Distributional Effects of Taxes and Benefits in Korea*

Myung Jae Sung, Byung Mok Jeon***, and Byung-hill Jun******

Abstract: A simulation model has been developed in Korea, named Korea Institue of Publc Finance Simulation Model (KIPFSIM), which aims to estimate the effects of taxes and transfers in Korea. The current version of KIPFSIM adopts a static approach combined with a zero-elasticity assumption that there will be no change in labor supply and consumption decisions even after changes in taxes and transfers. KIPFSIM uses a representative sample from the Household Income and Expenditure Survey, compiled and released by the Statistical Office of Korea. Using KIPFSIM, we investigated the distributional effects of the proposed income tax cut, with hypothetical changes in taxes and transfers, which is set to be enacted in 2009 and 2010. We found that the benefit of the income tax cut is concentrated mostly on high-income taxpayers in terms of absolute value, but more on middle-income taxpayers in terms of percentage of the tax burden. Therefore, the new income tax law is considered to strengthen the progressive nature of the tax code and to lower tax burdens and tax revenue. We also found that after-income-tax income inequality, as measured by Gini coefficient, was slightly worsened, primarily due to the decrease in income tax revenue, which helps equalize income distribution.

Keywords: Gini, Microsimulation, Income Tax, Distributional Effects.

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INTRODUCTION

Policy makers and academic researchers have long been interested in estimating the effects of changing government policies on taxes and benefits. To achieve this goal, many models have been developed. Among them, the microsimulation model is a very strong tool for analyzing the effects of tax rates on micro-based distributions such as changes in poverty rates, inequality indexes, relative income, or consumption ratios between different income groups.

Many developed countries have their own microsimulation models, which are widely used in policy design and evaluation. The U.S. Congress uses microsimulation to review proposed new and revised tax acts; the Joint Committee on Taxation is in charge of this analysis. Other U.S. government bodies such as the Congressional Budget Office and Office of Tax Analysis have their own microsimulation models and actively apply them.[1] The NBER (National Bureau of Economic Research) provides a tax simulation model (TAXSIM).[2] The United Kingdom, Australia, Canada, France, Ireland, Sweden, Norway, New Zealand, and many more countries have their own tax-benefit models.[3]

In Korea, several attempts have been made to develop a simple simulation model. Sung (1997) and Sung and Chun (1998) used the Household Income and Expenditure Survey (HIES), which is compiled and released by the Statistical Office of Korea and contains valuable tax-related information, to develop primitive tax calculator programs for personal income tax. These calculator programs were extended by Sung and Park (2008) to calculate distributions of taxes and benefits by income deciles. However, their models were too simple to analyze the 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 would be the most useful source of information for microsimulation analysis of the tax burden. However, tax returns, even samples, are not available in Korea. The National Tax Service provides tax-related information in aggregate

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, 2008b, 2008c, 2008d), and Urban Institute (2000, 2002, 2003, 2004, 2007).
2. See NBER (1997) for more details.
3. See HM Treasury (2007), IFS (1995), POLIMOD (2007), King's 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.

form to the public, but under the Personal Privacy Protection Act, no information on individual tax returns is legally accessible, even for academic or policy research. This obstacle has constrained tax-policy-related research for a long time in Korea. As an alternative, we used the HIES[4] to construct a microsimulation model named Korea Institute of Public Finance Simulation Model (KIPFSIM), which is equipped with a set of tax calculators and with tools for analyzing fiscal expenditures or public services rendered to individual households.

The Korean government modifies the tax code 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 realistically the results in terms of tax revenue, distributional effects, and so on. We expect that it will contribute significantly to planning and evaluation of tax and fiscal policies.

In KIPFSIM, a simulation model for personal income tax takes the form of a tax calculator. Personal income tax directly affects taxpayers' economic activities, such as labor market participation and hours worked. The progressive rate structure is also a critical factor affecting income redistributive effects. Thus, personal income tax is an important research issue because it affects individual disposable income directly and significantly. Personal income tax as a policy option sometimes saves on administrative costs related to fiscal expenditure. For instance, a subsidy or a transfer can be rendered in the form of refundable tax credits. In such a case, there may not be a need for a government organization to implement an additional subsidy program. The earned income tax credit, which has been effective since 2008 in Korea, is an example. This change in personal income taxation increases the need for policy simulations focused on specific deductions or credits. KIPFSIM is being developed to meet various such policy planning and evaluation needs.

KIPFSIM is being developed in three steps. In the first step, it functions as a simple tax calculator focusing mostly on details of the income tax system and consumption taxes. In the second step, behavioral changes and dynamic effects will be incorporated into the model. Finally, we will expand the model by developing benefit calculators.

This article primarily aims to develop the first step with tax calculators, and ana-

4. The HIES only contains income- and expenditure-related household information, usually in aggregate form. It is not easy to draw information from it about asset/debt distributions, individual income, expenditures, burdens of taxes and/or social security contributions, and benefits. Using the HIES, we can estimate tax liabilities and benefits up to a certain limited level. When an alternative survey data set containing more information is available, we may be able to create a more advanced simulation model. Such 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 to compile a panel data set related to taxes and benefits.

lyzes revenue effects, distributional effects of income and consumption taxes, and benefits from the private and public sectors. It develops the basic microsimulation model, and then analyzes the effects of taxes and transfers, mainly focusing on the personal income tax.

MODEL AND DATA

Model

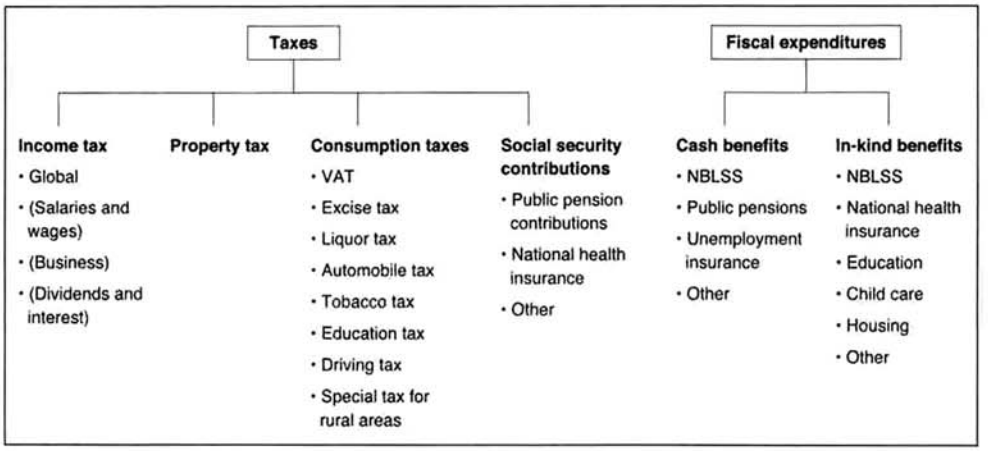
The main objectives of KIPFSIM are to estimate distributions of taxes and benefits and to analyze distributional effects of policies and their changes. The current primitive version of KIPFSIM is not always able to simulate individual responses. Income and consumption taxes are computed using tax calculator programs embedded in the model.[5] However, we do not yet have sufficient information and technique to calculate cash benefits from survey data. 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 under the current KIPFSIM framework are available only for income and consumption taxes. Later in this article, we report distributions of taxes and benefits, and show a couple of simulations of personal income tax rates using KIPFSIM, to evaluate the effects of the changes in personal income tax law passed by the National Assembly of Korea in late 2008, which become effective in 2009.

The current version of KIPFSIM consists of two parts. The first part is composed of programs to calculate income and consumption taxes, and the second part is for benefits, property tax, and social security contributions with the reported values. The households are arranged by gross income in ascending order. Using information on demographic characteristics and incomes, personal income tax burdens are calculated using the income tax calculator. Household income tax burdens are estimated by summing up the income tax burdens of all household members. Using information on item-by-item consumption expenditures contained in the HIES, item-by-item household consumption tax burdens are calculated. 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.

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

KIPFSIM does not consider behavioral changes in labor-supply or consumption/saving decisions: it assumes that the economic agents stick to current their positions, no matter what takes place. We think that this assumption is unrealistic, a shortcoming we plan to modify in the next study.

Figure 1. Basic Structure of the KIPFSIM Microsimulation Model



NBLSS 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 lack of information. Recently, Sung and Park (2008) estimated distribution of in-kind benefits. However, we think a more rigorous basic study is required for more consistent and robust results, and we plan to incorporate those in future studies.

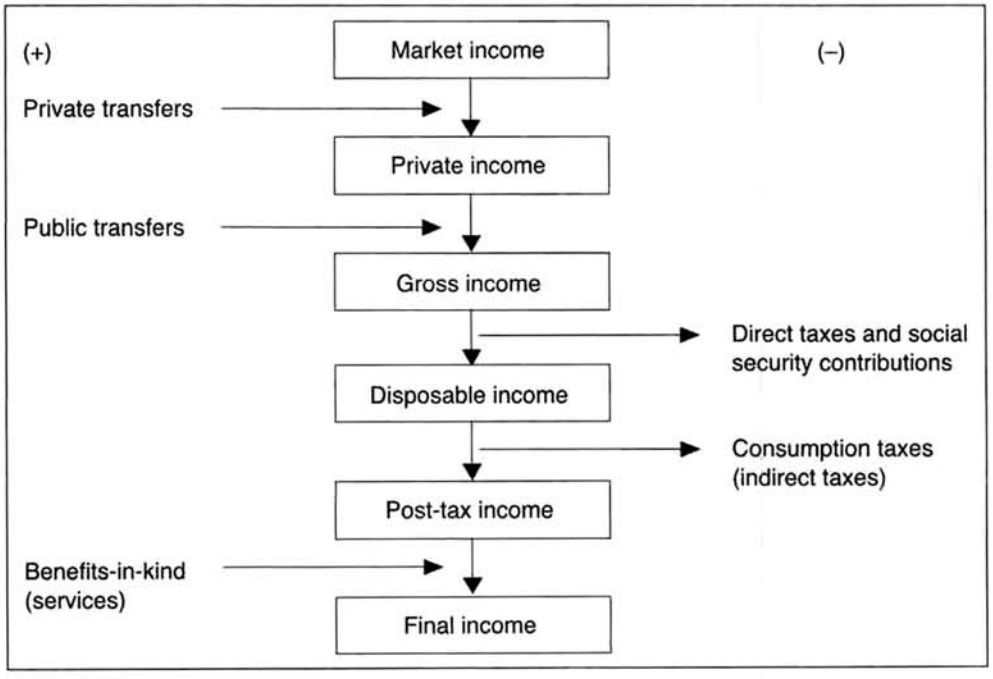
Data

This paper uses the raw data of the HIES, which contains demographic characteristics and income- and expenditure-related information for households. The HIES covers all types of households except those working in farming and fishing, which account for 1 or 2 percent of the whole population. It is compiled monthly and released quarterly. Every household is required to remain in the sample for three years. Therefore, the HIES seems to be a rotating panel. However, the annual attrition rate is more than 30 percent; the Statistical Office must regularly replace participants, and thus it releases cross-sectional information only.

Monthly observations are converted into annual observations by summing up the monthly incomes and expenditures of matched households using household ID numbers. Some monthly observations are inevitably missing, and this often yields a selec-

tion bias. Sung (2002) found that the quarterly information in the HIES reveals statistically significant seasonality and, furthermore, that missing observations are not random. Therefore, any computation involving missing monthly data that does not correct for seasonality and selection bias would create misleading inferences about annual trends. Sung suggests a method of annualizing the monthly data without causing inconsistency, and this study followed his method.

Figure 2. Types of Income



Source: Sung and Park 2008.

In this study, we divided the concept of income into several subcategories—market, private, gross, disposable, post-tax, and final income. Market income, which is often called original income, is income earned in the market by supplying labor or capital. Private income is the sum of market income and private transfers. Gross income is derived by adding public transfers to private income. Disposable income is defined as income after subtracting direct taxes, including social security contributions, from gross income. Post-tax income is derived by subtracting indirect taxes from disposable income. Final income is income after taxes and benefits, which is derived by adding in-kind benefits and services, measured in cash value, to post-tax income. Usually, post-tax and final incomes are not observed, since consumption taxes

and in-kind benefits are not observable.

This study estimated the distribution of income and taxes for the year 2009. The most recent available information (raw data set) is for 2006. Therefore, it is necessary to convert 2006 data to 2009 values. All variables related to income and consumption were assumed to change proportionally with the per-capita nominal GDP growth rates: 5.84 percent in 2007 and 6 percent each in 2008 and 2009. This implies that the relative distribution structure remains the same as that for 2006. For simplicity of discussion, all information regarding demographic characteristics was assumed to be unchanged.

The average household size is 3.0 for all households, 3.15 for employed households, and 3.34 for self-employed households. The average size of unemployed households is 1.97, which is much smaller than that of other household types since they mostly consist of older single people or couples without dependents. The average number of workers (those who earn income by supplying labor) in a household is 1.28 for all households and 0.16 for unemployed households. The average age of household heads is 48.8; it is 63.3 for unemployed households.

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 percent.

Table 1. Descriptive Statistics of the HIES Based on Converted Values for 2009

Category	Sample mean	Category	Sample mean
Household size		**Gross income**	
Whole	3.00	Whole	44,542,441 KRW
Employed	3.15	Employed	46,416,740 KRW
Unemployed	1.97	Unemployed	27,678,017 KRW
Self-employed	3.34	Self-employed	50,973,815 KRW
Number of income earners		**Consumption expenditure**	
Whole	1.28	Whole	27,191,798 KRW
Employed	1.45	Employed	29,154,775 KRW
Unemployed	0.16	Unemployed	15,478,926 KRW
Self-employed	1.64	Self-employed	30,449,098 KRW
Age of household head		**Average propensity to consume**	
Whole	48.77	Whole	61.05%
Employed	44.76	Employed	62.81%
Unemployed	63.33	Unemployed	55.92%
Self-employed	47.59	Self-employed	59.73%

Note: Demographic characteristics are from 2006; all other values were converted to 2009 values by multiplying 2006 data by the rate the per-capita GDP was expected to grow between 2006 and 2009.

SIMULATIONS

To illustrate the use of KIPFSIM, we analyzed the effects of recent personal income tax changes. In the Personal Income Tax Law passed by the National Assembly of Korea in late 2008, which applies to 2009 taxes, the marginal income tax rates were lowered by two percentage points for each tax bracket and the basic deduction schemes were adjusted. The level of basic deduction applicable to dependents including taxpayer increased from 1 million KRW to 1.5 million KRW per dependent. For salary and wage income earners, the deduction rate decreased from 100 percent to 80 percent for the range of zero to 5 million KRW. Table 2 describes the changes in detail.

Table 2. Changes in Tax Law Regarding Salary and Wage Income

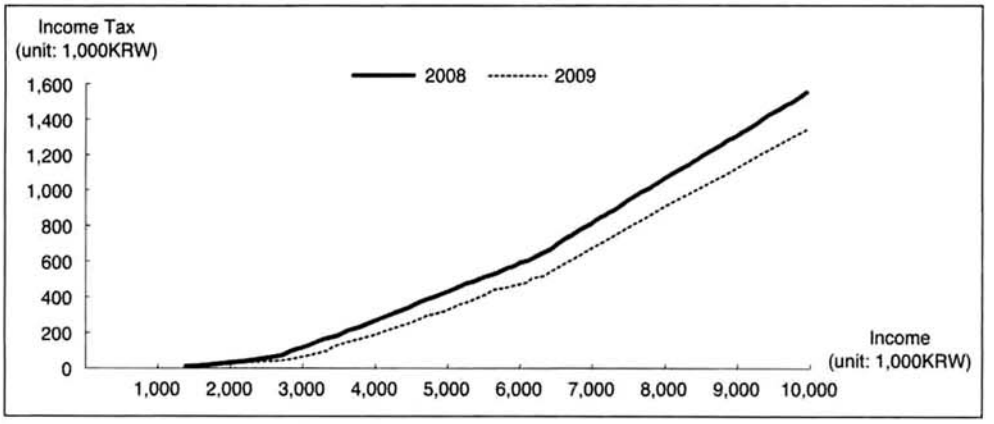
	Income	2008	2009
Tax rates	12 million KRW	8%	6%
	12-46 million KRW	17%	15%
	46-88 million KRW	26%	24%
	88 million+ KRW	35%	33%
	Range	8-35%	6-33%
Salary and wage income deduction rates	0-5 million KRW	100%	80%
	5-15 million KRW	50%	50%
	15-30 million KRW	15%	15%
	30-45 million KRW	10%	10%
	45 million+ KRW	5%	5%
Basic deduction		1 million KRW	1.5 million KRW

Under the new tax law, most Koreans can expect to pay a lower income tax. For example, the income tax burden for a person with two dependents and an annual income of 30 million KRW will decrease by about 0.3 million KRW.[6] As shown in Figure 3, it is likely that the income tax burden will decrease across all income levels. High income earners are expected to receive the largest tax cut in absolute value, while middle income groups will benefit the most in terms of percentage decreases. The overall distributional effects of the income tax change do not immediately follow

6. This example assumes that the taxpayer has only salary and wage income and claims only the basic deduction and the standard deduction. Under these assumptions, his or her income tax decreases from 1.53 to 1.24 million KRW.

from the fact that all income groups benefit from it. An income inequality index such as the Gini coefficient takes into account both relative and absolute tax reductions. To examine how the effects of the tax change are distributed across different income groups, we used KIPFSIM and compared after-income-tax income distributions under the past and the current laws.

Figure 3. Income Tax Burdens Under the 2008 and 2009 Laws



A wage earner with three dependents is assumed. Furthermore, the standard deduction applicable to those whose do not file itemized deductions among wage and salary income earners or to those of self-employed business income earners and wage and salary income deduction are also applicable.

As mentioned before, we derived market income and consumption values for 2009 by assuming that they increased proportionally with the nominal per-capita GDP growth rate and multiplying the 2006 values by that rate. We also assumed that there was zero price elasticity in the labor supply[7]—00that changes in income tax rates would not affect a household's labor supply decisions. The following discussion present two scenarios for tax and benefit distributions in 2009—the first based on the 2008 income tax law and the second based on the law passed in late 2008 and effective in 2009.These distributions are presented in detail in the appendix.

Tax and Benefit Distribution Under the Old Law

We start by presenting a hypothetical baseline distribution based on market income distribution adjusted for 2009 and the income tax law effective in 2008. In 2009, the

7. Admittedly, this assumption is very restrictive and will need to be relaxed to get more plausible results.

average estimates of household market and gross incomes are 41.0 and 44.5 million KRW, respectively. On average, each household bears a direct tax burden of 2.2 million KRW, which is 4.4 percent of its gross income. The average social security contributions and consumption taxes per household are 1.8 and 2.2 million KRW, respectively.[8] In sum, the average household pays 5.9 million KRW in taxes and social security contributions, leaving an average disposable income of 38 million KRW. In the lowest income decile, the average market and disposable incomes are 7.1 and 9.9 million KRW, respectively. The gap stems from 3.6 million KRW of transfer income and 0.8 million KRW of taxes. In contrast, the average household in the highest income decile has 99.7 million KRW of market income and 4.8 million KRW of transfer income. It pays 17.2 million KRW in direct and indirect taxes and social security contributions. As a result, its post-tax income is 87.0 million KRW.

Table 3. Direct tax by Gross-income Deciles (%)

Effective tax rate	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Average
Income tax	0.40	0.68	0.94	1.48	2.24	2.63	3.35	4.29	4.97	7.46	4.09
Property tax	0.44	0.37	0.31	0.28	0.29	0.27	0.32	0.27	0.39	0.42	0.34
Total direct tax	0.84	1.05	1.25	1.77	2.53	2.89	3.66	4.56	5.36	7.88	4.43
Share	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	7.50	10.4	10.45	17.97	28.53	100
Total direct tax	0.45	0.97	1.54	2.70	4.66	6.27	9.25	13.47	19.05	41.63	100

This table is based on the tax law valid in 2008 and income data adjusted for 2009. Direct tax consists of income tax plus property tax. The effective tax rate is the rate relative to gross income. The share is the percentage of the total tax burden.

Table 3 shows distributions of direct taxes by income deciles. The average effective rate of direct taxes relative to gross income is 4.4 percent. (The effective tax rate is defined as the tax on gross income, and the average effective rate is defined as the ratio of average tax burden to average gross income.) The effective rate of direct taxes, especially of income tax, tends to increase with gross income. For example, the first decile pays, on average, 0.84 percent of its gross income for direct taxes, while the tenth decile pays 7.88 percent. In terms of direct taxes, high-income deciles bear the most burden. The upper three deciles contribute 80 percent of the total direct tax revenue, while the lower three deciles contribute less than 3 percent. This highly skewed direct-tax structure has an equalizing effect on income distribution.

8. They correspond to 4.0 percent and 4.9 percent of gross income, respectively.

Table 4 illustrates distribution of consumption taxes, transfers, and social security contributions. Unlike direct taxes, the effective rates of consumption taxes do not necessarily increase with household income. They range more or less irregularly from 4.5 percent to 5.9 percent. Consumption taxes are, in fact, regressive. However, the highest three income deciles have lower-than-average effective rates. The liquor and tobacco tax burden is very similar across all deciles due to the highly inelastic demand for them and their specific tax structures. Therefore, their effective tax rates decrease against gross income. However, their redistributive effects on income distribution turn out to be negligible, as measured by percentage changes in the Gini coefficient, since their revenue size is too small to affect it significantly.

Table 4. Consumption Taxes by Gross-income Deciles (%)

Effective tax rate	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Average
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 tax	0.42	0.4	0.37	0.32	0.32	0.29	0.25	0.2	0.18	0.11	0.23
Total consumption taxes	4.58	4.99	5.45	5.57	5.67	5.86	5.58	5.13	5.11	4.55	5.18
Share	1st	2nd	3rd	4th	5th	6th	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 tax	4.32	7.1	8.84	9.28	11.44	12.33	12.31	11.23	12.4	10.77	100
Total consumption taxes	2.11	3.94	5.76	7.27	8.93	10.86	12.06	12.96	15.53	20.58	100

This table is based on the tax law valid in 2008 and income data adjusted for 2009. The effective tax rate is the rate relative to gross income. The share is the percentage of the total tax burden.

Tables 5 and 6 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. Transfer income does not show a clear relationship with gross income. It oscillates between 2.9 and 4.8 million KRW; it is largest in the tenth decile and smallest in the eighth decile. This observation is not only true of private transfers; public transfers have similar patterns. By design, a high income earner receives a higher pension benefit. Thus, public pensions are weakly and positively correlated with household income under some conditions.[9] As a result, transfers are about

9. Public pensions depend on profiles of earnings over time, while income deciles are classified

Table 5. Transfer Incomes by Gross-income Deciles (%)

Effective rate	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Average
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
All transfers (A + D)	33.55	22.42	17.16	13.44	9.32	7.83	6.23	5	5.77	4.62	8.43
Share	1st	2nd	3rd	4th	5th	6th	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
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
All transfers	9.5	10.91	11.17	10.79	9.02	8.92	8.28	7.78	10.79	12.84	100

This table is based on the tax law valid in 2008 and income data adjusted for 2009. The effective rate is the rate relative to gross income. The share is the percentage of the total tax burden.

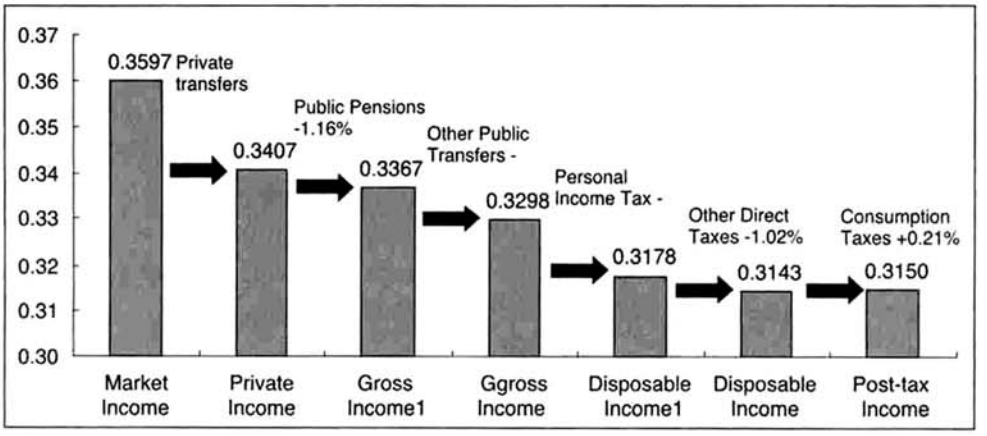
Table 6. Social Security Contributions by Gross-income Deciles (%)

Effective rate	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Average
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
Share	1st	2nd	3rd	4th	5th	6th	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

This table is based on the tax law valid in 2008 and income data adjusted for 2009. The effective rate is the rate relative to gross income. The share is the percentage of the total tax burden.

by gross income in a given year. This means that a person earning a low income in 2009 may receive relatively high pension benefits owing to large past contributions. The positive correlation between current income and pension benefits implies a positive correlation between the present value of an individual's lifetime earnings and his or her household income in 2009.

Figure 4. Redistributive Effects of Taxes and Benefits.



* Figure is based on the tax law valid in 2008 and income data adjusted for 2009.

** Gross income 1 = private income plus benefits from public pensions. Disposable income 1 = gross income minus 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 7. Gini Coefficients of Various Incomes

Income	2008 law	2009 law
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 - national 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

SET, LT, TRT and TOBT stand for special excise tax, liquor tax, transportation tax, and tobacco tax, respectively.

evenly distributed over the income deciles.

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

Figure 4 and Table 7 show income inequality measured by Gini coefficients. Based on the estimates in Tables 3 through 6, we may expect that direct taxes and social security contributions make income distribution more even while indirect taxes make it less even. As expected, 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.

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 found 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. On the other hand, 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 0.001, which is only 0.21 percent of the private income Gini coefficient.

Table 8. Relative Income Ratios of the Highest- to Lowest-income Deciles

	Market income	Private income	Gross income	Disposable income	Post-tax income
Ratio	14.10	11.12	9.82	8.88	8.84

Tax and Benefit 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 percent. As shown in Figures 5 and 6, the tax decrease is widely observed for all income deciles, although its relative percentages are asymmetric across income deciles. We found that the top income decile gets the largest tax cut in absolute value-about 1.2 million KRW. About 67 percent of the total income tax cut, in absolute value, takes place in the upper three income deciles. But in terms of relative percentage changes in income tax burdens, the result is reversed, and the percentage decreases are largest in the lowest income decile. Low-

Figure 5. Effective Income Tax Rates by Income Deciles

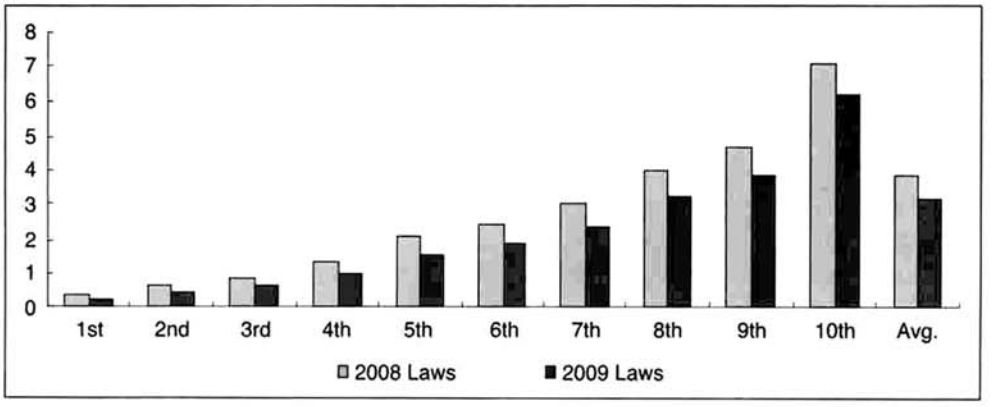
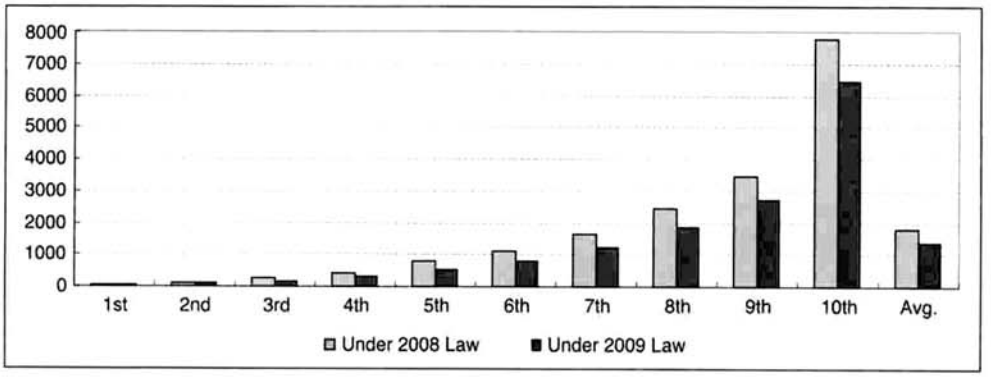


Figure 6. Income Tax Burdens by Income Deciles



income deciles tend to get greater tax relief from the recent 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 the income tax burden rises from 76 percent to 78 percent. 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 indexing for inflation.

The third column in Table 8 shows the Gini coefficients under the 2009 tax law. The Gini coefficient for 2009 gross income is 0.32975. Under the 2009 income tax law, the Gini coefficient for post-income-tax income is 0.31964, which is 3.1 percent lower than for 2009 gross income. 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 an income-equalizing effect; therefore, a decrease 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 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 households and average income tax burden per household. Based on this information, 2009 income tax revenue is estimated to be 21.4 billion KRW under the 2009 tax law; it would have been about 27.4 billion KRW under the old law. Thus, we can conclude that the income tax change lowers revenue by 6 billion KRW.[10]

CONCLUSION

Income tax and subsidies follow complicated institutional designs and directly affect taxpayers' disposable income. As the role of the government expands with time, it becomes more important to understand policy effects. As the economy grows, a more rigorous policy analysis is required 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 an extremely valuable tool, and a microsimulation model is an especially popular and powerful tool for economic policy analysis. Therefore, many developed and developing countries have their own models and apply them to their policy design processes.

We constructed a microsimulation model, KIPFSIM, for analyzing the effects of taxes and benefits in Korea. It estimates distributions of various types of incomes, taxes, and benefits, and the effect of government policies on issues such as redistribution, revenue, and changes in labor supply. As of now, KIPFSIM is mainly a collection

10. 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 Taxation does not list income tax revenue from the given year. 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. Second, our estimate of income tax revue includes only the global income tax and the tax on wage and salary income.

of basic tax calculators covering income, value-added, and excise taxes. It also uses information about benefits from transfers and social security contributions directly from the survey data set, the HIES.

Using the KIPFSIM, we analyzed the economic effects of the 2008 tax reform. The tax cuts yield more tax savings to high taxpayers in absolute value, but in relative terms, as a percentage of tax burden, they offer the largest relief to low-income taxpayers. It is also expected that income tax revenue will decrease significantly, to 22 percent less than the projected revenue under the past law. Income tax cuts are likely to worsen disposable-income inequality, in spite of the resulting more progressive tax burden, mainly due to this decrease in income tax revenue. These simulation results raise an issue of further reforming the income tax system to increase income redistribution. To this purpose, a way to increase the income tax must be found, for example by reducing deductions or raising tax rates. But a tax increase would be difficult to pass, especially at this time. For now, it is recommended that deduction levels and tax brackets be fixed for the time being.

Our results also hint at the distributional effect of hypothetical changes in consumption taxes and public transfers. Consumption tax increases would be expected to significantly affect post-tax income distribution, since their structure is nearly proportional to disposable income. Increasing public transfers would be expected to have a significant income-redistributive effect because they are aimed more at low-income groups.[11] Given budget constraints, this implies that targeted expenditures can improve equity more effectively and efficiently.

We need to expand and improve KIPFSIM by incorporating more analysis of issues such as taxpayers' behavioral responses and the dynamic effects of policy changes.

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Appendix

Table A-1. Distribution of Incomes, Taxes, and Transfers Under 2008 Law

Amounts (1,000 KRW)	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Average
Market income	7,061	14,158	20,265	26,088	32,937	39,453	46,732	55,418	66,210	199,574	40,789
Private transfers (A)	2,151	2,636	2,418	2,486	2,030	1,905	1,945	1,874	2,231	2,869	2,255
Private income	9,213	16,794	22,682	28,574	34,967	41,358	48,677	57,292	68,441	102,443	43,043
Public pensions (B)	387	436	934	877	891	1061	764	724	1299	1236	861
Other social security cash benefits (C)	1,027	1,019	845	687	462	385	396	322	524	714	638
Public transfers (D = B + C)	1,414	1,455	1,779	1,564	1,353	1,446	1,160	1,046	1,823	1,950	1,499
Transfers (A + D)	3,565	4,092	4,196	4,051	3,383	3,351	3,105	2,920	4,053	4,820	3,754
Gross income	10,627	18,250	24,461	30,138	36,320	42,803	49,837	58,338	70,264	104,393	44,542
Income tax (E)	42	123	229	447	814	1,125	1,668	2,503	3,494	7,787	1,823
Property tax (F)	47	68	76	86	106	114	158	159	274	434	152
Direct taxes (G = E + F)	89	191	305	533	920	1,239	1,826	2,662	3,767	8,221	1,975
Public pension contributions (H)	52	170	338	513	710	951	1,202	1,550	1,777	2,481	974
National health insurance contributions (I)	130	258	375	499	584	751	839	1,007	1,186	1,658	729
Other social security contributions (J)	3	7	24	30	54	65	75	91	116	135	60
Total social security contributions (K = H + I + J)	185	436	737	1042	1348	1766	2116	2648	3079	4274	1763
Disposable income	10,352	17,623	23,420	28,564	34,052	39,798	45,895	53,028	63,417	91,898	40,804
VAT	338	627	869	1,076	1,289	1,549	1,729	1,920	2,254	3,028	1,468
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	1,239	541
Liquor tax	15	20	28	31	37	36	34	36	44	47	33
Tobacco tax	44	73	91	95	117	126	126	115	127	110	102
Total consumption taxes	487	910	1,332	1,678	2,060	2,507	2,781	2,991	3,589	4,750	2,309
Post-tax income	9,865	16,713	22,087	26,887	31,993	37,291	43,114	50,037	59,828	87,148	38,496
Ratios to gross income (%)	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Average
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)	0.4	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 pension contributions (H)	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 contributions (I)	1.22	1.41	1.53	1.65	1.61	1.75	1.68	1.73	1.69	1.59	1.64
Other social security contributions (J)	0.03	0.04	0.1	0.1	0.15	0.15	0.15	0.16	0.16	0.13	0.13
Total social security contributions (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 tax	0.42	0.4	0.37	0.32	0.32	0.29	0.25	0.2	0.18	0.11	0.23
Total 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

This table is based on income data adjusted for 2009.

Table A-2. Distribution of Incomes, Taxes, and Transfers Under 2009 Law

Amounts (1,000 KRW)	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Average
Market income	7,061	14,158	20,265	26,088	32,937	39,453	46,732	55,418	66,210	99,574	40,789
Private transfers (A)	2,151	2,636	2,418	2,486	2,030	1,905	1,945	1,874	2,231	2,869	2,255
Private income	9,213	16,794	22,682	28,574	34,967	41,358	48,677	57,292	68,441	102,443	43,043
Public pensions (B)	387	436	934	877	891	1,061	764	724	1,299	1,236	861
Other social security cash benefits (C)	1,027	1,019	845	687	462	385	396	322	524	714	638
Public transfers (D = B + C)	1,414	1,455	1,779	1,564	1,353	1,446	1,160	1,046	1,823	1,950	1,499
Transfers (A + D)	3,565	4,092	4,196	4,051	3,383	3,351	3,105	2,920	4,053	4,820	3,754
Gross income	10,627	18,250	24,461	30,138	36,320	42,803	49,837	58,338	70,264	104,393	44,542
Income tax (E)	30	81	147	298	552	790	1,200	1,878	2,727	6,474	1,418
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	1,359	2,037	3,001	6,908	1,570
Public pension contributions (H)	52	170	338	513	710	951	1,202	1,550	1,777	2481	974
National health insurance contributions (I)	130	258	375	499	584	751	839	1,007	1,86	1,658	729
Other social security contributions (J)	3	7	24	30	54	65	75	91	116	135	60
Total social security contributions (K = H + I + J)	185	436	737	1,042	1,348	1,766	2,116	2,648	3,079	4,274	1,763

Disposable income	10,365	17,666	23,502	28,713	34,314	40,133	46,363	53,653	64,184	93,211	41,210
VAT	338	627	869	1,076	1,289	1,549	1,729	1,920	2,254	3,028	1,468
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	1,239	541
Liquor tax	15	20	28	31	37	36	34	36	44	47	33
Tobacco tax	44	73	91	95	117	126	126	115	127	110	102
Total consumption taxes	487	910	1,332	1,678	2,060	2,507	2,781	2,991	3,589	4,750	2,309
Post-tax income	9,878	16,756	22,169	27,035	32,254	37,626	43,581	50,661	60,595	88,461	38,901
Ratios to gross income (%)	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	top	Average
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 pension contributions (H)	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 contributions (I)	1.22	1.41	1.53	1.65	1.61	1.75	1.68	1.73	1.69	1.59	1.64
Other social security contributions (J)	0.03	0.04	0.1	0.1	0.15	0.15	0.15	0.16	0.16	0.13	0.13
Total social security contributions (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 tax	0.42	0.4	0.37	0.32	0.32	0.29	0.25	0.2	0.18	0.11	0.23
Total 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

This table is based on income data adjusted for 2009.