Tax Equity and Income Inequality in Korea

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Abstract

Applying newer methods of analysis to panel data from the Korean Household Panel Study, this study

empirically explored the various equity consequences of the Korean income tax system during the period of 1992 to 1998. In terms of either the structural measure of average rate progression or the distributional measure of the Center of Gravity of income distribution, tax effects on vertical equity were found to be insignificant throughout the sample years, despite the statutory progressivity. While these results basically agree with previous studies, this study also found that the absolute tax payments as well as the average effective tax rates failed to be monotone increasing in income deciles, providing strong evidence against the principle of progressive taxation. In addition, decomposition analysis found that the income inequality within income deciles was negatively affected by income taxation despite the unambiguous improvement in overall inequality both in 1992 and 1996. The analysis with Tax Mobility Matrices found that the Korean income tax system induced extensive income re-rankings affecting most households in all sample years, and, generally speaking,

the middle-income class of the fifth and sixth deciles were most rank-shifted to adjacent deciles. The Mean Squared Relative Rank-Shift, which was computed as a summary measure of overall re-rankings, did not find any obvious trend; however, the average distance of rank-shifts gradually decreased from 1992 until 1997 and then rather sharply increased in 1998. Lastly, the sample year of 1998, which corresponded to the period of Economic Crisis in Korea, was distinguished from the rest in notable respects: the progression of effective tax rates was most prominent; the distributional tax effect on income inequality was also most prominent; yet, the percentage of rank-shifted households was lowest and the extent of the tax-induced re-rankings was second-lowest among the sample years.

I. Introduction

Fairness in income distribution is a basic command of social justice, and redistribution in accordance with tax equity is an important statutory function of the income tax system. In the same vein, an empirical study of the redistributive effects of the income tax system is an important undertaking that can provide useful policy implications for tax reforms as well as a valuable assessment of the tax system in relation to equity principles. In this light, I investigated various equity consequences of personal income taxation in Korea, and this report summarizes my findings.

The income tax system in Korea is known for the generally low tax burden on taxpayers, which is mostly attributed to the generous tax allowances and exemptions and the lack of strong and uniform enforcement of tax codes in comparison with other countries. According to Dalsgaard(2000), the average effective tax rate on labor during the period of 1991-1997 was only 7.7 percent, which was the lowest among the OECD countries and substantially lower than the OECD average of 33.4 percent. However, the importance of the Korean income

tax as a revenue source is one thing, and the extent of the redistributive role of the tax can be another. In effect, this study is an exploration into this proposition.

In this study, I considered the redistributive effects of the Korean income tax system from the perspective of vertical equity, horizontal equity and tax-induced income re-rankings. Progressivity as a manifestation of vertical equity was examined by means of both a structural measure of average rate progression and a distributional measure of the center of gravity of income distribution. Using the distributional measure, overall inequality effect was decomposed into the effect on income inequality across income groups and the effect on inequality within income groups.

In view of income re-rankings as an equivalent of horizontal inequity, I constructed the tax mobility matrix for the purpose of a visual presentation of re-rankings, and measured the extent of re-rankings using a summary statistic of mean squared relative rank-shift. This measure of horizontal inequity was justified by the use of equivalent household income serving as a money-metric measure of household welfare.

The existing literature on the redistributive effects of the Korean income taxation is not particularly rich but includes a few inspiring studies with important findings

that will be referred to in the discussion of empirical findings, such as Hyun(1996, 1999), Im(1996), Lee(1997), and Sung and Lee(2001). However, this study departs from existing ones in several meaningful respects. First, I used equivalent household income as the unit of analysis, which renders the obtained results welfare interpretations.

Secondly, I used data from all six waves of the Korean Household Panel Study covering the sample period of January 1992 to July 1998, and this consistency in the observed households and methods of analysis renders the obtained results meaningfully comparable over the sample years.

Lastly but most importantly, while existing studies typically focus on either horizontal or vertical equity aspect of the Korean income tax system, I address vertical equity, horizontal equity and income re-rankings from a methodical point of view in this study. In particular, tax-induced income re-rankings have been neglected in existing studies, and I intend to fill the void with this study.

This report is organized as follows. Section II discusses the methodology used in this study with reference to relevant equity principles. Section III explains the data source and procedures taken. In Section IV, I discuss empirical findings in comparison with existing studies in

the following order: average rate progression in light of (structural) vertical equity, tax-induced income re-rankings in light of horizontal inequity, and center of gravity and its decomposition in light of (distributional) vertical equity.

Lastly, I make concluding remarks in Section V.

II. Method of Analysis

1. Equivalent Household Income

$$\Gamma = (A + \rho K)^{\gamma} \quad (1)$$

Unlike many previous studies, I used equivalent household income as the income unit of analysis. Equivalent household income is household income adjusted for household structure using an equivalence scale Γ defined as

where A and K are, respectively, the numbers of adults and children in the household, and ρ is a parameter for the weight of a child relative to an adult, and γ is a parameter for the economies of scale within the household.

In an income study, equivalent household income is considered to be a money-metric measure of household well-being, which conveniently allows cross-household comparisons. Abstracted from different abilities-to-pay of households caused by different household sizes and compositions, it is also considered to be a more appropriate unit of analysis than household income in examining the redistributive effects of income taxation.

As for the parameter values of ρ and γ, there is neither normative theory nor empirical consensus, and

different values have been adopted in previous studies. For example, Aronson, Johnson and Lambert(1994), Cheong (2000, 2001), and Williams, Weiner and Sammartino(1998) set both parameters equal to 0.5; Atkinson, Rainwater and Smeeding(1995) and Kang and Hyun(1998) set ρto 1 and ν to 0.5, respectively. The OECD generally used the latter set of parameters too.

While recognizing its normative merit, Decoster and Ooghe(2002) concluded that using equivalent income might be ineffective at the empirical level since welfare results were sensitive to the choice of equivalence scales in their experiment. In my opinion, their conclusion only signifies the importance of using equivalent income, and thus calls for empirical efforts in pursuit of reasonable and acceptable equivalent scales for the sample households in Korea. In this study, however, I followed the choice of Kang and Hyun(1998) without making further effort to estimate these parameters.

2. Tax Mobility Matrix and Mean Squared Relative Rank-Shift

While there is virtual unanimity that horizontal equity is a worthy goal of any tax system, a workable definition of horizontal equity has been elusive.[1)]

1) This sentence draws on Auerbach and Hassett(1999).

One approach in the literature, such as Aronson et al.(1994) and Wagstaff et al.(1999), is to adhere to the principle of the classical horizontal equity, that is, "the equal treatment of equals," and measure the extent of differential tax treatment of equals. In this approach, the ambiguity in the workable definition of horizontal equity is inherited by the definition of pre-tax equals or groupings of unequals since no two taxpayers are identical in reality. Although one can mitigate the arbitrariness by using the predicted income distribution estimated non-parametrically from the sample income distribution, the usual method of fixing income bands and using them to group taxpayers as equals is fundamentally arbitrary and thus likely to make the measure of tax equity sensitive to the choice of income bands.

Another approach is to recognize the existence of tax-induced income re-rankings as a necessary and sufficient condition for the violation of horizontal equity, and measure the extent of changes in income ranking between pre-tax and post-tax income distributions. For example, King(1983) measured the re-ranking of an individual taxpayer using the scaled order statistic defined by the normalized difference between the actual income and the income in post-tax distribution corresponding to the taxpayer's pre-tax income ranking.

The occurrence of income re-rankings resulting from taxation, or the tax mobility in Atkinson's term(1980), is not entirely avoidable in practice. As a matter of fact, tax equity requires differential treatments of households with different needs and abilities-to-pay, by means of various tax exemptions and deductions and other provisions. Therefore, certain income re-rankings based on income sources and household characteristics are equitable and thus intended by a typical progressive income tax system. There are, however, income re-rankings that cannot be justified on the equity ground. Some re-rankings may be intentional on the efficiency ground and others may be due to imperfections in the operation of the tax system. Like any other study of the redistributive effects of income taxation, I concentrate on the income re-rankings with no equity justification in assessing the equity consequences of the Korean income tax system.

In this study, tax-induced income re-rankings are considered unjustifiable on the equity basis unless they reflect the intentional unequal treatment of households with the same income but with different needs. Therefore, tax inequity directly measured from household income, whether progressivity, horizontal inequity, or the extent of income re-rankings, is necessarily inclusive of equitable differential treatments and hence leads to false judgments.[2] On the

contrary, tax inequity measured from equivalent household income should be free from such intended equitable differences since their consideration is already factored into the household equivalence scale, which expresses household income in per adult equivalent terms. In light of this normative proposition, any tax-induced re-ranking of equivalent household income is attributed to the violation of tax equity principles.

I measure the extent of the tax-induced re-ranking using the mean squared relative rank-shift, which is the arithmetic average of the squared "distances" of relative rank-shifts resulting from income re-rankings. First, the relative rank is defined as the (absolute) income rank divided by the total number of households. The relative rank-shift is then obtained as the difference between a household's relative ranking in the pre-tax income distribution and its relative ranking in the post-tax income distribution. If there were no income re-rankings, all distances of relative rank-shifts would be constant at zero and hence the mean squared relative rank-shift would be zero. Other things being equal, the mean squared relative

2) In the same vein, Wagstaff et al.(1999) noted that the classical horizontal inequity might be more appropriately called horizontal inequality since some horizontal inequality may be considered equitable.

rank-shift would increase as the number of re-rankings increases or the distances of rank-shifts increase. The formal definition of the mean squared relative rank-shift is as follows:

$$\frac{1}{N}\sum_{i=1}^{N}(p_i - q_i)^2 \qquad (2)$$

where p_i and q_i are household i's relative income rankings in the pre- and post-tax income distributions, respectively. It is noted that the average of relative rank-shifts for all households is necessarily zero and, therefore, the mean squared relative rank-shift is nothing but the variance of relative rank-shifts itself.

It should be noted that the mean squared relative rank-shift employed as a measure of tax inequity in this study is invariant to replications of the sample population. In other words, this measure satisfies the so-called Dalton's Population Principle often required for a measure of income inequality. Consequently, merging identical income distributions under the common income tax system would not alter the extent of income re-rankings measured by the mean squared relative rank-shift.

Using a summary statistic of the mean squared relative rank-shift to measure certain tax inequity implies that I am implicitly imposing a social welfare function that is inversely related to the variance of relative rank-shifts. One

notable implication is that rank exchanges of the same distance would make the same impact on tax equity. For example, a complete reversal of income rankings within a decile will cause the same extent of tax inequity, regardless of which decile undergoes such change.

Whether it is acceptable or not does not seem relevant in effect, since there is no consensus about welfare weights of rank-shifts in the literature.

As an additional attempt to investigate the tax-induced re-ranking, I constructed the so-called tax mobility matrix following Atkinson(1980).

The tax mobility matrix is a transition matrix of which an element m_{ij} represents the percentage share of the i^{th} decile households in the pre-tax distribution that end up in the j^{th} decile in the post-tax distribution. If income taxation were to induce no income re-ranking, all diagonal elements of the matrix would be 100's and all off-diagonal elements would be zeros. Due to the presence of income re-rankings in reality, the tax mobility matrix is never obtained as a diagonal matrix although its diagonal elements are dominant.

3. Center of Gravity of Income Distribution

As a measure of income inequality, I use the center of gravity of income distribution (denoted as COG) developed in Cheong (2000). The COG is the average of households'

relative income rankings weighted by their income shares, and computed as follows:

$$COG = \sum_{i=1}^{N} \frac{i}{N} \frac{y_i}{Y} \qquad (3)$$

where y_i denotes the income of the i^{th} poorest household, N the total population, Y the total income (such that $Y = \sum_{i=1}^{N} y_i$).

By construction, the COG identifies the household on which an ordered income distribution is centered. For example, the computed COG being 0.62 implies that the given income distribution is centered on the sixty-second poorest household in percentile income rankings. In other words, the sixty-second poorest household "represents" the income distribution provided that there are a total of one hundred households in the income distribution.

As intuition would tell, the COG obtains its maximum value of 1 when the income distribution is completely concentrated, so that the income distribution is centered on the richest household, and its minimum value of ½ when the income distribution is completely equal, so that the income distribution is centered on the midst-income household.

It should be noted that the COG can be expressed as a simple linear transformation of the Gini coefficient, thereby

allowing not only an intuitive meaning to the Gini coefficient but also allowing inequality comparison regardless of the Lorenz curve crossings.[3] Another notable benefit from using the COG is that this measure allows an easy yet useful decomposition of an overall inequality change into the change due to within-group inequality and the change due to between-group inequality.

Using decile income groups means that an ordered income distribution is partitioned into ten income groups with equal group sizes. Defining the within-group inequality (COG_K) as the center of gravity of income distribution within a group, we have the following relationship:[4]

$$COG = \sum_{K=1}^{10} \frac{1}{K} \frac{Y_K}{Y} COG_K + \sum_{K=1}^{10} \frac{K}{10} \frac{Y_K}{Y} - \frac{1}{10} \qquad (4)$$

where Y is the total income of the whole income distribution and YK is the total income of group K. The first term on the right-hand side of Equation (4) is the weighted average of within-group inequalities with each group's weight being the product of the group's income share and population share; whereas the second term simply computes the center of gravity of group income

3) See Cheong (2000) for further discussion of the Center of Gravity of income distribution relative to the Gini coefficient.

4) See Cheong (2000) for proof of Equation (4).

distribution, (Y_1, Y_2, Y_3, ⋯, Y_{10}), that is, the inequality between groups.

Since the seminal paper of Musgrave and Thin(1948) who proposed that income tax progressivity, as an implementation of vertical equity, be measured by "the extent to which a given tax structure results in a shift in the distribution of income toward equality," the inequality of the pre-tax and post-tax income distributions in terms of the Gini coefficient has been widely used in previous studies. I follow this intuitively appealing approach, taking advantage of the property of the COG being only a linear function of the Gini coefficient. Strictly speaking, progressivity measured in this way is distributional progressivity, which was referred to as effective progression by Musgrave and Thin(1948). In discussing empirical findings, I will also use the notion of progressivity based on average rate progression. Formal discussion of the measurement of progressivity can be found in many existing studies, such as Dardanoni and Lambert (2000), Kakwani (1977), and Podder (1997).

It should be also noted that distributional progressivity would be undermined by horizontal inequity resulting from undesirable income re-rankings induced by the tax system. As will be discussed, the Korean income tax system induced considerable income re-rankings during the sample

period. Such income re-rankings may be further investigated by adopting decomposition analysis, such as Aronson, Johnson and Lambert(1994) and Duclos, Jalbert and Araar(2000), in which tax progressivity and re-ranking effects are mutually exclusively defined. While it is worthwhile and, in fact, overdue in the literature of the Korean tax system, an application of such decomposition is put beyond scope of this study.

III. Data

I used both household- and individual-level data from the Korean Household Panel Study (KHPS) conducted by the Daewoo Economic Research Institute, which has ceased to exist any more. The KHPS had been the only source of panel data for Korea until the Korean Labor and Income Panel Study (KLIPS) was launched by the Korean Labor Institute in 1998.[5] There had been a total of six waves of the KHPS from 1993 to 1998, and all waves were used in my study.

While each wave of the KHPS covered a sample period of twelve months, the months actually covered in a wave changed in the 1994 and 1995 waves. Specifically, the 1993 wave covers a period from January to December 1992; the 1994 wave covers from April 1993 to March 1994; all the subsequent waves respectively cover from the August of the previous year to July of the survey year. Considering these differences, I renamed the sample years as 1992, 1993, 1995, 1996, 1997 and 1998, respectively in

5) The KLIPS is mainly focused on labor market activities and does not address tax questions.

a chronological order. For example, the sample year 1998 in this study covers a period of August 1997 to July 1998, which almost coincided with the period of Economic Crisis in Korea.

The sample size of 4,547 households and 10,460 individuals in the first wave of the KHPS continuously decreased to the size of 2,468 households and 5,875 individuals in the last wave. This implies a fast rate of attrition compared to other panel data such as the Michigan Panel Study on Income Dynamics (PSID), which reached the level of 50 percent sample loss in twenty years from the initial 1968 wave.[6)]

The first wave data provide the sampling weight of each household, which is the inverse of the probability that each household would be selected from the population distribution in Korea in 1992. These sampling weights were preserved in all analyses throughout the study. Consequently, the actual number of households belonging to each decile is different across deciles as deciles were defined in terms of the weighted number of households.

A small number of households in the first wave had been split into more than one household in later waves for various reasons such as marriage and divorce. I discarded

6) Interestingly, the PSID remained roughly representative though the years, according to Fitzgerald, Gottschalk and Moffitt (1989).

all households that had been split at least once during six waves, in order not to reduce the effectiveness of household sampling weights.

One frequently encountered issue in empirical studies on the income taxation in Korea is as to what tax data to use for self-employed (and employer) households. Tax data for self-employed households may be simply unavailable[7] or deemed to be less reliable than those for worker households because of their different tax treatments. Specifically, tax dues of self-employed taxpayers (that is, Global Income Taxes) are determined mainly on the basis of their voluntarily reported income amounts whereas income taxes for salary workers (that is, Class A Income Taxes) are initially withheld at their income sources. In addition, the use of the reported income amounts in the determination of the Value Added Tax (VAT) bases for self-employed taxpayers contributes to additional incentives for tax evasion.

Given this situation, some studies, such as Hyun (1999), chose to impute the self-employed taxpayers' income amounts and thus tax payments, which are typically estimated from their consumption amounts under the assumption that self-employed taxpayer households have

7) For example, data from the Urban Household Income and Expenditure Survey (UHIES) include income data only for worker households.

the same consumption functions as the demographically comparable salary worker households.[8] Other studies, such as Lim(1996), chose to use the original data provided by the survey without making adjustments. I chose the latter approach in this study, considering the following points. First, the imputation approach necessarily includes arbitrary assumptions about the tax behavior or tax evasion of self-employed taxpayers once their disposable income levels are estimated; however, differentiated tax behavior or tax evasion imbedded in real data is also an effect of the income tax system in place. Secondly, this study is more focused on delineating trends in tax effects during the sample period than proposing the true numbers of tax effect for a particular year; therefore, using the same approach consistently throughout the sample period is likely to mitigate the issue of different biases from different approaches.

Besides usual data cleaning procedures, I discarded all households that completely failed to report their income or tax amounts or answered "Don't Know." For the small number of households who answered "Don't Know Exactly" but chose one of the preset ranges instead of writing in the exact amounts, I used the midpoint value of

8) Based on the UHIES data, Cheong (2000) indicated that this assumption might not be appropriate for the Korean households.

the chosen range if it is bounded but the lowest in the chosen range if it is unbounded as in previous studies, such as Reed (1999). Accordingly, the households who selected "More Than 1,000,000 won" were treated equally to those who wrote in 1,000,000 won.

One of the well-known characteristics of income tax data for Korea is that there are a number of zero-tax payers. For the most part, it is attributed to the generous tax exemptions and deductions allowed by the Korean income tax system. However, it is also due to widespread tax evasion and poor tax administration in Korea. Unfortunately, no existing data for Korea provide enough details to compute the exact amounts of tax obligations, and there is no consensus on how to deal with this difficulty. For example, Lim(1996) had to repeat the same analysis for two data sets: one with zero-tax payers included and the other without zero-tax payers in his study using the first wave of the KHPS data. In this study, I chose to discard the households who paid no taxes but earned more than their tax thresholds or tax exemption points. Specifically, tax exemption points were estimated separately for two income categories: Class A Income and Global Income considering household sizes in accordance with the income tax codes in each year, and then any household with Class A or Global Income higher than the corresponding exemption point but with no tax payment was deleted

from the sample. I adopted this data procedure as a second best solution compromising with reality. It should be noted, however, that such data procedure is likely to overestimate the tax exemption point because of the tax allowances and exemptions based on the factors other than household sizes, such as insurance premium deduction. In the same vein of deleting households reporting unreasonable tax amounts, I also deleted households who reported tax amounts resulting in the average tax rates higher than the maximum marginal tax rates in the income tax codes.

The final data set includes varying sample sizes over sample years as shown by Table 1. The table presents the distribution of sample households across deciles generated according to the sampling weight and pre-tax income of each household.[9)]

<Table 1> Sample Size per Equivalent Household Income Decile

	1992	1993	1995	1996	1997	1998
Bottom Decile	401	333	301	252	250	195
Second	344	311	259	225	198	164
Third	297	258	216	186	161	168
Fourth	271	237	202	155	166	145
Fifth	258	226	195	178	151	150
Sixth	262	213	200	173	138	128
Seventh	270	247	192	164	158	129
Eighth	275	225	196	168	143	137
Ninth	242	243	191	169	153	141
Top Decile	253	217	182	171	145	129
All Households	2873	2510	2134	1841	1663	1486

9) Unless specified otherwise, income deciles are defined on the basis of pre-tax equivalent household income levels in this study.

The sample years of 1992～1998 represent a period of moderate economic growth in Korea, with the annual real GDP growth rate being consistently higher than 5 percent until the year of 1998, which was marked with a negative growth rate for the first time in many years. The Economic Crisis erupted in the last quarter of 1997 brought about dramatic economic downturn unprecedented in the recent economic history of Korea. Among other things, unemployment rate, which had been traditionally as low as 2 to 3 percent in Korea, abruptly increased to about 7 percent in the wake of its socio-economic consequences.

Tax reforms or piecemeal policy changes implemented in Korea during the sample period may be briefly summarized as follows:[10] (1) In support of the Five Year Plan for the New Economy, Tax Reform in 1993 included policy changes geared toward enhancing tax equity and secure tax revenue by lowering individual income tax rates but reducing various kinds of non-taxation and tax exemptions; (2) In the spirit of leveling playing field, the 1994 Tax Reform lowered the income tax rates but broadened the tax base by incorporating interest and

10) This summary heavily draws on Ministry of Finance and Economy of Korea (1999). More details may be found in the source or similar government publications.

dividend income into the global income tax system and introducing the self-assessment system for individual income taxes, both of which actually went into effect in 1996; (3) In 1996, individual income tax brackets and their marginal tax rates were adjusted, and tax exemption points were substantially raised; (4) In coping with the Economic Crisis, a series of tax policy measures to prevent excessive revenue shortfalls were implemented in 1998, such as switching the progressive taxation of interest income to a proportional withholding tax and making various exemptions and tax reductions subject to sun-set rules.

Due to their complicated nature, one can hardly determine ex ante whether tax equity ought to be improving or worsening as a result of the tax policy changes implemented during the sample period. Horizontal equity would have been clearly improved if all households had become subject to global income taxes based on all sources of income. However, no sample year had policy changes all aligned in the same direction.

Implications on vertical equity or progressivity seem to be even more ex ante ambiguous due to a series of changes in income tax brackets.[11] It is, however, at least

11) As illustrated by Dardanoni and Lambert (2000), income brackets with low marginal tax rates can be more progressive because it matters for progressivity where the taxpayers are located.

certain that the rate structure was progressive in every sample year in that the statutory average tax rate was non-decreasing in income level. In fact, this study intends to investigate the effective progressivity (or distributional progressivity) that is a projection of the statutory progressivity on the dimension of household welfare.

IV. Empirical Findings

1. Equivalence Scales and Equivalent Household Income

Using the parameters chosen earlier, equivalence scale was computed for each sample household as the first step toward computing equivalent household income. Table 2 presents the average equivalence scales obtained for each pre-tax income decile and the total sample. First, the average equivalence scale shows little change over sample years, if not a slight decrease. Since the weight of children relative to adults was set at 1, it means the household size varied little during the period.

〈Table 2〉 Average Household Equivalence Scale

	1992	1993	1995	1996	1997	1998
Bottom Decile	1.69	1.71	1.58	1.60	1.63	1.55
Second	1.93	1.88	1.85	1.76	1.79	1.62
Third	2.00	1.99	1.95	1.90	1.91	1.87
Fourth	1.96	1.99	1.98	1.98	1.92	1.95
Fifth	1.94	1.99	1.99	2.02	2.02	1.99
Sixth	1.99	1.92	1.99	2.02	1.92	2.03
Seventh	1.95	1.97	1.99	2.02	1.98	2.04
Eighth	1.95	2.00	1.98	1.99	1.99	1.99
Ninth	1.90	1.97	1.98	1.99	1.95	2.05
Top Decile	1.92	1.95	1.92	1.94	1.95	2.01
All Households	1.92	1.94	1.92	1.92	1.90	1.91

Nation-wide data on household sizes are not collected annually in Korea.

Population and Housing Census is conducted every fifth year ending in zero or five and, according to the most recent census report (The Korea National Statistical Office, 2001), the average household size decreased from 3.3 to 3.1 during 1995～2000. Such change is equivalent to a decrease from 1.82 to 1.76 in terms of the same household equivalent scale used in this study, implying that sample households in the KHPS are rather larger than those in the Census on average.

Another source of data on the household sizes in Korea is the Urban Household Income and Expenditure Survey conducted monthly by the National Statistical Office in Korea. This is a nation-wide survey on urban households with more than one household member. Since the single-person households are excluded and the urban households are larger than non-urban households in Korea, the average household size obtained from this survey is generally larger than that from the Population and Housing Census. According to the 2000 Survey Report (The Korea National Statistical Office, 2000), the average household size decreased from 3.92 to 3.62, or equivalently, the average equivalent household scale decreased from 1.97 to 1.90 during 1992-1998.

Due to the differences in sample years and the way each sample year is defined among the Census, Survey and KHPS, one should be cautious about making a direct comparison of the average household sizes from these three sources. It seems, however, that the average household size in the KHPS was rather stable or at least did not change at a rate comparable to the two other nation-wide averages. It is presumably due to various factors including the fact that the KHPS is a panel study with a high rate of attrition and the fact that the original sample picked in 1992 significantly underrepresented the single-person households. Given this bias, one might consider grossing up the KHPS sample on the basis of the census data. Due to the fact that the census is quinquennial, however, census data need to be somehow interpolated for all interim years, not to mention being adjusted for different months covered in a sample year.

Given these complications, I decided to take the initial selection bias as given, and did not take any remedial measure. It is unlikely that the selection bias was exacerbated in data cleaning stages in which household observations were deleted for various unrelated reasons aforementioned.

Table 2 also shows that equivalence scales hence household sizes are generally higher in the middle-income

class (of the third to eighth deciles) than in the lower income class (of the lowest two deciles) or the upper income class (of the top two deciles) in every year but the year of 1998.[12)]

In 1998, the relatively rich households were no smaller than the middle-income class households and, moreover, there seems to be statistical correlation between household size and equivalent income level in that the upper income class households are larger than the middle-income class households, which is then larger than the lower income class households on average. Given that the sample year of 1998 largely coincided with the period of the Economics Crisis in Korea, I am inclined to consider the peculiarity in 1998 as a result of socio-economic consequence of the Economic Crisis; that is, in such a harsh economic situation in which numerous businesses collapsed and numerous workers were laid off, how rich a household was relative to other households was mostly determined by how many bread earners were kept in the household.

As a money-metric measure of household welfare, pre-tax and post-tax equivalent household incomes were

12) There is no consensus about the definition of the middle-income class in the literature, and I follow the conventional usage by the Korea National Statistical Office in this study.

computed by applying household equivalence scales to household income and tax amounts. A household's income amount was obtained from the following income sources: wage and salary including bonuses, income from business activities and professional occupations, (imputed) income from farming and fishery, income from side jobs and businesses, dividends, interest and capital gains, pension, public subsidy, and private gifts. Due to this comprehensive coverage, the income variable in this study is deemed to be more faithful to its theoretical definition, "increase in one's net worth, tangible or not," than comparable existing studies such as Lim (1996). A household's tax amount was a total of the following tax items: Class A Income Taxes and Global Income.

Tables 3 and 4 present the results of computing pre-tax and post-tax equivalent household income. Since the purpose of these tables was to present a comparison between pre-tax and post-tax equivalent income distributions, two different sets of deciles were used in the tables: the deciles constructed on the basis of pre-tax equivalent income were used for pre-tax figures and the deciles constructed on the basis of post-tax equivalent income for post-tax figures. Consequently, households in a pre-tax decile are not necessarily the same as households

〈Table 3〉 Median Equivalent Household Income (in 10,000 won per month)

	1992		1993		1995	
	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax
Bottom Decile	11.79	11.74	13.83	13.84	14.43	14.43
Second	27.21	27.17	31.27	31.08	39.50	38.74
Third	40.00	39.74	47.14	46.58	55.00	54.21
Fourth	50.00	49.20	57.74	56.29	68.57	67.40
Fifth	57.50	55.83	65.32	64.50	76.03	75.31
Sixth	64.47	63.34	74.00	72.50	89.44	87.50
Seventh	75.00	72.92	83.72	82.50	100.00	98.96
Eighth	86.60	84.87	98.39	95.96	115.47	114.40
Ninth	104.72	102.42	115.00	113.06	146.00	143.92
Top Decile	150.00	146.39	162.13	158.44	205.00	200.69
All Households	60.17	59.58	70.00	68.94	83.00	81.67

	1996		1997		1998	
	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax
Bottom Decile	18.07	17.92	25.40	25.26	13.50	13.08
Second	40.41	40.29	48.06	47.73	30.00	30.00
Third	56.67	56.05	67.08	66.40	41.67	41.01
Fourth	71.00	70.29	80.50	80.00	55.00	54.21
Fifth	82.77	81.04	92.00	90.83	71.85	70.67
Sixth	91.92	90.78	102.06	100.00	83.75	81.75
Seventh	103.94	101.98	120.00	116.63	99.00	96.42
Eighth	122.61	120.21	140.00	138.29	115.00	113.13
Ninth	143.88	142.13	165.00	162.00	140.13	136.42
Top Decile	200.00	196.04	226.90	223.79	200.00	194.39
All Households	88.00	85.88	100.00	97.08	78.26	77.08

in the corresponding post-tax decile.[13)]

Table 3 presents median equivalent household income levels for each decile and the whole sample in 10,000 (nominal) won per month for each sample year. For example, the median pre-tax equivalent household income of the third decile households gradually increased from 400,000 won per month in 1992 to 670,800 won per month in 1997 and then decreased sharply to 416,700 won per month in 1998 due to the Economic Crisis. In fact, this observation of a gradual increase until 1997 followed by a sharp decrease in 1998 is found for every decile.

A simple calculation on the table shows that the median equivalent household income decreased by 21.7% on average from 1997 to 1998. It is also found that the percentage decrease for each of the lowest five deciles was higher than this average decrease whereas the percentage decrease for each of the highest five deciles was below the average. For example, the median equivalent household income of the poorest decile dropped by 46.8% while that of the richest decile dropped by 11.9%. In this sense, the figures in this table are

13) A pre-tax decile and the corresponding post-tax decile would include the same households if household income rankings were preserved through income taxation. However, it is far from true in Korea as will be discussed later.

consistent with the popular result in previous studies that the distributive impacts of the Economic Crisis were significantly different across different income classes.

Table 3 also shows that median post-tax equivalent household income levels were generally close to their post-tax counterparts, thus indicating that the income taxation in Korea did not significantly affect the size distribution of income. In fact, the same conclusion may be drawn from Table 4, which presents the pre-tax and post-tax average equivalent household income levels using the same template as Table 3.

In Table 4, both pre-tax and post-tax average equivalent household income levels increased for all deciles from 1992 to 1997. However, the rate of income growth varied over deciles. The average equivalent household income for the bottom decile doubled either in pre-tax or in post-tax terms whereas that for the top decile grew 1.4 times (either in pre-tax or in post-tax terms). The growth rate for the sample average was only 1.6 times (either in pre-tax or post-tax terms), which was only slightly lower than the growth rate for the middle-income class households.

〈Table 4〉 Average Equivalent Household Income (in 10,000 won per month)

	1992		1993		1995	
	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax
Bottom Decile	11.43	11.37	13.55	13.55	14.03	13.91
Second	26.98	26.82	31.39	31.21	38.44	38.15
Third	39.99	39.53	46.52	45.96	54.43	53.86
Fourth	49.53	48.75	56.98	56.07	68.25	67.22
Fifth	56.84	55.93	65.71	64.69	77.41	76.30
Sixth	64.39	63.35	73.38	72.25	89.02	87.52
Seventh	73.75	72.62	83.20	81.82	100.58	99.07
Eighth	86.37	84.53	96.88	95.24	116.97	115.38
Ninth	105.50	103.46	115.65	113.46	144.48	142.23
Top Decile	178.98	175.85	182.41	178.20	224.30	221.20
All Households	69.36	68.17	76.51	75.21	92.68	91.38

	1996		1997		1998	
	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax
Bottom Decile	17.20	17.08	22.94	22.78	12.57	12.41
Second	40.20	39.84	47.54	47.22	28.99	28.82
Third	56.45	55.78	66.42	65.80	42.24	41.86
Fourth	70.61	69.67	80.45	79.62	55.13	54.63
Fifth	81.89	80.53	93.30	91.45	71.50	70.17
Sixth	93.13	91.39	102.79	101.05	84.16	82.21
Seventh	104.69	103.00	118.72	116.77	97.88	95.83
Eighth	121.45	119.41	140.06	137.66	115.10	112.90
Ninth	142.82	140.79	166.28	163.56	140.51	137.48
Top Decile	229.82	226.66	253.64	250.17	225.41	218.99
All Households	95.75	94.33	109.14	107.53	87.08	85.42

Table 4 also illustrates how different income changes different income classes underwent during the Economic Crisis. The percentage decrease in the average equivalent household income for each decile relative to its 1997 level was inversely related to its decile ranking, ranging from an 11 percent decrease for the richest decile and a 45 percent for the poorest decile. This table also demonstrates the phenomenon that the upper five deciles suffered less but the bottom five deciles suffered more than the overall average experience, which was a 20 percent decrease in pre-tax terms.

The observation that the growth rates of pre-tax and post-tax average equivalent household incomes from 1992 to 1997 were almost identical per each decile suggests two possibilities: (i) the tax rate for each decile remained virtually identical between 1992 and 1997 and/or (ii) the tax rates were different but they were too low to produce visible differences in the growth rates of pre-tax and post-tax income levels. The first possibility is, however, against the fact that there had been a series of tax reforms in terms of the rate structure as well as tax exemptions and allowances.

Then there remains only the second possibility. It is indeed the case as will be shown later; that is, the effective income tax rates were considerably low relative

to the statutory tax rates during the period from 1992 to 1997 and, for that matter, in 1998 too.

2. Distribution of Tax Burden and Effective Tax Rates

One way to inspect equity aspects of the income tax system is to compare the income shares and tax shares of taxpayers, and Table 5 presents the pre-tax and post-tax equivalent household income shares and tax shares for deciles. It is noted that pre-tax income shares and tax shares were computed for pre-tax deciles, and post-tax income shares were computed for post-tax deciles. As pointed out earlier, households in a pre-tax decile are different from households in the corresponding post-tax decile to the extent of income re-rankings induced by the tax system.

First of all, it is noticed in Table 5 that the income gap between the rich and poor sharply widened during the Economic Crisis as the income shares of the bottom to sixth deciles all decreased while those of the richest four deciles increased. However, the 1998 income taxation did not effectively mitigate the income gap in the sense that post-tax income shares were not significantly different from pre-tax income shares although the income shares of the most upper deciles shrank after income taxation.

〈Table 5〉 Equivalent Household Income Share and Tax Burden(%)

	1992			1993			1994		
	Pre-Tax		Post-Tax	Pre-Tax		Post-Tax	Pre-Tax		Post-Tax
	Income	Tax	Income	Income	Tax	Income	Income	Tax	Income
Bottom Decile	1.65	0.28	1.67	1.77	0.26	1.81	1.52	0.46	1.52
Second	3.89	1.60	3.93	4.11	1.21	4.14	4.14	2.21	4.19
Third	5.77	3.38	5.79	6.07	4.62	6.12	5.87	4.65	5.90
Fourth	7.14	6.76	7.17	7.45	6.66	7.45	7.40	7.36	7.37
Fifth	8.20	7.16	8.18	8.62	7.37	8.61	8.32	8.97	8.33
Sixth	9.29	8.31	9.30	9.59	8.19	9.63	9.61	11.14	9.53
Seventh	10.62	9.81	10.65	10.95	10.53	10.82	10.82	11.78	10.84
Eighth	12.45	14.42	12.39	12.57	12.00	12.69	12.64	12.30	12.63
Ninth	15.19	18.75	15.24	15.10	14.22	15.07	15.64	15.71	15.66
Top Decile	25.80	29.51	25.66	23.76	34.94	23.66	24.03	25.42	24.02

	1996			1997			1998		
	Pre-Tax		Post-Tax	Pre-Tax		Post-Tax	Pre-Tax		Post-Tax
	Income	Tax	Income	Income	Tax	Income	Income	Tax	Income
Bottom Decile	1.80	0.40	1.81	2.11	0.82	2.12	1.46	0.30	1.45
Second	4.20	2.74	4.23	4.36	2.00	4.40	3.32	0.73	3.38
Third	5.93	4.41	5.94	6.09	3.45	6.11	4.87	1.15	4.89
Fourth	7.33	6.12	7.34	7.37	5.02	7.46	6.26	3.05	6.41
Fifth	8.56	9.83	8.57	8.55	10.02	8.46	8.75	5.42	8.23
Sixth	9.74	11.53	9.72	9.49	12.33	9.38	9.04	8.55	9.66
Seventh	10.94	13.83	10.93	10.77	11.56	10.89	11.27	14.08	11.27
Eighth	12.70	14.50	12.58	12.84	13.84	12.75	13.31	11.96	13.15
Ninth	14.94	14.48	14.97	15.21	18.33	15.25	16.14	18.75	16.09
Top Decile	23.87	22.15	23.92	23.20	22.61	23.18	25.57	36.02	25.48

In fact, the year of 1998 was not an exception, and the Korean income taxation also failed to significantly reduce the pre-tax income gaps in other years.

The principle of vertical equity does not require that the income share of the rich should be lowered and the income share of the poor should be raised as a result of equitable taxation. The equal absolute sacrifice principle may dictate proportional income taxation, which leaves income shares intact after tax payments.[14] On the contrary, the equal proportional sacrifice principle may lead to progressive income taxation through which the income share of the poor is raised but the income share of the rich is lowered.[15] Moreover, equal absolute sacrifice with respect to some utility function may be equivalent to equal proportional sacrifice with respect to another utility function that is a monotonic transformation of the original function.[16]

With this in mind, one can compare the pre-tax and post-tax income shares in Table 5 in order to investigate the equity consequences of the Korean income taxes. The result is, however, not as revealing as one might expect.

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14) A logarithmic utility function is an example of this case.

15) This would be also true for the equal marginal sacrifice principle as income distribution is completely equalized after taxation under this principle.

16) See Tresch (2002) for related discussion.

While it is true that they were generally upper income deciles, a majority of the deciles with shrinking income shares after taxation did not neighbor with each other. For example, the income shares of the fourth, sixth, eighth and top deciles shrank after the 1994 taxation, and the income shares of the sixth, eighth and top deciles shrank after the 1997 taxation. Interestingly, the income shares of as many as six deciles of the bottom, fifth, seventh, eighth, ninth and top deciles decreased due to the 1998 taxation. Therefore, it is not simple to figure out what vertical equity principles were implemented by the Korean income tax system and whether the tax system remained truly progressive during the sample period.

Table 5 also shows an interesting relationship between pre-tax income shares and tax shares. First, there are three (decile) cases in which the tax share of a decile was lower than that of a lower decile, producing evidence against progressive taxation. They are the ninth decile both in 1996, the seventh in 1997, and the eighth decile in 1998. Except these three cases, tax shares were monotone increasing in deciles. It is also an interesting observation that the lowest decile with the tax share being larger than its income share significantly varied over years. For example, it was only the richest decile that bore the redistributive burden in 1993 while the burden was shared

by five different deciles in 1994.

In Table 5, one can hardly overlook the phenomenon that the tax share of the poorest decile was significantly lower but that of the richest decile was significantly higher in 1998 than the previous year. It may not be surprising given the dramatic income changes during the Economic Crisis shown in Table 4. Yet interestingly, as will be noted in the discussion of Table 6, the year of 1998 was also when the average effective tax rate changed most widely from the poorest to the richest decile, potentially indicating highest vertical equity among the sample years. During the Economic Crisis, the Korean government implemented a series of tax policy changes to secure income tax bases in coping with shrinking tax revenues. It remains, however, doubtful whether and to what extent the vertical equity aspect of the Korean income tax system was affected as a result. It is rather presumed that the dramatic changes in income distribution itself were mostly responsible for the changes in the distribution of tax burdens.

Whether a given income tax system is structurally progressive or not may be determined by whether the marginal tax rate is higher than the average tax rate at all income levels, or equivalently by whether the average tax rate monotonically increases in income levels. In practice,

an individual taxpayer's effective tax rates is computed as the ratio of the amount of tax paid to the pre-tax income amount, and the tax system is considered progressive if a taxpayer with a higher pre-tax income faces a higher effective tax rate. In this study, I computed an individual household's effective tax rate as the equivalised tax amount divided by the pre-tax equivalent household income, which is, by construction, identical to the tax amount divided by the household income.

Table 6 presents the average equivalised tax payment and the average effective tax rates computed for deciles and the whole sample per year.

First of all, it is seen that the households in the ninth decile in 1996, the seventh decile in 1997, and the eighth decile in 1998 paid less taxes in absolute amounts than their immediately poorer deciles, respectively. It is a matter of course that any conceivable vertical equity principle would not dictate such phenomena, not to mention truly progressive taxation. This doubt on the vertical equity and progressivity of the Korean income tax system is, in fact, substantiated by the non-monotonic progression of the average effective rates shown in the same table.

〈Table 6〉 Average Effective Tax Rate and Equivalized Tax Payment(in 10,000 won per month)

	1992		1993		1995	
	Tax Rate	Tax Amount	Tax Rate	Tax Amount	Tax Rate	Tax Amount
Bottom Decile	0.62%	0.03	0.43%	0.03	0.85%	0.06
Second	0.71%	0.19	0.49%	0.16	0.72%	0.29
Third	1.00%	0.40	1.27%	0.60	1.10%	0.60
Fourth	1.62%	0.80	1.51%	0.86	1.39%	0.95
Fifth	1.49%	0.85	1.45%	0.95	1.51%	1.17
Sixth	1.52%	0.99	1.44%	1.06	1.63%	1.44
Seventh	1.58%	1.17	1.63%	1.35	1.53%	1.53
Eighth	1.96%	1.71	1.63%	1.57	1.36%	1.59
Ninth	2.13%	2.23	1.61%	1.84	1.40%	2.03
Top Decile	2.05%	3.51	2.44%	4.55	1.50%	3.32
All Households	1.47%	1.19	1.39%	1.30	1.30%	1.30

	1996		1997		1998	
	Tax Rate	Tax Amount	Tax Rate	Tax Amount	Tax Rate	Tax Amount
Bottom Decile	0.43%	0.06	0.54%	0.13	0.41%	0.05
Second	0.95%	0.39	0.66%	0.32	0.47%	0.12
Third	1.11%	0.62	0.84%	0.55	0.46%	0.19
Fourth	1.24%	0.87	1.00%	0.81	0.95%	0.51
Fifth	1.71%	1.39	1.72%	1.61	1.18%	0.85
Sixth	1.76%	1.63	1.90%	1.97	1.80%	1.52
Seventh	1.88%	1.96	1.57%	1.88	2.38%	2.33
Eighth	1.69%	2.05	1.60%	2.22	1.70%	1.97
Ninth	1.44%	2.05	1.77%	2.95	2.23%	3.12
Top Decile	1.38%	3.16	1.51%	3.64	2.59%	6.06
All Households	1.36%	1.42	1.31%	1.61	1.41%	1.66

If the Korean income tax system is to be progressive on the basis of household welfare measured by pre-tax equivalent household income, the average effective tax rate should be increasing in decile rankings. Table 6 shows that the taxation was not truly progressive during the sample period.

Most obviously, the average tax rate of the richest decile was not the highest among deciles in as many as four sample years. In any sample year, there were at least three deviating deciles that had lower average effective tax rates than poorer deciles, although one cannot miss the general tendency of average effective tax rates being higher for higher deciles. Moreover, one can hardly find a pattern from the distribution of those deviating deciles. For example, the fifth to seventh deciles had lower tax rates than the fourth decile and the top decile lower than the ninth decile in 1992 while the third decile had lower tax rates than the second decile and the eighth and ninth deciles lower than the seventh decile in 1998. Given these observations, it seems fair to conclude that the Korean income tax system failed to be progressive in terms of household welfare despite its statutory progressivity displayed by increasing marginal tax rate for income brackets.

Table 6 seems to indicate a decreasing trend in the

overall average effective tax rate until 1997, the year of which was then followed by a relatively significant increase by 0.1 percent in 1998. Interestingly, the sample year of 1998 shows the largest increase in the average effective tax rate from the poorest decile to the richest decile. It also happened that the average effective tax rate of the poorest decile being 0.41 percent was the lowest and that of the richest decile being 2.59 percent was the highest among the six sample years. As discussed earlier, this seemingly high progressivity in 1998 should rather be attributed to the combination of the existing tax structure and distinctive income dynamics during the Economic Crisis than the new tax changes implemented during the year.

As explained above, the average effective tax rates presented in Table 6 were computed as the average of all individual taxpayers' effective tax rates for each decile. In contrast, previous studies often investigated the progressivity of taxes on the basis of each decile's effective tax rate computed as the average tax payment divided by the average pre-tax income of all households belonging to the decile. The effective tax rates obtained in this way might not be as revealing or informative simply because no information about the distribution of tax rates within each decile is reflected in them. This method

is equivalent to assuming that each decile is completely represented by a hypothetical household earning the decile-average income and making the decile-average tax payment. Therefore, even if the same equivalent household income were used as the tax base in this method, the obtained rates would be different from the rates computed in this study because all households within each decile are not homogeneous in terms of income and tax payments.

For the sake of comparison, however, I additionally computed the effective tax rates using hypothetically representative households, which are juxtaposed with the effective tax rates quoted from comparable previous studies in Table 7[17] First of all, one should note that the effective tax rates for 1992, 1995 and 1996 in this table (that is, the second, fifth and seventh columns of the table, respectively) and the corresponding rates in Table 6 show non-negligible differences of which the extents were determined by the variation of income and tax payment distributions within deciles. For example, using representative households led to the overall effective tax rates being 1.71 percent in 1992, 1.40 percent in 1995 and 1.48 percent in 1996, each of which is higher than its

17) These previous studies have individually different scopes than this study and, therefore, my discussion of their effective tax rates quoted here are not meant to be overall comments on them.

counterpart of 1.47 percent, 1.30 percent and 1.36 percent in Table 6, respectively.

〈**Table 7**〉 **Effective Income Tax Rate (%)**

	1992 (This Study)	1992 (Im 1996)	1992 (Lee 1997)	1995 (This Study)	1995 (Hyun 1999)	1996 (This Study)
Data Coverage		Wage Earning Individuals	Same as This Study		Similar to This Study	
Source of Tax Data for Self-Employed Taxpayers	Survey Data		Estimated from Income	Survey Data	Survey Data	Survey Data
Bottom Decile	0.30	0.59	0.94	0.42	0.16	0.33
Second	0.70	0.69	0.96	0.75	0.23	0.97
Third	1.00	0.87	1.03	1.11	0.37	1.10
Fourth	1.62	0.89	0.96	1.39	0.50	1.24
Fifth	1.50	1.13	1.37	1.51	0.66	1.70
Sixth	1.53	1.17	1.89	1.62	0.81	1.75
Seventh	1.58	1.37	2.26	1.52	0.99	1.87
Eighth	1.98	1.34	2.80	1.36	1.08	1.69
Ninth	2.11	1.64	3.67	1.40	1.23	1.44
Top Decile	1.96	3.00	5.07	1.48	1.60	1.38
All Households	1.71		3.20	1.40	0.80	1.48

Two previous studies done for 1992, which are quoted in Table 7, were based on the KHPS data. As introduced earlier, Lim (1996) computed the effective tax rates for two sub-samples of wage earning individuals: one with zero-tax payers included and the other without zero-tax payers, and Table 7 presents the tax rates obtained from the latter. In comparing the tax rates computed in this study and those in Lim (1996) (that is, the second and third columns of the table), one should take into account of at least the following differences: (1) the sample unit was a wage-earning individual taxpayer in Lim (1996) whereas it was a household with comprehensive income sources in this study; (2) all zero-tax payers were included in Lim's (1996) sample whereas zero-tax payers with income levels higher than their estimated tax exemption points were excluded in this study; and (3) the unit of analysis was the pre-tax earnings defined as the total of wages and bonuses in Lim (1996) whereas it was the pre-tax equivalent household income derived from a more comprehensive household income in this study.

Among these three different factors, one would expect that the second factor would lead to Lim's (1996) rates being not higher than the rates in this study. However, the first and third factors are presumed to create the opposite bias, other things being equal, given that that the effective

tax rates for self-employed taxpayers are generally higher than those for wage earning taxpayers.[18] While the net consequence is thus a priori ambiguous, Table 7 shows that Lim's (1996) tax rates are mostly lower than the rates in this study although at varying degrees.

While based on the same KHPS data as Lim (1996) and this study, Lee's (1997) study is noted by the following factors: (1) the sample unit was a household like in this study; (2-a) zero-tax payers among wage earning households were included but (2-b) taxes paid by self-employed households were estimated from their reported pre-tax income in order to filter out tax data tainted by tax evasion; (3) the unit of analysis was the pre-tax household income, and (4) compulsory contributions to social security and medical insurance were added to income taxes. First of all, the factor of (3) would not create any bias, since tax payments were also equivalised. Apparently, the factor of (2-a) above would lead to Lee's (1997) tax rates being lower than the rate computed in this study while the factors of (2-b) and (4) would lead to the opposite direction. It is, therefore, hard to make an a priori conclusion as to the discrepancies between Lee's (1997) rates and the rates computed in this study.

18) I am indebted to an anonymous referee from the Korea Institute of Public Finance for factual clarifications on this.

However, Table 7 shows that Lee's (1997) rates are not only mostly higher than the rates in this study but also consistently higher than Lim's (1996), clearly indicating significant under-taxation of income for self-employed taxpayers.

Hyun's (1999) study quoted in Table 7 was based on data from the National Survey of Household Income and Expenditure conducted by the Korea National Statistical Office in 1996. The sample period of the survey was the calendar year of 1995, which partially overlapped with our sample years of 1995 and 1996. Hyun's (1999) study is also noted for the following factors: (1) the sample unit was a household like in this study; (2) zero-tax payers were not separately treated; (3) the unit of analysis was the pre-tax equivalent household income like in this study; and (4) the pre-tax income for self-employed taxpayers were estimated from their consumption under the assumption that consumption behavior was invariant with income sources. Given that different sample households were selected for a different sample period, one can hardly compare Hyun's (1999) rates with the rates in this study. Other things being equal, however, the factors of (2) and (4) would lead to Hyun's (1999) rates consistently lower than the rates in this study, and it is indeed the case as shown in Table 7. Interestingly, it is also seen in the table

that the discrepancies between Hyun's (1999) rates and the rates in this study are relatively decreasing in decile rankings although it is not known whether the phenomenon is due to different sampling or certain systematic bias.

Table 7 clearly illustrates how different estimates of effective tax rates can be obtained depending on the methodology and data used. The above discussion of Table 7 is, therefore, not meant to be a relative evaluation of different studies. However, it would be fair to say that this study stands out in that the same methodology was applied to panel data of a period of seven years, making it possible and meaningful to compare across different points of time and delineate trends during the sample period, if any.

3. Tax-Induced Income Re-Ranking

The tax mobility matrix is a fractile transition matrix by which income rankings are transformed as a result of taxation. I constructed tax mobility matrices using the decile rankings of pre-tax equivalent household income for all sample years, which are presented in Tables 8 - 13. As a matter of fact, two separate tax mobility matrices were constructed for each year: one based on equivalent household income and the other based on household income.

〈Table 8〉 Tax Mobility Matrix in 1992

Equivalent Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	98.58	1.42								
	Second	1.59	96.72	1.69							
	Third		1.83	94.43	3.74						
	Fourth			3.64	93.72	2.64					
	Fifth				2.77	92.12	5.10				
	Sixth					4.50	92.20	3.31			
	Seventh					0.45	2.53	94.50	2.52		
	Eighth						0.26	2.24	93.05	4.46	
	Ninth								4.41	93.59	2.00
	Top									2.50	97.50

Household Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	98.17	1.83								
	Second	1.76	96.83	1.41							
	Third		1.48	95.07	3.45						
	Fourth			3.18	88.71	8.11					
	Fifth				8.19	87.41	4.40				
	Sixth					4.76	91.57	3.67			
	Seventh					0.45	3.55	90.16	6.28		
	Eighth						0.26	6.02	88.77	4.96	
	Ninth								4.97	93.23	1.80
	Top									2.10	97.90

In the household income-based tax mobility matrices, any non-diagonal elements are violations of the classical horizontal equity or the principle of equal treatment of equals. However, as discussed earlier, the equity implication of household income re-rankings is rather ambiguous in the sense that the acceptable inequity and the unacceptable inequity are inseparably mixed. In this sense, these matrices in Tables 8-13 only serve illustrative purposes. In this study, "equals" are defined in terms of household size and composition, thereby encapsulated in the notion of household equivalence scale. It follows then that a re-ranking of equivalent household income indicates the existence of undisputed horizontal inequity and, for this reason, the discussion of tax-induced inequity is made only with reference to the equivalent household income-based matrices in Tables 8-13.

Table 8 presents the Tax Mobility Matrix for 1992. The table shows that 1.42 percent of the pre-tax bottom decile households were promoted to the second decile as a result of redistribution through the income tax system in that year. The 1992 Tax Mobility Matrix is tri-diagonal except for the seventh and eighth (pre-tax) deciles, showing that rank-shifts occurred mostly between immediately neighboring deciles. The fifth decile suffered the most income re-rankings with as much as 8 percent of the households

〈Table 9〉 Tax Mobility Matrix in 1993

Equivalent Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	99.27	0.73								
	Second	1.02	96.36	2.63							
	Third		2.72	95.84	1.44						
	Fourth			1.68	93.63	4.69					
	Fifth				4.00	89.50	6.49				
	Sixth					5.85	90.44	3.71			
	Seventh				0.73		3.14	91.44	4.69		
	Eighth							4.79	90.39	4.82	
	Ninth								4.11	92.63	3.26
	Top								0.38	2.67	96.95

Household Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	98.69	1.31								
	Second	1.37	96.45	2.17							
	Third		1.91	84.48	13.61						
	Fourth			15.27	76.01	8.73					
	Fifth				9.23	87.39	3.38				
	Sixth					1.53	86.59	11.87			
	Seventh					0.88	9.99	84.92	4.21		
	Eighth					0.72		3.30	89.79	6.19	
	Ninth								5.75	92.52	1.73
	Top									1.66	98.34

being promoted or demoted to the neighboring deciles. It was the seventh decile that experienced re-rankings most severely in terms of the "distances" of rank-shifts. It is seen that 0.45 percent of the eighth decile households were demoted to the fifth decile after taxation.

Table 9 also shows that income re-rankings happened mostly across the neighboring deciles in 1993. As a matter of fact, this observation is generally repeated in all sample years. Another common observation is that the fifth decile was subject to most re-rankings in all but 1997 when it was the sixth decile as seen in Table 12. In principle, income re-rankings can be caused by various differential treatments of different income sources, such as different statutory tax rates, tax administration or collection procedures, and relationships with other taxes. Not only did these differences generally exist among wage income, business income and financial income in Korea during the sample period, they were, in effect, also more prominent for the middle-income class. According to Table 8-13, the fifth and sixth deciles were the two deciles mostly affected by income re-rankings on average throughout the sample period.

Like in 1992, it was the seventh decile that experienced the most distant rank-shifts in 1993. Table 9 shows that 0.73 percent of the seventh decile households were

〈Table 10〉 Tax Mobility Matrix in 1995

Equivalent Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	99.16	0.84								
	Second	0.45	99.26	0.30							
	Third		0.61	97.39	1.99						
	Fourth			2.34	91.83	5.83					
	Fifth				5.95	89.84	4.20				
	Sixth					4.35	90.81	4.85			
	Seventh						4.52	91.73	3.75		
	Eighth							3.31	94.95	1.74	
	Ninth								1.48	97.46	1.06
	Top									1.11	98.89

Household Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	99.08	0.92								
	Second	0.60	98.94	0.47							
	Third		0.74	91.32	7.94						
	Fourth			7.89	86.42	5.70					
	Fifth				5.59	91.02	3.39				
	Sixth					3.99	92.17	3.84			
	Seventh						3.25	93.56	3.19		
	Eighth							2.58	94.67	2.75	
	Ninth								2.53	95.86	1.60
	Top									1.49	98.51

demoted to the fourth decile after taxation while none of the sixth decile households were demoted to lower than fifth decile.

The 1995 Tax Mobility Matrix in Table 10 is completely tri-diagonal unlike the matrices for other years. In addition, its diagonal elements are relatively larger than the corresponding elements in the other Matrices, thereby implying that relatively less re-rankings occurred in 1995. As will be discussed later in terms of the mean squared relative rank-shift, it was indeed the year of 1995 that experienced the least extent of income re-rankings among the sample years.

Table 11 displays the case of most (cross-decile) re-rankings in all sample years: the fifth decile in 1996. The table shows that about as much as 21 percent of the households in the decile ended up in other deciles after taxation. Interestingly, more than half of the affected households were demoted to the fourth decile while about the same number of the fourth decile households were promoted to the fifth decile due to taxation. This extent of income re-rankings seems to clearly indicate serious horizontal inequity although they happened across the adjacent deciles.

〈Table 11〉 Tax Mobility Matrix in 1996

Equivalent Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	98.61	1.39								
	Second	1.79	95.91	2.31							
	Third		2.17	93.21	4.62						
	Fourth			4.81	83.84	11.35					
	Fifth				11.84	79.03	9.13				
	Sixth					8.84	82.01	9.15			
	Seventh					0.61	9.05	84.92	5.43		
	Eighth							5.25	90.98	3.77	
	Ninth								3.51	94.65	1.84
	Top									1.75	98.25

Household Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	99.70	0.30								
	Second	0.17	97.96	1.86							
	Third		1.79	96.45	1.76						
	Fourth			1.96	82.16	15.88					
	Fifth				15.70	79.53	4.77				
	Sixth					4.89	80.07	15.05			
	Seventh					0.61	14.24	80.92	4.23		
	Eighth							4.38	92.77	2.85	
	Ninth								2.55	95.97	1.48
	Top									1.46	98.54

In 1997, it was the sixth decile that experienced the highest extent of re-rankings unlike any other sample year in which it was the fifth decile.

Table 12 shows that about 17 percent of sixth decile households were shifted to the adjacent deciles, among which about 12 percent were demoted to the fifth decile. In contrast, about the same number of the fifth decile households were promoted to the sixth decile.

In comparison with other tables, Table 12 also shows another couple of interesting observations peculiar to the year of 1997. Suppose we divide the six deciles of the middle-income class into three sub classes: the lower-middle class being the third and fourth deciles, the narrowly-defined middle-income class being the fifth and sixth deciles, and the upper-middle class being the seventh and eighth deciles. In all sample years, the order of increasing extent of income re-rankings is the lower-middle class, the upper-middle class and then the rest when the extent is measured by the percentage of the re-ranked households in all deciles belong to the sub-class. This is not surprising in that the fifth and sixth deciles were the most affected deciles throughout the sample period.

However, the year of 1997 stands out in terms of the difference between the extent of re-rankings happened to the lower-middle class and that of the upper-middle class.

〈Table 12〉 Tax Mobility Matrix in 1997

Equivalent Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	98.61	1.39								
	Second	1.55	96.85	1.60							
	Third		1.56	94.11	4.33						
	Fourth			4.02	92.29	3.69					
	Fifth			0.33	3.90	83.51	12.26				
	Sixth					11.92	83.27	4.81			
	Seventh						3.78	91.26	4.96		
	Eighth							5.09	85.73	9.18	
	Ninth								8.99	89.94	1.06
	Top									1.34	98.66

Household Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	99.22	0.78								
	Second	0.77	87.89	11.33							
	Third		10.86	86.58	2.56						
	Fourth			3.53	91.59	4.89					
	Fifth				4.50	83.71	11.80				
	Sixth				0.34	11.30	85.31	3.06			
	Seventh						3.38	88.54	8.09		
	Eighth							7.86	79.91	12.23	
	Ninth								12.78	86.10	1.11
	Top									1.23	98.77

The difference was about 10 percent whereas the second biggest difference was about 8 percent shown in 1993 and the smallest difference was less than one percent shown in 1992. The year even further stands out in terms of the difference between the extent of re-rankings happened to the lower-middle class and that of the narrowly defined middle-income class. The difference in 1997 was as much as 20 percent whereas the second biggest difference was about 16 percent shown in 1996 and the smallest difference was about 4 percent shown in 1992. These observations only signify how different extent of income re-rankings and hence horizontal inequity the Korean income tax system caused for different income groups.

The same exercise also reveals that it was the year of 1992 when the three sub-groups suffered re-rankings most evenly, and it was the year of 1996 when each of the three sub-groups suffered the most re-rankings relative to other years. This kind of exercise would become more useful in conjunction with normative considerations as to which income deciles or classes should be weighed relatively more or less in the Korean society, such as an endogenous tax model incorporating the Median Voter Theorem. Apparently, there is no consensus about such welfare(or political) weights of income classes, and further considerations are put beyond the scope of this study.

〈Table 13〉 Tax Mobility Matrix in 1998

Equivalent Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	98.46	1.54								
	Second	1.42	97.01	1.58							
	Third		1.43	95.06	3.52						
	Fourth			3.42	93.85	2.73					
	Fifth				2.75	86.16	11.08				
	Sixth					5.29	89.55	5.16			
	Seventh					0.64	4.49	92.25	2.61		
	Eighth							3.13	89.74	7.14	
	Ninth								7.49	90.90	1.62
	Top									1.03	98.97

Household Income		Post-Tax Deciles									
		Bottom	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Top
Pre-Tax Decile	Bottom	98.74	1.26								
	Second	0.85	96.73	2.42							
	Third		2.53	96.45	1.02						
	Fourth			0.99	97.90	1.11					
	Fifth				0.79	98.58	0.62				
	Sixth					1.80	93.00	5.20			
	Seventh						4.45	88.32	7.23		
	Eighth						0.65	6.72	87.77	4.87	
	Ninth								5.96	93.36	0.68
	Top									1.02	98.98

Table 13 presents the tax mobility matrix for the sample year of 1998, which was the period of the Economic Crisis in Korea. In general, the table shows that re-rankings happened only moderately relative to other years, indicating that income taxation caused less horizontally inequity in 1998 than in other sample years. The table also shows that the seventh decile experienced an extensive re-ranking in that some households were demoted to as far as the fifth decile. As indicated earlier, it would be more appropriate to attribute these phenomena to the distinctive income distribution dynamics during the Economic Crisis rather than tax policy changes implemented in the year.

Although the tax mobility matrix is useful for visually describing income movements induced by taxation, it necessarily neglects income re-rankings taking place within each income decile. In addition, the tax mobility matrix cannot show some important details of re-rankings, such as the distances of rank-shifts. As a complementary instrument to the tax mobility matrix, I also computed the mean squared relative rank-shift as a single summary measure of overall income re-rankings, which is presented in Table 14. The table also presents other useful statistics of the tax-induced re-rankings.

Table 14 shows that most households were rank-shifted

after paying income taxes in every sample year. For example, all but 82 of a total of 2873 households experienced tax-induced re-rankings in 1992.[19] In fact, the number of the rank-shifted households amounts to 94 to 97 percent of the total households over the sample years, of which the magnitude indicates that the Korean income tax system was hardly compatible with the classical horizontal equity. The table shows that the year of 1998 had the fewest re-rankings as the ratio of the rank-preserved households was as high as 6 percent whereas the ratio was as low as 3 percent in three of the remaining five sample years. Interestingly, however, the percentage of the promoted households in that year was the second highest among the sample years while the percentage of the demoted households was the lowest.

19) Due to the sampling weights of households, the numbers of households obtained for Table 14 were not necessarily natural numbers, but they were rounded up for the sake of presentation.

〈Table 14〉 Tax-Induced Re-ranking of Equivalent Household Income

	1992				1993			
	All Households	Promoted Households	Remaining Households	Demoted Households	All Households	Promoted Households	Remaining Households	Demoted Households
Number of Households	2873	66%	3%	31%	2510	65%	3%	32%
Average Equivalent Income	69.36	66.46	129.05	70.03	76.51	76.91	42.02	79.35
Average Change		0.005		0.011		0.006		0.011
Biggest Change		0.032		0.157		0.033		0.269
Measure of Overall Tax Mobility ($\times 10^7$)	1893				2173			

	1995				1996			
	All Households	Promoted Households	Remaining Households	Demoted Households	All Households	Promoted Households	Remaining Households	Demoted Households
Number of Households	2134	61%	5%	34%	1841	63%	4%	33%
Average Equivalent Income	92.68	90.30	92.75	96.97	95.75	89.55	134.36	102.41
Average Change		0.006		0.010		0.006		0.011
Biggest Change		0.038		0.110		0.034		0.154
Measure of Overall Tax Mobility ($\times 10^7$)	1196				1693			

〈Table 14〉 (Continued)

	1997				1998			
	All Households	Promoted Households	Remaining Households	Demoted Households	All Households	Promoted Households	Remaining Households	Demoted Households
Number of Households	1663	62%	3%	34%	1486	65%	6%	29%
Average Equivalent Income	109.14	104.56	105.72	117.76	87.08	85.46	59.42	96.51
Average Change		0.007		0.011		0.005		0.011
Biggest Change		0.058		0.186		0.027		0.181
Measure of Overall Tax Mobility ($\times 10^7$)	1881				1455			

Whenever an income re-ranking occurs between two adjacently ranked households, the number of promoted households and the number of demoted households will equally increase by one. But if a household is demoted by more than one rank, the number of promoted households will increase exactly by the change in the household's ranking or the distance of the household's rank-shift, while the number of demoted household will increase by one. Therefore, one can understand how big a typical rank-shift was by comparing the numbers of promoted and demoted households.

As for the numbers in Table 14, at least the following two observations are notable. First, the number of promoted households was significantly larger than that of demoted households in each sample year, implying that a typical re-ranking did not happen between two rank-adjacent households.

Moreover, the ratio of the number of promoted households over the number of demoted households generally decreased from 2.08 in 1992 to 1.81 in 1997.[20] This implies that the distance of a typical rank-shift decreased during the period, and, other things being equal, such change should be considered favorable relative to the horizontal equity principle.

Given that the average distance of promotions relative to demotions decreased during 1993～1997, and also that the percentage of households affected by re-rankings remained rather stable during the same period as discussed earlier, one might be tempted to draw such a conclusion that horizontal inequity measured by mean squared relative rank-shift must have been decreasing during the period. However, it should be pointed out that the frequency

20) One can make the same finding by comparing the average distance of promotions and the average distance of demotions in the table, since the sum of promotion distances must be identical to the sum of demotion distances.

distribution of (relative) rank-shift is tri-modal with one mode being zero among rank-preserved households, another being negative among demoted households and the last being positive among promoted households. Therefore, a decrease in the average distance of promotions relative to demotions may or may not decrease the overall variation of rank-shifts even if the fraction of the rank-shifted households were the same. For example, a replacement of a promotion with a "shorter" one, which reduces the variance of promotions, may increase the variance of (relative) rank-shift, while other things being equal.

The distinctiveness of the year of 1998 found in tax mobility matrices is repeated in Table 14. First, the percentage of rank-preserved households was the largest among the sample years as discussed earlier. In addition, the average distance of promotions relative to demotions was not only the longest but also sharply reversing the decreasing trend until then. These observations lead one to conclude that the tax-induced rank-shifts affected less households but more severely in 1998 than in other years. This conclusion seems to be also supported by the particular observation that, unlike the other years, the average equivalent income of the demoted households was exceedingly high in comparison with that of the all households as well as that of the rank-preserved households.

The Economic Crisis in Korea significantly impacted the distribution of income and hence income inequality as found by many previous studies.

Yet interestingly, this study also found that both the frequency and amplitude of the tax-induced income re-rankings in 1998 significantly deviated from their previous trends. While such aberration does not seem to have stemmed from the 1998 tax changes as indicated earlier, the exact causes are left to be further investigated by future studies.

Table 14 also shows that, in all years, the average equivalent income of demoted households was higher than that of all households, which was then higher than that of promoted households in all years but 1993. This implies that a typical re-ranking happened across the average income household in those five years. It is certainly an interesting phenomenon; yet its equity implications seem to be hardly comprehensible relative to the mean squared relative rank-shift used in this study.

In 1993, the average equivalent income of demoted households was higher than that of promoted households, which was then slightly higher than that of all households. It is also found that the average equivalent income of rank-preserved households was considerably low and comparable to that of the second or third decile in 1993

while the average equivalent income of rank-preserved households was even higher than that of the ninth decile in 1992. These findings imply that relatively more income re-rankings happened on the higher income side in 1993, and this notable change in equity consequences is deemed to be due to the 1993 tax changes implemented for the purpose of enhancing tax equity and securing tax revenue, such as the reduction of both tax rates and exemptions.

Table 14 also presents the mean squared relative rank-shift as a measure of the extent of tax-induced income re-rankings. It is seen in the table that its magnitude fluctuated during the sample period, failing to show any obviously increasing or decreasing trend. The mean squared relative rank-shift was largest in 1993 in which both promotions and demotions happened more on the higher income side as discussed earlier. It was smallest in 1995 in which the percentage of rank-preserved households was second highest and the average distance of promotions relative to demotions was shortest among the six sample years.

Given that there exist no related previous studies, it is hard to make a comparative conclusion on the measure of the mean squared relative rank-shift computed in this study. It seems, however, that the measure is sufficiently responsive to the changes in the tax system and/or income

distribution, providing additional description of the equity characteristics of the tax system that may not be captured by other single figures, such as the percentage of rank-preserved households and the average distance of rank-shifts.

4. Tax Effect on Inequality and Decomposition

In this study, the inequality effect - more precisely, distributional progressivity - of the Korean income tax system was first measured by the Center of Gravity of income distribution and then decomposed into two components: between-group inequality and within-group inequality. As noted earlier, the tax effect measured in this way is virtually identical to the measure of tax progressivity proposed Kakwani (1977) since the Center of Gravity is only a linear function of the Gini Coefficient. The computation results are presented in Table 15.

First of all, Table 15 shows that overall pre-tax (equivalent income) inequality significantly decreased between 1992 and 1997. In 1992, the overall inequality was 0.6752 in terms of the Center of Gravity (or equivalently, 0.3504 in terms of the Gini coefficient), which implies that the income distribution in 1992 was centered on the household of the 68th poorest percentile. Except in 1995, it gradually decreased every sample year

until it became as low as 0.6591 in 1997 (or equivalently, 0.3182 in terms of the Gini coefficient), which implies that the Center of Gravity of income distribution shifted down by two percentile during the period.

The inequality trend during 1992～1997 found in this study seems to make an interesting comparison with previous findings in the literature.

Using the UHIES data, Sung and Lee (2001) found that overall inequality measured by the Gini coefficient continued to deteriorate from 1995 to 1997 whereas the National Statistical Office announced that the deterioration in 1996 was more than recovered in 1997. According to Cheong (2000) who measured the Center of Gravity of equivalent household income distribution using the UHIES data, overall income inequality was improving during early 1990s or at least until the middle of 1994, and then started to deteriorate until a brief turn to an improvement in the middle of 1997.

〈Table 15〉 Tax Effect and Inequality Decomposition

	1992			1993		
	Pre-Tax	Post-Tax	Tax Effect	Pre-Tax	Post-Tax	Tax Effect
Overall Inequality (COG)	0.6752	0.6744	-0.0008	0.6632	0.6622	-0.0010
Between-Group Inequality (COG(K))	0.7207	0.7198	-0.0009	0.7094	0.7086	-0.0008
Within-Group Inequality	0.0545	0.0546	0.0001	0.0538	0.0536	-0.0002
% Change in COG(K) relative to Change in COG			110.32			81.89

	1995			1996		
	Pre-Tax	Post-Tax	Tax Effect	Pre-Tax	Post-Tax	Tax Effect
Overall Inequality (COG)	0.6680	0.6678	-0.0002	0.6641	0.6640	-0.0001
Between-Group Inequality (COG(K))	0.7142	0.7140	-0.0002	0.7098	0.7096	-0.0002
Within-Group Inequality	0.0538	0.0537	0.0000	0.0543	0.0544	0.0001
% Change in COG(K) relative to Change in COG			92.19			189.24

〈**Table 15**〉 **(Continued)**

	1997			1998		
	Pre-Tax	Post-Tax	Tax Effect	Pre-Tax	Post-Tax	Tax Effect
Overall Inequality (COG)	0.6591	0.6586	-0.0004	0.6875	0.6859	-0.0016
Between-Group Inequality (COG(K))	0.7053	0.7050	-0.0004	0.7321	0.7313	-0.0009
Within-Group Inequality	0.0537	0.0537	-0.0001	0.0554	0.0547	-0.0007
% Change in COG(K) relative to Change in COG			87.92			54.79

One should, of course, take into consideration that the KHPS data and UHIES data are different in many respects, such as geographical and occupational coverage of the sample households, coverage of income sources, and definition of the sample years. Despite all such differences, however, this study shares with previous studies the result that income inequality sharply deteriorated during the Economic Crisis as shown by the significant increase of the Center of Gravity from 0.6591 to 0.6875 in Table 15, which corresponds to a substantial increase of the Gini coefficient from 0.2804 to 0.3801.

Table 15 shows that the post-tax inequality closely followed the movement of the pre-tax inequality, implying that the tax effect on income inequality or the distributional progressivity might have not been significant during the sample period. In fact, the tax effect computed as the difference between the pre-tax Center of Gravity and the post-tax Center of Gravity ranges between ?0.0001 and ?0.0016, which corresponds to a range of ?0.0002 to -.0032 in terms of the Gini coefficient. Although all negative numbers imply that the income taxation in Korea was progressive throughout the sample years, the magnitude of the tax effect in such range is considerably small relative to previous results. For example, the 1995 tax effect being -0.0004 in terms of the Gini coefficient is much smaller than -0.0025 in Hyun (1999) and -0.0088 in Sung and Lee (2001).

Although the magnitude of the tax effect is rather small, its fluctuation relative to the tax mobility seems to illuminate useful information regarding the interpretation of the obtained numbers. It is found that the overall tax mobility presented in Table 14 and overall tax effect in Table 15 did not fluctuate in the same way, nor did they in the opposite ways. Compared to the corresponding previous sample years, they moved together in the same direction in 1993, 1995 and 1997, but they deviated in the

opposite directions in 1996 and 1998. If they always move differently, it would mean that vertical equity is always complementary to horizontal equity by way of reduced income re-rankings. On the contrary, if they always move together, it would mean that vertical equity is enhanced always at the expense of income re-rankings and vice versa. In other words, there is an unavoidable trade-off between vertical equity and horizontal equity.

However, the existence of such trade-off is denied by the results in Tables 14 and 15, which otherwise would restrict the flexibility in the government policy toward tax equity.

On the other hand, one should note that, in principle, the non-existence of income re-rankings is a premise of vertical equity. In this sense, the usefulness of a progressivity measure based on the Center of Gravity or the Gini coefficient, which does not filter out the effects of re-rankings, seems to be seriously undermined when the tax in consideration indeed caused as many re-rankings as seen in Korea.

Table 15 also presents the overall pre-tax and post-tax inequality respectively decomposed into between-group inequality and within-group inequality. It is not surprising at all that within-group inequality was dwarfed by between-group inequality and hence the change of overall

inequality was mostly driven by the latter in all sample years. However, it is an intriguing finding that the percentage change in between-group inequality relative to the change in the overall inequality exceeded 100 in 1992 and 1996, implying that within-group inequality increased rather than decreased due to the income taxation in those years. A truly progressive tax should be progressive on any subset of income distribution, as a higher income household should face a higher tax rate. In this sense, the observation of increased within-group inequality is inconsistent with the alleged progressive nature of the Korean income tax system. Put differently, income taxation in Korea does not seem to be as progressive as is suggested by the usual distributional measure of progressivity, not to mention the statutory rate structure.

Yet again, the sample year of 1998 seems to warrant additional attention.

First, the tax effect on overall inequality was most prominent in this year.

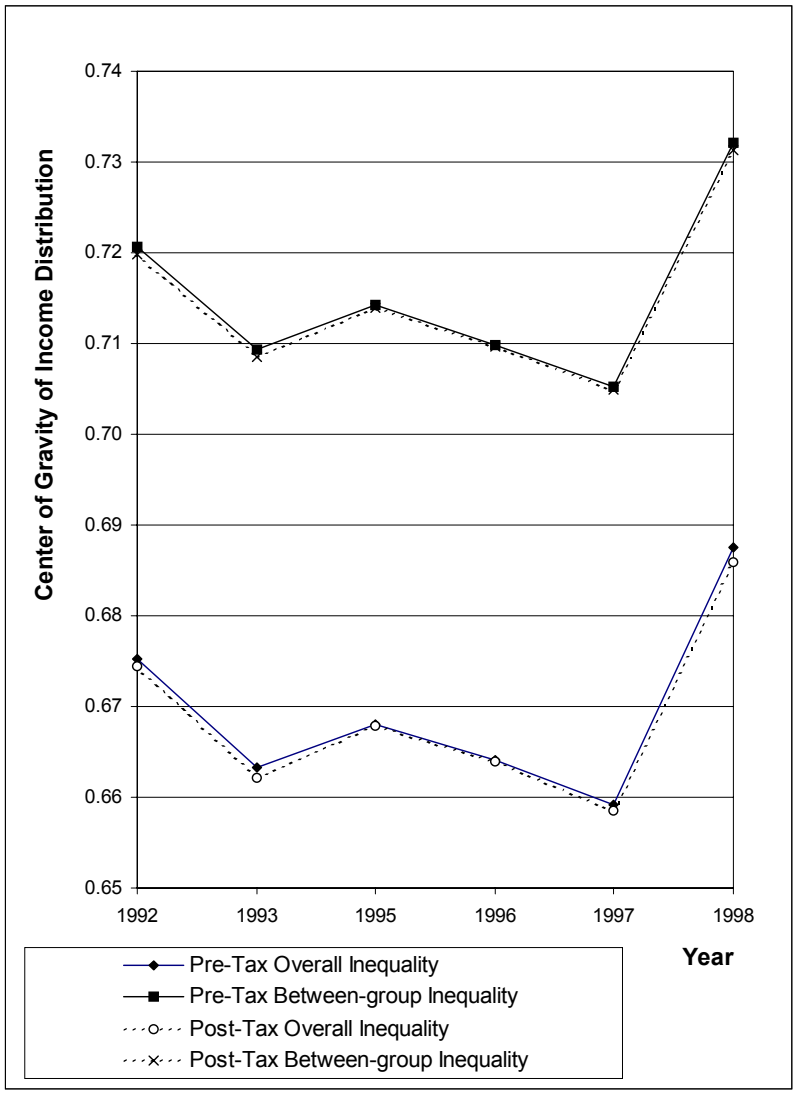
Furthermore, within-group inequality was most improved by taxation in the same year. Therefore, one may say that income taxation was most progressive in 1998, aside from the issues on true progressivity raised above. This conclusion seems to go in line with an earlier observation that the 1998 taxation showed higher progressivity than

any other sample year in terms of the faster average rate progression presented in Table 6.

However, one should also recall from Table 14 that income re-rankings affected least households but the average distance of re-rankings was longest in the same year. From the perspective of vertical equity, it is desirous of an income tax to improve inequality without causing re-rankings. Given the diverse income sources and their differential treatments in tax codes, however, income re-rankings cannot be completely avoided in reality. This line of thinking along with the previous observations leads one to conclude that income taxation in Korea was most consistent with vertical equity during the year of the Economic Crisis among the six sample years. As discussed earlier, however, this phenomenon seems not so much due to the tax changes implemented in 1998 as the income dynamics during the Crisis hosted into the peculiarities of the existing tax structure.

Lastly, Figure 1 is a visual presentation of pre-tax and post-tax inequality trends in Table 15. The figure illustrates how closely pre-tax inequality and post-tax inequality moved together, no matter whether in terms of inequality among all households or inequality across income deciles. It is also clearly illustrated how sharply income inequality was worsened during the Economic Crisis.

〈Figure 1〉 Pre-and Post-tax Inequality Trends



V. Concluding Remarks

Distributive justice is an important normative foundation of the income tax system, and the redistributive effects of the Korean income tax system are emerging as a popular topic in socio-economic policy debates. Applying newer methods of analysis to panel data from the Korean Household Panel Study, I empirically explored the various equity consequences of the Korean income tax system during the period of 1992 to 1998.

On the surface, the overall tax effects were not strong in terms of the welfare changes for individual households or the reduction of welfare gaps between the rich and the poor. Whether it is measured using the structural measure of average rate progression or the distributional measure of the Center of Gravity of income distribution, the extent of vertical equity implemented by the tax system was not significant throughout the sample years despite the apparent statutory progressivity.

While these results are basically in the same line with previous studies, I also found substantial evidence against the principle of progressive taxation. First, the average effective tax rates computed for equivalent income deciles

failed to consistently increase in decile rankings in each sample year. In addition, there are three cases in which income taxation incurred more welfare sacrifice to a lower decile than a higher decile. As a new addition to the literature, decomposition analysis further found that the within-group inequality was negatively affected by income taxation despite the unambiguous improvement in overall inequality during the sample years of 1992 and 1996.

The undesirable redistributive effects of income taxation in Korean were even further signified by the extent of the tax-induced re-rankings analyzed by means of the tax mobility matrix and the mean squared relative rank-shift. From the re-ranking analysis as yet another addition to the literature, I found that the Korean income tax system induced re-rankings of equivalent household income so extensively as to affect most households in all sample years, and, in general, the middle-income class of the fifth and sixth deciles were most rank-shifted to adjacent deciles.

The high frequency of the tax-induced re-rankings not only indicates a serious violation of horizontal equity but also significantly undermines effective progressivity measured in any fashion. As a summary measure of overall re-rankings, the mean squared relative rank-shift was computed to help delineate a better understanding of

tax inequity during the sample period. While fluctuating significantly over years, the mean squared relative rank-shift displayed no obvious trends like effective progressivity.

Interestingly, however, the average distance of rank-shifts gradually decreased from 1992 until 1997 and then rather sharply increased in 1998.

Given these observations, one can hardly conclude that a series of tax policy changes implemented during the sample period were visibly effective in alleviating horizontal inequity in taxation.

The sample year of 1998, which largely overlapped with the Economic Crisis in Korea, was worthy of note relative to the prior years. In the year, the progression of effective tax rates was most prominent; the distributional tax effect on income inequality was also most prominent; yet, the percentage of rank-preserved households was highest and the extent of the tax-induced re-rankings was the second lowest. In other words, the year is marked with significantly less tax inequity than the other sample years, which seems be attributed to the combination of the existing tax peculiarities and the distributive impacts of the Economic Crisis.

While agreeing with the general understanding that the redistributive effect of the Korean income tax system has

been only moderate in terms of effective progressivity, I went beyond the limit of existing studies by highlighting equity implications based on the tax-induced re-rankings, which have been long overdue in the literature. In a nutshell, the unfavorable redistributive effect in terms of re-ranking and hence horizontal inequity has been substantially large, although the significance has fluctuated over years.

I should note that all findings and conclusions made in this study may have inherited the limitations in the particular data set and methodology used, and thus they must be considered with caution. In the same vein, I suggest a direction for future studies, which would have important bearings on both normative and positive tax studies but has yet to be addressed in the literature of the Korean taxation.

In their recent insightful study, Alesina and Angeletos (2003) made an interesting proposition that the emphasis on the redistributive function of taxation depends upon the perceived source of income inequality in the society. According to their analysis, European countries choose more redistribution and hence more progressive taxation because their people perceive income inequality as largely the effect of luck and connections; whereas redistributive policies are much more limited in the United States

because Americans perceive income inequality as largely the effect of individual effort and talent although their preferences for fairness are no different from Europeans.

Drawing on their argument would make Korea appear to be an American case in the sense that the redistributive role of the income tax system is in effect limited and investment in human capital or education is remarkably high. As an extension on the same line of thinking, I propose that the redistributive effects of the Korean income tax system should be investigated and evaluated in relation to how the pre-tax income distribution is perceived by the voters in Korea. Studies reporting computational results without reference to the underlying equity preferences of the society as a whole might be partial and misleading. Of course, an appropriate politico-economic model regarding equitable taxation in Korea has yet to be developed. In this regard, it is noted that the Korean voters made their choice of the new political regime through the recent presidential election, and the new government is about to launch a series of tax policy changes. Therefore, there seems to be an imminent calling for future studies in the proposed direction.

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