THE ECONOMIC PSYCHOLOGY OF TAX COMPLIANCE: THE EFFECTS OF SEQUENTIAL INFORMATION AND ECONOMIC FACTORS

Gudono

Universitas Gadjah Mada

ABSTRAK

Kompleksitas urusan pajak yang tinggi dan faktor ekonomi bisa menyebabkan ketidaktaatan pembayar pajak. Paper ini melaporkan tiga eksperimen yang meneliti faktor-faktor tersebut secara simultan dalam kerangka belief revision theory (Einhorn & Hogarth, 1985; Hogarth & Einhorn. 1989). Di samping itu, penelitian ini memperluas temuan sebelumnya dengan meneliti pengaruh perubahan keyakinan (belief revision; pada keiaaian membayar pajak. Hasil eksperimen menunjukkan bahwa penyajian informasi secara berurutan dan konsisten punya pengaruh kecil pada perubahan keyakinan Relief revision; seseorang, sedangkan penyajian informasi secara campuran fmixedj punya pengaruh yang signifikan terhadap perubahan keyakinan (belief change; individu lentang keiaaian pajak. Di samping hasil tersebul, penelitian ini juga menemukan bahwa perubahan keyakinan pembayar pajak berpengaruh pada ketaaiannya dalam membayar pajak, namun pengaruh tersebut lergantung juga pada pengaruh reinforcer ratio. Temuan-temuan tersebut menunjukkan bahwa pengambilan keputusan yang kompleks, seperti halnya ketaatan dalam membayar pajak, tidak bisa hanya diamati dari sudut psikologi kognilif ataupun behavioral, melainkan harus dilihat dengan dua perspektif tersebut sekaligus.

1. INTRODUCTION

Taxpayer noncompliance remains a national problem. The IRS (1988) estimates that approximately 54 percent of taxpayers have engaged in some form of noncompliance. The dollar value of the underreported federal income tax for 1987 was $83-94 billion (IRS, 1990).

Noncompliance may result from a variety of factors ranging from probability of audit to complexity of tax law (Milliron & Toy, 1988; Schepanski & Shearer, 1995). Previous studies .have not provided consistent findings regarding the effect of tax law variables on compliance behavior (Milliron & Toy, 1988). Both complexity of tax law (Kaplow, 1996) and economic reasons (e.g., increasing tax rale see Louis, 1996

or audit rate see Ghosh & Crain, 1993) can be responsible for the underreporting income tax. This suggests that thorough study in taxpayers' noncompliance should simuiianeously investigate the effect of information processing and economic factors on tax payers' behavior.

Alm (1991) indicates that tax compliance is a complicated decision. We argue that, as the result of complexity of tax law, taxpayers may process various attributes of tax law variables in a sequential manner (see also Pei et al 1992 for tax professionals). Because the majority of previous research does not adopt sequential information processing, it may fail to capture the whole process of compliance behavior. Hogarth and Einhorn's belief revision theory is one of theories that explain sequential information processing and this study adopts Hogarth and Einhorn's (1989) belief revision theory to study tax payer information processing. At the same time, this also serves as a test whether the application of the belief revision theory can be extended to individual tax compliance research.

Even though belief revision theory has found support from at least two studies (Ashton & Ashton 1988; Pei *et al*, 1990), its link to actual, behavior is rarely investigated. Further, studies of this link usually employ an indirect measure of individual's action such as asking whether a certain action is justified (Dillard *et al*, 1991). In the present study, tax payers' decisions are measured directly based on the amount of tax they paid. We hypothesize that the effect of belief change on tax payers' behavior is contingent on the ratio of some economic factors. It is also expected that knowledge about the impact of belief change on actual behavior will clarify the relevance of the belief-adjustment model for studying human individuals decision.

2. THEORETICAL OVERVIEW AND HYPOTHESES DEVELOPMENT

2.1. Belief Revision

Research in both psychology and in accounting indicates that, as the level of complexity and uncertainty increases, decision makkers tend to process information

using simpler mechanisms, known as heuristics (Tversky & Kahneman, 1974). One common heuristics is anchoring and adjustment1. Much of daily life actually consists of the "anchoring and adjustment" process. For example, auditors usually collect evidence across time and integrate information from the new evidence to form judgments. Given this illustration, a relevant important question is how additional new information affects decision outcomes.

Descriptive models for step-by-step information processing were developed in the context of belief revision theory (Einhom & Hogarth, 1985; Hogarth & Einhom, 1989). The models presume that people handle belief updating tasks by a general, sequential anchor-ing-and-adjustment process. It is assumed that people anchor initial opinions on the first piece of evidence presented, and then adjust this for the impact of succeeding pieces of evidence. The models can be written as follows:

$$S_k = S_{k-1} + wk[s(x_k).R] \quad (1)$$

where

S_k = strength of belief after evaluating k pieces of evidence (0 Sk 1)

S_{k-1} = anchor or prior opinion. The initial strength of belief is denoted SO.

$s(x_k)$ = subjective evaluation of the kth piece of evidence.

R = the reference point or background against which the impact of the kth piece of evidence is evaluated.

wk = the adjustment weight for the kth piece of evidence.

The model suggests that encoding is adaptive and reflects the purpose for which beliefs are revised (Hogarth & Einhorn, 1989). Therefore, the adjustment weight, wk, should depend on the valence of the impact of the evidence (i.e., $s(x_k)$-R) and the level of the anchor (i.e., Sk-1). Hogarth and Einhom theorize that the relationship between wk and anchors would be as follows.

$$w_k = \alpha S_{k-1} \text{ when } s(xk) \leq R \text{ (negative evidence)} \quad (2\,a)$$

$$rk = \beta(1\text{-}Sk\text{-}l) \text{ when } s(xk) > R \text{ (positive evidence)} \quad (2b)$$

Where α and β are sensitivity to new information and their values are constants, rk plays the same role as wk (weight).

These models lead to a *contrast or surprise effect*. This means that a larger anchor S_{k-1} (a strongly held belief) will experience a larger adjustment weight for additional negative evidence, but a smaller adjustment weight for additional positive evidence. Within this context, *negative evidence* is information that reduces the strength of individuals' belief about compliance (e.g., a higher tax rate or perceived unfairness of tax law). On the other hand, positive evidence is information that strengthens individuals' belief about compliance (e.g., an audit rate or a penalty rate). Based on these two predictions, the first two hypotheses are written in alternative forms as follows.

H1 : In sequential processing, weakly held beliefs wili be increased more than strongly held beliefs when a taxpayer receives consistently positive information.

H2 : In sequential processing, weakly heid beliefs will be reduced less than strongly held beliefs when a taxpayer receives consistently negative information.

Hogarth and Einhom (1989) argue that when people encode new information as negative or positive relative to the hypothesis under consideration, R would be zero. Hence, by substituting equation 2a to equation l, when R=0 we find that

$$Sk = Sk\text{-}l\ (l\text{-}s(xk)] \qquad (3a)$$

When k=2, equation 3a can be expanded to

$$S2 = S0[l\text{-}s(xl)][1\text{-}s(x2)] \qquad (3b)$$

The same process can be done also for equation 2b and we find

$$S2=S0 + \beta(l\text{-}S0)[s(xl)+ s(x2)- \beta s(xl)s(x2)] \qquad (3c)$$

Note that since multiplication and addition are commutative[2], the value of S2 will not change if the order information presentation is changed. Hence, there will be no order effect in consistent information presentation. In other "words, the effect of SW order (i.e., strongly perceived evidence followed by weakly perceived evidence)

and WS order (i.e., weakly perceived evidence followed by strongly perceived evidence) will be relatively the same. This leads to the next two hypotheses (written in null form).

H3 : In sequential processing, the effect of SW order will not be significantly different from that of WS order when a taxpayer receives consistently positive information.

H4 : In sequential processing, the effect of SW order will not be significantly different from that of WS order when a taxpayer receives consistently negative information.

When people process different types of evidence (e.g., negative information followed by positive information, known as *mixed* information), Hogarth and Einhorn (1989) predict that the step-by-step process (with R= 0) leads to an order effect, in particular recency effect (the individual putting greater weighl on later information than on earlier information). Suppose that strength of belief after processing negative evidence followed by positive evidence is denoted as S(-+), and *vice versa*, then an order effect may bedefined as follows.

$$D = S(-+) - S(+-) \quad (4a)$$

This can be written

$$D = [S0-wls(x-) + r2s(x+)]-[S0+rls(x+)-w2s(x-)]$$
$$= s(x+)(r2-rl)+s(x-)(w2-wl)$$
$$= \beta s(x-)s(x+) \quad (4b)$$

Thus, unless the individual is insensitive to new information (which means that. = 0 or 8=0). D would be greater than zero. Based on this argument, the fifth hypothesis is written in alternative form as follows.

H5 : When taxpayers receive mixed information sequentially, those who receive [-+] order of treatment presentation will show greater belief at the second stage than those who receive [+-] order of treatment presentation.

Some studies which tested the effect of belief revision on individuals behavior did not find significant results. For instance, Dillard et al., 1991 found that mixed information presentation does not have significant impact on individual decision. However, we speculate that belief revision may not be the only factor that influence behavior. Prior studies in compliance behavior found that taxpayers are also influenced by some type of reinforcers. For instance, high and low noncompliance are related to declining audit rate and an increase in penalty rate (Witte & Wcodbury, 1985; Richard & Tittle, 1981).

Literature in reinforcement theory argues that individuals' relative choice of a behavior is determined by the reinforcers ratio of those choices (Rachlin, 1976; Rachlin et al., 1986; Redmon & Lockwood, 1986). Further, the effect of reinforcers may not be linear (Rachlin, 1976). Instead, it is influenced aiso by individuals' bias and sensitivity toward reinforcers (Rachlin, 1976). In this study we conjecture that cognitive factors such as belief change determines bias and sensitivity, the effect of belief revision is contingent upon the effect of reinforcer ratio. Given this relationship, we develop the sixth hypothesis as follows.

H6 : Taxpayers compliance level is affected by their belief change, but this effect is contingent upon the relative reinforcer ratio.

3. METHOD

3.1. Subjects

Three experiments were conducted. Fifty undergraduate and ten graduate students in business from a large state university participated in these experiments for pay. Thirty seven subjects participated for the first and the second experiments, while twenty three subjects participated in the third experiment. The payment was contingent upon subjects' choices; specifically (1) the amount of tax they declared and (2) whether or not they cheated and were caught. They consisted of twenty females and forty males, fifty-two participants majoring in business and management,

mean age 24 years. On average, they believe that about 53 percent of Americans cheat on their tax filing.

3.2. General Procedure

The hypotheses were tested in a series of experimental settings that manipulated the order of information presentation and the strength of initial anchors. Six different versions of a computer program were developed to process information and collect data. These computer programs contain cases of individual income tax.

The first four programs were used in experiment one and two, while the last two programs were used in experiment three. Accounting and psychology faculty and Ph.D. students helped evaluate the computer program and eight undergraduate students participated in a pilot study. Responses from this pilot were analyzed to improve the reliability of the treatment variables. Based on this, the following categorization of strong (S) and weak (W) information of each variable was made as shown in Table 1: 80 and 25 percent (audit rates), 75 and 20 percent (penalty rates), 50 and 25 percent (tax rates), 75 and 10 percent (unfairness level), 80 and 25 percent (the compliance levels - anchors). Audit rate and penalty rate serve as positive information (i.e.. they are expected to increase compliance), while increase in tax rate and unfairness level serve as negative information (i.e., they are expected to reduce compliance).

Variabel	Level		Valence
	High	Low	
Audit rate	80%	25%	Positive
Penalty rate	75%	20%	Positive
Unfairness	75%	10%	Negative
Tax rate	50%	25%	Negative
Compliance	80%	25%	Not applicable

Subjects were randomly assigned to use one of the six computer programs. Those who used the first to fourth computer programs performed two cases and those who used the fifth and sixth computer programs performed only one case.

In the program's introduction subjects were asked to assume that they lived in a fictitious country called NIRVANA whose currency was named BOS (B). A fictitious country was used to eliminate confounding effect between treatments (e.g.. tax rale) that are used in this study and the U.S. taxation. Each subject was told that s/he would be paid B40.000 (equivalent to $10) less an applicable tax. They were also told that the tax law of the fictitious country required them to disclose and pay a twenty percent income tax. However, they could choose either to comply with the tax law or not. If they did not comply and were caught cheating, they were told that they would be charged a penalty in addition to the tax due. Initially, they were told that the penalty rate was ten percent. The money left after taxes and penalties, if applicable, was paid in dollars at the end of the exercise. This *contingent* payment provided a direct measure of each participant's compliance behavior.

Experiment one. To test the effect of order and anchor in consistent positive information presentation, experiment one was performed. Thirty seven subjects participated in this experiment, where order and anchor were manipulated across subjects. There were four groups of subjects in which the first group (n=8) was given high anchor (i.e., subjects were told that the current compliance level is eighty percent) and weak-strong (i.e., 25% audit rate followed by 75% penalty rate) order. The second group (n = 11) received high anchor and strong-weak (80% audit rale and 20% penalty rate) order. The third group (n = 9) was given low anchor (25% compliance rate) and strong-weak order. The fourth group (n = 9) was given low anchor and strong-weak order. Every after these groups received each of the information, these questions were asked:

(1) "Given this information, how likely do you think it is that taxpayers will comply with the Nirvana tax law?" and

(2) "Recall, you will receive B20,000 (before tax) for participating in this exercise and the Nirvana government requires you to determine or declare your tax. Now, write the amount of tax you are willing to pay?"

Experiment two. Similar to experiment one, in the second experiment thirty seven subjects participated and order as well as anchor was manipulated across subjects. However, in this experiment instead of receiving positive information (something that will increase tax compliance), each subject received negative information (variables that will reduce the compliance -- i.e., perceived unfairness level and an increase in tax rate). This experiment is needed to test the effect of anchor and order when subject receive consistently negative information. There were four groups. The first group (n = 8) was given high anchor (80% compliance level) and weak-strong (i.e. 10% public perceived unfairness level and 50% new tax rate) order. The second group (n= 11) received high anchor and strong-weak (i.e., 75% perceived unfairness level and 25% new tax rate). The third group (n = 9) received low anchor (i.e., 25% public compliance level) and weak-strong order. The fourth group (n = 9) was given low anchor and strong-weak order. After subjects received each of the information, they were asked the same questions as those in experiment one.

Experiment three. Experiment three was used to test hypotheses five and seven. Twenty three subjects were participated in this experiment. Information order was manipulated, in which the first group (n = 9) was given a [+-] (i.e., 80% audit rate followed by 50% new tax rate) order and the second group (n = 14) was given (-+] (i.e.. 50% new tax rate followed by 80% audit rate) order. Since the belief revision does not have a specific prediction regarding the effect of anchor in mixed presentation, anchor was not varied (i.e., it was maintained at 25% compliance level). After subjects were given each of the information they also asked similar question as those in the first two experiment.

3.3. Measures

For tests of hypotheses one to five, subjects' belief revision served as the dependent variable. To measure this variable, two pieces of evidence were presented sequentially in two windows. Belief revision was measured by subtracting SO (i.e., *the anchor* or initially held belief -- initial information about the compliance level) from S2 (subject's belief strength after the second evidence was received), simmilar to that in Hogarth and Einhom (1989). The independent variables were order and anchor. Order was a categorical variable, i.e., either SW (strong information followed by weak information) or WS (weak information followed by strong information). Anchor is also categorical, i.e., either high anchor or Sow anchor.

Besides the SW and WS categorization, information order may also be categorized as [+-] order (i.e., positive information followed by negative information) or [-+] order (i.e., negative information followed by positive information). The later categorization is especially useful to test the recency effect of mixed information presentation.

To test the effect of belief revision on individual behavior (compliance level), the authors used three other measures, i.e., COMPL (compliance level), RfA (the non-compliance behavior reinforcer), and RfB (the compliance behavior reinforcer). They are defined as follows.

COMPL = Tax paid/ TAX (5)

if AUDIT is NA.then Rfa

= (1+(PR/100))*TAX (6a)

Rfa =

Otherwise, Rfa

= (l+(PR/100))*TAX*(AUDIT/100) (6b)

if UNFAIR is NA, then Rfb = TAX (7a)

Rfb =

Otherwise, Rfb = (l+UNFAlR/100)*TAX (7b)

Where,

TAX = the correct amount of taxes the subject should pay.

Tax paid = the amount of money that subjects really paid after they received the second information in each trial.

AUDIT = The probability the subject will be audited and caught

NA = Not applicable (meaning that the subject does not receive the treatment)

PR = Penalty rate

UNFAIR = Information about the percentage of population that says that the tax law is unfair.

Note that either Rfa or Rfb is defined based on their "punishing effect."[3] For instance, in equation 6a, if a subject decides not to underreport his/her income, the punishment value (Rfa) of this noncompliance behavior will be total tax plus penalties. In equation 7b it is assumed that the unfairness treatment will increase the value of the perceived burden of complying with the tax law. Hence, the punishment value of compliance behavior will be (1 + unfairness level of the tax) x total tax. It is expected that the greater the reinforcer ratio (Rfa / Rfb), the greater the compliance rate (COMPL),

4. RESULTS

Experiment One. For the instance of consistent positive information presentation, belief revision theory predicts that smaller anchors are increased more than are larger anchors (a contrast/surprise effect) and that there is no order effect. To test this prediction a 2 x 2 (anchors by order) ANOVA is conducted. In this test an audit rate and a penalty rate were used as the positive information. Each of these factors is classified into "high" and "low". When subjects received low anchor, the mean belief revision is 47 (see also Figure 1). On the other hand, when subjects received high anchor, the mean belief revision is 3.3. The ANOVA results indicate

that the effect due to size of anchor is significant (F= 24.01, 0= .0001, df= 1, 36). Further, mean belief revision in the SW order is 27.389 and that in the WS order is 19.364. The difference is not significant (F= 0.9, p= .3703, df= 1, 36). The interaction effect between anchors and order on belief revision is not significant (F= .22, p= .64, df = 1,36), Anchor explains about 37 percent (ω^2) of the variance, while order explains only 2.9 percent of the variance.

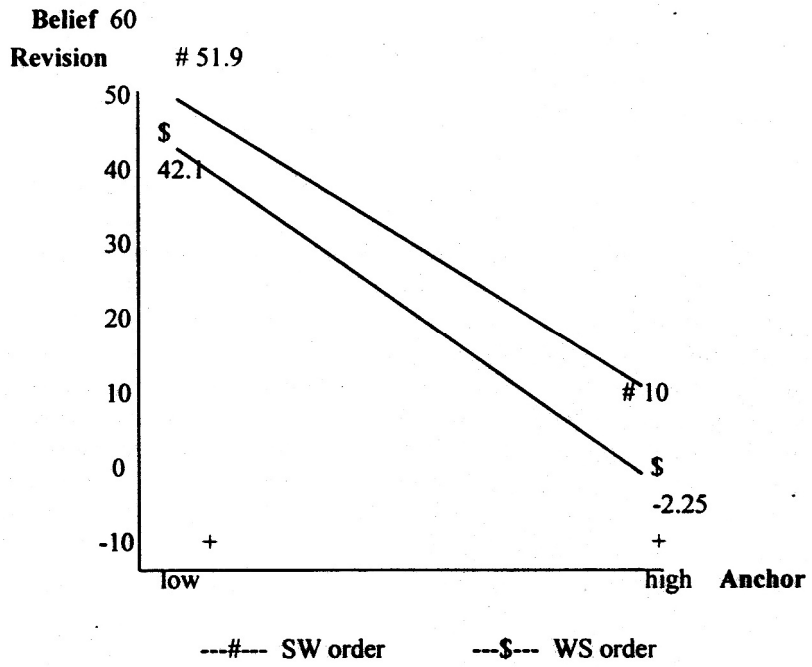

Figure 1. Anchor Effect (Positive Informasion)

Experiment Two. Weakly held beliefs will be reduced less than strongly held beliefs (F=24.47, p < 0.01, df = 1, 36). In addition, the effect of SW order is not significantly different from that of WS order (F = 1.89, p>.2, df= 1, 36). When subjects received low (high) anchor, for the SW order their belief revision is 30 (-19.8). On the other hand, for the WS order, their belief revision is 14.7 (-22.4) after they received low (high) anchor. Anchor explains 40 percent of the variance (ω^2), while order explains only 3.7 percent of the variance. The direction of relationship between anchors and belief revision is confirmed in figure 2. The interaction effect of these two variables is not significant (F= .75, p= .3934, df= 1,36).

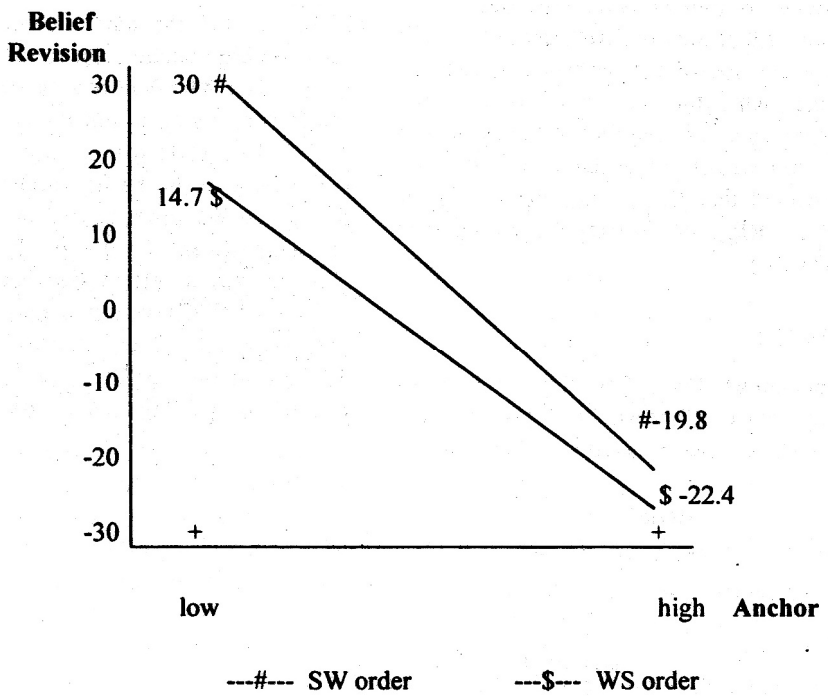

Figure 2. Anchor Effect (Negative Informasion)

Experiment Three. Hypothesis five predicts the effect of mixed information presentation on belief revision. In particular it is expected that individuals with [-+] order will show greater belief at the second stage (S2) than those with [+-] information order presentation. To test this hypothesis a new variable called recency is introduced. Recency is coded one if the subject receives [+-], otherwise it is coded zero. Results from a one-way ANOVA show thal the recency effect is significant at p=0.009 (F = 8.57, df = 1, 18) and recency explains more than 34 percent of variance ((ω^2). The direction of point-biserial correlation between belief revision and recency effect is also confirmed (R = -0.568, p = 0.009, see also figure 3).

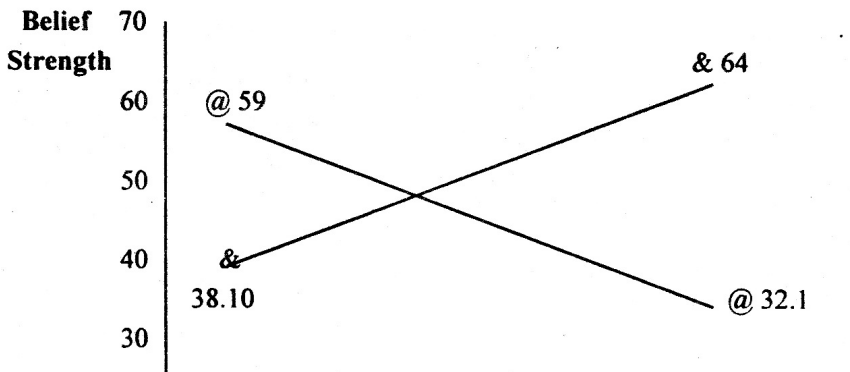

Figure 3. Recency Effect (Mixed Informasion)

Hypothesis six conjectures that cognitive aspect may mediate the effect of environmental factors (i.e., reinforcers). It is quite possible that the result of an individual evaluation of the effect of his/her behavior (i.e., rewards or punishments) shapes parts of overall attributes of the compliance behavior. If belief revision strengthens the attribute of tax compliance, this will increase the probability of tax compliance. On the other hand if the belief change goes to the direction that reduce the strength of the attribute, the result will be reduction in the probability of tax compliance, in other words, the effect of the reinforcement rate is contingent upon changes in belief. To test this hypothesis, belief revision (BR) was classified into positive belief revision (BR) and non-positive BR and then the following regression model was drawn :

COMPL = a + b 1. BEL + b2 REIN + b3.[BEL*REIN] (8)

Where, BEL = 1 if BR > 0 and BEL = 0 if eise

REIN is reinforcement rate (RA/RB) a is the intercept

bl ... b3 are the regression coefficient.

The results show that all of the regression coefficients are significant (BEL = .609. p= .0034 and REIN= .5607, p = .0009). The fact that the interaclion variables (BEL*REIN) is significant (a = .248. p = .043) indicates that compliance behavior is jointly effected by both the environmental factor (reinforcer rate -REIN) and cognitive aspect (BEL). In other words, the effect of reinforcer ratio on taxpayers' compliance level (COMPL) is contingent upon other factor (i.e., belief revision - BEL), *vice versa*.

5. CONCLUSIONS, LIMITATIONS,AND POLICY IMPLICATIONS

The present study extends the belief revision models (Einhom & Hogarth, 1985; Hogarth and Einhorn, 1989) to the context of taxpayer compliance. From these results il may be advanced that like tax professionals, individuals tax payers process tax-related information sequentially (e.g., Pei, Reckers, & Wyndelts, 1992). Results from this study confirm prior research results (e.g., Ashton & Ashton, 1988) that the initial position of individual's belief plays a significant role in their belief revision process (Hogarth & Einhoro, 1989).

Most psychologists accept a cognitive approach as useful only for the study of perception, attention, memory, and thinking (Kreitler & Kreitler. 1976). They do not yet consider the possibility that cognitive processes act as a major determinant of human behavior. On the other hand, behaviorisls often reject the notion that the inner state (i.e.., cognitive aspects) is a relevant factor in a functional (causal) analysis. They argut that we cannot account for the behavior of any system while staying wholly inside it (Pinder. 1986). If is interesting to note, however, that the evidence from this research seems to support a linkage between cognitive processes and human behavior.

Since, in this study the individual's actual behavior (i.e., paying taxes) was observed and analyzed in conjunction with the way the individual processes information about the tax compliance variables (e.g., the tax rate and the penalty rate), this study allows the authors to further test the effect of the belief revision on

compliance behavior. Contrary to the results of Dillard et al. (1991), evidence from this study suggests that belief revision (i.e., a cognitive aspect) can be an influential behavior determinant when it is considered in conjunction with environmental behavior reinforcers. Further, this conclusion could probably explain why prior research in tax compliance thal adapts only one paradigm (i.e., either the cognitive aspect or environmental factors) fails to provide consistent findings about the cause of noncompliance behavior (summarized in Milli-ron&Toy, 1988).

6. LIMITATIONS

There are some limitations in this study that provide opportunities for improvement in the future. The first is its small sample size (sixty participants). The effect of small sample size could be that the statistical conclusion validity of all results of this study is relatively low. Secondly, the fact that this study employed students, rather than true taxpayers, would somehow limit the external validity of the results. The use of real taxpayers, such as business entrepreneurs or employees, should increase its validity. However, White *et al.* (1993) found that the use of undergraduate business students as surrogates for experienced taxpayers appears to be appropriate for analyzing the relative effects of behavioral variables on tax compliance decisions. The third is that this study did not employ a within person repetition. This factor makes it impossible to study the effect of "history" or "learning" that is sometimes cruciai in any behavioral study. For example, it is possible that taxpayer compliance is also influenced by their *real* experience of being caught. If this is the case, then this study has failed to capture the "learning" aspect of taxpayer behavior.

7. POLICY IMPLICATIONS

These findings may have some tax policy implications. Since, on average, subject's belief about taxpayer noncompliance is relatively high (51%), public tax education that consistently provides negative information, such as higher audif or

penalty rates, would be expected to significantly weaken taxpayers" belief about the high noncompiiance rate. This research also indicates that belief revision and the reinforcer rates of compliance behavior jointly affect individuals' actual compliance rates. Since the tax compliance rate is higher only when people experience both positive belief change and the higher reinforcer rate, a further tax policy implication would be to increase the visibility of higher punishment for noncompliance behavior. Thus through a deft melding of theory from both the cognitive and the behavioral domains, it may be possible ti gain a better understanding of noncompliance and also provide useful knowledge for those working in the realm of tax compliance.

8. FOOTNOTES

1. Others may include representativeness and availability (Tversky and Kahneman (1974).
2. Proof of commutativity; s(xl)+s(x2)= s(x2)f s(xl) and s(xl)s(x2)= s(x2)s(xl)
3. If punishment is defined as the consequence that decreases the probability of the behavior it follows (Skiner, 1953, p. 185), then Rfa is the value of the punishment of noncompliance behavior (if they dare to do so). Rfb is the value of punishment of compliance behavior.

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