
Role of Exchange Equity in Tax Reporting: An Experimental Approach

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Abstract: This study experimentally examines the role of exchange equity on reported income when a tax rate increase also increases the level of the public transfer from the government to the taxpayer. The experimental data show that while subjects were generally aware of exchange equity, perceived exchange equity played a significant role in reporting decisions for some subjects only. For one subject group whose reporting behaviors were less likely to be affected by perceived exchange equity, their reporting decisions were consistent with the economic predictions. On the other hand, for another subject group whose reporting behaviors were more likely to be affected by perceived exchange equity, an increase in tax rates potentially produced two offsetting effects: a positive economic effect in the direction of higher reported income and a negative exchange inequity effect in the direction of lower reported income. When perceived exchange equity was controlled for the second group, only the positive economic effect prevailed so that their behaviors were also consistent with the economic prediction. The results in the current study, together with the findings of previous experimental studies, provide a plausible clue to the reconciliation of the conflict regarding the effect of a tax rate change on tax reporting decisions between the economic prediction and empirical evidence in both field and experimental studies by controlling the effect on tax reporting decisions of perceived exchange equity (a factor not included in the economic model).

Key words: Exchange equity, Experiment, Public transfer, Tax compliance, Tax rate, Tax reporting

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I. Introduction

The basic analytical models of tax compliance (Allingham and Sandmo 1972; Yitzhaki 1974) predict that a tax rate increase results in higher reported income. While subsequent economic models with public goods also predict that the effect of a tax rate change on reported income remains positive, such predictions depend on the nature of the public goods and the validity of the assumptions as to how public goods enter the taxpayer's utility function (e.g., Cowell and Gordon 1988; Falkinger 1988). Assuming an expected utility maximizing taxpayer, these models stress the expected cost of economic sanctions based on the audit probability and the penalty structure as the only determinants of tax compliance decisions.

Contrary to the economic prediction, however, previous empirical results from field studies (e.g., Clotfelter 1983; Poterba 1987) have generally shown that a tax rate increase leads to lower reported income (or, equivalently, more tax evasion). Using the Taxpayer Compliance Measurement Program (TCMP) data in the U. S., Clotfelter (1983) found that both the after-tax income and marginal tax rates have a significant negative effect on tax compliance. However, the interpretation of the findings from field studies must be qualified because of several limitations of field research. First, there is a problem with official data sources like the TCMP data in that taxpayers who did not file any return at all cannot be included. Second, unintentional underreporting is not distinguished from intentional underreporting. Finally, other methodological problems may exist as well such as an endogeneity problem¹ and an omitted variable problem.²

1. The probability of audit by the IRS and taxpayers' reported income may be simultaneously determined if the IRS's audit policy is endogenous. Also, the correlation of marginal tax rates and income is likely to bias the resul-

In response to the limitations of empirical field research, increased attention has been devoted to the use of laboratory experiments in generating data on tax compliance.³ Since the experimental research in tax compliance was initiated by Friedland, Maital, and Rutenberg (1978), the results in this line of research (e.g., Alm, Jackson, and McKee 1992; Baldry 1987; Becker, Buchner, and Sleeking 1987; Benjamini and Maital 1985; Collins and Plumlee 1991; Moser, Evans, and Kim 1995) have consistently found a negative effect of a tax rate increase on reported income, results contrary to the economic prediction. As an exception, Beck, Davis, and Jung (1991) experimentally support the economic prediction. However, their experiment uses neutral terms rather than tax terms adopted by most other experimental tax studies.

Motivated by the inconsistent results among experimental studies, Alm (1991) emphasizes a need for a broader approach to tax compliance research, arguing that the basic analytical models are generally incapable of explaining existing observations. In fact, previous research in various accounting contexts has shown that preferences for non-monetary factors such as equity or honesty also play an important role in reporting decisions (e.g., Evans, Hannan, Krishnan, and Moser 2001; Luft 1997; Moser, Evans, and Kim 1995), which suggests that equity consideration can help us to provide a clue to reconcile the conflict between the economic prediction and empirical evidence regarding the effect of

ting estimates. For a detailed critical analysis, see Cox (1984) and Poterba (1987).

2. A single taxpayer faces a higher tax rate than a married taxpayer with the same income. Since marriage is self selected, the effect of tax rate change may be confounded with such an uncontrolled factor.
3. The advantages of an experimental approach in accounting including tax compliance research are well documented in Davis and Swenson (1988) and Moser (1998).

a tax rate change on tax reporting decisions. In other words, the reconciliation can be achieved by identifying factors which are potentially important in tax reporting decisions, but not included in the economic models of tax compliance. We speculate that taxpayers' perceived exchange equity is one of such factors, and its role in tax reporting is explicitly examined in the current study.

Equity theory (Adams 1965; Lewis 1982; Walster, Walster, and Berscheid 1978) predicts that subjects will act to rectify exchange equity by reporting less income when they perceive inequity in their exchange with the government.⁴ In particular, when taxpayers perceive a lessening of exchange equity due to a tax rate increase, they are likely to restore exchange equity by reporting less income. Operating in this way, perceived exchange equity, which is omitted in the economic models of tax compliance, may be an important factor in explaining the prior empirical and experimental results. Moser et al. (1995) reported that taxpayers responded differently to tax rate changes under different horizontal equity conditions. Subjects in the horizontal inequity condition reported less income as tax rates increased, while subjects in the horizontal equity condition reported no significant change in reported income as tax rates increased.⁵ Failing to support the positive effect of a tax rate increase on reported income in their experiment, they suggest that the tax rate increase would worsen subjects' exchange inequity with the gov-

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4. Other equity concepts, including horizontal equity and vertical equity, are also relevant in tax settings. These types of equity refer to the treatment of particular taxpayers relative to other taxpayers. More specifically, horizontal equity refers to the treatment of particular taxpayers relative to other taxpayers with the same income, while vertical equity refers to the treatment of particular taxpayers relative to other taxpayers who have different incomes.
 5. In their experiment, subjects in the horizontal inequity (equity) condition were informed that the tax rate they faced was higher than (equal to) the tax rate faced by some other taxpayers.

ernment, which subsequently offset the economic effect of the tax rate increase on reported income. However, as they did not control the change in perceived exchange equity due to the tax rate increase, their design was unable to isolate the economic effect of a tax rate increase on tax reporting.

Results from public opinion survey research can provide an additional insight into equity argument. In particular, survey results (e.g., Harris and Associates, Inc. 1988; Yankelovich, Skelly, and White, Inc. 1984) show that taxpayers do think of their relation with the government as an exchange relationship and also show that a significant portion of taxpayers chose exchange inequity as a rationale for tax cheating. Kim (2002) supported the survey findings using an experimental setting where perceived exchange equity was manipulated by the provision of public transfer.⁶ The results showed that the effect of a public transfer on reported income depended on the extent to which the taxpayers used the perception of exchange equity in their tax reporting decisions. Subjects who perceived exchange equity to be important in making tax reporting decisions reported more income when they received a public transfer than when they received no public transfer. In contrast, among subjects who did not consider exchange equity in making tax reporting decisions, subjects with no public transfer tended to report more income than those with a public transfer. Thus, if we do not carefully evaluate the different roles of perceived exchange equity to different taxpayer groups in reporting decisions, any attempt may be neither complete nor accurate to reconcile the conflict between the economic prediction and empirical evidence regarding the effect of a tax rate change on tax reporting decisions.

The current study is the first to address how perceived ex-

6. The term “public transfer” represents a cash transfer from the government in exchange for taxes paid.

change equity differently affects tax reporting behaviors among taxpayers when a tax rate increase also affects the level of public transfer from the government. In the current study, both the tax rate and the level of public transfer are varied to manipulate taxpayers' perceived exchange equity with the government. In addition, based on the post-experimental questionnaire data, subjects are further separated into two groups according to the degree to which their perceived exchange equity affects their decision as to how much income to report. This experimental design enables us to test whether the tax rate increase would affect taxpayers' perceived equity with the government and more importantly to test whether the change in perceived exchange equity affects taxpayers' reporting behaviors differently. Specifically, we hypothesize that a tax rate increase interacts with the public transfer to worsen perceived exchange equity and that, for some taxpayers whose decisions are more likely to be affected by perceived equity, a tax rate increase results in the same reported income for those who do not receive a public transfer but more reported income for those who do receive a public transfer.

The experimental data show several interesting results, which are generally consistent with our hypotheses. First, subjects who received no public transfer in the experiment perceived their exchange with the government to be less equitable than subjects who did receive a public transfer. Also, when subjects faced a tax rate increase, the decrease in perceived exchange equity was greater among subjects who received no public transfer. More interestingly, perceived exchange equity played different roles in reporting decisions for different subject groups. For one subject group whose reporting behaviors were less likely to be affected by perceived exchange equity, they reported more income as the tax rate increased regardless of whether they received a public transfer or not. On the other hand, for another subject group whose reporting behaviors were more likely to be

affected by perceived exchange equity, an increase in tax rates potentially produced two offsetting effects: a positive economic effect in the direction of higher reported income and a negative exchange inequity effect in the direction of lower reported income. When perceived exchange equity was controlled for the second group, only the positive economic effect prevailed so that we had experimental results consistent with the economic prediction regarding the effect of a tax rate increase on reported income.

The results in the current study, together with the findings of previous experimental studies, provide a plausible clue to the reconciliation of the conflict regarding the effect of a tax rate change on tax reporting decisions between the economic prediction and empirical evidence in both field and experimental studies by controlling the effect on tax reporting decisions of perceived exchange equity (a factor not included in the economic model). It is also hoped that our results can help to develop a comprehensive theory and to enrich future research design, especially in experimental studies.

II. Hypotheses development

Adopting an expected utility framework in which a taxpayer chooses how much income to report in the light of the costs and benefits of misreporting, the basic economic models (Allingham and Sandmo 1972; Cowell 1985; Yitzhaki 1974) predict that the effect of a tax rate increase on reported income is positive under the assumptions of a proportional penalty system⁷ and decreasing absolute risk aversion (hereafter DARA) or constant absolute risk aversion (hereafter CARA).⁸

This study extends the basic economic model in Yitzhaki

7. Under a proportional penalty system, the fine for underreporting is proportional to the unpaid tax.

(1974) with a public transfer in order to examine whether the positive effect of a tax rate increase on reported income predicted in the basic model is still valid when the public transfer is considered. In addition to the conventional assumptions in the basic economic model, this extended model with a public transfer (hereafter PT model) assumes that the public transfer take the form of a cash payment from the government to the taxpayer whose level is set at half of his own actual tax payment, but not on how much tax other taxpayers actually pay. In this way, the PT model offers the advantages of providing an unambiguous prediction regarding the effect of a tax rate change on reported income, and of relatively simple operationalization of parameters in an experimental setting. Based on the PT model, we have the following proposition:⁹

Proposition 1: If an increase in the public transfer does not fully compensate the additional tax payment due to a tax rate increase, a taxpayer with DARA or CARA will report more income as the tax rate increases.

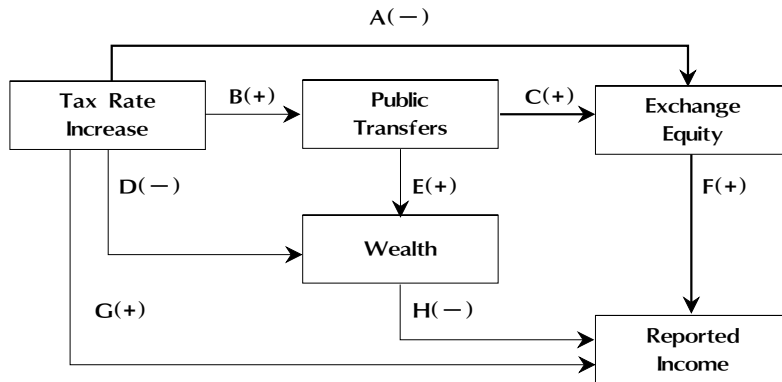
Equity theory (Adams 1965; Lewis 1982; Walster et al. 1978) has focused on two social issues: (1) What is perceived to be fair or equitable? and (2) How do people respond to this equity perception? In answering these research questions, equity theory first predicts that when individuals find themselves participating

8. DARA and CARA are characterized by $R_A(W_1) = \frac{U''(W_1)}{-U'(W_1)} \geq R_A(W_2) = \frac{U''(W_2)}{-U'(W_2)}$ for all $W_1 < W_2$. The equality holds with CARA, while with DARA the inequality is strict. DARA implies that a risk averse taxpayer is willing to take more risk if his wealth level increases, and CARA, on the other hand, implies that the risk preference of a risk averse taxpayer is invariant to the level of his wealth.

9. The PT model and the proof of Proposition 1 are available upon request.

in inequitable relationships they will become distressed. Further, individuals who discover they are in an inequitable relationship will attempt to eliminate their distress by restoring equity. Thus, the greater the inequity that exists, the more distress they will feel, and the harder they will try to restore equity. For taxpayers who perceive exchange inequity, one way to restore equity is to evade taxes.

Figure 1 depicts the theoretical relations among factors affecting reported income predicted by the PT model and equity theory. Each of symbols 'A' through 'H' represents the relation between two factors connected by a line, and the signs "+" and "-" indicate that the predicted effects of the changes in the preceding factors on the subsequent factors are positive and negative, respectively. The single solid lines (\rightarrow) represent the economic model predictions, while the double solid lines (\Rightarrow) represent equity theory argument. A tax rate increase is first hypothesized to affect perceived exchange equity directly (symbol A) and indirectly through the increase in the public transfer (symbols B and C). Then, a tax rate increase is also hypothesized to affect reported income in three ways: by increasing the riskiness of evasion (symbol G), by decreasing taxpayers' wealth directly (symbols D and H) or indirectly through the increase in the public transfer (symbols E and H), and by decreasing taxpayers' perceived exchange equity (symbols A, C, and F). The first two ways represent the economic prediction and the last way represents the prediction by equity theory.

Figure 1. Diagram of the hypothesized relations

Each of symbols 'A' through 'H' represents the relation between two factors connected by a line. The signs "+" and "-" indicate that the predicted effects of the change in the preceding factors on the subsequent factors are positive and negative, respectively. The double solid line (—>) represents equity theory argument, while the single solid line (—>) represents the economic model prediction.

Equity theory predicts that participants evaluate their contribution to, and benefits from, the system they belong to. Thus, in tax contexts, the relative magnitudes of a taxpayer's contributions (e.g., tax payments) and benefits (e.g., public transfers) in his exchange relationship with the government will affect his perceived exchange equity. As a result, for a given level of tax payment, taxpayers who receive no public transfer will perceive a lower level of exchange equity than taxpayers who receive a public transfer. The symbol C in Figure 1 depicts this prediction, and we have the following hypothesis:

H1. For a given level of tax rate and reported income, perceived exchange equity is lower among taxpayers who receive no public transfer than among those who do receive a public transfer.

As a tax rate increases, taxpayers will evaluate their addi-

tional tax payment and the additional public transfer from the government caused by the tax rate increase. Equity theory predicts that taxpayers' perceived exchange equity becomes worse if the additional tax payment is not compensated by an increase in the public transfer. This prediction is described by the combination of the symbols A and C in Figure 1, and leads to H2:

H2. For a given level of reported income, as the tax rate increases, perceived exchange equity worsens more for taxpayers who receive no public transfer than those who receive public transfer.

In the economic model, the predicted effect of a tax rate increase on reported income has two components. First, as a higher tax rate increases the riskiness of underreporting, risk averse taxpayers will report more income as the tax rate increases. The symbol G in Figure 1 represents this positive effect on reported income. Second, when a tax rate increase produces a proportional but smaller increase in the public transfer received by the taxpayer (i.e., the wealth decrease represented by symbol D is fully compensated by the wealth increase through the public transfer represented by symbol E), the net effect is a reduction in the taxpayer's wealth which produces a further increase (no change) in the DARA (CARA) taxpayer's reported income. The symbol H in Figure 1 describes this negative wealth effect. Thus, a tax rate increase leads a risk averse taxpayer to report more income due to the increased riskiness and the reduction in wealth. Note that this prediction is derived based on the assumption that tax compliance decisions are only affected by monetary factors. That is, only the single solid lines in Figure 1 will prevail. Equivalently, the node symbolized by F in Figure 1 is excluded in tax reporting decision. Thus, Proposition 1 predicts that the tax compliance behavior of the taxpayer group whose decisions are based on eco-

conomic factors, and we have the following H3A:

H3A (Proposition 1). As a tax rate increase produces a proportional but smaller increase in the public transfer, the tax rate increase results in more reported income for all taxpayers whether they receive a public transfer or not.

Equity theory, on the other hand, predicts that subjects will restore equity when they perceive inequity in their exchange with the government. In addition, according to survey findings (e.g., Yankelovich et al. 1984), this prediction will be applicable only to those taxpayers whose decisions are more likely to be affected by perceived exchange equity. When the additional tax payment due to a tax rate increase is not compensated at all, the taxpayer's perceived exchange equity obviously worsens. Therefore, with no public transfer, the negative effect on reported income of increased exchange inequity (represented by the double solid lines in Figure 1) is expected to offset the positive economic effect of a tax rate increase on reported income (represented by the single solid lines in Figure 1). The combinations of F, G, and H, thus, predict that a tax rate increase will result in no change in reported income. Conversely, when the additional tax payment due to a tax rate increase is compensated by a corresponding increase in the public transfer, taxpayers' perceived exchange equity is expected to remain relatively constant after the tax rate increase and their reporting behaviors can be characterized by the economic prediction (Proposition 1). That is, once the effect characterized by the symbol F is controlled, only the economic effect through riskiness (symbol G) and wealth (symbol H) will prevail. These arguments predict the tax compliance decisions of the taxpayers whose decisions are more likely to be affected by perceived exchange equity. Thus, the prediction which combines both economic and exchange equity effects of a tax rate increase on reported income is presented in H3B.

H3B (Combined). For taxpayers whose decisions are more likely to be affected by exchange equity, a tax rate increase results in the same reported income when they do not receive a public transfer and more reported income when they do receive a public transfer.

III. Experiment

Design

Figure 2 summarizes the overall experimental design with two between-subjects factors: Tax Rate Pattern and Public Transfer Condition. Tax Rate Pattern has two levels: Constant and Increasing. In the Increasing Tax Rate condition, Tax Rate is a within-subject factor with two levels: a 20% tax rate for the first four periods and a 40% tax rate for the last four periods. In any single period all subjects faced the same tax rate and this rate was publicly announced. Public Transfer Condition has also two levels: No Public Transfer and Public Transfer. In the No Public Transfer condition, subjects received no public transfer. In the Public Transfer condition, each subject received a public transfer equal to 50% of the taxes he had actually paid in that same period.

Figure 2. Experimental design

Public Transfer Conditions (Between-Subjects)	Tax Rate Patterns (Between-Subjects)	<i>n</i>	Tax Rates (Within-Subject)	
			Periods 1-4	Periods 5-8
No Public Transfer	Constant(NPTC)	20	20%	20%
	Increasing(NPT)	22	20%	40%
Public Transfer	Constant(PTC)	24	20%	20%
	Increasing(PT)	25	20%	40%

NPTC: No Public Transfer with Constant Tax Rate condition

NPT: No Public Transfer with Increasing Tax Rate condition

PTC: Public Transfer with Constant Tax Rate condition

PT: Public Transfer with Increasing Tax Rate condition

Ninety-one MBA students from a major U. S. university voluntarily participated in one of four experimental sessions. As shown in Figure 2, 20 subjects were randomly assigned to the No Public Transfer with Constant Tax Rate condition (NPTC), 22 subjects were assigned to the No Public Transfer with Increasing Tax Rate condition (NPT), 24 subjects were assigned to the Public Transfer with Constant Tax Rate condition (PTC), and the remaining 25 subjects were assigned to the Public Transfer with Increasing Tax Rate condition (PT). The Constant Tax Rate sessions (NPTC and PTC) were used as baseline conditions to estimate the potential effect on subjects' responses of repeated experience with the task. That is, the purpose of these baseline conditions was to provide a measure of subjects' reported income in the absence of any change in the tax rate.

Procedures

Each experimental session consisted of eight periods plus one practice period, and lasted a total of approximately 75 minutes. Once subjects were randomly assigned, they received an envelope which contained all necessary experimental materials including the post-experimental questionnaire.¹⁰ Before the session started, subjects read the instruction which clearly specified that: 1) all taxpayers had the same taxable income of 10,000 Lira¹¹ in every period; 2) the probability of being audited was fixed at 28% in each period; and 3) the penalty rate was 100% of the tax evaded. Consistent with establishing perceived horizontal equity for all subjects, the instructions emphasized that all subjects had the *same* taxable income of 10,000 Lira in every period and that all

10. These experimental materials are available upon request.

11. An experimental currency called Lira was used during the experiment. At the end of the experiment Lira were converted into cash at a rate of \$1.00 per 1,000 Lira.

subjects faced the *same* tax rates in each period. The instructions also explained the underlying public transfer system. Specifically, the instructions for the NPT and NPTC conditions stated that all participants would receive no government services in exchange for the taxes paid. On the other hand, the instructions for the PT and PTC conditions stated that a taxpayer would receive a public transfer equal to 50% of the actual tax paid by him in the same period so that this transfer was independent of taxes paid by other subjects. This information was repeated at the start of each of the eight periods.

After subjects reviewed the instructions, a practice period was conducted to familiarize the subjects with the experimental procedures. Subjects were informed that their performance in the practice period did not affect their payment. Each of the eight periods began with subjects reading the information for that period from their Personal Record Sheet which was also used as the subjects' personal record of their decision for that period. Subjects then chose how much of their 10,000 Lira taxable income to report for the period, and recorded the amount on their Personal Record Sheet and then recorded this same amount on their Income Tax Report for the period. After the Income Tax Reports were collected from the subjects, the audit process was conducted for that period.

The audit process, which took place in full view of all subjects at the end of each period, randomly selected subjects to be audited by drawing numbered chips from a container with one chip for each subject. The audit resulted in perfect detection of any unreported income for those subjects who were audited. After the audit process was completed in one period, subjects calculated their after tax income for that period. Since all parameters were fixed throughout the experiment, subjects were simply repeating the same task in each of the eight periods.

At the end of the experiment, one of the eight periods was

randomly selected for payment. The Lira earned in the selected period were converted to dollars and paid in cash. Because each period had an equal probability of being selected for payment, this payment scheme produced the same incentives in each period for subjects to choose how much income to report. The payment scheme was explained to the subjects before the actual experimental periods began. The average payoff was around 10 dollars including 3 dollar participation fee.

Post-Experimental Questionnaire

After the payment period was selected, subjects completed a post-experimental questionnaire in which subjects responded to questions that assessed the effectiveness of certain experimental controls and manipulations. These questions concerned the level of public transfer that subjects received and the income and tax rate experienced by other taxpayers. The question regarding the level of public transfer provided a manipulation check on the Public Transfer variable. The question regarding the income and tax rate experienced by other taxpayers were included to check whether horizontal equity was adequately controlled. Horizontal equity was operationalized by publicly announcing that all subjects had the same income and faced the same tax rate.

Subjects' perceived exchange equity was measured by asking subjects to rate the fairness of their exchange of taxes paid for government services received. To measure this perception, a seven-point scale was used, ranging from "Not fair at all" (0) to "Very fair" (6). The midpoint was defined as "Somewhat fair" (3). This rating was measured to test the effect of the level of the public transfer on perceived exchange equity predicted in H1. The post-experimental questionnaire also contained an additional item asked subjects to rate on a seven-point scale their change in perceived exchange equity from the first four periods (20% tax rate) to the last four periods (20% rate in the NPTC and PTC con-

ditions or 40% rate in the NPT and PT conditions). The endpoints were labeled “Decreased a great deal” (-3) and “Increased a great deal” (3), while the midpoint was labeled “Stayed the same” (0). This rating provided the data concerning whether the changes in subjects’ perceived exchange equity were differently affected between NPT and PT conditions by the tax rate increase from 20% to 40%. This rating was measured to test the effect of the tax rate increase on perceived exchange equity predicted in H2.

H3A and H3B predict the reporting behaviors of two types of taxpayers whose behaviors are differently affected by perceived exchange equity. Thus, in order to separate subjects according to the degree to which their perceived exchange equity with the government actually affected their decision as to how much income to report, subjects were asked to rate on a seven-point scale, ranging from “No effect at all” (0) and “Very significant effect” (6). The midpoint was labeled “Moderate effect” (3). Finally, information regarding subjects’ gender and experience with tax system was also collected in order to check the degree to which subject groups represented taxpayers.

IV. Data Analysis and Results

1. Baseline Data

Before reporting tests of the hypotheses, the data from baseline conditions (i.e., NPTC and PTC conditions) are examined to identify a possible experience effect. Such an effect is important in interpreting whether any difference between reported incomes at 20% and reported incomes at 40% is attributable to subjects’ increasing experience with the experimental task. Experience and tax rate are clearly related because subjects in the NPT and PT conditions faced the lower 20% tax rate in periods 1-4 and the higher 40% tax rate in periods 5-8. Thus, in order to distinguish

the effect of the tax rate increase from any potential experience effect, the baseline data are used. Table 1 summarizes the mean reported income averaged across periods 1-4 (AVE1), the mean reported income across periods 5-8 (AVE2), and the mean reported income across all eight periods (AVEALL) for the baseline conditions (i.e., NPTC and PTC conditions).

Table 1. Mean Reported Income Amounts in the Baseline Condition (in Lira)

Experimental Condition	<i>n</i>	Periods 1-4(AVE1)	Periods 5-8(AVE2)	Marginal Mean
NPTC	20	3,600	3,415	3,508
PTC	24	4,327	4,390	4,358

NPTC: No Public Transfer with Constant Tax Rate condition

PTC: Public Transfer with Constant Tax Rate condition

Using the average data in Table 1, an Analysis of variance (ANOVA) was conducted with Public Transfer as a between-subjects factor with two levels (NPTC and PTC) and Periods as a within-subject factor with two levels (AVE1 for Periods 1-4 and AVE2 for Periods 5-8) as independent variables. The ANOVA results show that Periods had no effect ($F = .04$, $p = .847$) and that there was no interaction between Public Transfer and Periods ($F = .15$, $p = .697$). A paired t-test for the individual differences between AVE1 and AVE2 show the same results for the NPTC and PTC conditions. That is, the change of mean reported income from 3,600 Lira to 3,415 Lira in the NPTC condition is not statistically significant ($t = .36$, $p > .72$), and neither is the change of mean reported income from 4,327 Lira to 4,390 Lira in the PTC condition ($t = -.16$, $p > .87$). These results imply that there was no significant experience effect in either condition. Thus, no adjustment for experience is made in data analysis.

2. Hypotheses Tests

H1

H1 predicts that perceived exchange equity is lower among taxpayers who receive no public transfer than among those who receive a public transfer. Results in Table 2 show that subjects in the NPT condition reported lower perceived exchange equity than those in the PT condition. However, since subjects faced two tax rates (i.e., 20% for periods 1-4 and 40% for periods 5-8), H1 was tested separately at the 20% and 40% tax rates. First, for perceived exchange equity at the 20% tax rate, the ratings of subjects in the NPT condition (mean=1.5) were significantly lower ($t=4.32$, $p<.001$, one-sided) than those in the PT condition (mean=3.9), a result consistent with H1.¹²

Table 2. Perceived Exchange Equity by Public Transfer Condition

		Tax Rates		two-tailed t-test statistics
		20%	40%	
Overall	$n = 47$	2.8	2.0	$t = 3.60$ $p = .001$
NPT	$n = 22$	1.5	0.2	$t = 3.22$ $p = .004$
PT	$n = 25$	3.9	3.5	$t = 1.84$ $p = .078$
two-tailed t-test statistics between the NPT and PT conditions		$t = 4.32$ $p = .0001$	$t = 4.56$ $p = .0001$	

NPT: No Public Transfer with Increasing Tax Rate condition

PT: Public Transfer with Increasing Tax Rate condition

The numbers in each cell are subjects' mean ratings of exchange equity on a sevenpoint scale where 0 was defined as "not fair at all," the midpoint of 3 was defined as "somewhat fair," and 6 was defined as "very fair".

12. Consistent with the recommendation of McNeil, Newman, and Kelly (1996), we report p-values for one-sided tests for all directional hypotheses including directional interaction hypotheses.

Similarly, for perceived exchange equity at the 40% tax rate, t-test results show that the ratings of subjects in the NPT condition (mean=.2) were significantly lower ($t=4.56$, $p<.001$) than the ratings in the PT condition (mean=3.5).¹³ These results for H1 establish that subjects in the NPT condition did perceive significantly lower exchange equity than those in the PT condition at both tax rates.

H2

H2 predicts the decrease in perceived exchange equity due to a tax rate increase will be higher among taxpayers who receive no public transfer as the tax rate increases. As Table 2 shows, subjects as a whole experienced a decrease in perceived equity from 2.8 to 2 ($t=3.6$, $p=.001$) after the tax rate increase. In particular, the decline in perceived equity for subjects in the NPT condition (from 1.5 to 0.2) was significantly greater ($t=1.85$, $p<.035$, one sided) than the decline for subjects in the PT condition (from 3.9 to 3.5). In addition, the decrease from 1.5 to .2 in the NPT condition is statistically significant ($t=3.22$, $p=.004$), while the decrease from 3.9 to 3.5 in the PT condition is only marginally significant ($t=1.84$, $p=.078$). These patterns are in general consistent with H2.

H3A and H3B

Because of the nature of H3A and H3B, the effect of the tax rate increase on reported income was tested separately for one group of taxpayers whose decisions are less likely to be affected by perceived exchange equity and for another group of taxpayers whose decisions are more likely to be affected by perceived ex-

13. Perceived exchange equity after the tax rate increase was calculated by adding the perceived exchange equity before the tax rate increase and the change in perceived exchange equity due to the tax rate increase.

change equity. The first type of taxpayers is called as the Low Use of Equity (hereafter LU) group and the second type as the High Use of Equity (hereafter HU) group. The separation of subjects was made according to the degree to which their perceived exchange equity with the government affected their decision as to how much income to report to the government, which was obtained from the post-experimental questionnaire.¹⁴ We classified twenty-four subjects who rated less than 3 in the measurement as the LU group, and the remaining twenty-three subjects as the HU group. Table 3 shows the detailed distribution of subjects.¹⁵

Table 3. Mean Reported Income by Use of Equity, Public Transfer, and Tax Rate (in Lira)

Use of Equity	Public Transfer Conditions	n	Tax Rates		Marginal Mean
			20% Periods 1-4 (AVE1)	40% Periods 5-8 (AVE2)	
LU	NPT	10	4795	5430	5113
	PT	14	4746	5346	5046
HU	NPT	12	4958	4963	4961
	PT	11	4555	5990	5273
Marginal Mean		47	4766	5417	5092

NPT: No Public Transfer with Increasing Tax Rate condition

PT: Public Transfer with Increasing Tax Rate condition

LU: Low use of equity group

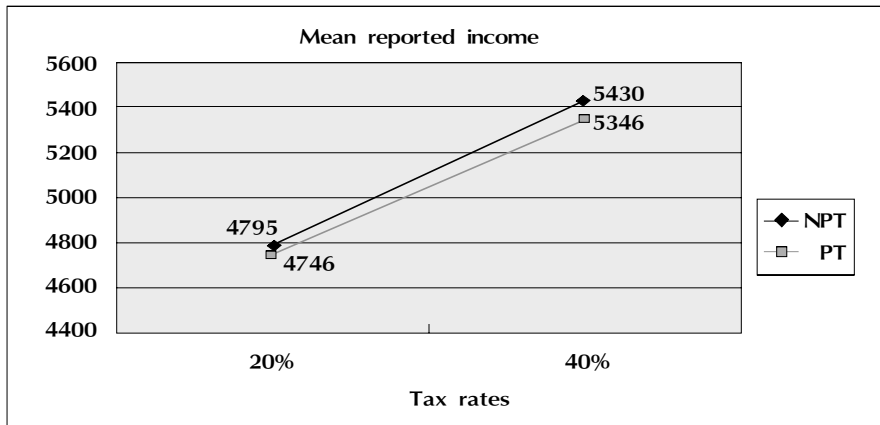
HU: High use of equity group

14. Subjects rated the degree to which their perceived fairness of their exchange with the government affected their decision as to how much income to report to the government on a seven-point scale, ranging from “No effect at all” (0) and “Very significant effect” (6). The midpoint was labeled “Moderate effect” (3).
15. As the responses of subjects to whether their perception of exchange equity affected their reporting decisions were collected after the experimental tasks, the use of equity might simply be a justification for tax evasion. However, there was no significant correlation between the reported income and the use of equity.

Table 3 also reports the mean reported income over the first four periods at the 20% tax rate (AVE1) and the second four periods at the 40% tax rate (AVE2) separated by Use of Equity (LU and HU) and Public Transfer (NPT and PT). The data in Table 3 show different reporting patterns between the LU and HU groups as the tax rate increases. Subjects in the LU group reported more income as the tax rate increased regardless of whether they received the public transfer or not. On the other hand, subjects in the HU group exhibited different reporting behavior depending on whether they received the public transfer or not. Only subjects in PT condition reported more income as the tax rate increased.

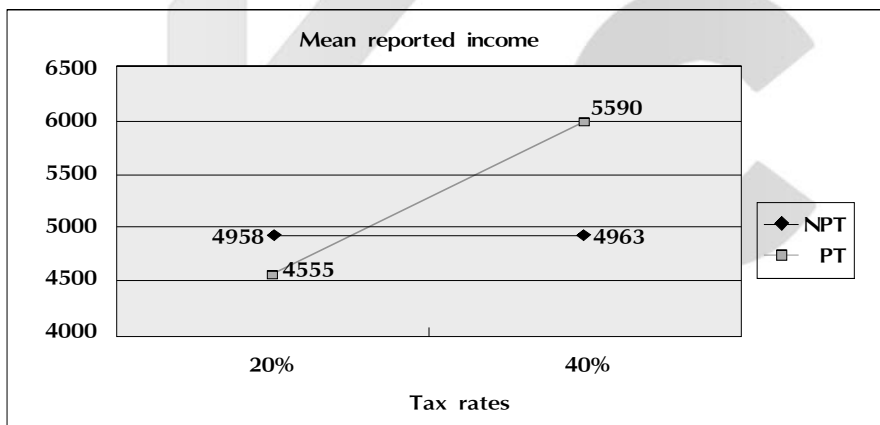
H3A predicts the effect of a tax rate increase on reported income for subjects in the LU group. Specifically, H3A predicts that a tax rate increase results in more reported income for the taxpayers in the LU group whether they receive a public transfer or not. H3B, on the other hand, predicts for the HU group that a tax rate increase results in the same reported income for taxpayers who do not receive a public transfer but more reported income for taxpayers who do receive a public transfer. Figures 3 and 4 illustrate the patterns of mean reported income reported in Table 3 for the LU and HU groups, respectively. Figure 3 shows that subjects in the LU group respond in a pattern directionally consistent with H3A. Likewise, Figure 4 depicts that subjects in the HU group also respond in a pattern directionally consistent with H3B.

Figure 3. Mean reported income for the LU



LU: Low use of equity group
NPT: No Public Transfer with Increasing Tax Rate condition
PT: Public Transfer with Increasing Tax Rate condition

Figure 4. Mean reported income for the HU



HU: High use of equity group
NPT: No Public Transfer with Increasing Tax Rate condition
PT: Public Transfer with Increasing Tax Rate condition

In order to analyze the patterns formally, separate ANOVA were performed for each Use of Equity group using the data in Table 3 with Public Transfer as a between-subjects factor with two levels (NPT and PT), Tax Rate as a within-subject factor with two levels (20% and 40%) as independent variables, and AVE1 and AVE2 as repeated measures dependent variables. In order to justify the separation of data by Use of Equity, we first conducted a three way ANOVA Public Transfer for full data with three independent variables; Use of Equity, and Tax Rate. The three way interaction was marginally significant ($p < .13$, one-sided). The separate ANOVA results reported in Panels A and B in Table 4 show that while Public Transfer was statistically significant for neither in the LU group nor in the HU group, Tax Rate is marginally significant ($p < 0.8$, one-sided) in both groups. In addition, the marginally significant interaction between Public Transfer and Tax Rate ($p = .075$, one-sided) in the HU group implies that subjects in the HU group responded differently to the tax rate increase depending on whether they received a public transfer or not. These results support H3A for the LU group and H3B for the HU group.¹⁶

16. To check whether these results were sensitive to the selection of 3 as the cutoff point for defining “Low” versus “High” Use of Equity, the analysis was repeated with 2 and 4 as alternative cutoff points rather than the original cutoff of 3. The original patterns are basically invariant when either rating of 2 or 4 was used as an alternative cutoff point. Tax Rate was not statistically significant at any condition except the High Use of Equity group when 4 was used where Tax Rate was marginally significant ($F = 3.48$, $p = .089$).

Table 4. ANOVA for Mean Reported Income Amounts

Panel A: U (n=24)		
Factors:	F	Significance of F
Public Transfer	.00	.966
Tax Rate	2.15	.157
Public Transfer by Tax Rate	.00	.967
Panel B: HU(n=23)		
Factors:	F	Significance of F
Public Transfer	.06	.808
Tax Rate	2.25	.148
Public Transfer by Tax Rate	2.23	.150

LU: Low use of equity group
 HU: High use of equity group

Table 5 reports perceived exchange equity separated by Use of Equity, Public Transfer conditions, and Tax Rates, and strongly indicates that perceived exchange equity works in the HU group only. This pattern is further analyzed by an Analysis of Covariance (ANCOVA) for the mean reported income data in Table 3 with perceived exchange equity data in Table 5 as a covariate.

Table 5. Perceived Exchange Equity by Use of Equity and Public Transfer Conditions

Use of Equity	PT Conditions		Tax Rates		two-tailed t-test statistics
			20%	40%	
LU	NPT	n = 10	1.0	-0.2*	t = 1.91 p = .089
	PT	n = 14	4.4	3.9	t = 1.84 p = .089
HU	NPT	n = 12	1.9	.6	t = 2.53 p = .028
	PT	n = 11	3.4	3.0	t = .84 p = .420

LU: Low use of equity group
 HU: High use of equity group
 NPT: No Public Transfer with Increasing Tax Rate condition
 PT: Public Transfer with Increasing Tax Rate condition

The numbers in each cell are subjects' mean ratings of exchange equity on a seven-point scale where 0 was defined as "not fair at all," the midpoint of 3 was defined as "somewhat fair", and 6 was defined as "very fair".

* Perceived exchange equity after the tax rate increase was calculated by adding the perceived exchange equity before the tax rate increase and the change in perceived exchange equity due to the tax rate increase.

An ANCOVA was conducted with Public Transfer with two levels (NPT and PT) and Use of Equity with two levels (LU and HU) as between-subjects factors, and Tax Rate as a within-subject factor with two levels (20% and 40%) as independent variables, AVE1 and AVE2 as repeated measures dependent variables, and perceived exchange equity as a covariate. The ANCOVA results in Table 6 show that when the effect of perceived exchange equity is controlled, Tax Rate becomes strongly significant ($p = .003$, one-sided) in the HU group but remains basically the same significance ($p = 0.88$, one-sided) in the LU group. With these results, we can conclude that perceived exchange equity affects only the reporting decisions in the HU group. That is, the node F in Figure 1 prevails for subjects in the HU group only.

Table 6. ANCOVA for Mean Reported Income by Perceived Exchange Equity as a Covariate

Panel A: LU ($n=24$)		
Factors:	<i>F</i>	Significance of <i>F</i>
Public Transfer	1.71	.206
Tax Rate	1.97	.176
Public Transfer by Tax Rate	.01	.909
Panel B: HU ($n=23$)		
Factors:	<i>F</i>	Significance of <i>F</i>
Public Transfer	.84	.372
Tax Rate	9.26	.006
Public Transfer by Tax Rate	.01	.442

LU: Low use of equity group

HU: High use of equity group

To clarify the effect of exchange equity in the HU group, we performed a t-test for the NPT and PT conditions separately. When the equity effect is not controlled, Tax Rate is significant only in the PT condition ($p = .054$, one-sided), a result consistent with H3B. However, when the equity effect is controlled, the effect of Tax Rate now becomes marginally significant in the NPT condition ($p = .083$, one-sided) and becomes even stronger in the PT condition ($p = .016$, one-sided). These results clearly demonstrate that once the effect of perceived exchange equity is controlled, we can observe the positive effect of a tax rate increase on reported income for subjects in the HU group as well.

V. Discussion

This study illustrates how equity consideration can improve the economic models' ability to explain the effect of a tax rate increase on tax reporting, especially for those taxpayers whose tax reporting decisions are more likely to be affected by exchange equity. The experimental data show several interesting results, which are consistent with our hypotheses. First, subjects were generally aware of exchange equity with the government in tax reporting. That is, subjects who received no public transfer in the experiment perceived their exchange with the government to be less equitable than subjects who did receive a public transfer. Second, when subjects faced a tax rate increase, the decrease in perceived exchange equity was greater among subjects who received no public transfer.

More interestingly, perceived exchange equity played a different role in reporting decisions for different subjects. For one subject group whose reporting behaviors were less likely to be affected by perceived exchange equity, they reported more income as the tax rate increased regardless of whether they received a public transfer or not. On the other hand, for another subject group

whose reporting behaviors were more likely to be affected by perceived exchange equity, an increase in the tax rate produced two offsetting effects: economic effect in the direction of higher reported income and exchange equity effect in the direction of lower reported income. When perceived exchange equity was controlled for the second group, we had experimental results consistent with the economic prediction regarding the effect of a tax rate increase on reported income.

The results in the current study, together with the findings of previous experimental studies, provide a plausible clue to the reconciliation of the conflict regarding the effect of a tax rate change on tax reporting decisions between the economic prediction and empirical evidence in both field and experimental studies by controlling the effect on tax reporting decisions of perceived exchange equity (a factor not included in the economic model). In addition, this study can contribute to tax compliance research by extending previous literature in several ways. First, to derive unambiguous prediction concerning the effect of a tax rate change on reported income when the tax rate change also affects the level of public transfer, this study develops a model incorporating a public transfer that is operationalized in a manner different from those used in previous experiments. Second, the design of this study allows the explicit examination of the role of exchange equity. Unlike previous experiments in which inequity was assumed or hypothetical, exchange equity in this study was explicitly manipulated with the provision of public transfer and also measured. Further, this study more clearly refines the role of exchange equity by identifying two types of subjects whose decisions are differently affected by perceived exchange equity.

There are several potential limitations regarding the generalizability of findings, though. One possible limitation of generalizability is the use of natural or loaded terms. However, because the tax reporting decision is not necessarily a simple gamble, ex-

periments with neutral terms may not capture other factors which appear to be important in determining reporting behavior in tax compliance research. Also, Fischer, Wartick, and Mark (1992) argue that the generalizability of experiments can be enhanced by making the experimental setting more reflective of the real-world setting. Thus, the use of natural terms may be an unavoidable limitation, especially in tax experiments. Another limitation regarding generalizability is the use of students as subjects. The use of student subjects may limit the generalizability of the results beyond the student groups, although the use of student subjects has been common in most previous tax experiments (e.g., Beck et al., 1991). Also, as we use the American subjects, it is an open question whether the results can be generalized in Korean tax setting. Finally, the experimental tasks used in this study were simple, and parameters were usually higher than those in most actual tax settings.

The findings from this study have potential policy implications. Policy makers may be able to reduce or prevent the negative effect on tax revenues of a tax rate increase (due to increased evasion) not only by appealing to economic sanctions but also by explicitly demonstrating to taxpayers the benefits of their tax payment. Given the observation that there are two types of taxpayers whose reporting decisions are differently affected by perceived exchange equity, it is beneficial for the government to understand the process of how taxpayers perceive equity in exchange relationship with the government and also the characteristics of the taxpayers whose tax reporting behaviors are more likely influenced by perceived exchange equity.

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