions for the inheritance tax. Second, when the progressivity of the inheritance tax rate increases, it may conflict with other factors. Discouragement from capital accumulation particularly affects households having a large amount of capital, which also discourages them from engaging in labor. On the other hand, when the inheritance tax reduces the overall wealth, it generates an asset effect that increases the labor supply of high-income/asset households, and increases the savings of low-income households subject to lower tax rates.

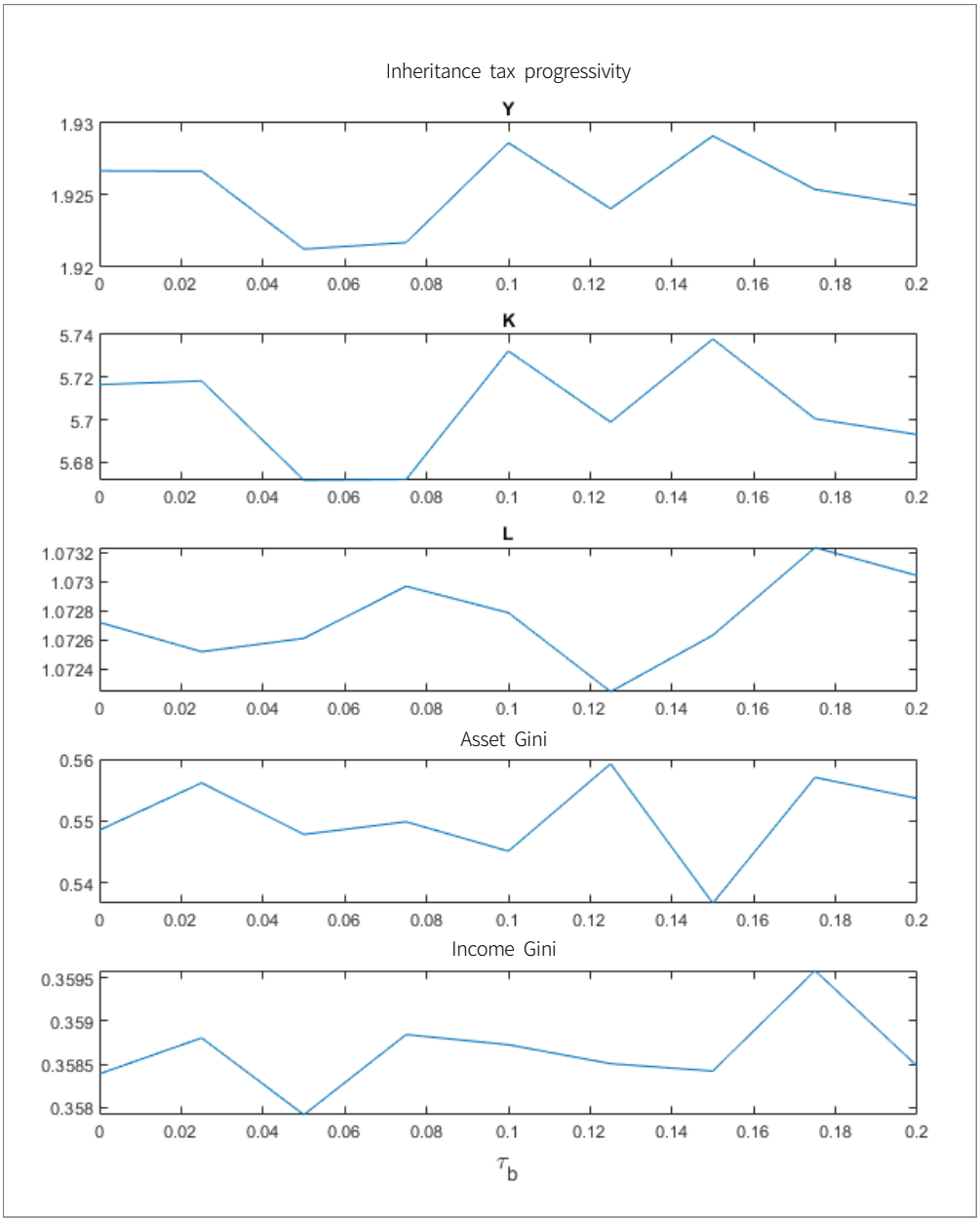
Figure 19 shows the Gini coefficients on asset/income distribution, as well as the total production, labor, and capital of the economy across different income tax rates. The graphs do not reveal any clear relationship between property tax increase and total production, because an increase in the income tax reduces capital while increasing labor. A property tax increase was found to discourage households from accumulating capital, thus reducing the total assets in the economy. On the other hand, a decrease in capital generates an income effect that increases the total labor supply. The different effects cancel each other out, however, resulting in an absence of a clear relationship between the total production and the property tax. In addition, the Gini coefficient on assets increased along with the property tax rate, albeit with some fluctuations. In other words, a higher property tax rate increased the level of inequality in terms of asset distribution. This finding suggests that the taxation of assets in the form of a property tax makes it more difficult for low-income groups to maintain their assets. The Gini coefficient on income declined at higher property tax rates, indicating that a higher property tax rates increases both the overall labor supply and, at a higher rate, the labor supply of low-income households.

Figure 17_Changes in Economy Across Inheritance tax Levels



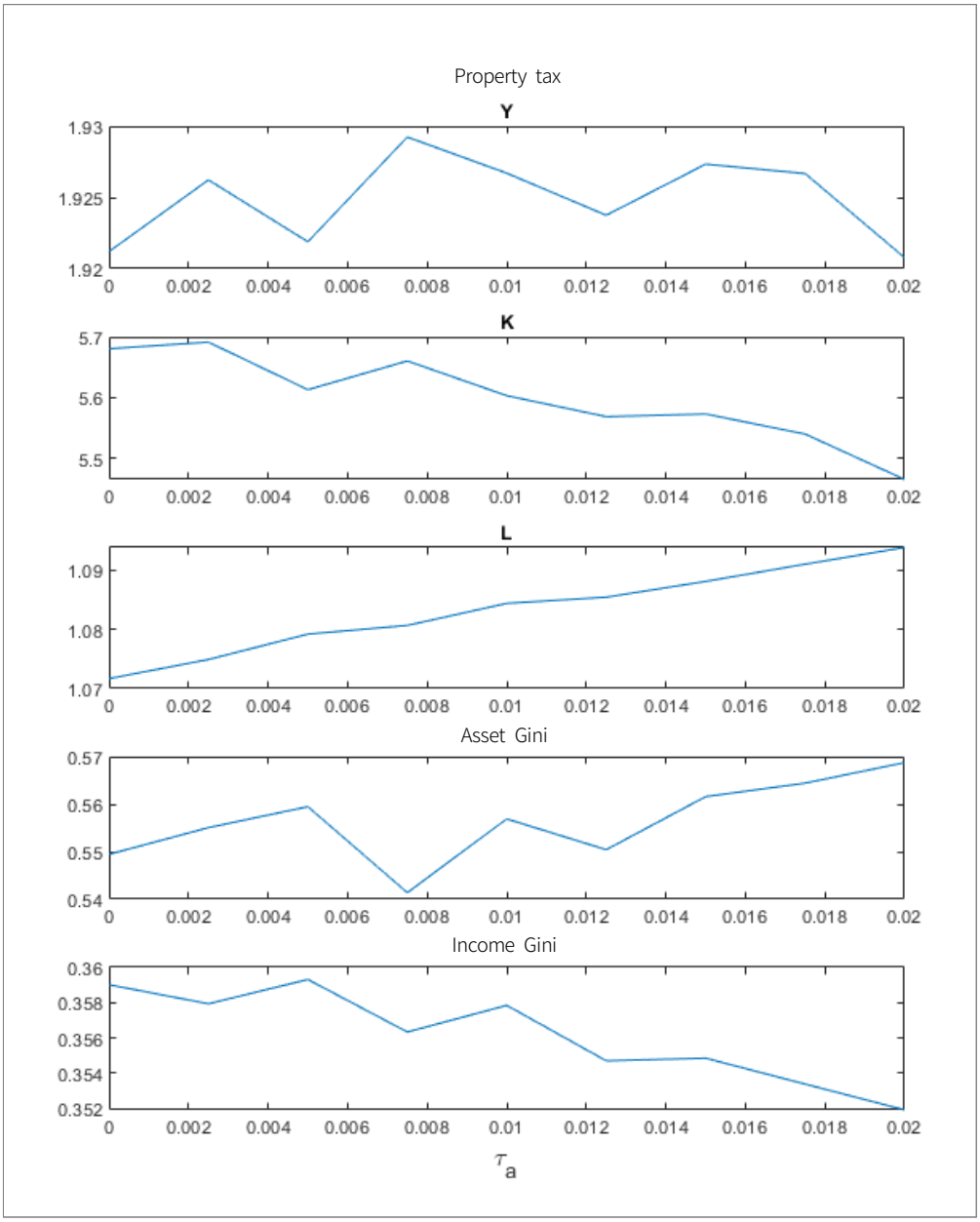
Source: Present study

Figure 18_Changes in Economy Across Inheritance Tax Progressivity Levels



Source: Present study

Figure 19_Economic Changes Across Different Property Tax Rates



Source: Present study

IV. Conclusions and Policy Implications

In this study, we analyzed asset gaps in Korea and discussed their causes. It is important to note that the quantity and quality of asset data used are inferior to those of income data, as information pertaining to household assets cannot be readily and accurately identified. These factors restricted our analysis on asset gaps. Despite these limitations, however, we used microscopic and macroscopic data to identify the current status of asset gaps in Korea, and estimated their causes and the effect of policies on these asset gaps. In our analysis using microscopic data, income inequality and inheritance status partially explained the asset gaps. However, educational attainment alone did not sufficiently explain asset gaps. The effect of income on asset gaps varied depending on the age group. Income was found to have a greater influence on assets in older age groups, whereas the asset accumulation of younger age groups was less affected by their income. These findings indicate that, for younger generations, it is more difficult to accumulate assets solely by relying on their employment income.

The asset gaps that are not fully explained by income can be explained by the effects of savings and inheritance. The microscopic data indicated that households receiving inheritance accumulated assets faster than households not receiving inheritance. However, further study is required because the results varied depending on the year of inheritance, in addition to other factors. However, given the slowing economy and the approaching retirement and death of the so-called "baby boomers" in Korea, we can expect the role of inheritance to grow in the future. As a result, the effect of inheritance on asset gaps will gradually increase. In this case, it would be safe to conclude that, in the future, inheritance will exert a greater effect on asset accumulation than income. If a person fails to accumulate assets early in their life cycle, they may experience more difficulties in accumulating assets later on.

Lastly, using a model economy, we examined the effect of tax policies on asset gaps. For this task, we developed a general equilibrium model consisting of heterogeneous economic agents. To simulate the effect of tax policies, we defined an HSV tax equation and analyzed the model by including the income tax, inheritance tax, and property tax. As mentioned in our microscopic analysis, gaps in the return on capital varied depending on capital size, which also affected asset accumulation. As a result, differences in the return on capital worked as a key factor causing asset inequality. Asset gaps were also affected by tax rate changes. A higher level of inheritance tax progressivity and a higher income tax rate reduced the asset gaps. Conversely, a higher property tax rate increased the asset gap.

The findings obtained from the model economy can be used to develop ways to mitigate asset gaps. In particular, possible options for asset gap mitigation include an adjustment of

the income tax, the inheritance tax, and the property tax. However, raising the income tax is not a desirable way to mitigate asset gaps, because a higher income tax burden may encourage individuals and households with low labor productivity to further reduce their labor supply, and thus actually raising the overall level of inequality. A policy that raises the progressivity of income tax seems to be highly desirable if we only consider asset inequality. As for the inheritance tax, a higher inheritance tax rate may mitigate asset inequality. Medium/low-income households may not be significantly burdened by an increase in the inheritance tax rate, because they have access to various tax benefit programs such as inheritance deductions. On the other hand, large asset holders may be more significantly affected by inheritance tax raise, which may result in a lower level of asset inequality. In terms of property tax, a higher property tax rate may increase asset inequality. In order to reduce asset inequality, the government needs to adjust the degree of tax increase across different property sizes.

Overall, the level of asset accumulation in Korea is lower than in developed countries, which indicates a lower level of asset inequality. However, asset gaps are likely to increase over time. Importantly, the return on assets is a key cause of asset gaps in Korea. Large asset holders are likely to enjoy a higher return on their assets, which will further increase the asset gap. The findings of our model economy simulation indicate that increasing the progressivity of the income tax and raising the inheritance tax rate may dampen the deepening asset gaps in Korea. However, it is crucial to establish appropriate tax rates that are based on a comprehensive review of the effect of core economic factors such as total production, which needs to be discussed further in future studies.

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Financing Experience in Transitional Countries and Implications for North Korea: Focus on Vietnam

Ha Sejeong*

I. Introduction

By many, the current North Korean regime is considered to be attempting to achieve its own perestroika and glasnost, at a strength greater than that of its predecessors. The stance of the current regime has raised concerns of the citizens and government of South Korea with regards to the economic growth of North Korea, the normalization of the North Korean state, and finally, a possible detente on the Korean Peninsula. However, given the South's unique relationship with its Northern counterpart, many South Koreans are worried, and have wondered who will finance potential economic development projects including the construction of roads, railroads, and other infrastructure.

In this report, we review Vietnam's experience with the attraction and management of official development assistance (ODA) projects, and look for implications for North Korea's attraction and management of ODA projects in the future. Specifically, from Vietnam's experience, we will derive implications regarding the actions that North Korea should take to secure funds required for infrastructure construction during the early stages of economic development. We also discuss what South Korea needs to do, and what supports it should

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provide to North Korea.

Chapter 2 covers the background of this study, examining previous studies that shed light on the infrastructure status in North Korea, infrastructure needs in the future, as well as construction costs. Chapter 3 discusses the types of financial resources available for potential infrastructure projects. Chapter 4 presents Vietnam's experience as an ODA beneficiary. Specifically, we discuss the current status and progress of ODA projects in the country, their outcomes, relevant factors, and related issues. Chapter 5 projects the implications of Vietnam's experience with ODAs to the current status of North Korea, and discusses whether South Korea can learn lessons from their experience.

Ⅱ. Outlook for Infrastructure Development in North Korea

1. Social and Economic Infrastructure in North Korea

A. Economic Infrastructure

North Korea's traffic and transportation infrastructure is reportedly very poor considering the geographical and population size of the country. As the country relies on railroads for the majority of its transportation needs, road construction and development has been slow at best. The total extension of roads increased from a mere 20,000 km to 26,178 km between 1965 and 2017. This construction represents a 23.6% increase over 52 years, which means the annual growth rate is 0.45% (Statistics Korea, 2018, pp. 28~29). In fact, it may be meaningless to discuss North Korea's total road extensions because roads are in such poor conditions that most actually require reconstruction rather than simple repairs.

The total extent of North Korean railroads is far longer, however. Railroads were introduced to the Korean Peninsula during the Japanese occupation of the Peninsula, and they were a state-of-the-art transportation system at the time. In years that followed, highly advanced railroad networks continued to be built in the north, as the region was the economic center of the Peninsula and a bridgehead for accessing mainland China. Against this historical backdrop, railroads remain the main mode of transportation in the country. However, North Korea requires further railroad construction because most railroads need to be modernized by laying double tracks and high-speed railroads. If North Korea decides to proceed with transportation and energy infrastructure development, the existing railroads in the region are expected to be temporarily used for transportation construction materials in the early stages

of the development, before being replaced with modernized railroads or roads.

Another concern is that North Korea's port capacity has not significantly improved since the 1980's. In fact, the inter-Korean gap in port capacity far exceeds any gaps in roads and railroads, because South Korea has continued to expand its port facilities after 2000.

Table 1_Traffic and Transportation Infrastructure in North Korea

(Units: km, 1,000 tons)

Year	Total roads		Total railroads		Cargo handling capacity at ports	
	North Korea	South Korea	North Korea	South Korea	North Korea	South Korea
1965	20,000	28,145	4,349	2,980	-	-
1980	21,000	46,951	4,370	3,135	30,980	82,261
1990	23,000	56,715	5,045	3,091	34,900	224323
2000	23,633	88,775	5,214	3,123	35,500	430,437
2010	25,950	105,565	5,265	3,557	37,000	928,524
2017	26,178	110,091	5,287	4,078	41,560	1,109,669

Source: Cited from Statistics Korea (2018), pp. 28~29, North Korea Statistics in 2018.

For industrial growth, the electrical power infrastructure is as important as transportation infrastructure. However, North Korea does not fare any better in this area. North Korea's power generation capacity has not changed significantly over 30 years, since it reached 7,000 MW in the 1990's. South Korea surpassed North Korea in terms of installed capacity around 1975. South Korea then continued to increase its capacity, whereas North Korea's current installed capacity is only 6.6% of its neighbor in the south (Statistics Korea, 2018, p. 25). A similarly large gap is observed with power generation between the two Koreas.

Table 2_Power Generation Facilities and Power Generation in North Korea

(Units: MW, 100 million kWh)

Year	Installed capacity		Power generation	
	North Korea	South Korea	North Korea	South Korea
1965	2,385	769	132	33
1980	5,010	9,391	212	372
1990	7,142	21,021	277	1,077
2000	7,552	48,451	194	2,664
2010	6,968	76,078	237	4,747
2017	7,721	117,158	235	5,535

Note: North Korean power generation refers to the amount of electrical power it can supply.
Source: Cited from Statistics Korea (2018), p.25.

B. Social Infrastructure

According to South Korean studies on housing in North Korea, the housing shortage in North Korea is at a critical level. According to Choi et al. (2015, p. 131), the ratio of housing units to households in 2014 is estimated at between 58% and 80%, as of 2014. The Construction and Economy Research Institute of Korea (CERIK) estimates the ratio of housing units to households between 74% and 80%. This difference comes from different estimations of the total number of housing units in North Korea.[1] In a more recent study, Tak (2017, p.42) estimated the ratio of housing units to households in North Korea at 60% to 80%. Given these findings, at least one million housing units need to be supplied in order to raise ratio closer to 100%.

Table 3_Estimations of Ratio of Housing Units to Households in North Korea

(Units: no. of persons, 10,000 households, 10,000 units, %)

Category	North Korean Economy Forum	Korea Research Institute for Human Settlements	Construction and Economy Research Institute of Korea	Land and Housing Institute
Household size	4.18	4.3	4.08	4.4
No. of households	480	537	588	590
No. of housing units	288~384	412~447	447~482	345~472
Ratio	Around 70% (1995)	77~83% (2006)	74~80% (2013)	58~80% (2014)

Source: Cited from Choi et al. (2015), p. 67, Table 3-20; KB Financial Group Management Institute (2018), p. 5.

Given the seriousness of the housing shortage and the deterioration of the existing housing units, North Korea needs millions of new housing units, at least. According to the KB Financial Group Management Institute (2018, p. 5), among the 5.33 million housing units supplied as of 2014, nearly 90% were built in 1993 or earlier.

As for healthcare institutions, North Korea has different levels of institutions from clinics to central hospitals, which can be grouped into primary, secondary, tertiary, and quaternary institutions. Primary institutions include clinics and people's hospitals at the town/village level (Ri). Secondary institutions consist of people's hospitals at the city/council (Si, Gun) level. Central hospitals and provincial hospitals form the tertiary and quaternary institution groups. As of 2008, North Korea has 6,263 clinics, 974 people's

1 KB Financial Group Management Institute (2018), p. 5, Table 2.

hospitals at the town/village level, 601 people's hospitals at the city/county level, and 133 central/provincial hospitals and research centers. Clinics comprise the highest percentage at 78.6%, and the percentage of top-tier hospitals is 1.7%. Hospital beds number at 307,293, or around 128 per 10,000 capita.[2]

Even though the latest statistics on North Korean hospitals are not readily available, considering the widely agreed observation that North Korea's public healthcare delivery system collapsed after the March of Hardship in the 1990's, it seems unlikely that the country has added a significant number of hospitals since then. It is thus expected that future development projects for North Korea's medical infrastructure will focus on tertiary and quaternary institutions, and the current number of those hospitals does not seem to have increased significantly since 2008. Kim Jong-un is reportedly more interested in healthcare than his predecessor, Kim Jong-il, and the North Korean press has reported the construction of several hospitals under the Kim Jong-un regime, including the Ryugyong Oral Hospital, the Ongnyu Children's Hospital, and the Daesongsan General Hospital, all of which are tertiary and quaternary hospitals in Pyongyang.

Table 4_Healthcare Facilities in North Korea

(Units: no. of institutions, %)

Type	Sub-type	No. of institutions	Percentage
Hospital	Central/provincial hospitals, research institutes (tertiary/quaternary)	133	1.7
	City/county people's hospitals (secondary)	601	7.5
	Town/village people's hospitals (primary)	974	12.2
	General clinics/clinics (primary)	6,263	78.6
	Subtotal	7,971	100.0
Others	Sanitarium	682	70.7
	Preventive clinic	55	5.7
	Sanitation/disease control institutions	228	23.6
	Subtotal	965	100.0
Total		8,936	-

Source: North Korea Information Portal http://nkinfo.unikorea.go.kr/nkp/overview/nkOverview.do?sumryMenuId=SO316, accessed on: June 22, 2019.

2 North Korea Information Portal, http://nkinfo.unikorea.go.kr/nkp/overview/nkOverview.do?sumryMenuId=SO316, accessed on: June 22, 2019.

C. Latest Status of Construction and Development in North Korea

In each quarter since 2017, South Korea's Land and Housing Corporation (LH) has collected and shared North Korean news reports pertaining to transportation, energy, production facilities, housing, local development, and infrastructure. According to these reports, North Korea's infrastructure construction over the last two years did not improve significantly from the past. There have been few road and railroad construction projects initiated, with most projects being maintenance projects for existing facilities. Most of the production facilities built in the country are small-scale primary industry facilities. Some observers have argued that the housing supply market is being boosted by private sector capitalists. However, with the current level of housing shortages, it is difficult to expect the country to notably increase the number of ongoing housing construction projects. Hospitals and medical facilities are not being built in sufficient numbers, either. Granted, North Korea seems to be actively pursuing local development projects in high-interest areas such as Samjiyon and Wonsan. However, given the currently available information, the country's infrastructure stock will significantly increase in the near future.

2. Previous Research on Infrastructure Development Costs for North Korea

In this section, we estimate the infrastructure development costs for North Korea by reviewing previous research on infrastructure development costs and the potential costs of inter-Korean unification. The highest estimate was proposed by the National Assembly Budget Office (2014) at KRW 769.6 trillion, which is 7.5 times higher than the lowest estimate proposed by Ahn et al. (2011), KRW 97.3 trillion. Most studies reviewed in this paper have proposed estimated costs of around KRW 100 trillion, with others reporting estimates up to KRW 300 trillion. For this reason, it is difficult to meaningfully narrow the scope of development cost estimates based on the small number of studies.

The original expectation was that a consensus on the costs could be reached by compiling the findings of previous research. However, it remains difficult to narrow the scope. A consensus on this issue requires a certain level of agreement regarding North Korean infrastructure development plans, in addition to assumptions on construction costs and other factors. However, such an agreement does not exist at the moment. Furthermore, it is not clear whether the studies that proposed estimates of around KRW 100 trillion have included cost estimates for the same type and scale of infrastructure development.

Nevertheless, given the fact that the estimated costs range from tens to hundreds of trillions of Korean Won, depending on the construction plan and unit cost, North Korea will need a minimum of KRW 100 trillion regardless of the scenario chosen. Coincidentally, in 2010, North Korea itself estimated the costs of its 10-year economic development at USD 100 billion. With more studies on this issue, it would be possible to obtain more reliable information about the minimum development costs.

None of the previous studies based their estimates on the full completion of infrastructure development in North Korea. Most assumed short/medium-term development projects ranging between 10 and 20 years, which means that the researchers estimated the costs of urgently required infrastructure. In fact, in typical cases, after the first round of infrastructure development projects, additional infrastructure needs to be built. Therefore, it would be reasonable to estimate the costs of the most required infrastructure developments, and set the financing goals based on this estimate.

A realistic estimation of the first round of infrastructure development would require specific development plans based on urgent infrastructure needs. In this regard, the approach proposed by Park (2019) is promising. Park proposed an estimate based on the development

Table 5_North Korean Infrastructure Construction Project Cost Estimates by Area (10-year estimates)

Study title	Costs	Period	Infrastructure type
Ahn et al. (2011)	KRW 97.3~148.9 trillion	10 years after unification	▪ Transportation (expressways, national roads, railroads, port construction and reconstruction) ▪ Energy (chemical plant repair, power distribution) ▪ Agriculture (land development, greening, agricultural water development) ▪ Manufacturing (technical training centers, industrial complexes)
Hong et al. (2011)	USD 119.3 billion	20 years after unification	▪ Railroads, roads, ports, power and communications, housing
Lee et al. (2013)	KRW 93.5 trillion	10 years	▪ Tourism zones, industrial zones, energy, roads, railroads, airports, ports
National Assembly Budget Office (2014)	KRW 769.6 trillion	30 years after unification	▪ Investments in social overhead costs (SOCs)
Park (2019)	KRW 306 trillion	10 years	▪ Industrial zones (mining, heavy industries, petrochemical, advanced science and technology complexes) ▪ Transportation networks (railroads, expressways, airports) ▪ Agricultural development (pesticide plants, seeds bases, agricultural machinery, and animal feeds plants) ▪ Electrical power development (coal mine construction, thermal powerplant construction, power transmission networks)

Source: Present study

plans and costs proposed by North Korea and the plans and costs proposed by Lee et al. (2013), by adjusting for overlapping plans and costs. Park's estimates consider the infrastructure urgently needed by North Korea, as it is based on the 10-year development plan established by the country. The estimates are also based on the North Korean part of South Korea's development plan for the Korean Peninsula. Even though considerable time has passed since the North Korea plans were generated and the estimations made by South Korean researchers, it is unlikely that the plans and estimated needs would require fundamental revisions—given the low level of fluctuations in North Korea's infrastructure stock. However, as opinions on unit prices are likely to vary, we can expect to arrive at a more realist cost estimate by considering various levels of unit prices and the probability of each.

III. Types of Financial Resources for Infrastructure Development for North Korea

The financial resources for infrastructure development in North Korea can be secured from various sources. First, North Korea will need to commit its own resources. However, given the economic status of North Korea and the ongoing international sanctions against the country, North Korea's internal financial resources are expected to be depleted at a fast rate. If development projects need to begin before North Korea recovers from the depletion, a large part of the required resources will have to be secured from external sources.

External sources consist of public and private resources. In the following sections, we identify the current status of resources by their sources, and discuss how each type of resource can contribute to development projects in North Korea.

1. Internal Sources

The North Korean government holds the principal responsibility for financing the development projects. The government will have to commit its fiscal resources for urgently required development projects. North Korea's treasury revenue was estimated to be USD 8.17 billion as of 2018. It is vastly insufficient to cover the development costs, given the estimation proposed by Park (2019), which is KRW 30 trillion over 10 years. The government can also secure financial resources by issuing bonds. However, this option is not promising, considering the low level of treasury revenue and the credit ratings of the North Korean regime.

Table 6_North Korea's Fiscal Scale

(Units: KRW 100 million, KRW, USD 100 million)

	Fiscal scale	Government-set exchange rate	Fiscal scale
2000	201.0	2.19	91.8
2001	216.4	2.21	97.9
2002	-	153.0	-
2003	3,234.0	145.0	22.3
2004	3,488.0	139.0	25.1
2005	4,049.6	140.0	28.9
2006	4,235.5	141.0	30.0
2007	4,453.0	135.0	33.0
2008	4,578.9	130.0	35.2
2009	4,831.1	134.2	36.0
2010	5,197.6	101.3	51.3
2011	5,677.0	98.3	57.8
2012	6,250.4	101.5	61.6
2013	6,612.3	99.7	66.3
2014	6,978.0	99.8	69.9
2015	7,339.5	108.8	67.5
2016	7,702.8	109.4	70.4
2017	8,009.8	109.8	72.9
2018	8,440.7	103.3	81.7

Source: Lee(2018), p. 88.

North Korea is a communist country. In theory, there should be no capitalists with privatized means of production in the country. However, the reality is that such capitalists do exist. These capitalists, called *donju* ("money owners") seem to be leading the transition of the North Korean economy by providing capital for the construction, transportation, and manufacturing industries.

However, little is known about the number of these capitalists and the amount of their capital. Some media outlets have covered the issue. According to one account, as of 2016, a person was considered a *donju* if they held more than USD 10 thousand (KRW 11 million) in areas north of Pyongyang, or USD 5 thousand (KRW 5.5 million) in areas south of Pyongyang, though the current criteria are likely to be higher.[3] A news article reported that

3 *Money Today*, August 6, 2018, https://news.mt.co.kr/mtview.php?no=2018080606513319118, accessed on

the South Korean National Intelligence Service (NIS) estimates the number of *donju* holding between USD 50~100 thousand (KRW 55~120 million) to be 240,000, which is a little short of 1% of the North Korean population.[4] Given these estimates, and the short-term large-scale construction projects carried out under the Kim Jong-Un regime, these *donju* seem to have sizable amounts of capital, and be capable of investing between ten thousands and hundred thousands of dollars.

However, it should be noted that the *donju* mostly invest in housing units, which represent a relatively profitable option. To induce them to invest in more urgent infrastructure such as roads, railroads, and waterworks, these capitalists would need official guarantees on return on investments, rather than merely a tacitly recognized contractual relationship with the government.

2. External Sources

Due to the limited financial resources of North Korea, the country will have to rely on external aid from South Korea and other international countries. However, other than existing "cooperation funds," the South Korean government's decision regarding the use of public resources will be largely affected by the public opinion regarding further financial support. It should be also noted that South Korea's fiscal position has not improving in the current environment. As such, private sector investments from South Korea and other countries are unlikely given the risks and profitability of early infrastructure development.

Then, one of the more realistic options for North Korea includes official development assistance (ODA) support from international countries. ODAs explicitly target development projects in low-income countries having a low commercial feasibility. They are a suitable option for basic infrastructure development in North Korea. However, the resources available from ODAs would not be sufficient to fully cover the estimated costs. As for bilateral ODA projects, no beneficiary country received has more than USD 3 billion in recent years. The resources available for a single country would require a plan for specific circumstances regarding the aid. However, the upper limit derived from past experiences would be meaningful for North Korea as well. For multilateral ODA projects, the total amount granted

July 12, 2019.

4 *Money Today*, August 6, 2018, https://news.mt.co.kr/mtview.php?no=2018080606513319118, accessed on July 12, 2019.

by the World Bank and the Asian Development Bank (ADB) stands at around only a half of the total amount of bilateral ODAs. Therefore, the amount available for a single country from multilateral ODAs may be lower than for bilateral ODAs. If ODAs are not sufficient to cover the development costs, it seems that North Korea will have to rely on private sector investments from other countries. However, ODAs can help North Korea proceed with the early stages of infrastructure development, and show the global community that it is committed to, and capable of, working with the international society for infrastructure development. In this sense, ODAs can serve as "priming water" for North Korea's cooperation with the global private sector.

IV. Vietnam's Experience as ODA Recipient and its Implications

1. Vietnam's Experience as an ODA Recipient

A. Vietnam's Experience as an ODA Recipient

According to statistics pertaining to ODA recipient and donor countries provided by the Organisation for Economic Cooperation and Development (OECD), the total amount committed by official donors to Vietnam was around USD 84.5 billion,[5] of which loans/long-term capital and grants comprise 69.3% (USD 58.6 billion) and 29.2% (USD 24.7 billion), respectively.

Among donors, members of the Development Assistance Committee (DAC) committed around USD 56.9 billion, or 67.3% of the total commitments, followed by multilateral donor institutions at USD 27.4 billion (32.4%). DAC member states provided 85.3% of the grants to Vietnam.

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5 Money provided through ODAs consists of commitments and disbursements. Commitment refers to an amount that a donor pledges to provide to a beneficiary, and disbursement is the amount actually provided. The amounts of the two items can be different for various reasons. In this study, we focus on commitments, as they hold greater significance for beneficiary countries.

Table 7_ODA Commitments to Vietnam (1966~2017)

(Units: USD million (nominal price), %)

		All donors	Bilateral ODAs		Multilateral ODAs
			DAC member countries	Other countries	
Total commitment	Amount	84,524.9	56,893.4	206.0	27,425.5
	Percentage	100.0	67.3	0.2	32.4
Grants	Amount	24,723.8	21,089.7	1.1	3,633.0
	Percentage	100.0	85.3	0.0	14.7
Loans and other long-term capital	Amount	58,599.7	35,332.4	204.2	23,063.1
	Percentage	100.0	60.3	0.3	39.4
Others	Amount	1,201.4	471.3	0.7	729.4
	Percentage	100.0	39.2	0.1	60.7

Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

Major donor countries in bilateral ODAs include Japan, the United States, France, Germany, and South Korea. The United States donated vast amounts during the Vietnam War. However, the country provided nominal aid after 1993, when the international society resumed the provision of aid to Vietnam. Therefore, major donor countries in bilateral ODAs for Vietnam currently include Japan, France, Germany, and South Korea.

Table 8_ODA Commitments to Vietnam from DAC Member Countries (1966~2017)

(Unit: USD million (nominal price))

	Total commitment	Grants	Loans and other long-term capital	Other
Japan	29,424.9	3,297.5	26,127.3	0.1
United States	5,102.8	4,030.2	745.9	326.6
France	4,291.5	1,423.0	2,872.4	0.0
Germany	4,005.5	1,813.7	2,191.8	0.0
South Korea	3,256.2	573.9	2,682.2	0.0
Sweden	1,998.8	1,998.3	0.6	0.0
Australia	1,758.1	1,758.1	0.0	0.0
Denmark	1,132.5	1,037.5	95.0	0.0
United Kingdom	849.5	828.2	15.4	5.8
Netherlands	776.8	746.4	30.5	0.0
Finland	676.4	651.4	25.1	0.0
Belgium	600.7	538.4	62.4	0.0
Canada	594.4	594.4	0.0	0.0
Switzerland	493.3	460.5	32.8	0.0

Table 8_ODA Commitments to Vietnam from DAC Member Countries (1966~2017)(continued)

(Unit: USD million (nominal price))

	Total commitment	Grants	Loans and other long-term capital	Other
Norway	459.6	398.2	61.4	0.0
Italy	343.4	67.6	275.8	0.0
Spain	237.6	142.8	94.8	0.0
Ireland	213.6	213.6	0.0	0.0
Luxemburg	200.3	200.3	0.0	0.0
Austria	187.7	173.1	14.7	0.0
Poland	145.8	1.3	4.5	140.0
New Zealand	128.7	128.7	0.0	0.0
Hungary	7.2	7.1	0.0	0.1
Czech Republic	6.8	4.3	0.0	2.5
Greece	1.0	1.0	0.0	0.0
Portugal	0.2	0.2	0.0	0.0
Slovakia	0.2	0.2	0.0	0.0
Iceland	0.0	0.0	0.0	0.0
Slovenia	0.0	0.0	0.0	0.0

Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

In multilateral ODAs, the World Bank has committed around USD 20.4 billion, which accounts for 74.3% of the total multilateral ODA commitments to Vietnam. Regional development banks committed USD 2.15 billion, most of which came from the ADB. The United Nations (UN) is the third-largest donor, and has provided the majority of grants to the country.

Table 9_Multilateral ODA Commitments to Vietnam (1966~2017)

(Unit: USD million (nominal price))

	Total commitment	Grants	Loans and other long-term capital	Others
World Bank	20,367.7	35.0	19,723.5	0.0
Regional development banks	2,149.5	26.8	2,122.8	0.0
UN	1,825.8	1,464.2	298.3	0.0
International Monetary Fund (IMF)	159.0	0.0	159.0	0.0
Others	2,923.5	2,107.0	759.5	729.5
Total	27,425.5	3,633.0	23,063.1	729.5

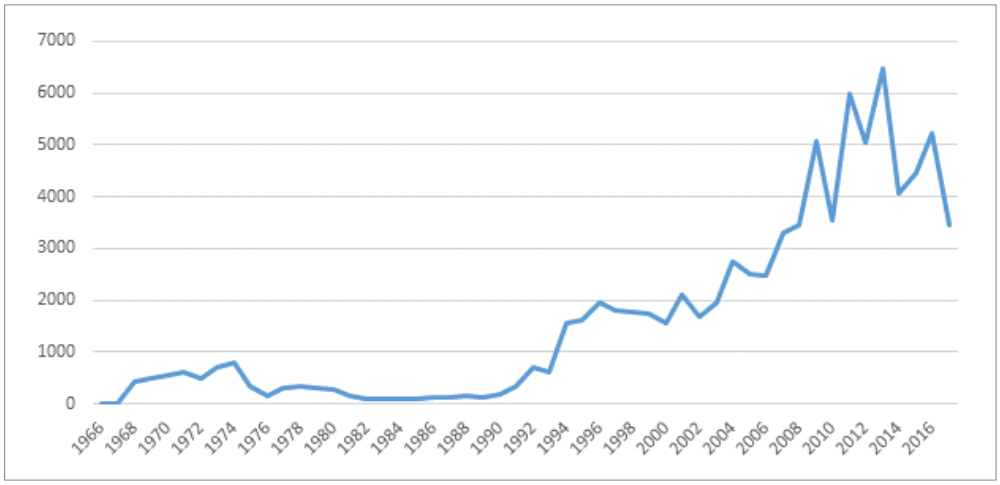
Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

B. ODA Attraction in Vietnam

The OECD statistics on ODAs received by Vietnam begins with 1966 data, and show fluctuations of the received amounts per period. The fluctuations come from differences in the nature of ODAs provided during different periods.

Figure 1_ODA Commitments to Vietnam

(Units: USD million, present price)



Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

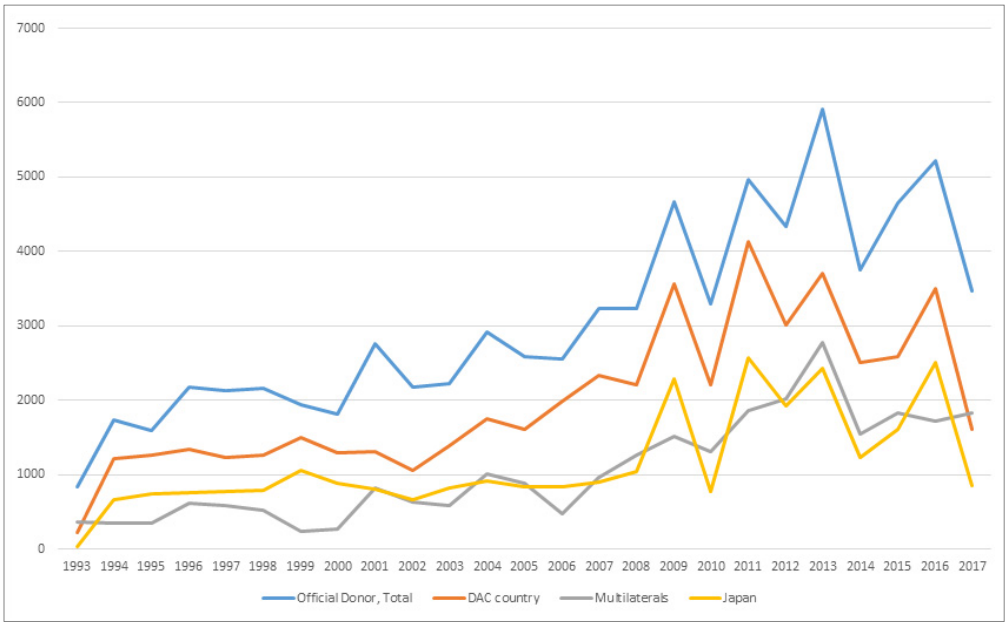
During the Vietnam War in the 1960's and the 1970's, Vietnam received ODAs for wartime relief and post-war restoration. Most of the ODAs during this period were bilateral ODAs from DAC member countries, led by the United States.

According to the OECD ODA statistics, ODAs to Vietnam took a downturn during the 1975~1992 period. ODAs requested from DAC member countries and international development banks were declined, with the United States leading the trend. Sweden was the only DAC member country that provided meaningful aid during this period.

The Vietnamese government realized that the success of its economic reform and liberalization hinged on its relationship with the United States, and subsequently made efforts to improve its political relationship with the country. These efforts resulted in the resumption of aid from international financial institutions in 1993, which significantly increased the ODAs to Vietnam. The ODAs increased at faster rates between 2007 and 2013, except for a downturn in 2010 caused by the global recession at that time.

Figure 2_Commitments to Vietnam ODAs by Donor

(Units: USD million, present price)



Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

Shortly after the resumption of ODAs in 1993, Japan and other DAC member countries greatly increased their number of ODA projects. The commitments from multilateral ODAs began to increase in earnest in 1996, after three years of stagnation.

After the fast growth in the first few years, the ODA commitments to Vietnam slowly increased until 2007. As the largest bilateral donor country, Japan provided a stable flow of commitments. Commitments from international organizations remained at constant levels, save for some fluctuations. After the early 2000's, DAC member countries other than Japan drove the slow growth of ODAs to Vietnam. In particular, France greatly boosted its contributions, and the commitments from Sweden, Denmark, Australia, the Netherlands, the United States, and the United Kingdom evenly increased.

In the years following 2008, the changes in the ODA commitments significantly varied from year to year, even though the overall amount increased. Between 2007 and 2013, the total amount of commitments nearly doubled from the previous period. This was the golden period for Vietnam ODAs, with a rapid increase in contracts with multilateral organizations.

Between 2014 and 2017, both bilateral and multilateral ODAs reported a decline in

commitments compared with the peak year in 2013. This decline could be attributed to multiple factors. Importantly, the Vietnam government became concerned about the increase in the country's public liabilities, and put pressure on the execution of ODA agreements and the attraction of new ODA agreements.

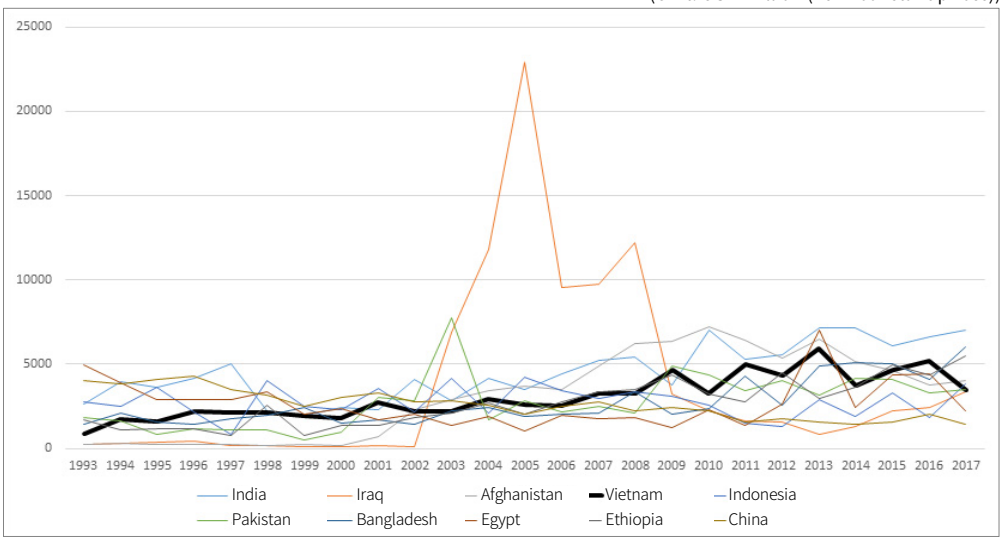
C. Outcomes of Vietnam ODAs

From the outset of its ODA projects, Vietnam was praised as a model recipient country. The projects also produced positive outcomes. Among ODA recipient countries, Vietnam ranked sixth in total ODA commitments between 1966 and 2017.[6] In and after 2000, Vietnam ranked between second and fourth in the annual amount of commitments received.

Among ASEAN countries and Far East Asian countries, Vietnam ranks high in ODA receipt. The amount of ODAs received by the country does not fall far behind those of Indonesian and China, countries having much larger territories and populations. In fact, Vietnam surpassed Indonesia and China in and after 1993.

Figure 3_Annual ODA Receipt By Receipt Country (1993~2017)

(Unit: USD million (2017 constant prices))



Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

6 As the commitments received by countries peaked at different points, from 2017 we compared the amounts received based on constant prices.

D. ODA Contribution to Infrastructure Construction

ODAs provided Vietnam with benefits including: improvement of macroeconomic indicators, improvement of systems and public administration, and achievement of key development goals proposed by the international development cooperation society (Ministry of Foreign Affairs, 2018, p.171). The majority of ODAs to Vietnam (around 75%) were invested in infrastructure development. The percentage of economic infrastructure and services (50%) was nearly two times higher than the percentage of social infrastructure and services. In addition, 49.0% of aid provided between 2005 and 2017 were spent on economic infrastructure and service development, 34.5% on transportation and communication

Table 10_Bilateral ODA Commitments to Vietnam By Sector (2005~2017)

(Units: USD million (nominal price), %)

Sector	Vietnam		All beneficiaries	
	Commitment	Percentage	Commitment	Percentage
1000: Bilateral ODA commitment	35,141.7	100.0	1,142,931.4	100.0
100: Social infrastructure and services	9,208.4	26.2	430,311.5	37.6
110: Education	2,095.6	6.0	88,960.6	7.8
140: Water	3,542.3	10.1	54,171.9	4.7
200: Economic infrastructure and services	17,219.8	49.0	198,761.3	17.4
230: Energy	4,541.7	12.9	70,147.3	6.1
215: Transportation and communication	12,139.5	34.5	90,422.6	7.9
300: Production	2,431.3	6.9	76,456.5	6.7
310: Agriculture, forestry, and fishery	1,572.4	4.5	53,101.9	4.6
320: Industry, mining, and construction	694.4	2.0	15,134.1	1.3
330: Trade and tourism	164.6	0.5	8,220.7	0.7
400: Cross-cutting (environment and others)	3,979.8	11.3	108,782.0	9.5
500: Program aid	1,769.7	5.0	37,492.5	3.3
520: Food aid	16.8	0.0	12,363.8	1.1
600: Loan write-off	159.3	0.5	30,957.7	2.7
700: Humanitarian support	113.8	0.3	116,396.9	10.2
998: Undistributed	259.6	0.7	143,772.8	12.6

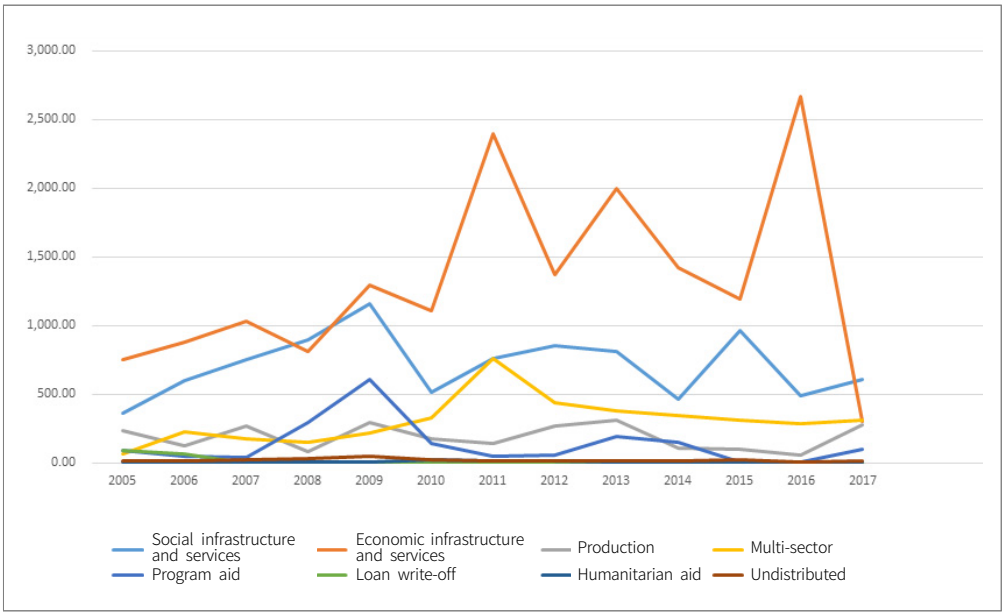
Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

infrastructure, and 12.9% on energy infrastructure. Compared to other beneficiary countries, Vietnam recorded a lower percentage of investments in social infrastructure and services, whereas the country's percentage of investments in economic infrastructure and services was almost three times higher than the average.

ODA commitments allocated to economic infrastructure and services accounted for high percentages almost every year, and continued to gradually increase with some fluctuations. Social infrastructure and services ranked second in most years, rising and falling within a range.

Figure 4_Bilateral ODA Commitments to Vietnam by Sector (2005~2017)

(Units: USD million (nominal price), %)



Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

Between 2006 and 2010, ODAs took up around 20% in the Vietnam government's budget for infrastructure development. The percentage of ODA was the highest in transportation infrastructure at 27%, and the lowest in education and training at 16%. According to the South Korean Ministry of Foreign Affairs (2018, p. 171), the percentage of ODAs in public investment in recent years ranges between 15 and 17%, which represents a slight decline from the percentage in the mid and late 2000's.

2. Contributing Factors to ODA Attraction in Vietnam

Key factors contributing to Vietnam's success in ODA attraction can be found in two respects: the motivations of donor countries and organizations, and the circumstances and efforts of Vietnam.

A. Vietnam's Circumstances and Efforts Regarding ODA Attraction

1) Vietnam's Efforts and Measures to Resume ODAs

For a long time, Vietnam maintained its determination to open its economy to other countries. The reason for this drive incudes the country's dedication to achieving economic growth, and the need for financial resources to achieve that goal. In 1986, Vietnam put forward the Doi Moi policy. The policy was aimed at transforming the country's economic system while maintaining its political system, and involved opening up its economy for public funds from other countries (Lee et al., 2018, p. 2). Vietnam had no choice but to pursue this policy because of several issues that required assistance from overseas, including: prolonged macroeconomic distress, the country's economic isolation, and an underdeveloped industrial structure.

In response to these crises and other macroeconomic issues, including its failed agricultural reform, increasing fiscal deficit, and inflation, the Vietnam government adopted the Doi Moi policy at the 6th Communist Party National Congress in December 1986. The policy defined the five principles of the country's economic reform and liberalization: improvement of production efficiency, establishment of long-term economic policies, harmonization with the market economy, pursuit of liberalization policies, and the achievement of an autonomous and independent economy. Under the policy, Vietnam built the institutional foundation for an agricultural reform, its transition to a market economy, and the opening of its economy to other countries (Won and Kim, 2018, p. 5).

After the adoption of the Doi Moi policy, it still took considerable time to gain positive responses from major countries and international organizations to affirm Vietnam's dedication to opening up its economy. During this period, the Vietnam government engaged in political and diplomatic efforts to improve its relationship with Western countries, especially with the United States.[7] These diplomatic efforts and reforms contributed to

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7 The following account of the diplomatic history between Vietnam and the United States is based on *VOA Korea*, February 23, 2019, https://www.voakorea.com/a/4800163.html, accessed on October 12, 2019.

improving the country's relationship with the international world, and the reformed systems were combined with aid from overseas to create positive economic outcomes (Won and Kim, 2018, p. 6).

2) Vietnam's Efforts and Actions to Expand ODAs

A) Consistent Liberalization Policy

The ODA attraction of Vietnam remained at a constant level until the early 2000's. However, a drastic increase was reported starting in 2007. In particular, into the late 2000's, the ODA received increased at an even faster rate, with many donor countries calling Vietnam the "donor darling;" the country generally ranked second or third among beneficiary countries in annual ODA receipt. This success stems from Vietnam's liberalization policies and its determination to achieve economic growth by attracting funding from overseas.

Between the 1990's and the early 2000's, Vietnam lacked the resources to invest in its economy, and had to rely on financial resources from outside the country. Vietnam attracted these external resources by actively seeking and supporting ODAs and foreign investments. The country had to build and improve its transportation, energy, and industrial infrastructure to ensure a continuous stream of foreign investments, as the government budget was not sufficient to cover the construction projects, which was another reason for Vietnam's efforts to secure ODAs.

B) Highly Effective ODA System

One of the main characteristics of Vietnam's ODA system was its centralized nature (Ohno, 2004, p. 5). In Vietnam, the Ministry of Planning and Investment (MPI) coordinates the efforts to secure ODAs.[8] While multiple central government ministries and the central bank comprise the official ODA management system, the MPI plays the pivotal role in the collection, review, selection, supervision, and evaluation of candidate projects.

The ODA system serves as an efficient and rapid communication channel between donor countries and Vietnam, and facilitates the selection, execution, revision, and evaluation of ODA projects. The system helps donor countries identify Vietnam's needs for ODA donations, and convey their opinions and requests during the execution of ODA projects. In turn, Vietnam screens development plans from ministries and local governments based on its

8 An interview with a member of the KOICA Office in Hanoi (September 23, 2019).

social and economic development strategies and plans to select development plans with higher social utility, which contributes to improving the effectiveness of ODA projects and attracting even more assistance from donor countries.

C) Efforts to Hear and Act on Opinions from Donor Countries

Vietnam made active efforts to maintain relationships with donor countries, and listened to their opinions and requirements through various types and levels of communication channels. The Vietnam Development Partnership Program is one channel, which met twice a year until 2016. It has since been replaced by the annual Vietnam Development Forum, which consists of meetings with ODA organizations of various types and sizes, including: a forum on ODA efficacy, executive committees, and working groups (Ministry of Foreign Affairs, 2018, p. 172). The Forum allows Vietnam to share the outcomes of its ODA projects with the world, and to gather opinions and requirements from donor countries and international organizations.

3) Creation of an ODA Virtuous Cycle

After the resumption of ODA projects, Vietnam generated outcomes from ODA projects through institutional and political efforts and measures. These efforts resulted in a virtuous cycle, in which the success of previous ODAs led to additional assistance from donor countries and international organizations. As a result, from the mid-2000's the amount of ODA commitments rapidly increased.

A) Virtuous Cycle of ODA Expansion Through ODA Outcomes

Vietnam impressed the world with its early achievement of the majority of the eight Millennium Development Goals proposed by the UN.[9] The country completely achieved four of the eight goals: eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; and improve maternal health, and partially achieved three goals: combat HIV/AIDS, malaria, and other diseases; ensure environmental

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9 The Millennium Development Goals were proposed in 2001 to achieve goals regarding the eradication of poverty and development that were included in the Millennium Declaration adopted at the 2000 UN Millennium Summit. The goals consist of 8 goals, 18 targets, and 48 indicators to be achieved jointly by international society. (South Korea ODA website, http://odakorea.go.kr/fileDownLoad.xdo?f_id=13774849624681722016183B21ME2046YNZFX8EKGAK, accessed on October 12, 2019).

sustainability; and develop a global partnership for development. The achievement of the development goals resulted in the perception of Vietnam as a model beneficiary country, which resulted in the continuous growth of ODA commitments to Vietnam.

B) Loan Repayment

Vietnam's fast growth and virtuous cycle in ODA attraction were also driven by the international society's trust toward the country's ability to repay the principal and interest of its national loans through successful ODA projects and economic growth.[10] Around 70% of ODAs to Vietnam consist of loans and other long-term capital. Donor countries and organizations are required to recover the principal and interest of loans funded by their taxpayers or member countries. For this reason, donors provide loans based on the beneficiary's ability to repay the principal and interest. Into the 2000's, Vietnam's economy steadfastly grew at around 6% per year. It seems that Vietnam is in a virtuous cycle in which successful ODAs have contributed to the country's economic growth, and this growth has raised the government's tax revenues and its ability to repay loans in the long term. These results have improved repayments and the ability to drive even more ODAs.

C) Testbed for ODA Projects

Donor countries do not join ODA projects solely for humanitarian purposes. They seek to further their national interests through ODAs. For this reason, they often learn effective aid models and practices from more developed donor countries. When Korea transitioned from a beneficiary to a donor country, it also accepted and adapted the ODA strategies and practices of major donor countries, including Japan. To achieve success in ODA projects and learn from the experience, it is important to select a suitable beneficiary country. In this regard, Korean experts with experience in ODA projects for Vietnam and other Southeast Asian countries say that Vietnam is a strong testbed for ODAs. Vietnam is one of the most politically and economically advanced countries in Southeast Asia, and other countries tend to learn from Vietnam's experiences. The country also produced excellent outcomes in ODA projects, which is why donor countries often take their experience and practices from Vietnamese ODAs and apply them to ODAs in other countries.

10 It was an official at the Vietnam Ministry of Planning and Investment who listed the country's repayment results and ability as a factor behind Vietnam's success with ODAs.

B. Motivation for Donor Countries

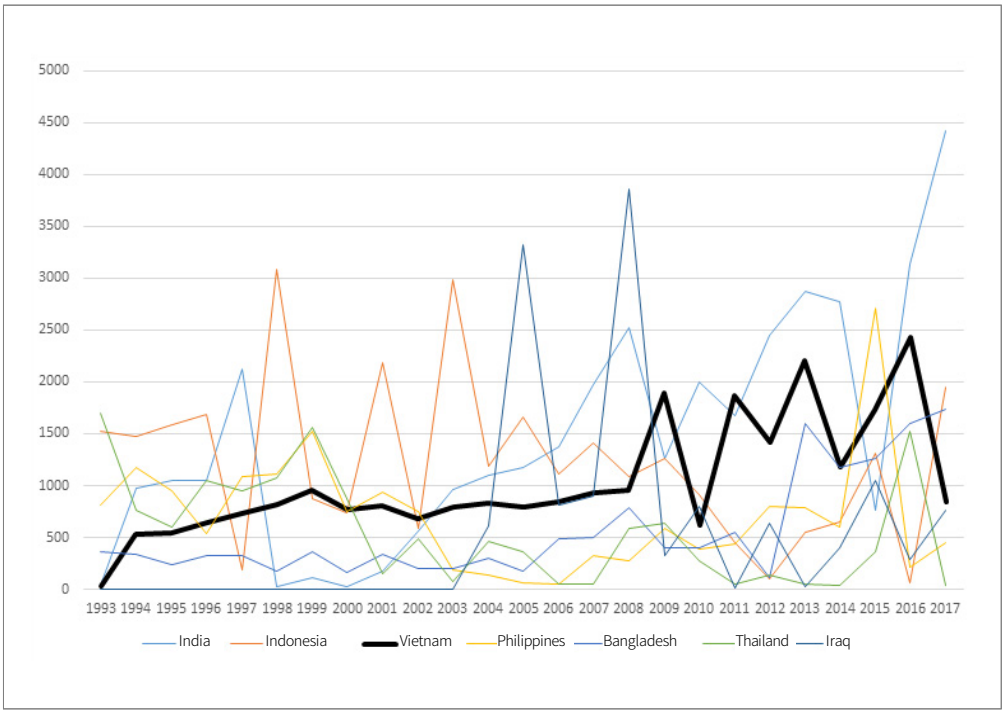
Major donor countries in bilateral ODAs for Vietnam include Korea, Japan, Germany, and France. Donor countries favor Vietnam because the country's efforts and characteristics help them achieve their goals in an efficient and effective manner. Therefore, examining the common and individual motivations of major donor countries will help us understand why Vietnam has been successful in securing ODA projects.

1) Japan

Japan has been the largest donor country for Vietnam. Likewise, Vietnam holds a significant position among the beneficiaries of Japan's ODA projects. Japan provided Vietnam with a steady stream of assistance in the 1990's. Japan increased its aid to Vietnam

Figure 5_Aid Provided to Major Beneficiary Countries by Japan's Bilateral ODAs (1993~2017)

(Unit: USD million (2017 constant prices))



Source: OECD Statistics, https://stats.oecd.org, accessed on October 19, 2019.

even further starting in 2009. Since then, Vietnam has ranked first or second among countries receiving aid from Japan. In addition, the amount of the aid provided to Vietnam fluctuates less than the aid provided to other beneficiary countries.

Japan's bilateral ODA is strongly motivated by the country's pursuit of its economic interests. Granted, countries typically pursue their economic interests through ODAs. The difference lies in the strength and explicitness of their intention. Japan lists ODAs as one of the key diplomatic policy instruments under its Development Cooperation Charter, and makes it clear that the purpose of their development cooperation projects are established based on Japan's foreign affairs policies.

Vietnam is one of the best examples showing the motivations and characteristics of Japan's bilateral ODA projects. Given the country's population and natural resources, in addition to economic and commercial environment that includes trade deals with the United States and other developed countries, Vietnam is an attractive production base, source of resources, and consumer market for Japan.[11] Through ODAs focused on economic and social infrastructure, Japan offered its own construction firms opportunities to profit from Vietnam's infrastructure construction projects, and expand their operations in future infrastructure construction markets. In addition, the infrastructure constructed through these projects served as visual proof of the technical expertise and competitive edge of Japan and its businesses, which indirectly helped other Japanese firms access the Vietnamese market.

2) France

Between 1966 and 2017, France became the second largest donor country to Vietnam. However, the country's ODA projects have been aimed at establishing diplomatic relationships with its former colonies, particularly those in Africa (Lee, 2017, p. 9).[12] Specifically, France preferentially provides assistance to African countries; its strategic goal states that 50% of its ODA commitments go to countries in the region (Korea International

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11 According to a report from a Japanese market study firm, Japanese companies operating in Vietnam had keen interest in Vietnam's advantage as an export base, and the country's steadfastly growing domestic market. (*KOTRA Overseas Market News*, August 16, 2016, http://news.kotra.or.kr/user/globalAllBbs/kotranews/album/2/globalBbsDataAllView.do?dataIdx=151382&column=title&search=&searchAreaCd=&searchNationCd=&searchTradeCd=1039122&searchStartDate=&searchEndDate=&searchCategoryIdxs=&searchIndustryCateIdx=&page=2&row=10, accessed on October 23, 2019).

12 Cited from Hong and Kim (2018), p. 81.

Cooperation Agency, 2018, p. 81).

Considering the relative size of assistance provided to Vietnam, and France's ODA strategies, Vietnam does not seem to be a major beneficiary country for France.

The percentages of sectors receiving assistance also differ between Vietnam and other countries. In contrast, African countries report percentages similar to other countries. In Vietnam and Far East Asian countries, the percentage of loan write-offs is markedly lower than the average, with assistance for socio-economic infrastructure and services and multiple areas (environment and others) comprising higher percentages. Vietnam reports a higher percentage of assistance for economic infrastructure and services than other beneficiary countries, or even Far East Asian countries. The percentages of assistance for social infrastructure and services, and production are also high.

Compared with Japan, the percentages of education and multi-sector (including environment) assistance are relatively high, and the percentages of transportation and communication are relatively low. France is not motivated by economic reasons or national interest as strongly as Japan, and pursues the proper goals of ODAs to some extent, which is to help beneficiary countries achieve social and economic growth and escape poverty.

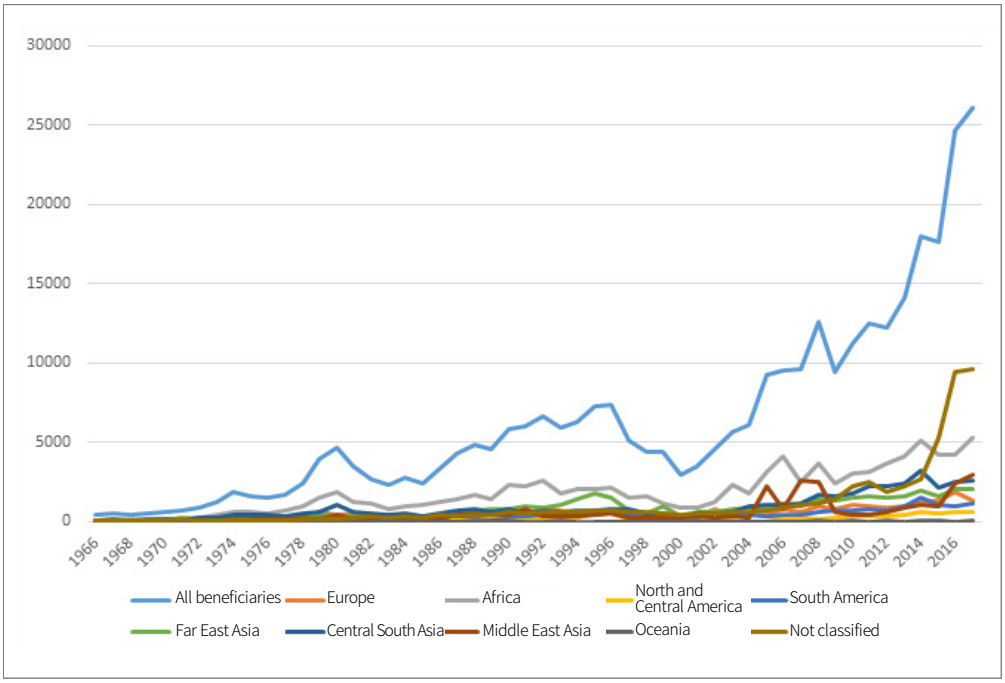
3) Germany

The overall focus of German ODA projects is set on reducing poverty, and the country has consistently stressed that its ODA projects are aimed at achieving the sustainable development goals set by the receiving country and the UN. Overall, Germany is generally considered as a country that pursues the proper goals of ODAs (Park and Ye, 2014, p. 1).[13]

13 Cited from Korea International Cooperation Agency (2018), p. 86.

Figure 6_Germany's Bilateral ODA Commitments By Region (1966~2017)

(Unit: USD million (nominal price))



Source: OECD Statistics, https://stats.oecd.org, accessed on September 29, 2019.

The beneficiary countries are evenly distributed across multiple regions. The top ten countries receiving the largest commitments from Germany include India, China, Turkey, Indonesia, Egypt, Pakistan, Iraq, Morocco, Brazil, and Israel. Vietnam ranks 19th, which hardly makes it one of the key ODA partner countries for Germany. Given the diversity of sectors and the relatively even distribution, Germany is strongly motivated by the proper goals of ODAs.

3. Issues with ODAs in Vietnam

A. Worsening Conditions for ODA Attraction

The conditions for ODAs in Vietnam are worsening for internal and external reasons. As mentioned above, starting in 2010, the World Bank classified Vietnam as a lower

middle-income country, which has led to a decline in concession-type loans. Now, the country has to rely on ODAs with terms closer to commercial loans. For this reason, the Ministry of Planning and Investment believes that ODA loans are not always more favorable than commercial loans, due to the time required for approval and payment, and the requirements from donor countries and institutions. Vietnam's public debt-to-GDP ratio is close to the limit set by the Vietnamese parliament (65%). Therefore, even if Vietnam receives concession-type loans through ODAs as it did in the past, the country may not be able to accept the conditions required by donor countries. Over the last three years, Vietnam has been refraining from receiving new commitments and disbursements other than existing commitments. However, Vietnam's infrastructure still needs improvement to be competitive, and construction projects will remain in demand for the next few decades.

B. Low ODA Disbursement Ratio

The deteriorating conditions are a relatively recent issue. On the other hand, the country's low disbursement-to-commitment ratio has been a chronic issue, for which donor countries and institutions have repeatedly requested improvement. Discrepancies between disbursements and commitments are mostly caused by delays in projects to which commitments have been made. The low disbursement ratio has been repeatedly pointed out since the resumption of ODA projects in the 1990's. Indeed, the low ODA ratio is one of the major issues faced by Vietnam, because it not only means that the country is not fully utilizing the funds that it has received, but also reduces potential ODA commitments in the future.

C. Inefficiency and Moral Hazard at Some Departments

The worsening of the ODA conditions has led to voices within Vietnam stating that there is no "free lunch" and that ODA funding should be viewed as debts, with external criticisms stating that administrative inefficiency lowers the disbursement ratio. Vietnam has been praised for building a well-established ODA governance structure with a centralized screening, supervision, and evaluation system led by the Ministry of Planning and Investment. However, with regard to the implementation and management of ODA projects, the central and local governments are being criticized for inefficiencies and moral hazards.

Ⅴ. Conclusion

1. Implications for Infrastructure Development and Financing for North Korea

A. Efforts and Preparations to Secure ODA Projects

The size and growth potential of ODA projects will be determined by the level of preparation in North Korea. It is expected that North Korea's success in securing ODA projects will hinge on its expressed commitment to liberalization and reforms, relevant policies and institutional supports, and its preparations to learn about ODAs and to then contact major donor countries and multilateral organizations. North Korea seems to be more determined than ever to overcome its economic distress by communicating with the outside world and securing assistance therefrom, as evidenced by its continuous efforts to negotiate the lifting of economic sanctions with the United States. However, due to its prolonged isolation from international society, in an attempt to hold a more advantageous position in negotiations, North Korea has displayed a strong tendency to refuse the conditions currently put forward by the United States and other countries. It is still too early to determine whether these isolationist behaviors will work for or against the country. However, such behaviors are not conducive to the country's efforts to secure financial resources from sources outside North Korea.

B. An Efficient ODA Management System

Among the internal preparations required for ODA reception, the development of ODA management governance holds the greatest technical significance and urgency. From the onset of receiving ODA projects, Vietnam built its ODA management system with the efforts of the Ministry of Planning and Investment and other central government departments. This centralized management system facilitated communication between donor countries, and helped Vietnam attract ODA projects by reducing the time required for discussing and completing the administrative process for ODA projects.

The centralized system also served as the focal point for ODA project management in Vietnam, and allowed for consistent and efficient project selection, supervision, and follow-up evaluation at the central government level. The centralized system also helped Vietnam reinforce its ownership over ODAs. When a beneficiary country reinforces its

ownership over ODAs, and uses them in accordance with its national development plans, it improves the effectiveness of the projects in the long term and allows donor countries to avail themselves of the outcomes of the ODAs.

Establishing a similar centralized ODA system will be an important goal in terms of ODA reception and management in North Korea. However, given North Korea's limited contact with the Western world, and the current status of its central administration systems and commitment management system, in the short term, North Korea may not be able to achieve that goal on its own. North Korea will have to build ODA administration systems with assistance from South Korea and other countries that have extensive experience as ODA beneficiaries, and to then improve these systems based on its own experiences.

C. Early ODA Outcomes for More ODA Commitments

Vietnam's ODA receipt rapidly increased over a short period of time, largely because it achieved ODA outcomes early on. Therefore, North Korea needs to work toward achieving ODA outcomes in a similar manner. In particular, improvement of performance indicators regarding poverty are likely to have great impact on the decisions of multilateral organizations because, unlike donor countries, these organizations do not have personal stakes in ODA projects.

D. Communication System with Donors

Many observers agree that Vietnam was able to secure vast resources by building a positive reputation among donor countries and multilateral organizations, and then maintaining strong ownership and control over ODA projects. Vietnam's reputation as a model beneficiary has been furthered by its efforts to gather, and act on, opinions from donor countries and multilateral organizations through multiple channels during and after ODA projects. Similarly, North Korea needs to engage in meaningful communications with donor countries and multilateral organization, to seek advice regarding ODA project needs, obstacles regarding financing and other aspects, and other issues requiring assistance.

E. Securing of Diverse Bilateral ODA Donor Countries

To secure better and consistent outcomes from ODA projects, North Korea needs to seek assistance from diverse DAC member countries. Indeed, cooperation with the international

development cooperation community should be the country's basic strategy for attracting assistance. It also needs to identify the assistance behaviors of individual countries, and to then analyze the major countries aided by each donor country in order to develop suitable strategies and plans. With regards to donor countries having a limited historic and diplomatic relationship with North Korea, the country needs to rely on economic motivations. It seems that there exists room for North Korea's active efforts to attract ODAs, at least in the area of infrastructure development.

F. Securing Non-ODA Financing Options

For developing countries in the early stages of national development, ODAs are likely to be their only available financing option. ODAs are aimed at helping developing countries achieve growth and escape poverty. For this reason, most requirements for ODA projects can be easily achieved by developing countries. However, as the economic situation in a developing country improves, donor countries may reduce or even discontinue assistance. In addition, despite their high accessibility, the duration of ODAs may be shorter than expected by developing countries. Likewise, North Korea is likely to face few obstacles in receiving humanitarian assistance in the early years. However, with the progress of the development projects and the growth of its income, it will be more difficult for North Korea to rely solely on external assistance. Given the fundamental goals of ODA projects, these limitations are inevitable and must be accepted by recipient countries. Therefore, North Korea should be aware of these possible limitations, and make the preparations required for seeking alternative financial resources and building the relevant systems.

G. Efforts for Efficient Use of ODA Commitments

From Vietnam's experience, a country in extreme poverty may use ODA commitments inefficiently, because the commitments are provided either for free or at low cost. North Korea may also go through the same issues on account of administrative regulations and inefficiency, in addition to its lack of experience in ODA projects. Lim et al. (2010, p. 257) stressed that North Korea should be prepared to deal with the issues found in Vietnamese ODA projects, where bureaucratism, slow implementation, and low competency led to degrees of dissatisfaction among donor countries and organizations.

Corruption, bureaucratism, and the resulting administrative inefficiencies are issues that go beyond the ODA sector, and may require prolonged nation-wide administrative reforms.

North Korea needs to build a centralized ODA management system, and use the system to hold project implementers accountable through monitoring, evaluation, compensation, and sanctions. ODAs are aid by definition, which means they are limited, and require compliance with specific requirements. A beneficiary country may find itself in a difficult situation if ODA commitments to the country do not produce the expected outcomes. Government departments tasked with carrying out ODA projects need to understand these issues and to build foundations the promote the efficient use of ODA funds.

2. Implications for South Korea

South Korea can provide indirect assistance to improve the possibility for North Korea to succeed with ODA projects. The assistance will mainly take the form of administrative support to make up for North Korea's lack of ODA experience. During the political preparations and efforts required for lifting international sanctions, South Korea can provide consultations regarding the systems, programs, and organizations for securing, implementing, and managing ODAs as part of North Korea's preparation for liberalization and reforms. South Korea has experience both as a donor country and a beneficiary country. As such, it will be able to benchmark cases of high-performing beneficiary countries such as Vietnam and advise North Korea as they apply those experiences to its own systems.

Vietnam's centralized ODA system is considered one of the key factors behind the country's success in ODA projects. South Korea needs to provide meaningful support for North Korea's efforts to build a similar system within the central government, and enable it to assign appropriate roles and build a cooperative system among the participating institutions. It will be difficult for North Korea to build such a system from scratch, and support from South Korea is likely to improve the effectiveness of the system. In this regard, ODA system development is one of the key areas of support for South Korea.

After establishing an internal system, North Korea will then need to develop performance management strategies and systems. The country will need to define strategic performance indicators aimed at achieving the results expected by international organizations and donor countries, and to commit resources to improving those indicators. This will be difficult to achieve for North Korea on its own, and the country will require substantial support and advice from South Korea, especially in the early years of its ODA projects.

The experience of Vietnam has confirmed the importance of communication and trust between donor countries and beneficiary countries in securing further commitments. It

largely falls on North Korea to revitalize communications with donor countries, build trust, and expand ODAs through those efforts. Unlike institutional reforms, system development, and strategy establishment, this is the area where South Korea has less room for direct intervention. However, South Korea can still provide North Korea with advice on how to communicate with donor countries, originating from its own experience as a donor country.

Apart from these diverse areas of support, South Korea can also directly provide ODAs to North Korea. These ODAs will not only help North Korea secure required financial resources, but also allow North Korea to build ODA experience early on, and confirm North Korea's commitment to liberalization, reforms, and its determination and management capabilities as an ODA recipient country. If backed by positive outcomes, those efforts will create further opportunities for securing assistance from major donor countries.

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