

Distributional Effects of Taxes and Benefits in Korea

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We develop a tax and transfer simulation model in Korea, which is named KIPFSIM. KIPFSIM aims to estimate effects of taxes and transfers in Korea. The current version of KIPFSIM adopts a static approach combined with an assumption of zero-elasticity; we assume that there exists no behavioral change in labor supply and consumption decision even after changes in taxes and transfers. KIPFSIM uses a representative sample of the Household Income and Expenditure Survey compiled and released by the Statistical Office of Korea. Using KIPFSIM, we investigate distributional effects of the proposed income tax cut, hypothetical changes in taxes and transfers, which is enacted in 2009 and 2010. We find that the benefit of the income tax cut is concentrated mostly on high income taxpayers in absolute value, but relatively more on middle income taxpayers in terms of percentage decreases in tax burdens. Therefore, the new income tax law is considered to strengthen the progressive structure change results and lower tax burdens (or revenue). We also find that the relative after-income-tax income inequality measured by Gini coefficient is slightly worsened, primarily due to the decrease in the income tax revenue, which works for equalizing income

Key Words: Gini, microsimulation, income tax, distributional effects

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1. Introduction

It has long been an academic and policy interest both for policy makers and for academic researchers to estimate the effects of government policies regarding taxes and benefits, and their changes. To achieve this goal, many types of models have been developed. Among them, a microsimulation model is a very strong tool analyzing the effects on micro-based distributions such as changes in poverty rates, inequality indexes, relative income or consumption ratios between different income groups, effective tax rates, and et cetera.

Many developed countries do have their own microsimulation models, which are widely used in policy design and evaluation. The Congress of the United States reviews proposed new/revised tax acts with policy analyses; the Joint Committee on Taxation (JCT) is in charge. Other government bodies such as Congressional Budget Office (CBO) and Office of Tax Analysis (OTA) also have their own and actively apply them¹. The NBER provides a tax simulation model (TAXSIM)². The UK, Australia, Canada, France, Ireland, Sweden, Norway, New Zealand and many more countries do have their own tax-benefit models³.

In Korea, several studies have been devoted to developing a simple simulation model. Sung (1997), and Sung & Chun (1998) focused on the Household Income and Expenditure Survey (HIES) compiled and released by the Statistical Office of Korea, which contains tax-related valuable information, and developed primitive versions of simple tax calculator programs for personal income tax. These calculator programs were extended by Sung & Park (2008) to see distributions of taxes and benefits by income deciles. However, their models were too simple to analyze more complicated effects of taxes and benefits. They could only deliver limited information on distributional characteristics. Therefore, a more rigorous and complicated model is required.

A tax return data set is the most useful source of information in the analysis of tax burden for microsimulation models. However, the tax returns and even their sample are not available in Korea. National Tax Service (NTS) of Korea provides tax-related information in the aggregate forms to the public. Due to the Personal Privacy Protection Act, any information on individual tax returns is not at all accessible by law, even for the academic or policy research purposes. This obstacle has constrained tax policy related research activities for a long time in Korea, despite its necessity. An alternative way has to be pursued; we use the HIES in constructing a microsimulation model⁴.

¹ For more detailed information, see CBO (2004, 2007), Juvenile Justice System (2006), University of Washington (2008), Urban-Brookings Tax Policy Center (2005), University of California-Berkeley (1998), Policy Simulation Group (1995,2008A·B·C·D), and Urban Institute (2000,2002,2003,2004,2007).

² See NBER (1997) for more details.

³ See HM Treasury (2007), IFS (1995), POLIMOD (2007), Kings College London (2003), University of Nottingham (1998), University of Melbourne (2004), University of Canberra (2003,2006,2007), Statistics Canada (2009), Center for Strategic Analysis (2006), ESRI (2006), Ministry of Finance (2005), Statistics Norway (1998), Treasury (2003) and OECD (2001) for more details.

⁴ The HIES only contains income and expenditure related household information, usually in aggregate levels. It is not at all easy to draw information of asset/debt distributions, individual income, expenditures, burdens of taxes and/or social security contributions, and benefits thereof. Using the HIES, we can impute tax liabilities and

In this paper, we construct a microsimulation model, which is named KIPFSIM. The KIPFSIM is equipped with a more complete set of tax calculators and also with analyzing tools for fiscal expenditures or public services rendered to the individual households.

Korean government modifies tax codes almost every year. Understanding the effects of tax change is very important to the public as well as to the government. KIPFSIM can illustrate more realistic results in tax revenue, distributional effects, and et cetera. We expect that the KIPFSIM will certainly contribute planning and evaluation of tax and fiscal policies.

In the KIPFSIM, a simulation model for the personal income tax is of the form of tax calculator. Personal income tax directly affects taxpayers' economic activities, such as labor market participation, labor hour decision, and et cetera. The progressive rate structure is also a critical factor affecting income redistributive effects. After all, personal income tax is important research agenda which affects individual disposable income directly and significantly. The personal income tax as a policy option sometimes saves administrative costs of fiscal expenditure. For instance, a subsidy or a transfer can be rendered in the form of negative personal income tax as refundable tax credits. In this case, we may not need additional government organization/institution to implement an additional subsidy program. The earned income tax credit is an example, which becomes effective since 2008 in Korea. This change in personal income taxation increases the needs for policy simulations with specific deductions or credits. In this sense, the KIPFSIM is developed to meet various policy planning and evaluation needs.

The microsimulation model named KIPFSIM is being developed in three steps. In the first step, it is constructed as a simple tax calculator model focusing mostly on detailed income tax system and consumption taxes. In the second step, behavioral changes and dynamic effects will be incorporated explicitly into the model. Finally, we will expand the model by developing benefit calculators. This paper primarily aims to develop the original model of the first step with tax calculators, and analyzes revenue effects, distributional effects of income and consumption taxes and benefits from private and public sectors.

The main body of this paper is as follows. Chapter 2 develops a basic version of a microsimulation model (KIPFSIM). Chapter 3 analyzes the effects of taxes and transfers mainly focusing on the personal income tax. Chapter 4 concludes this paper.

2. Model and Data

2.1. Model

The main objects of KIPFSIM are to estimate distributions of taxes and benefits, and to analyze

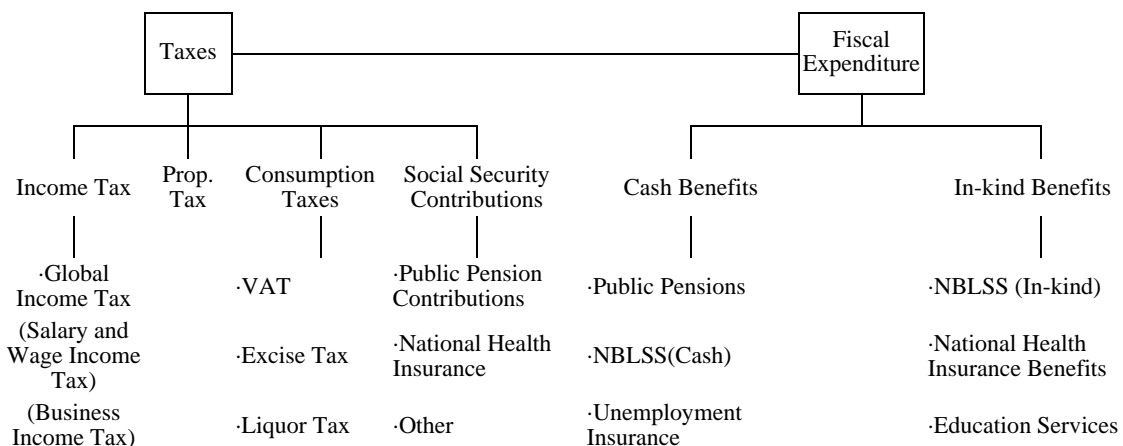
benefits up to a certain limited level. When an alternative survey data set containing more information is available, we may extend the primitive version of simulation model with limited information to more advanced one. Therefore, an additional data set is required for more robustness and consistent estimation. For this reason, the Korea Institute of Public Finance recently launched a project of compiling a panel data set related to taxes and benefits.

distributional effects of policies and their changes. KIPFSIM is a primitive version and, thus, it is sometimes not tractable to simulate individual responses. Income and consumption taxes are imputed using tax calculator programs embedded in the model⁵. However, we do not have sufficient information and technique to calculate cash benefits from survey data as of now. Regarding benefits, property tax burden, and social security contributions, reported values in the HIES are used in estimating overall distributions of taxes and benefits. Therefore, policy simulations are available only for income and consumption taxes under the current KIPFSIM framework. In the following chapter, we report distributions of taxes and benefits, and show a couple of simulations on personal income tax to evaluate the effects of changes in personal income tax law passed by the National Assembly of Korea in late 2008, using KIPFSIM.

KIPFSIM consists of two parts: the first part is composed of tax calculator programs for income and consumption taxes and the second part is for benefits, property tax, and social security contributions without imputation. The households are rearranged in accordance with gross income in ascending order. Using information of demographic characteristics and incomes by sources, personal income tax burdens are calculated through income tax calculator. Household income tax burdens are estimated by summing up all income tax burdens of household member(s). Using information of item-by-item consumption expenditures contained in the HIES, item-by-item household consumption tax burdens are calculated by backward deduction methods. Household cash benefits (or transfers), other direct taxes, and social security contributions are used as reported. Market income is reported in the HIES. All necessary information is either estimated or reported, private through post-tax incomes are derived from these. Using individual data, Gini coefficients and concentration indexes are calculated.

KIPFSIM does not consider behavioral changes in labor supply or consumption/saving decision: in other words, we assume that the economic agents stick to current positions, no matter what takes place. We think that this assumption is too unrealistic: we will modify this shortcoming in the next study.

Table 1. Basic Structure of Microsimulation Model (KIPFSIM)



⁵ In-kind benefits can be imputed using calculator-program as of now. However, we do not consider in-kind benefits here since we are not yet ready to impute for reliable results.

·Dividend & Interest Income Tax	·Automobile Tax	·Other	·Childcare Services
	·Tobacco Consumption Tax		·Housing Services
	·Education Tax		·Other
	·Driving Tax		
	·Special Tax for Rural Area		

Note: NLBSS stands for the National Basic Livelihood Security System provided for the poor.

The analysis of benefits-in-kind is beyond the scope of this study due to the lack of necessary information. Recently, Sung & Park (2008) estimated distribution of in-kind benefits; however, we think a more rigorous basic study is required for more consistent and robust results. Therefore, we will incorporate those in the future studies.

2.2. Data

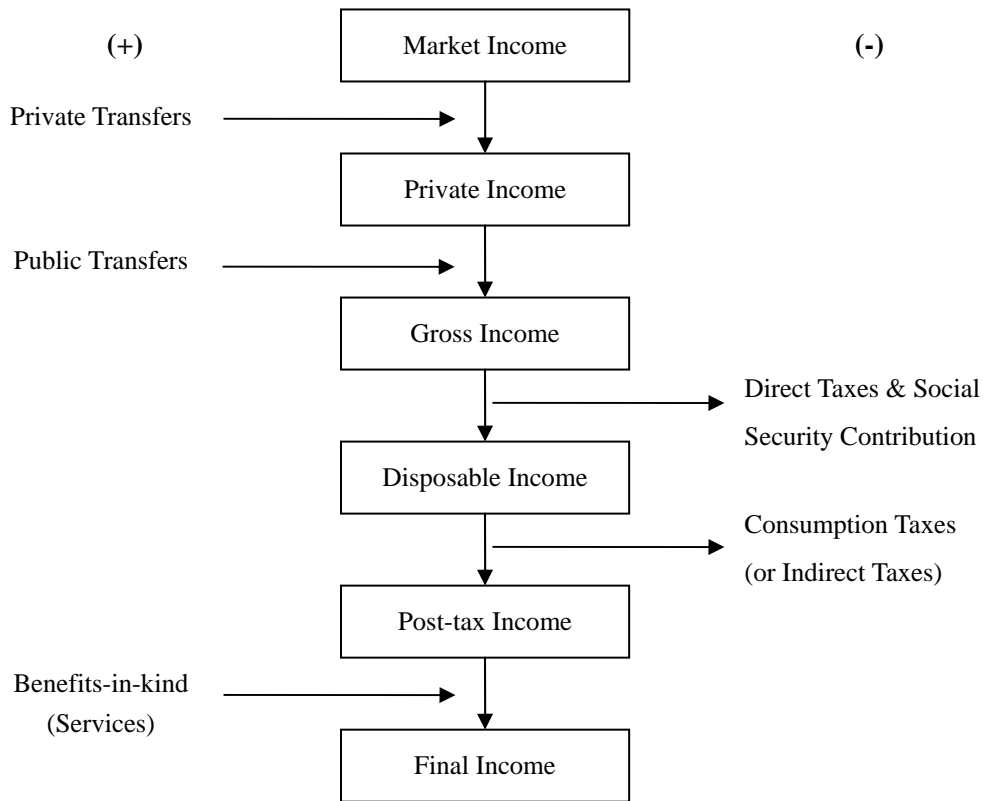
This paper uses the raw data of the HIES. The HIES contains demographic characteristics, income and expenditure related information of households. The HIES covers all types of households except those working in farming and fishing industries which account for only a couple of percents of whole population or less. It is compiled by bookkeeping method on a monthly basis and released on a quarterly basis: the records are collected once a month. Every household is required to remain in the sample for three years. Therefore, the HIES seems a changing panel. However, the annual attrition rate is more than 30% and, thus, the Statistical Office replaces missing observations regularly and releases cross-sectional information only.

Monthly observations are converted into annual observations by summing up monthly incomes and/or expenditures of matched households by household ID numbers. It inevitably faces missing monthly observations and this often yields selection bias. Sung (2002) found that the quarterly information of the HIES reveals statistically significant seasonality and, furthermore, that missing observations are not chosen randomly. Therefore, any imputation of missing monthly data without correcting seasonality and selection bias misleads inference on annual information. He suggests a method of annualizing the monthly data without causing inconsistency and this paper follows his method.

In this paper, we introduce numerous definitions of income such as market, private, gross, disposable, post-tax and final incomes. Market income which is often called ‘original income’ is income earned in the market by supplying labor and capital. Private and gross incomes are derived by adding private and public transfers to market income, respectively. Disposable and post-tax incomes are defined as income after subtracting direct and indirect taxes including social security contributions from gross income. Final income is after-taxes-and-benefits-income which is derived from adding in-kind benefits or services

measured in cash value to post-tax income. Usually, post-tax and final incomes are not observed in general since consumption taxes and in-kind benefits are not tangible or observable.

Figure 1. Definitions of Incomes



Source: Sung & Park (2008)

This paper estimates the distributions of income and taxes for the Year 2009. The most recent available information (i.e. raw data set) is for the Year 2006. Therefore, it is necessary to convert 2006 data set to 2009 data set. All variables related to income and consumption are assumed to change proportionally with the per-capita nominal GDP growth rates: 5.84% in 2007 and 6% each in 2008 and 2009. This implies that the relative distribution structure remains the same as that for the Year 2006. All information regarding demographic characteristics is assumed to be unchanged for simplicity of discussion.

An average household size is 3.0: it is 3.15 for employed households and 3.34 for self-employed households. The household size of not-employed is 1.97, which is much smaller than other household types since they are mostly old singles or couples without dependents. The average number of workers (or income earners by supplying labor) of all households is 1.28; whereas it is 0.16 for not-employed households. The average age of household heads is 48.8; it is 63.3 for not-employed households, which strongly implies that not-employed households consist most of households the heads of which are old.

The average gross income and consumption expenditure per household are 44.5 and 27.2 million KRW, respectively; the average propensity to consume is 61.1%.

Table 2. Descriptive Statistics of the HIES Based on the Converted Values for the Year 2009

	Sample mean
Household Size	
Whole	3.00
Employed	3.15
Not-Employed	1.97
Self-Employed	3.34
Number of Income Earners	
Whole	1.28
Employed	1.45
Not-Employed	0.16
Self-Employed	1.64
Age of Household Head	
Whole	48.77
Employed	44.76
Not-Employed	63.33
Self-Employed	47.59
Gross Income (KRW)	
Whole	44,542,441
Employed	46,416,740
Not-Employed	27,678,017
Self-Employed	50,973,815
Consumption Expenditure (KRW)	
Whole	27,191,798
Employed	29,154,775
Not-Employed	15,478,926
Self-Employed	30,449,098
Average Propensity to Consume (%)	
Whole	61.05
Employed	62.81
Not-Employed	55.92
Self-Employed	59.73

Notes: The converted values for the Year 2009 are converted from 2006 data. Demographic characteristics are those for the Year 2006, and other information is the converted values for the Year 2009. 2009 values are obtained by multiplying expected per-capita GDP growth rates between 2006 and 2009.

3. Simulations

To illustrate the use of KIPFSIM, we analyze the effects of recent personal income tax change. According to the Personal Income Tax Law passed by the National Assembly of Korea in late 2008, the marginal income tax rates are lowered by two percentage points for each tax bracket and the basic deduction schemes are adjusted. The basic deduction level increases from 1 million KRW to 1.5 million KRW. Instead, for salary and wage income earners, the deduction rate decreases from 100% to 80% for the range of zero to 5 million KRW. Table 3 describes the detailed changes in Personal Income Tax Law.

Table 3. Changes in Personal Income Tax Law

(Unit: 10,000 KRW)

	2008	2009 (Law Passed in 2008)
Salary and Wage Income Deduction Rates	~ 5 million KRW: 100% 5~15 million KRW: 50% 15~30 million KRW: 15% 30~45 million KRW: 10% 45 million KRW~ : 5%	~ 5 million KRW: 80% 5~15 million KRW: 50% 15~30 million KRW: 15% 30~45 million KRW: 10% 45 million KRW~ : 5%
Tax Rates	* 8~35% ~12 million KRW: 8% 12~46 million KRW: 17% 46~88 million KRW: 26% 88 million KRW~: 35%	* 6~33% ~12 million KRW: 6% 12~46 million KRW: 15% 46~88 million KRW: 24% 88 million KRW~: 33%
Basic Deduction	1 million KRW per eligible person ⁶	1.5 million per eligible person

According to the new tax law, we can expect the decrease in income tax burden. Consider a person with 2 dependents and annual income of 30 million KRW. In this case, his/her income tax burden decreases by about 0.3 million KRW⁷. As shown in Figure 2, it is not difficult to expect that the income tax burden will decrease across all income levels and that the high income earners will face the largest tax cut in absolute value from the income tax change. However, it is also expected that the middle income groups will be most beneficial in terms of percentage decreases in income tax burden. The overall distributional effects of the income tax change do not immediately follow from the fact that all income groups benefit from income tax cut. The income inequality index such as Gini coefficient relies on the relative amount of the reduced tax burden as well as the absolute amount of the reduced tax burden. To examine how the effects of the tax change are distributed across different income groups, we use KIPFSIM and compare after income tax income distributions under the past and the current laws.

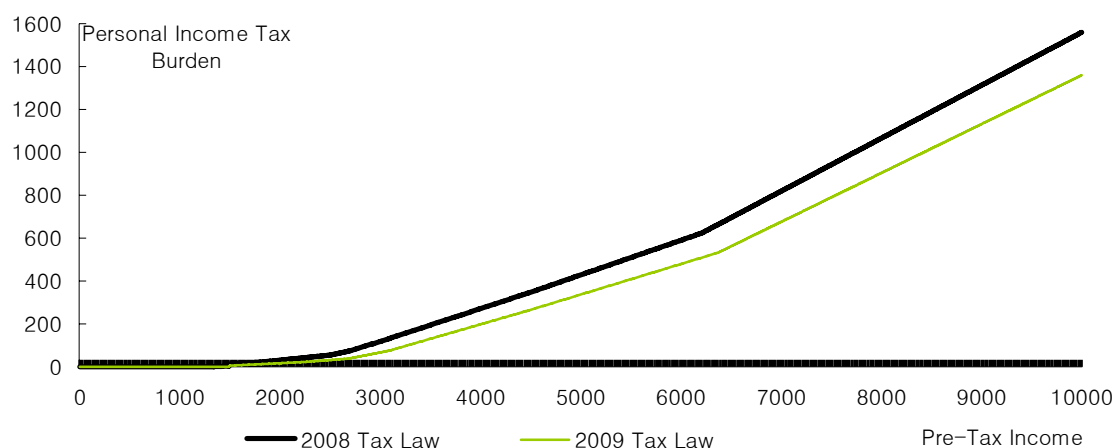
Figure 2. Income Tax Burdens under 2008 and 2009 laws⁸

(Unit 1,000 KRW)

⁶ A family member can be claimed to be eligible for basic deduction, if her annual income is less than 1 million KRW.

⁷ For this example, we assume that he/she has only salary and wage income and that he/she claims only the basic deduction and the standard deduction. Under these assumptions, his/her income tax burden decreases from 1.53 to 1.24 million KRW.

⁸ In this case, basic deduction is applicable for three persons. Furthermore, standard deduction, and wage and salary income deduction are also applicable.



Aforementioned, we derive the market income and consumption values for the year 2009 by assuming that they increase proportionally with the nominal per-capita GDP growth rate. In other words, the 2009 values of market income and consumption are calculated by multiplying their 2006 values by the projected nominal GDP per-capita GDP growth rate between 2006 and 2009. Another implicit but critical assumption in this analysis is the zero price elasticity of labor supply⁹. Even after the changes in income tax rates, each household is assumed not to change its labor supply decision.

In what follows, we present two imaginary cases of tax and benefit distributions projected for the year 2009. The first distribution is obtained by assuming that the current income tax law is imaginarily maintained in 2009. The other is obtained by applying the current income tax law passed in late 2008 to the market income data with 2009 values. Evaluation of the effects of income tax changes follows from comparing these two cases.

3.1. Tax and Benefit Distribution: Baseline Distribution under the Law Effective in 2008

We start with presenting a baseline distribution, which is a hypothetical distribution estimated under the derived market income distribution for the year 2009 combined with income tax law effective in 2008. In 2009, the average estimates of household market and gross incomes are 41.0 and 44.5 million KRW, respectively. On average, each household bears direct tax burden of 2.2 million KRW, which is 4.4 % of its gross income. The average social security contributions and consumption taxes per household are 1.8 and 2.2 million KRW, respectively¹⁰. In sum, the average household bears 5.9 million KRW in taxes and social security contributions, which results in an average disposable income of 38 million KRW. As for the lowest income decile, its market and disposable incomes are 7.1 and 9.9 million KRW, respectively. Their gap stems from 3.6 million KRW of transfer income and 0.8 million KRW of taxes. In contrast, the highest income decile has 99.7 million KRW of market income and 4.8 million KRW of transfer income.

⁹ Admittedly, this assumption is very restrictive and, so, it needs to be relaxed to get more plausible results.

¹⁰ They correspond to 4.0% and 4.9% of the gross income, respectively.

The 10th decile bears 17.2 million KRW in direct taxes, indirect taxes, and social security contributions. As a result, its post-tax income is 87.0 million KRW.

Table 4 shows distributions of direct taxes by income deciles. The average effective rate of direct taxes relative to the gross income is 4.4%¹¹. The effective rate of direct taxes, especially that of income tax, tends to increase with gross income. For example, the first decile bears 0.84% of its gross income for direct taxes. However, the tenth decile bears 7.88% of its gross income for direct taxes. In terms of direct taxes, high income deciles bear most burden. The upper three deciles contribute 80% of the total direct tax revenue, while the lower three deciles contribute less than 3%. The highly skewed direct tax burden structure generates an equalizing effect of resulting income distributions.

Table 4. Distribution of Direct Taxes by Gross Income Deciles (As of 2009 Based on 2008 Laws, Projected)

(Unit: %)

Effective Tax Rates Relative to Gross Income	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Avg.
Income Tax (A)	0.4	0.68	0.94	1.48	2.24	2.63	3.35	4.29	4.97	7.46	4.09
Property Tax (B)	0.44	0.37	0.31	0.28	0.29	0.27	0.32	0.27	0.39	0.42	0.34
Direct Taxes (A+B)	0.84	1.05	1.25	1.77	2.53	2.89	3.66	4.56	5.36	7.88	4.43
Shares	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Income Tax	0.23	0.68	1.26	2.45	4.47	6.17	9.16	13.73	19.14	42.73	100
Property Tax	3.09	4.45	4.98	5.64	6.98	7.5	10.4	10.45	17.97	28.53	100
Direct Taxes	0.45	0.97	1.54	2.7	4.66	6.27	9.25	13.47	19.05	41.63	100

Before presenting results under the recently changed income tax law, we briefly illustrate distributions of consumption taxes, transfers, and social security contributions. Unlike the direct taxes, the effective rates of consumption taxes do not necessarily increase with household income. The effective tax rates range more or less irregularly from 4.5% to 5.9%. The consumption taxes are in fact regressive. However, highest three income deciles have lower effective rates than average. For liquor tax and tobacco consumption tax, its burden is very similar across all deciles due to their highly inelastic demands and specific tax structures. Therefore, their effective tax rates decrease against gross income. However, their redistributive effects on income distribution turn out to be negligible, measured by the percentage changes in Gini coefficient, since their revenue size is too small to affect significantly.

Table 5. Distribution of Consumption Taxes by Gross Income Deciles (As of 2009, Projected)

(Unit: %)

Effective Tax Rates Relative to Gross Income	1st	2nd	3rd	4th	5th	6 th	7th	8th	9th	10th	Avg.
VAT	3.18	3.43	3.55	3.57	3.55	3.62	3.47	3.29	3.21	2.9	3.3
Special Excise Tax	0.41	0.38	0.39	0.44	0.42	0.46	0.39	0.35	0.34	0.31	0.37

¹¹ The effective tax rate is defined as a tax to the gross income. Also we define the average effective rate as the ratio of average tax burden to average gross income.

Transportation Tax	0.43	0.66	1.02	1.14	1.28	1.4	1.4	1.23	1.32	1.19	1.21
Liquor Tax	0.14	0.11	0.11	0.1	0.1	0.08	0.07	0.06	0.06	0.04	0.07
Tobacco Consumption Tax	0.42	0.4	0.37	0.32	0.32	0.29	0.25	0.2	0.18	0.11	0.23
Consumption Taxes	4.58	4.99	5.45	5.57	5.67	5.86	5.58	5.13	5.11	4.55	5.18
Shares	1st	2nd	3rd	4th	5th	6 th	7th	8th	9th	10th	Total
VAT	2.3	4.27	5.92	7.33	8.79	10.55	11.79	13.08	15.34	20.64	100
Special Excise Tax	2.65	4.22	5.7	8.04	9.14	12	11.82	12.19	14.5	19.73	100
Transportation Tax	0.85	2.23	4.63	6.34	8.64	11.05	12.92	13.3	17.09	22.93	100
Liquor Tax	4.56	6.22	8.46	9.6	11.22	11.08	10.41	10.89	13.32	14.26	100
Tobacco Consumption Tax	4.32	7.1	8.84	9.28	11.44	12.33	12.31	11.23	12.4	10.77	100
Consumption Taxes	2.11	3.94	5.76	7.27	8.93	10.86	12.06	12.96	15.53	20.58	100

Table 6 and 7 summarize the estimates of transfers and social security contributions by income deciles. In 2009, the average transfer income of a household is expected to be 3.8 million KRW. The transfer income does not show a clear relationship with the gross income. It oscillates between 2.9 and 4.8 million KRW; it is the largest in the tenth decile and the smallest in the eighth decile. This observation does not result only from private transfers. Public transfers also have similar patterns. By design, a high income earner receives more pension benefit. Thus, public pensions are weakly and positively correlated with household income under some conditions¹². As a result, transfers are pretty much evenly distributed over the income deciles.

In contrast to transfers, social security contributions clearly reveal a progressive distributional structure. The first income decile bears 0.2 million KRW of social security contributions, which amounts to 1.7% of its gross income. The highest income decile bears 4.3 million KRW per household of social security contributions, which amounts to 4.1% of its gross income.

Table 6. Distribution of Transfer Incomes by Gross Income Deciles (As of 2009, Projected)
(Unit: %)

Effective Rates Relative to Gross Income	1st	2nd	3rd	4th	5th	6 th	7th	8th	9th	10th	Avg.
Private Transfers(A)	20.24	14.45	9.88	8.25	5.59	4.45	3.9	3.21	3.17	2.75	5.06
Public Pensions (B)	3.64	2.39	3.82	2.91	2.45	2.48	1.53	1.24	1.85	1.18	1.93
Other Social Security Cash Benefits (C)	9.66	5.59	3.45	2.28	1.27	0.9	0.79	0.55	0.75	0.68	1.43
Public Transfers (D=B+C)	13.31	7.98	7.27	5.19	3.73	3.38	2.33	1.79	2.59	1.87	3.37
Transfers (A+D)	33.55	22.42	17.16	13.44	9.32	7.83	6.23	5	5.77	4.62	8.43
Shares	1st	2nd	3rd	4th	5th	6 th	7th	8th	9th	10th	Total
Private Transfers	9.54	11.7	10.71	11.03	9.01	8.45	8.64	8.31	9.88	12.73	100
Public Pensions	4.5	5.07	10.83	10.19	10.36	12.32	8.89	8.41	15.07	14.36	100

¹² Public pensions depend on earnings profile of eligible family members. However, income deciles are classified by gross income in a given year. Such fact allows a low income earner in 2009 may receive relatively high pension benefits owing to sufficiently large past contributions of his. The positive correlation between current income and pension benefits implies the positive correlation with the present value of his lifetime earnings and his household income in 2009.

Other Social Security Cash Benefits	16.09	15.99	13.23	10.77	7.24	6.03	6.21	5.04	8.2	11.2	100
Public Transfers	9.43	9.72	11.85	10.44	9.03	9.64	7.75	6.98	12.15	13.01	100
Transfers	9.5	10.91	11.17	10.79	9.02	8.92	8.28	7.78	10.79	12.84	100

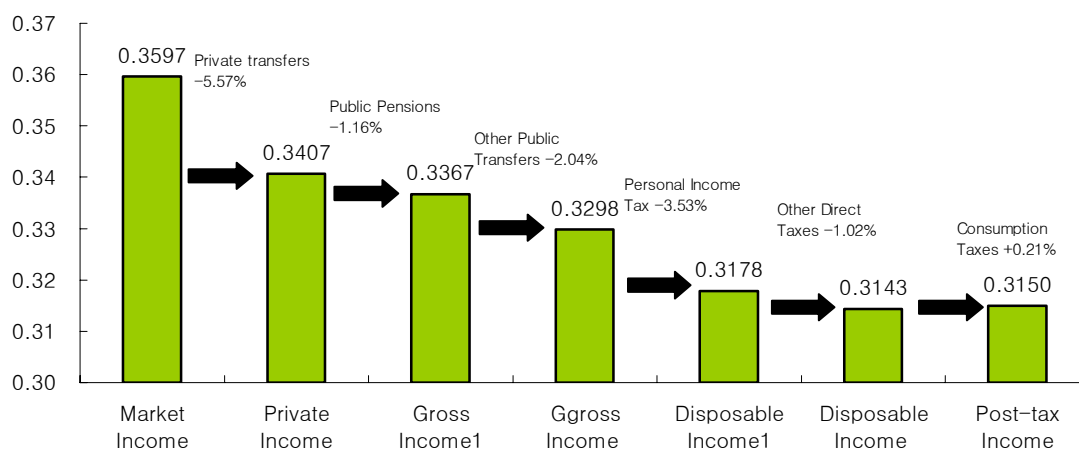
Table 7. Distribution of Social Security Contributions by Gross Income Deciles (As of 2009, Projected)

(Unit: %)

Effective Rates Relative to Gross Income	1 st	2nd	3rd	4th	5th	6 th	7th	8th	9th	10th	Avg.
Public Pensions	0.49	0.93	1.38	1.7	1.95	2.22	2.41	2.66	2.53	2.38	2.19
National Health Insurance	1.22	1.41	1.53	1.65	1.61	1.75	1.68	1.73	1.69	1.59	1.64
Other	0.03	0.04	0.1	0.1	0.15	0.15	0.15	0.16	0.16	0.13	0.13
Total	1.74	2.39	3.01	3.46	3.71	4.13	4.25	4.54	4.38	4.09	3.96
Shares	1st	2nd	3rd	4th	5th	6 th	7th	8th	9th	10th	Total
Public Pensions	0.54	1.75	3.47	5.27	7.29	9.76	12.34	15.9	18.22	25.47	100
National Health Insurance	1.78	3.54	5.13	6.85	8.02	10.3	11.53	13.81	16.26	22.76	100
Other	0.51	1.23	3.96	4.98	9.01	10.77	12.52	15.23	19.26	22.55	100
Total	1.05	2.47	4.17	5.91	7.65	10.02	12.01	15.02	17.44	24.25	100

Figure 3 and Table 8 show income inequality measured by Gini coefficients. Based on the estimates in Tables 4 through 7, we may expect that direct taxes and social security contributions ameliorate, but indirect taxes deteriorate income distribution. As expected, the income inequality improves in every step up to disposable income. The Gini coefficients of market and post-tax incomes are 0.3597 and 0.3150, respectively.

Figure 3. Redistributive Effects of Taxes and Benefits (As of 2009 Based on 2008 Laws, Projected)



Notes: Gross Income 1 = Private Income + Benefits from Public Pensions
 Disposable Income 1 = Gross Income – Personal Income Tax
 The percentage change in Gini coefficient is defined as the change in Gini coefficient divided by the Gini coefficient of the Private Income.

Table 8. Gini Coefficients of Various Incomes (As of 2009, projected)

Incomes	2008 Laws	2009 Laws
Market Income (MY)	0.35970	0.35970
Private Income (PY = MY + Private Transfers)	0.34066	0.34066
PY + Benefits from Public Pensions	0.33674	0.33674
Gross Income (GY=PY+Public Pensions+Other Public Transfers)	0.32975	0.32975
GY – Income Tax	0.31779	0.31964
GY – Income Tax – Property Tax	0.31759	0.31945
GY – Income Tax – Property Tax – Public Pension Contributions	0.31494	0.31687
GY–Income Tax–Property Tax–Public Pension Contributions–Nat’l Health Insurance Fee	0.31446	0.31643
Disposable Income (DY=GY–Income Tax–Property Tax–Public Pension Contributions–National Health Insurance Fee–Other Social Security Contributions)	0.31432	0.31629
DY – VAT	0.31494	0.31698
DY – VAT – SET	0.31511	0.31715
DY – VAT –SET - LT	0.31524	0.31728
DY – VAT –SET - LT - TRT	0.31443	0.31651
Post-Tax Income (PTY= DY – VAT –SET - LT - TRT -TOBT)	0.31496	0.31704

Notes: SET, LT, TRT and TOBT stand for Special Excise Tax, Liquor Tax, Transportation Tax and Tobacco Consumption Tax, respectively.

The relative income ratios of the tenth to the first income deciles show similar results. The gap between those two income deciles can be decomposed. We find that private transfers have the strongest positive redistributive effect, and that income taxes and other social security benefits have the second and third largest effects, respectively. We can conclude from these that direct taxes and benefits have positive income redistributive effects. To the contrary, indirect taxes work against equalizing income across households. Fortunately, however, the effects of the latter turn out to be quite small. Indirect taxes raise the Gini coefficient by about 0.001p, which is only 0.21% of the private income Gini coefficient.

Table 9. Relative Income Ratios of the highest to the lowest Income Deciles

	Market Income	Private Income	Gross Income	Disposable Income	Post-tax Income
Ratios	14.10	11.12	9.82	8.88	8.84

3.2 Tax and Benefit Distribution: Distribution under the New Law

In comparison with the 2008 income tax law, the 2009 income tax law lowers the average effective income tax burden by about 22% on average. According to Figures 4 and 5, the reduced income tax burden is widely observed for all income deciles, although the relative percentage decreases in tax burden are asymmetric across income deciles. We find that the top income decile gets largest tax cut in absolute value. Without the income tax change, the top income decile would pay additionally 1.2 million KRW more. About 67% of the total income tax cut takes place in the upper three income deciles. In terms of relative percentage changes in income tax burdens, the result is reversed. The percentage decreases in income tax burdens are largest in the lowest income decile. Low income deciles tend to be more relieved by the recent income tax changes in relative terms. These seemingly contradictory results are perfectly consistent with the direction of the income tax cut, which lowers the marginal tax rate evenly for all

income tax brackets and increases basic deductions. As a result, the income tax burden becomes more progressive: the upper three income deciles' share in income tax burden jumps up from 76% to 78%. The nominal income tends to increase with time due to inflation and real growth. Almost every income decile would experience higher marginal tax rates without inflation indexation.

Figure 4. Effective Income Taxes Rates Before- and After-2009 Income Tax Changes by Income Deciles Group

(Unit: %)

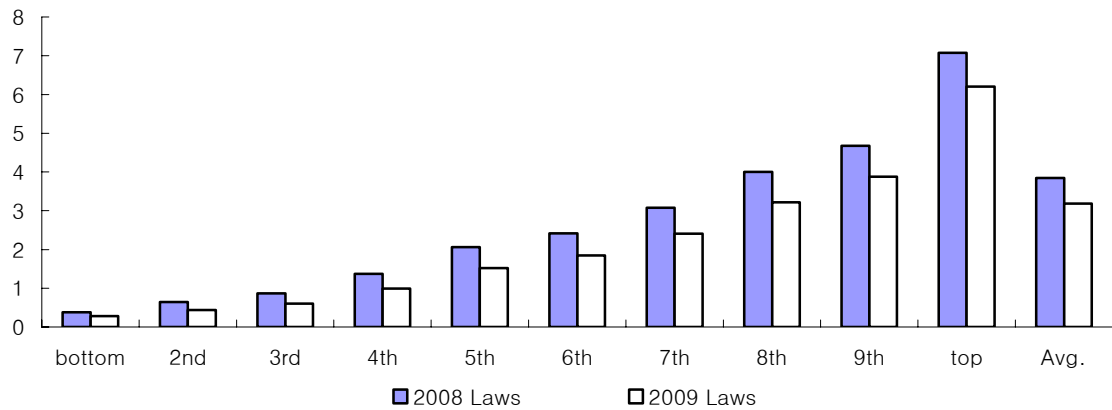
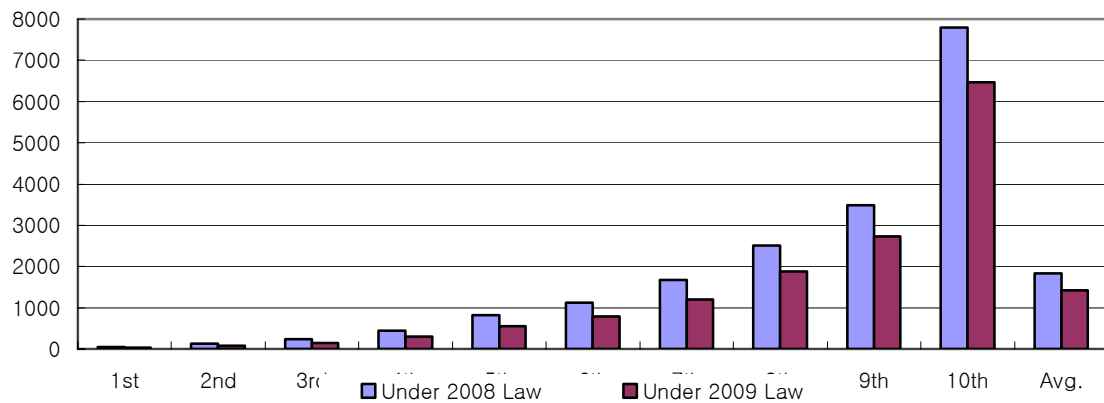


Figure 5. Distribution of Income Tax Burdens Before- and After-2009 Income Tax Changes by Income Deciles Group

(Unit: 1,000 KRW)



The third column shows the Gini coefficient under 2009 tax laws. The Gini coefficient of the 2009 gross income is 0.32975. Under the 2009 income tax law, the Gini coefficient of post-income-tax income is 0.31964, which is 3.1% lower than the 2009 gross income. Recall that the corresponding Gini coefficient under the 2008 income tax law is 0.31780. The redistributive effect through personal income tax becomes smaller, although the progressive feature is more salient in the new income tax law. These seemingly contradictory results come from the decrease in income tax revenue. Income tax has income equalizing effect; therefore, the decrease in income tax revenue generally weakens its redistributive effect. However,

the normalized redistributive effect of income tax defined as the change of the Gini coefficient relative to income tax revenue is higher under the 2009 income tax law.

We can infer the revenue effect of income tax change from the changes in effective income tax rates or average income tax burden per household between the two cases of 2008 and 2009 laws, using information on the number of households. The total income tax revenue is equal to the product of the number of household and average income tax burden per household. Using this information, the income tax revenue for the year 2009 under the 2009 tax laws is estimated to be 21.4 billion KRW. The income tax revenue would reach 27.4 billion KRW, without tax changes. Thus, we can conclude that the income tax change lowers the revenue by 6 billion KRW¹³.

4. Conclusion

Income tax and subsidies follow complicated institutional design and directly affect taxpayers' disposable income. As the roles of the government expand with time, it becomes more important to understand policy effects. As the economy grows, a more rigorous policy analysis is requested for more equitable and efficient national resource allocation. Thus, a more logical and analytical tool is desirable to estimate or forecast potential changes in resource allocation. In this sense, a simulation model is one of the most wanted tools. A microsimulation model is a popular and powerful economic tool for policy analysis. Therefore, many developed and developing countries have their own models and apply them for their policy design processes.

To do this, here, we construct a microsimulation model of analyzing the effects of taxes and benefits, named KIPFSIM. The KIPFSIM estimates distributions of various definitions of incomes, taxes and benefits, and estimate effectiveness/efficiency of government policies such as redistributive effects, revenue effects, changes in labor supply, and et cetera. The current version of KIPFSIM developed here is mainly a collection of basic tax calculators. It covers income tax, value-added tax and excise taxes. As of now, it also uses information of benefits from transfers and social security contributions directly from the survey data set, the HIES.

Using the KIPFSIM, we analyze the economic effects of 2008 tax reform. The decreases in income tax rates yield more tax savings to high taxpayers in absolute value, but largest tax relieves to low income deciles in terms of percentage changes. It is also expected that the income tax revenue will decrease significantly by 22%, compared with the projected revenue under the past law. The results show that income tax cut would worsen disposable income distribution, even with the resulting increased progressiveness of tax amount mainly due to the decrease in income tax revenue.

¹³ This estimate should be interpreted carefully since it is likely to have some estimation errors for the following reasons. First, the statistical yearbook of national tax does not provide the income tax revenue from the given year's income. Instead it reports the income tax revenue collected in the given year. The latter is the sum of the withheld or self-assessed income tax for the year and the adjustment for the previous year. Secondly, our estimate of income tax revenue includes only (i) the global income tax and (ii) income tax of wage and salary income.

Our results hint at the distributional effect of hypothetical changes in consumption taxes and public transfers. The consumption tax increases would be expected to significantly affect post-tax income distribution, since their burden structure is more or less very close to proportional to disposable income. Increasing public transfers would be expected to have significant income redistributive effects due to their distributional characteristics aiming low income groups more.¹⁴ Given budget constraints, this implies that more targeted expenditure can improve equity more effectively and efficiently. We need to expand and improve the KIPFSIM by incorporating taxpayers' behavioral responses, dynamic effects of policy changes and et cetera.

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¹⁴ Simulation using KIPFSIM confirms our anticipation although we do not provide detailed results in this paper.

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Appendix

Table A-1. Distribution of Incomes, Taxes, and Transfers by Gross Income Deciles Groups (As of 2009
Based on 2008 Laws, Projected)

Amounts (1,000 KRW)	bottom	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Avg.
Market Income	7061	14158	20265	26088	32937	39453	46732	55418	66210	99574	40789
Private Transfers(A)	2151	2636	2418	2486	2030	1905	1945	1874	2231	2869	2255
Private Income	9213	16794	22682	28574	34967	41358	48677	57292	68441	102443	43043
Public Pensions(B)	387	436	934	877	891	1061	764	724	1299	1236	861
Other Soc. Sec. Cash Ben. (C)	1027	1019	845	687	462	385	396	322	524	714	638
Public Transfers(D=B+C)	1414	1455	1779	1564	1353	1446	1160	1046	1823	1950	1499
Transfers (A+D)	3565	4092	4196	4051	3383	3351	3105	2920	4053	4820	3754
Gross Income	10627	18250	24461	30138	36320	42803	49837	58338	70264	104393	44542
Income Tax(E)	42	123	229	447	814	1125	1668	2503	3494	7787	1823
Property Tax(F)	47	68	76	86	106	114	158	159	274	434	152
Direct Taxes(G=E+F)	89	191	305	533	920	1239	1826	2662	3767	8221	1975
Public Pensions Cont.(H).	52	170	338	513	710	951	1202	1550	1777	2481	974
Nat'l Health Ins. Cont.(I)	130	258	375	499	584	751	839	1007	1186	1658	729
Other Soc. Sec. Cont.(J)	3	7	24	30	54	65	75	91	116	135	60
Soc.Sec. Cont.(K=H+I+J)	185	436	737	1042	1348	1766	2116	2648	3079	4274	1763
Disposable Income	10352	17623	23420	28564	34052	39798	45895	53028	63417	91898	40804
VAT	338	627	869	1076	1289	1549	1729	1920	2254	3028	1468
Special Excise Tax	44	70	94	133	151	198	195	201	240	326	165
Transportation Tax	46	121	251	343	467	598	698	719	925	1239	541
Liquor Tax	15	20	28	31	37	36	34	36	44	47	33
Tobacco Consumption Tax	44	73	91	95	117	126	126	115	127	110	102
Consumption Taxes	487	910	1332	1678	2060	2507	2781	2991	3589	4750	2309
Post-tax Income	9865	16713	22087	26887	31993	37291	43114	50037	59828	87148	38496
Ratios to Gross Income (%)	bottom	2nd	3rd	4th	5th	6th	7th	8th	9th	top	Avg.
Market Income	66.45	77.58	82.84	86.56	90.68	92.17	93.77	95	94.23	95.38	91.57
Private Transfers(A)	20.24	14.45	9.88	8.25	5.59	4.45	3.9	3.21	3.17	2.75	5.06
Private Income	86.69	92.02	92.73	94.81	96.27	96.62	97.67	98.21	97.41	98.13	96.63
Public Pensions(B)	3.64	2.39	3.82	2.91	2.45	2.48	1.53	1.24	1.85	1.18	1.93
Other Soc. Sec. Cash Benefits (C)	9.66	5.59	3.45	2.28	1.27	0.9	0.79	0.55	0.75	0.68	1.43
Public Transfers(D=B+C)	13.31	7.98	7.27	5.19	3.73	3.38	2.33	1.79	2.59	1.87	3.37
Transfers (A+D)	33.55	22.42	17.16	13.44	9.32	7.83	6.23	5	5.77	4.62	8.43
Gross Income	100	100	100	100	100	100	100	100	100	100	100
Income Tax(E)	0.4	0.68	0.94	1.48	2.24	2.63	3.35	4.29	4.97	7.46	4.09
Property Tax(F)	0.44	0.37	0.31	0.28	0.29	0.27	0.32	0.27	0.39	0.42	0.34
Direct Taxes(G=E+F)	0.84	1.05	1.25	1.77	2.53	2.89	3.66	4.56	5.36	7.88	4.43
Public Pensions Cont.(H).	0.49	0.93	1.38	1.7	1.95	2.22	2.41	2.66	2.53	2.38	2.19
Nat'l Health Ins. Cont.(I)	1.22	1.41	1.53	1.65	1.61	1.75	1.68	1.73	1.69	1.59	1.64
Other Soc. Sec. Cont.(J)	0.03	0.04	0.1	0.1	0.15	0.15	0.15	0.16	0.16	0.13	0.13
Soc.Sec. Cont.(K=H+I+J)	1.74	2.39	3.01	3.46	3.71	4.13	4.25	4.54	4.38	4.09	3.96
Disposable Income	97.42	96.57	95.74	94.78	93.76	92.98	92.09	90.9	90.26	88.03	91.61
VAT	3.18	3.43	3.55	3.57	3.55	3.62	3.47	3.29	3.21	2.9	3.3
Special Excise Tax	0.41	0.38	0.39	0.44	0.42	0.46	0.39	0.35	0.34	0.31	0.37
Transportation Tax	0.43	0.66	1.02	1.14	1.28	1.4	1.4	1.23	1.32	1.19	1.21
Liquor Tax	0.14	0.11	0.11	0.1	0.1	0.08	0.07	0.06	0.06	0.04	0.07
Tobacco Consumption Tax	0.42	0.4	0.37	0.32	0.32	0.29	0.25	0.2	0.18	0.11	0.23
Consumption Taxes	4.58	4.99	5.45	5.57	5.67	5.86	5.58	5.13	5.11	4.55	5.18

Post-tax Income	92.83	91.58	90.3	89.21	88.08	87.12	86.51	85.77	85.15	83.48	86.42
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Table A-2. Distribution of Incomes, Taxes, and Transfers by Gross Income Deciles Groups (As of 2009
Based on 2009 Laws, Projected)

Amounts (1,000 KRW)	bottom	2nd	3rd	4th	5th	6th	7th	8th	9th	top	Avg.
Market Income	7061	14158	20265	26088	32937	39453	46732	55418	66210	99574	40789
Private Transfers(A)	2151	2636	2418	2486	2030	1905	1945	1874	2231	2869	2255
Private Income	9213	16794	22682	28574	34967	41358	48677	57292	68441	102443	43043
Public Pensions(B)	387	436	934	877	891	1061	764	724	1299	1236	861
Other Social Security Cash Benefits (C)	1027	1019	845	687	462	385	396	322	524	714	638
Public Transfers(D=B+C)	1414	1455	1779	1564	1353	1446	1160	1046	1823	1950	1499
Transfers (A+D)	3565	4092	4196	4051	3383	3351	3105	2920	4053	4820	3754
Gross Income	10627	18250	24461	30138	36320	42803	49837	58338	70264	104393	44542
Income Tax(E)	30	81	147	298	552	790	1200	1878	2727	6474	1418
Property Tax(F)	47	68	76	86	106	114	158	159	274	434	152
Direct Taxes(G=E+F)	76	149	223	384	658	904	1359	2037	3001	6908	1570
Public Pensions Con(H).	52	170	338	513	710	951	1202	1550	1777	2481	974
Nat'l Health Ins. Con.(I)	130	258	375	499	584	751	839	1007	1186	1658	729
Other Soc. Sec. Con.(J)	3	7	24	30	54	65	75	91	116	135	60
Soc. Sec. Con(K=H+I+J)	185	436	737	1042	1348	1766	2116	2648	3079	4274	1763
Disposable Income	10365	17666	23502	28713	34314	40133	46363	53653	64184	93211	41210
VAT	338	627	869	1076	1289	1549	1729	1920	2254	3028	1468
Special Excise Tax	44	70	94	133	151	198	195	201	240	326	165
Transportation Tax	46	121	251	343	467	598	698	719	925	1239	541
Liquor Tax	15	20	28	31	37	36	34	36	44	47	33
Tobacco Consumption Tax	44	73	91	95	117	126	126	115	127	110	102
Consumption Taxes	487	910	1332	1678	2060	2507	2781	2991	3589	4750	2309
Post-tax Income	9878	16756	22169	27035	32254	37626	43581	50661	60595	88461	38901
Ratios to Gross Income (%)	bottom	2nd	3rd	4th	5th	6th	7th	8th	9th	top	Avg.
Market Income	66.45	77.58	82.84	86.56	90.68	92.17	93.77	95	94.23	95.38	91.57
Private Transfers(A)	20.24	14.45	9.88	8.25	5.59	4.45	3.9	3.21	3.17	2.75	5.06
Private Income	86.69	92.02	92.73	94.81	96.27	96.62	97.67	98.21	97.41	98.13	96.63
Public Pensions(B)	3.64	2.39	3.82	2.91	2.45	2.48	1.53	1.24	1.85	1.18	1.93
Other Social Security Cash Benefits (C)	9.66	5.59	3.45	2.28	1.27	0.9	0.79	0.55	0.75	0.68	1.43
Public Transfers(D=B+C)	13.31	7.98	7.27	5.19	3.73	3.38	2.33	1.79	2.59	1.87	3.37
Transfers (A+D)	33.55	22.42	17.16	13.44	9.32	7.83	6.23	5	5.77	4.62	8.43
Gross Income	100	100	100	100	100	100	100	100	100	100	100
Income Tax(E)	0.28	0.44	0.6	0.99	1.52	1.85	2.41	3.22	3.88	6.2	3.18
Property Tax(F)	0.44	0.37	0.31	0.28	0.29	0.27	0.32	0.27	0.39	0.42	0.34
Direct Taxes(G=E+F)	0.72	0.81	0.91	1.27	1.81	2.11	2.73	3.49	4.27	6.62	3.52
Public Pensions Con(H).	0.49	0.93	1.38	1.7	1.95	2.22	2.41	2.66	2.53	2.38	2.19
Nat'l Health Ins. Con.(I)	1.22	1.41	1.53	1.65	1.61	1.75	1.68	1.73	1.69	1.59	1.64
Other Soc. Sec. Con.(J)	0.03	0.04	0.1	0.1	0.15	0.15	0.15	0.16	0.16	0.13	0.13
Soc. Sec. Con(K=H+I+J)	1.74	2.39	3.01	3.46	3.71	4.13	4.25	4.54	4.38	4.09	3.96
Disposable Income	97.54	96.8	96.08	95.27	94.48	93.76	93.03	91.97	91.35	89.29	92.52
VAT	3.18	3.43	3.55	3.57	3.55	3.62	3.47	3.29	3.21	2.9	3.3

Special Excise Tax	0.41	0.38	0.39	0.44	0.42	0.46	0.39	0.35	0.34	0.31	0.37
Transportation Tax	0.43	0.66	1.02	1.14	1.28	1.4	1.4	1.23	1.32	1.19	1.21
Liquor Tax	0.14	0.11	0.11	0.1	0.1	0.08	0.07	0.06	0.06	0.04	0.07
Tobacco Consumption Tax	0.42	0.4	0.37	0.32	0.32	0.29	0.25	0.2	0.18	0.11	0.23
Consumption Taxes	4.58	4.99	5.45	5.57	5.67	5.86	5.58	5.13	5.11	4.55	5.18
Post-tax Income	92.95	91.81	90.63	89.7	88.8	87.9	87.45	86.84	86.24	84.74	87.33