

## **The Discrepancy between Statutory Tax and Real Tax Burden: The Case of Korea<sup>\*</sup>**

Jin Kwon Hyun<sup>\*\*</sup> · Seung-Hoon Jeon<sup>\*\*\*</sup> · Byung In Lim<sup>\*\*\*\*</sup>

This paper estimates the effective income tax function using a micro-level dataset. The purpose is to establish the actual tax so that the effect of the changes to income tax law (intended to reduce the tax burden) can be evaluated. Income tax policy in Korea has focused on reducing the tax burden through a reduction in the statutory tax rate that allows a greater level of allowance and deduction. However, the real tax burden is moving in the opposite direction to that intended, as there was an increase in effective and marginal tax rates from 1998-2005. The impact appears weaker after the change in the law than the effect of the increase in the nominal income levels for the taxpayers. Marginal tax rates increased from 5.12% in 1998 to 6.67% in 2005, despite the changes in the income tax law that were meant to reduce the tax burden on the taxpayer. There is a need for greater emphasis on examining the impact of the tax change on the actual tax burden, rather than blindly accepting that the law has furthered this aim.

JEL Classification: H24

Keywords: income tax, effective income tax function, marginal tax rate

---

\* Received August 18, 2008. Accepted December 30, 2008.

\*\* Department of Economics, Ajou University, Suwon, South Korea, E-mail: jkhyun@ajou.ac.kr

\*\*\* National Assembly Budget Office, Seoul, South Korea, E-mail: jsh1105@nabo.go.kr

\*\*\*\* Author for correspondence, Department of Economics, Chungbuk National University, E-mail: billforest@hanmail.net

## 1. INTRODUCTION

Income tax law in Korea changes almost yearly with the purpose of reducing the tax burden using policy variables such as statutory tax rates, allowances, and deductions. It is because the income tax is a sensitive issue and is used to gain political support from taxpayers. Despite the statutory tax changes, there are doubts if the real tax burden decreases. Political groups and government officials tend to exaggerate how the change in tax policy would reduce the tax burden borne by taxpayers. However, there is a need to examine the real change in the tax burden to evaluate the income tax law changes accurately.

The effective income tax function, developed by Berliant and Gouveia (1993), and applied by Gouveia and Strauss (1994, 1999), Lim and Hyun (2006), is a practical model used to examine the real tax burden incurred through tax changes. This function has been analyzed using the micro-level household dataset, which includes behavioral change after tax changes. Statutory tax law is a benchmark before the tax change, so estimates from ex-post data reflect a more realistic situation in relation to the tax burden.

This paper examines the real tax burden of income tax after changes in income tax law and is to test whether Korean tax changes that reduce income tax are as intended.<sup>1)</sup> If there is a discrepancy between what is advertised about policy for reduction of the tax burden and actual tax burden, taxpayers may be misled about the effect of statutory tax law. This paper applies the effective income tax function to a micro-level household dataset as a simple and practical way to measure the real tax burden. In order to examine in detail the relationship between income tax changes and the real tax burden, a dataset is used that covers an eight year period from 1998-2005.

This paper is as follows: section 2 gives an overview of the Korean income tax system, section 3 briefly explains the structure of an effective income tax function, section 4 presents the empirical results, and section 5 provides

---

<sup>1)</sup> There are several studies focussed on the redistributive effect of the Korean income tax system, for example, Hyun and Lim (2005), Lim and Hyun (forthcoming).

concluding remarks.

## 2. OVERVIEW OF THE KOREAN INCOME TAX SYSTEM

This study reviews the changes in the Korean income tax system over the period of 1998-2005. Three types of policy tools are used to determine the income tax burden: the tax base, the tax credit, and the tax rate. Allowances and deductions are main sources for determining the size of the tax base. The level of allowance for elderly and disabled people has increased over time. For example, the allowance for the elderly was 0.5 million won in 1998 and increased to 1 million won in 2002. The reason for a tax policy that increases the level of benefits received is that certain political groups can increase support.

A tax credit is similar to the tax base, but is mainly for income derived from labor. Horizontal inequity between income derived from labor and self-employed income has not formerly been addressed by the income tax policy of Korea. The government has used tax credits to partially solve the horizontal inequity problem of these two types of income. The level of tax credits for income derived from labor over the period researched has been the higher of the two.

Table 1 shows the changes in the statutory tax rate and the tax rate for each income bracket has decreased over the period. It is inferred that, with the

**Table 1 Changes in Income Tax Rates over Time**

(Unit: %)

Taxable Income	Tax Rate		
	1998-2001	2002-2004	2005
10M below	10	9	8
10M - 40M	20	18	17
40M - 80M	30	27	26
80M above	40	36	35

Note: 1M means 1 million Korean won, which was approximately equivalent to \$1,000.

**Table 2 Changes in Taxable Income Distribution over Time**

(Unit: %)

Taxable Income	1998	1999	2000	2001	2002	2003	2004	2005
Zero	14.3	20.2	15.2	12.3	10.7	5.7	5.9	9.0
10M below	46.6	40.4	40.3	36.8	36.7	33.0	30.2	24.9
10M-40M	37.2	37.2	40.8	45.8	46.9	49.8	49.4	50.1
40M-80M	2.0	2.0	3.3	4.7	4.7	10.6	13.6	14.4
80M above	0.0	0.2	0.4	0.5	1.0	0.9	0.9	1.5

change in the income tax system, there is a reduction in income tax. However, there is a need to examine the change in income levels over time to assess and compare the real changes in tax. The amount of the tax change is only one, but is an important way of evaluating the real change in income tax, and explains why the micro-simulation model (based on the micro-level dataset) is important in reflecting how the system of taxation impacts the actual economic situation of households.

Table 2 shows the changes in taxable income distribution during the research period. As real income increases over eight years, so does the taxable income. For example, the proportion of taxpayers with no taxable income was 14.3% in 1998, but 9% in 2005; this shows a decreasing pattern over time. For the highest income group (within the more than 80 million won taxable income bracket) there were very few in 1998. However, this bracket accounted for almost 1.5% of taxpayers in 2005. It was found that the nominal income of taxpayers had actually increased and moved them into the higher income bracket despite the income tax law being changed to reduce the amount of tax through consistent decreases in the tax rates that included more generous levels of allowances and deductions. The pattern of increasing nominal income casts doubt on the claim that the change in the law led to a reduction in the tax burden during those eight years. This is

why a more exact examination of the impact of tax law changes on taxes (as well as changes in nominal income levels) needs to be carried out. As the Korean taxation system has been progressive, the real impact of the changes depends upon the degree of progress as well as the rate of increase in taxable income. A micro-level dataset allows for an examination of the real impact of the tax changes on taxes.

### 3. THE EFFECTIVE INCOME TAX FUNCTION

The effective income tax function was originally derived from the equal sacrifice theory by Young (1988, 1990) and more generally by Berlaint and Gouveia (1993), and was applied in practice by Gouveia and Strauss (1999, 1994) and Lim and Hyun (2006). This study is an application of the model in the Korean situation and there exists a need to explain how the equation was derived. Young (1990) presented the tax functions constructed by applying the absolute version of the equal sacrifice principle to the isoelastic utility function as follows

$$u = -c^{-p},$$

where  $u$  is the level of utility,  $c$  is the level of consumption, and  $p$  is a parameter. The rule defines the tax function that causes a sacrifice of ‘ $s$ ’ from economic income,  $y$  as the solution to

$$-y^{-p} + (y - t(y))^{-p} = s,$$

from which the total tax function is

$$t(y) = y - (y^{-p} + s)^{-1/p}.$$

The average tax function is derived as follows

$$\bar{t} = 1 - (s^* y^p + 1)^{-1/p}.$$

This equation has the asymptotic marginal and average tax rates of 100% that might affect the willingness to work. The above function does not consider the incentive effects of income tax on the labor supply. So Berliant and Gouveia (1993) incorporate a labor supply component in this framework by integrating the notion of equal sacrifice on optimal income taxation. Empirical studies were carried out by Gouveia and Strauss (1994, 1999) by adding a specification with one parameter ‘*b*’ as an approximation to incentive compatible to the equal sacrifice tax function as follows

$$atr = b - b^* (s^* y^p + 1)^{-1/p} + \varepsilon, \quad (1)$$

where

*atr*: average tax rate

*y*: economic income

*b*, *s*, *p*: parameters to be estimated

$\varepsilon$ : an additive statistical disturbance

The equation (1) is used to estimate the effective income tax function. The economic implications of parameter estimates from the effective income tax function can now be discussed. First, the estimate of ‘*b*’ represents the maximum effective tax rate, which is interpreted as a weight given to incentives in the design of the effective income tax function. The parameter ‘*b*’ was interpreted as a maximum politically feasible tax rate (Gouveia and Strauss, 1994).

The marginal tax rate is useful when trying to evaluate the economic implications, such as the degree of incentive required for the labor supply. There also exists a need to aggregate the estimates of the marginal tax rates for each household into one index number for the purposes of policy evaluation. The average of marginal tax rates are used to ascertain the time trend of the economic impact on the labor supply as follows

$$AMTR = \sum_{i=1}^N \frac{t'(y_i)}{N}, \quad (2)$$

where  $t'(y_i)$  is a marginal tax rate for each household and can be computed by first derivative of (1), and  $N$  is the number of taxpayers. This index of the average marginal tax rate ( $AMTR$ ) is more useful (rather than the statutory tax rate) when measuring the economic implications of the system of taxation.

The Household Income and Expenditure Survey released by the Korean National Statistical Office, called “Urban Household Survey” until 2002, is used for the estimation. It is used to find out household income and expenditure so as to: understand the current status and changes of households, provide data required for measuring and analyzing the standard of life, provide data for the weighing in the Consumer Price Index, provide basic data for the establishment of various economic and social policies, and provide data for the estimation of national income. The periodicity of the survey is monthly, but the tabulation and release are both quarterly and annually. Survey items include household distinction, the number of household members, the number of earners, the marital status, the sex/age/educational attainment/industry/occupation of household head and spouse, items concerning other household members (relationship to household head, sex, age, and activity status), the household type, the income source in non-occupation households, the yearly income, items concerning residence, the type of living quarters, the number of private automobiles, types/amount of income items, and the amount of expenditures. Of interest is in the tax derived from labor income and a sample of urban households with labor income is used for the analysis.

#### 4. EMPIRICAL RESULTS

Table 3 shows estimates of income tax function, (1). All estimates are

statistically significant. As 'b' represents the convergent value of the effective tax rate as income increases, it might be an approximate index to evaluate the tax burden for each year. It shows an increasing pattern of change, except for the year 2001. It is possible to predict that although the income tax law had been changed (ostensibly to reduce tax) the real impact may be opposite.

Two tax rates are used (the effective tax rate and marginal tax rate) to analyze the pattern of income tax. Table 4 shows the results. This paper compares the predicted value of the average effective tax rate with the real

**Table 3 Estimation Results over Time**

Year	<i>b</i>	<i>s</i>	<i>p</i>	<i>F</i> -value	<i>R</i> <sup>2</sup>	N
1999	0.1334** (0.0045)	0.0000036960** (0.0000019290)	3.8508** (0.1936)	3841.5***	0.7635	3,573
2000	0.1606** (0.0050)	0.0000099620** (0.0000036350)	3.3871** (0.1347)	5117.4***	0.7920	4,034
2001	0.1391** (0.0035)	0.0000010620** (0.0000006803)	4.2337** (0.2255)	5243.5***	0.8003	3,928
2002	0.1373** (0.0039)	0.0000015360** (0.0000009418)	3.9753** (0.2118)	4927.8***	0.7992	3,717
2003	0.1394** (0.0048)	0.0000150000** (0.0000064620)	3.0676** (0.1531)	4988.1***	0.7456	5,109
2004	0.1397** (0.0041)	0.0000027640** (0.0000016310)	3.5793** (0.1945)	5183.6***	0.7627	4,841
2005	0.1597** (0.0030)	0.0000006725** (0.0000003247)	4.0060** (0.1556)	10079.1***	0.8382	5,840

Note: Standard errors in ( ). \*: 10%, \*\*: 5%, \*\*\*: 1% significance level.

**Table 4 Effective and Marginal Tax Rates over Time**

(Unit: %)

Year	Predicted Average	Real Average	<i>AMTR</i>
1998	1.74	1.74	5.12
1999	1.59	1.58	4.78
2000	1.93	1.92	5.62
2001	2.32	2.34	6.47
2002	2.23	2.24	6.20
2003	2.44	2.43	6.39
2004	2.55	2.55	6.68
2005	2.44	2.44	6.67

effective tax rate, and finds that the estimates from the effective income tax function are very close to the real values.

The average values of the marginal tax rate are computed with the reliability of the estimated effective income tax function. The estimates show great fluctuation in absolute values, even though the tax law supposedly reduced the tax burden. It can be interpreted that the impact of the tax law changes (and the increase in nominal incomes of taxpayers) on taxes work in opposition, so that the real amount of tax depends upon which factor has the greater impact. For example, the effective tax rate decreased in 2002 after the change in the law, but increased in 2003. The impact of the 2002 tax law change was greater than that of the increase in nominal income, but reversed in 2003.

The estimates of the average values of marginal tax rates with (2), and the patterns over time, are the same as those of the average effective tax rates. The estimates of the marginal tax rates enable us to explain the economic implications of income tax policy. The marginal tax rate in 1998 was 5.12%, but fluctuated over time and reached 6.67% in 2005. The government

**Table 5 Average Marginal Tax Rates over Time by Quantiles**

(Unit: %)

Year	Median	Q1	Q2	Q3	Q4
1998	4.34	0.46	2.65	6.44	10.93
1999	3.57	0.32	2.10	5.87	10.83
2000	4.41	0.59	2.83	6.65	12.41
2001	6.15	0.60	3.67	8.80	12.83
2002	5.75	0.63	3.55	8.20	12.43
2003	6.25	1.05	4.37	8.19	11.94
2004	6.68	0.80	4.31	8.95	12.66
2005	5.76	0.23	2.92	9.12	14.40

promised to decrease taxes with both a reduction in tax rates and more generous levels of allowances and deductions.

However, the real economic impact had the opposite result due to the increasing trend of marginal tax rates. It is known that income tax operates as a disincentive to labor. The use of a marginal tax rate might be a useful index to evaluate the degree of disincentive toward the labor supply. In fact, these disincentives became larger over the research period. Of note was that a general tendency for the income tax burden increased with economic development. This means that the increase in the marginal tax rate should be natural. The policy implication is to have an income tax system more neutral to inflation by introducing indexation.

The tax burden is calculated by four income groups, including the mean and the median income (See table 5). Measures show that *AMTR*, on average, increases in all quartiles during 1998-2005. However, the first and the second quartile decrease over 2003-2005 and implies that labor income deduction and tax credit are relatively beneficial to laborers for those years.

## 5. CONCLUSIONS

The effective income tax function is estimated using a micro-level dataset as it allows the determination of both the effective tax rate and the marginal tax rate. Korean income tax policy has been reduced the burden of income tax through decreasing the tax rate, and allowing for a higher level of allowances and deductions. However, it is found that this is not the case as there was an increase in the effective and marginal tax rates during the period of 1998-2005. It can be interpreted that the impact of the changes in income tax law has a weaker effect on tax than the increase in nominal income levels. Marginal tax rates increased from 5.12% in 1998 to 6.67% in 2005, even though the tax law had changed to reduce taxes. The income tax policy in Korea can be considered as more disincentive toward labor supply.

The suggestion of this paper is that intention of the policy that brings about changes in the tax law is counter to the reality of the tax burden borne by taxpayers, implying the introduction of the price-indexed income tax law. More work needs to be done to examine the actual impact of tax changes, rather than assuming that statutory tax changes will benefit the taxpayer. The use of the effective income tax function should be used as a guideline to examine the real impact of any tax changes. However, *AMTR* increases over time (despite decreases in statutory tax rates) because of inflation and economic growth and this suggests that further studies are needed, i.e., work to decompose increase in *AMTR* into two parts, one from inflation and the other from economic growth.

## REFERENCES

- Berliant, M. and M. Gouveia, "Equal Sacrifice and Incentive Compatible Income Taxation," *Journal of Public Economics*, 51, 1993, pp. 219-240.

- Gouveia, M. and R. Strauss, "Effective Tax Functions for the US Individual Income Tax: 1966-89," Proceedings of 92nd Annual Conference on Taxation, National Tax Association, 1999, pp. 155-165.
- \_\_\_\_\_, "Effective Federal Individual Income Tax Function: An Exploratory Empirical Analysis," *National Tax Journal*, June 1994, pp. 317-339.
- Hyun, J. K., "Tax Compliances in Korea and Japan: Why are they so different?," *Journal of the Korean Economy*, 7(1), Spring 2006, pp. 135-153.
- Hyun, J. K. and B. I. Lim, "Redistributive Effect of Korea's Income Tax: Equity Decomposition," *Applied Economics Letters*, 12, 2005, pp. 195-198.
- Lim, B. I. and J. K. Hyun, "Comparative Analysis of the Effective Income Tax Function: Empirical Evidence using LIS Data," *Applied Economics Letters*, 13, 2006, pp. 117-121.
- \_\_\_\_\_, "What Makes the Income Tax System so Progressive?: The Case of Korea," *Applied Economics Letters*, forthcoming.
- Yoo, I., "Public Finance in Korea since the Economic Crisis," *Journal of the Korean Economy*, 9(1), April 2008, pp. 141-177.
- Young, H. P., "Distributive Justice in Taxation," *Journal of Economic Theory*, 44, 1988, pp. 321- 335.
- \_\_\_\_\_, "Progressive Taxation And Equal Sacrifice," *American Economic Review*, 80(1), March 1990, pp. 253-266.