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Personal Income Tax Evasion Determinants Revisited: An Exploratory Study Using Newly Available Data

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Abstract

In 2010, the IRS released a series on tax evasion running through 2005. Using these data, the *most current available* from the IRS, this study investigates the impact on tax evasion of income tax rates, IRS audit rates, the unemployment rate, the public's approval rating of the President, the Tax Reform Act of 1986, and two variables previously unstudied in a time-series context, namely, the percentage of filed tax returns having itemized deductions and the interest rate on three year Treasury notes. All of these factors are found to exercise statistically significant influences over personal income tax evasion over the study period 1976-2005.

Introduction

It has been known for some time that U.S. households admit to holding only a small fraction, about 15 percent, of the supply of U.S. currency held outside of financial institutions (Cagan, 1958; Bawley, 1982; Carson, 1984; Pyle, 1989; Feige, 1994; Cebula, 2001). It is also known that that some portion of this unaccounted-for currency is held overseas whereas some sizable portion is held domestically and used for transactions involving incomes unreported to the IRS (Feige, 1994; Cebula, 2001; Ledbetter, 2004). This activity is known as the "underground economy hypothesis" (Feige, 1994). The latter hypothesis has in fact led to the evolution of a body of literature addressing income tax evasion. Income tax evasion effectively consists of taxable income that is either unreported or underreported to the IRS, although it also can consist of spurious or inflated tax deductions.

Studies of income tax evasion behavior essentially fall into three categories. First, there are the principally theoretical Models of tax evasion behavior, such as Allingham and Sandmo (1972), Falkinger (1988), Klepper, Nagin, and Spurr (1991), Das-Gupta (1994), Pestieau, Possen, and Slutsky (1994), Caballe and Panades (1997), and Gahramanov (2009). Such studies are often elegant mathematically and in many cases identify variables that *theoretically may* affect tax evasion. However, such studies tend to provide limited guidance regarding the expected magnitudes of the effects of variables they Model.

Second, there are a number of studies that either (a) use questionnaires or (b) undertake experiments, such as Spicer and Lundstedt (1976), Spicer and Thomas (1982), Baldry (1987), Thurman (1991), and Alm, McClelland, and Schulze (1999). These studies are of course empirical in nature, deriving the data largely (if not entirely) from the experiments. Certain of these studies indicate an aversion to the prospect of being audited while others reveal a lack of such risk-averse behavior; still others imply that taxpayers may be averse to tax evasion on moral grounds. Additionally, the incentive provided by higher marginal income tax rates to evade taxation by underreporting income is also revealed in various such studies.

Third, there are those studies that largely or in some cases exclusively adopt what is referred to as "official data," data obtained from the IRS (or its counterpart outside of the U.S.) and/or some other "official," i.e., "government" source. Among the types of information thusly obtained and analyzed are data on tax evasion, tax rates, and audit rates. Such studies endeavor typically to estimate either the size of the "underground economy" or the aggregate degree of tax evasion or to identify the determinants of same (Tanzi, 1982, 1983; Clotfelter, 1983; Carson, 1984; Long and Gwartney, 1987; Pyle, 1989; Feinstein, 1991; Erard and Feinstein, 1994; Feige, 1994; Cebula, 2001, 2004, 2008; Ali, Cecil, and Knoblett, 2001; Ledbetter, 2004; Connelly, 2004; Christie and Holzner, 2006; Alm and Yunus, 2009; Cebula and Coombs, 2009).

Within the latter context, this exploratory study seeks to add to the rich literature on income tax evasion by empirically investigating determinants of aggregate federal personal income tax evasion in the U.S. using the *most current data available* from the IRS. To date, the empirical literature has effectively failed to investigate determinants of aggregate income tax evasion in the U.S. for recent years; indeed, except for a *single*, somewhat narrowly focused study that investigated tax evasion and government-spending-induced budget deficits through the year 2001 (Cebula and Coombs, 2009), the most recent year considered in the tax-evasion-determinants literature is in fact 1997 (Cebula, 2008; Ali, Cecil, and Knoblett, 2001; Alm and Yunus, 2009). However, the IRS (2010) has very recently released new *time-series* data on tax evasion running through the year 2005. Using these and other new data derived by the IRS (2009A; 2009B; 2010), the present study seeks to identify key personal income tax evasion determinants through the year 2005.

In addition to investigating the effects of the most commonly recognized factors that allegedly influence personal income tax evasion, such as income tax rates and IRS audit rates, this study also investigates the potential impacts of the unemployment rate, the public's job approval rating of the President, and the Tax Reform Act of 1986. Furthermore, this project examines the potential tax evasion impacts of two variables previously unstudied in a purely *time-series* context,

namely, the percentage of filed tax returns that include itemized deductions and the interest rate yield on three year U.S Treasury notes. Interestingly, all of these factors are found to be statistically significant influences over the aggregate degree of federal personal income taxation over the 30 year period from 1976 through 2005, the most recent several years of which have not been previously investigated.

The framework for the empirical analysis is presented in the next section of this study. The formal empirical analysis is provided in the subsequent section of the study. Finally, the closing section provides an overview of the study findings.

Framework for the Analysis

In this study, the *relative* probability that the *representative* economic agent will *not* report his/her taxable income to the IRS is treated as positively impacted by (an increasing function of) the expected gross benefits to the agent of not reporting income, *eb*, and as negatively impacted by (a decreasing function of) the expected gross costs to the agent of not reporting income, *ec*. Thus, the ratio of the probability of not reporting income to the IRS, *pnr*, to the probability of reporting income to the IRS, (1-*pnr*), is described for the representative economic agent by:

$$pnr/(1\text{-}pnr) = f(eb, ec), f_{eb} > 0, f_{ec} < 0. \quad (1)$$

Expressing probabilities in *relative* terms such as shown in equation (1) possesses the virtue that it thereby reflects the form of the available tax evasion data, i.e., data where (as described below) the aggregate degree of federal personal income tax evasion is expressed in relative terms (IRS, 2010).

As already observed, the gross expected benefits from *not* reporting income to the IRS are hypothesized to be directly related to the federal personal income tax rate (Cagan, 1958; Bawley, 1982; Tanzi, 1982; Clotfelter, 1983; Pyle, 1989; Feige, 1994). To reflect the federal personal income tax rate, most previous studies using official data for the U.S. have adopted either of two alternative measures: an average effective federal personal income tax rate (*ATR*) or the maximum marginal federal personal income tax rate (*MAXT*). In this study, the *MAXT* measure of the income tax rate is adopted because, as argued in Feige (1994), this tax rate is likely to be a more representative measure of the overall tax burden of the personal income tax rate than *MAXT* would be. Accordingly, it is hypothesized, *ceteris paribus*, that:

$$eb = g(ATR), g_{ATR} > 0. \quad (2)$$

The Tax Reform Act of 1986 [*TRA*] may have been perceived by at least some portion of the general public as an honest, good faith effort to reform, i.e., to simplify and increase the equity of the Internal Revenue Code. As Musgrave observed (1987, p. 59), "The Tax Reform Act of 1986 is the most sweeping reform since the early 1940s..." Indeed, the *TRA* did introduce a number of reforms, many of which are outlined in broad terms in Ott and Vegari (2003), Barth (1991), and Sanger, Sirmans, and Turnbull (1990). For example, as observed in Ott and Vegari (2003, p. 279), "The Act introduced major cuts in the personal tax rate. When fully effective, only two tax brackets, set at 15 and 28 percent, were to replace the 14 bracket tax schedule with rates in the range of 11 to 50 percent...[while it] broadened the tax base by reducing the itemized deduction." Musgrave (1987, p. 59) further observes that prior to the *TRA*, a slow erosion of the income tax base had been occurring. Musgrave (1987, p. 57) was particularly dismayed by the widening of tax loopholes and the emergence of high income tax shelters that had "...gained momentum in recent years and undermined the public's faith in the income tax." In this vein, Barth (1991) and Sanger, Sirmans, and Turnbull (1990) describe how the *TRA* decreased depreciation benefits from financial investments in residential as well as commercial real estate, established limitations on the tax deductibility of losses from "passive" investments that affected limited partnerships syndications (including those involving real estate ventures), and terminated favorable capital gains treatment of real estate. Musgrave (1987, p. 59) also expressed concern that the "...compounding of the investment tax credit and accelerated depreciation diluted and distorted the base of the corporate income tax." Musgrave (1987, p. 59) asserted that the *TRA* "...reversed these trends, a major accomplishment that all reformers will welcome." Based on Musgrave's (1987) arguments, then, it is expected in the present study that taxpayers might well have favorably regarded the *TRA* and been less resentful of the Internal Revenue Code than before, at least initially. Thus, it is hypothesized here that during the time frame when the *TRA* was enacted and became fully effective (1986-1987) and also received the greatest publicity, reduced taxpayer resentment of the federal income tax system/Internal Revenue Code would/could, at least temporarily, have resulted in a reduced degree of tax evasion, *ceteris paribus*. The reason this reaction to the *TRA* might be only *temporary* is revealed in the words of Slemrod (1992, p. 45), who argues that it would take at least some time for taxpayers "...to learn about and adjust to the new law [the *TRA*]." Consequently, it is hypothesized here that, for the period 1986-1987, the aggregate degree of federal personal income tax evasion was reduced. Accordingly, (2) above is replaced by (3):

$$eb = j(ATR, TRA), j_{ATR} > 0, \; j_{TRA} < 0. \quad (3)$$

Next, this study seeks to inquire further into an issue studied by Alm and Yunus (2009), who examined a cross-state panel of *individual* income tax returns for the period 1979-1997. In spirit following Alm and Yunus (2009) but dealing with *aggregate time-series* data rather than a panel of individual tax returns, the present study empirically investigates the impact of itemizing deductions on income tax returns on the propensity to engage in income tax evasion. Arguing that the presence of itemized tax deductions would make any individual tax return more complicated for the IRS to investigate or challenge and hence arguing that such itemized deductions created a potential *opportunity* for *individuals* to engage in increased tax evasion, Alm and Yunus (2009) found modest empirical evidence that this factor potentially raised the degree of income tax evasion. This factor has not previously been considered in the related empirical *time-series* literature. Consequently, in order to help fill this potentially important omission, in the present study, it is also hypothesized that the greater the percentage of personal income tax returns *in the aggregate* that includes itemized tax deductions on Form 1040, Schedule A [*PCTITEM*], the greater the expected benefits from itemizing deductions and hence the greater the degree of personal income tax evasion, *ceteris paribus*. Based on this expectation, (3) is replaced by (4):

$$eb = j(ATR,\ TRA,\ PCTITEM),\ j_{ATR} > 0,\ j_{TRA} < 0,\ j_{PCTITEM} > 0. \tag{4}$$

Next, based on Alm and Yunus (2009), Gahramanov (2009), and Cebula and Coombs (2009), it is expected that the higher the unemployment rate [*UN*], the greater the expected benefits of personal income tax evasion, *ceteris paribus*. This is based on the reasoning that the higher the unemployment rate, the greater the extent to which the unemployed work in the "underground economy" and hence do not report income. Furthermore, this effect may be reinforced to the extent that a higher unemployment rate creates an incentive even for still-employed people to avoid taxes to the degree that they try to covet extra funds (by under-reporting income) in *anticipation* of a *possible future* lay-off (Alm and Yunus, 2009; Gahramanov, 2009; Cebula and Coombs, 2009). As a result, equation (4) is expanded to equation (5):

$$eb = j(ATR,\ TRA,\ PCTITEM,\ UN),\ j_{ATR} > 0,\ j_{TRA} < 0,\ j_{PCTITEM} > 0,\ j_{UN} > 0. \tag{5}$$

Additionally, there is the issue of the public's job approval rating of the President [*APPROV*]. Following the study of the period *prior to 1998* by Cebula (2008), it is argued here that the higher the public's job approval rating of the President's performance in office, the greater the degree to which there is satisfaction with the President's actions and policies. The latter can be interpreted, at least to some degree, as implying less public resentment towards or greater approval of his various spending and/or tax policies (as well, perhaps, as his other policies). Similarly, the lower the public's job approval rating of the President, the greater the degree to which the public is likely to be dissatisfied with the President's actions and policies. In turn, it can be reasonably argued that the latter can be interpreted, to at least some extent, as implying greater resentment of or less public support of his various spending and/or tax policies (as well, perhaps, as his other policies). Stated somewhat differently, the lower the level of *APPROV*, the greater the *subjective benefits* ("secondary gain") from personal federal income tax evasion, whereas the higher the level of *APPROV* the lower the *subjective benefits* (secondary gain) of personal federal income tax evasion. Based on this symmetrical argument, it is hypothesized that the greater the public's approval rating of the President, the lower the *eb* and hence the lower the aggregate degree of personal income evasion, *ceteris paribus*. Accordingly, equation (5) is transformed into equation (6), as follows:

$$\begin{gathered} eb = j(ATR,\ TRA,\ PCTITEM,\ UN,\ APPROV), \\ j_{ATR} > 0,\ j_{TRA} < 0, j_{PCTITEM} > 0, j_{UN} > 0, j_{APPROV} < 0. \end{gathered} \tag{6}$$

Finally, the second new variable integrated into this *time-series* framework is the interest rate yield on three year U.S. Treasury notes, *THREE*. This is a variable altogether overlooked in previous related empirical studies. It is argued here that the higher the level of *THREE*, the greater the expected benefits (*eb*) from engaging in income tax evasion since the dollars gained from that tax evasion can be invested in higher yielding securities. Alternatively stated, the higher the level of *THREE*, the greater the *opportunity costs of tax compliance*. Obviously, *THREE* is but one usable measure of the *opportunity costs of tax compliance*; for example, the yield on five year or ten year Treasury notes are reasonable alternative such measures. The adoption of THREE was based on the notion that it provides a greater yield than T-bills generally do, whereas it exposes its owner to much less interest rate risk than longer term notes (or bonds). Accordingly, it is hypothesized that the higher the value of *THREE*, the higher the *eb* associated with income tax evasion and hence the higher the aggregate degree of federal personal income evasion, *ceteris paribus*. Consequently, equation (6) is replaced by equation (7):

$$\begin{gathered} eb = j(ATR,\ TRA,\ PCTITEM,\ UN,\ APPROV,\ THREE), \\ j_{ATR} > 0, j_{TRA} < 0, j_{PCTITEM} > 0, j_{UN} > 0, j_{APPROV} < 0, j_{THREE} > 0. \end{gathered} \tag{7}$$

The expected gross costs of not reporting income to the IRS are hypothesized to be an increasing function of the expected risks/costs thereof (Alm, Jackson, and McKee, 1992; Pestieau, Possen, and Slutsky, 1994; Erard and Feinstein, 1994; Caballe and Panades, 1997; Cebula and Coombs, 2009). In this study, to the representative economic agent, the expected risks/costs (*ec*) from not reporting or from underreporting taxable income to the IRS are enhanced by an increase in *AUDIT*, the percentage of filed federal personal income tax returns that is formally audited by IRS examiners, *ceteris paribus*. Indeed, the experience of an IRS tax audit could imply non-pecuniary ("psychic") costs as well as pecuniary costs (including outlays for legal or other representation, along with the value of one's own time) above and beyond any potential added taxes, penalties, and interest assessed by the IRS. In addition, to reflect further the risks associated with tax evasion, the variable *PEN* is included in the Model. *PEN* reflects the average total of interest and other penalties assessed by the IRS per audited tax return. Thus, we have:

$$ec = j(AUDIT, PEN), j_{AUDIT} > 0, j_{PEN} > 0. \tag{8}$$

Substituting from equations (7) and (8) into equation (1) yields:

$$pnr/(1\text{-}pnr) = b(ATR, TRA, PCTITEM, UN, APPROV, THREE, AUDIT, PEN), \tag{9}$$
$$b_{ATR} > 0, b_{TRA} < 0, b_{PCTITEM} > 0, b_{UN} > 0, b_{APPROV} < 0, b_{THREE} > 0, b_{AUDIT} < 0, b_{PEN} < 0.$$

Let *AGI* represent the *actual total value of the aggregate federal adjusted gross income* in the economy, i.e., *AGI=UAGI+RAGI*, where *UAGI* is the dollar size of the *unreported aggregate federal adjusted gross income* in the economy, and *RAGI* is the dollar size of the *reported aggregate federal adjusted gross income* in the economy. It reasonably follows overall that:

$$UAGI = (pnr)*AGI \tag{10}$$

and

$$RAGI = (1\text{-}pnr)*AGI. \tag{11}$$

It then follows that:

$$UAGI/RAGI = (pnr)*AGI/(1\text{-}pnr)*AGI = (pnr)/(1\text{-}pnr). \tag{12}$$

From (9) and (12), substitution for *pnr/(1-pnr)* yields the following Model of aggregate personal income tax evasion:

$$UAGI/RAGI = b(ATR, TRA, PCTITEM, UN, APPROV, THREE, AUDIT, PEN), \tag{13}$$
$$b_{ATR} > 0, b_{TRA} < 0, b_{PCTITEM} > 0, b_{UN} > 0, b_{APPROV} < 0, b_{THREE} > 0, b_{AUDIT} < 0, b_{PEN} < 0.$$

Empirical Analysis

Based on the framework provided in (13) above, the following reduced-form equation is to be estimated:

$$(UAGI/RAGI)_t = a_0 + a_1 ATR_{t-1} + a_2 TRA_t + a_3 PCTITEM_{t-1} \tag{14}$$
$$+ a_4 UN_{t-1} + a_5 APPROV_{t-1} + a_6 THREE_{t-1} + a_7 AUDIT_{t-1} + a_8 PEN_{t-1} + u$$

where:

$(UAGI/RAGI)_t$ = the ratio of the aggregate *unreported* federal adjusted gross income in year t to the aggregate *reported* federal adjusted gross income in year t, expressed as a percent;

a_0 = constant term;

ATR_{t-1} = the average effective federal personal income tax rate in year t-1, expressed as a percent;

TRA_t = a binary (dummy) variable for the years 1986 through 1987, when the Tax Reform Act of 1986 was initially implemented and became effective: $TRA_t = 1$ for the years 1986 and 1987, and $TRA_t = 0$ otherwise;

$PCTITEM_{t-1}$ = the percentage of filed federal personal income tax returns with itemized deductions listed on Schedule A of Form 1040 in year t-1;

UN_{t-1} = the percentage unemployment rate of the civilian labor force in year t-1;

$APPROV_{t-1}$ = the public's average job approval rating of the President in year t-1: values for $APPROV_{t-1}$ lie between 0 and 100;

$THREE_{t-1}$ = the average percentage interest rate yield on three year U.S. Treasury notes in year t-1;
$AUDIT_{t-1}$ = the percentage of filed federal personal income tax returns in year t-1 that was subjected to a formal IRS audit involving IRS examiners;
PEN_{t-1} = the average total of interest and other penalties assessed by the IRS per audited tax return in year t-1; and
μ = stochastic error term.

The study period runs from 1976 through 2005. The choice of the year 1976 reflects the limited availability of the itemized deductions data; the choice of the year 2005 reflects the most recent availability of the official *UAGI/RAGI* data. Naturally, this restriction implies that the number of observations is only 30 and the degrees of freedom in the various estimates provided here is in the range of 20. As a result, the criteria for statistical significance are commensurately higher than would be the case were more observations involved. The data are all annual. Following previous time-series studies of tax evasion using official data (Tanzi, 1982, 1983; Clotfelter, 1983; Carson, 1984; Long and Gwartney, 1987; Pyle, 1989; Feinstein, 1991; Erard and Feinstein, 1994; Feige, 1994; Cebula, 2001, 2004, 2008; Ali, Cecil, and Knoblett, 2001; Connelly, 2004; Christie and Holzner, 2006; Cebula and Coombs, 2009), the right hand-side variables (aside from the binary *TRA* variable) are lagged one year. This lagging not only is intended to minimize the possibility of simultaneity bias, but also to avoid specification bias that would result since the deadline for filing federal income tax returns is April 15th of each year and non-lagging would technically portray un-lagged variables as influencing past events. The *UAGI/RAGI* data were obtained from the IRS (2010, columns 2 and 3).The data for the variable *ATR* were obtained from the IRS (2009B). The *PCTITEM* data were obtained from the IRS (2009A). The *AUDIT* and *PEN* data were obtained from the Government Accounting Office (1996, Table I.1) and the U.S. Census Bureau (1994, Table 519; 1998, Table 550; 1999, Table 556; 2001, Table 546; 2009, Table 469). The *TRA* variable is a dummy variable. The data for the variables *THREE* and *UN* were obtained from the Council of Economic Advisors (2010, Tables B-73, B-35). The data for the variable *APPROV* were obtained from the Gallup Poll (2009). The (*P-P*) Phillips-Perron and *ADF* (Augmented Dickey-Fuller) unit root tests indicate that all of the variables in the Model are stationary in levels for the study period. The mean value for variable *UAGI/RAGI* for the study period was 13.42, with a standard deviation of 1.66.

The OLS (ordinary least squares) estimation of equation (14), adopting the Newey-West heteroskedasticity correction, is provided in Model 1 of Table 1. In Model 1, the coefficients on all eight of the explanatory variables exhibit the hypothesized signs, with six being statistically significant at the one percent level, one being statistically significant at the 2.5 percent level, and one being statistically significant at the five percent level.. The coefficient of determination is 0.89, so that the Model explains nearly nine-tenths of the variation in the dependent (tax evasion) variable. The *F*-statistic is significant at the one percent level, attesting to the overall strength of the estimate. Finally, with a $DW = 1.90$, there is no concern regarding autocorrelation.

Table 1. Empirical Estimates

	Model 1		***Model 2***		***Model 3***		***Model 4***	
Variable	***Coefficient***	***T stat***	***Coefficient***	***T stat***	***Coefficient***	***T stat***	***Coefficient***	***T stat***
Constant	15.2		15.3		8.69		25.9	
ATR	0.86	2.83**	0.85	2.61**	0.72	2.23*	0.86	2.58**
TRA	-4.16	-6.57***	-4.057	-4.06***	-4.62	-9.87***	-2.66	-4.31***
PCTITEM	0.21	4.41***	0.203	2.79**	0.306	8.37***	-------	-------
UN	1.066	6.13***	1.07	5.66***	0.94	5.96***	1.23	6.69***
APPROV	-0.173	-5.25***	-0.176	-4.00***	-0.109	-4.20***	-0.259	-7.45***
THREE	0.357	2.29*	0.35	2.22*	0.335	2.19*	0.316	1.63
AUDIT	-1.36	-4.07***	-1.345	-4.30***	-------	-------	-2.626	-5.06***
PENALTY	-0.49	-7.05***	-0.47	-3.75***	-0.60	-7.25***	-0.36	-3.03***
TREND	0.008	1.79#	-------	-------	-------	-------	-------	-------
R^2	0.89		0.89		0.86		0.83	
adjR^2	0.84		0.83		0.80		0.76	
F	17.57***		14.77***		16.25***		12.9***	
DW	1.90		1.88		1.78		1.79	
Rho	0.05		0.06		0.11		0.10	

***Statistically significant at 1% level; **statistically significant at 2.5% level; *statistically significant at 5% level; #statistically significant at the 10% level.

The estimated coefficient on the *ATR* variable is positive and statistically significant at beyond the two percent level. Thus, the higher the average federal personal income tax rate, the greater the degree of federal income tax evasion by households, presumably because a higher income tax rate increases the incentive to evade taxes. This finding is consistent in principle with the conventional wisdom and with several previous empirical studies, including Tanzi (1982), Clotfelder (1983), Feige (1994), and

Cebula and Coombs (2009). The estimated coefficient on the Tax Reform Act of 1986 dummy variable (*TRA)* is negative, as hypothesized (Musgrave, 1987), and statistically significant at the one percent level, providing evidence that taxpayers may have regarded the Tax Reform Act of 1986 as a genuine, honest effort to reform the inequities of and diminish the complexities (compliance costs) of the existing Internal Revenue Code. Alternatively, as implied by Slemrod (1992, p. 45), the observed drop in personal federal income tax evasion for this brief period (1986-1987) may simply have reflected the time frame required by taxpayers to learn about and adjust to this allegedly "sweepingly reformed" (Musgrave, 1987, p. 59) new version of the Internal Revenue Code. The estimated coefficient on the *PCTITEM* variable is positive and statistically significant at the one percent level, implying that the greater the percentage of federal income tax returns in which deductions are itemized on Schedule A of Form 1040, the greater the degree of federal personal income tax evasion. This finding is consistent with the panel data analysis of individual tax returns by Alm and Yunus (2009). The estimated coefficient on the unemployment rate variable (*UN*) is positive, as hypothesized, and statistically significant at the one percent level. This finding is consistent with the hypothesis that the higher the unemployment rate, the greater the degree to which households enter the underground economy (Alm and Yunus, 2009; Gahramanov, 2009; Cebula and Coombs, 2009). Next, there is the issue involving the Presidential job approval rating: "Does a lower (higher) job approval rating of the President by the U.S. public act to increase (decrease) the degree of aggregate federal personal income tax evasion?" As shown in Model 1 of Table 1, the estimated coefficient on variable *APPROV* is negative (as hypothesized) and statistically significant at the one percent level. Thus, this finding provides empirical support for this hypothesis (Cebula, 2008). As for the variable *THREE*, its coefficient is positive and statistically significant at the four percent level, implying (arguably) that the higher the interest rate yield on three year Treasury notes, the higher the opportunity costs of tax compliance.

The estimated coefficient on the variable *AUDIT* is negative (as hypothesized) and statistically significant at the one percent level. This finding would suggest that taxpayers are *discouraged* from tax evasion behavior by greater prospects of detection (as represented by variable *AUDIT* (Clotfelder, 1983; Feige, 1994; Cebula, 2008). Finally, the estimated coefficient on the variable PEN is negative and statistically significant at the one percent level, implying that the greater the IRS penalty plus interest assessments on detected unreported income, the greater the disincentive to engage in income tax evasion.

As tests of the robustness of the basic Model, three alternative versions of the basic Model have been estimated.. They are summarized in Models 2, 3, and 4 of Table 1. In Model 2, where a linear trend variable was added to the Model, *TREND*, the results very closely resemble those in Model 1. In Model 3 of Table 1, the estimate excludes the audit rate variable; in this case, the overall results for the remaining variables closely resemble their counterparts in Model 1 and 2. Finally, in Model 4, the variable *PCTITEM* has been deleted from the basic Model; although the estimated coefficient on variable *THREE* becomes statistically insignificant at the ten percent level, the results for the remaining variables largely resemble those in Model 1. Thus, the Model exhibits a reasonably high degree of consistency, i.e., robustness.

Conclusion

This study has used newly available data from the IRS (2010) on income tax evasion to identify key determinants of aggregate federal personal income tax evasion for the period 1976-2005. To date, only one related study has appeared that investigates beyond the year 1997, and that more narrowly focused study (Cebula and Coombs, 2009) runs only through the year 2001 and uses a non-IRS dataset (Ledbetter, 2004).

The empirical estimates provided in the present study indicate that the aggregate degree of federal personal income tax evasion, $(UAGI/RAGI)_t$, is *directly impacted by* the average effective federal personal income tax rate (*ATR*), the unemployment rate (*UN*), the interest rate yield on three year U.S. Treasury notes (*THREE*), and the percentage of filed federal personal income tax returns listing itemized deductions (*PCTITEM*). Aggregate federal personal income tax evasion also is negatively impacted by the variables *TRA* (reflecting the various provisions of the Tax Reform Act of 1986), *APPROV*, the public's job approval rating of the President *per se*, the percentage of filed tax returns formally audited by IRS examiners (*AUDIT*), and the IRS penalty assessment on detected unreported taxable income (*PEN*). The uniqueness of this study derives in part from the adoption of variables *PCTITEM* and *THREE*, which have not previously been analyzed in aggregate *time-series* studies of personal income tax evasion, whereas *none* of these factors has been investigated to date for the years 2002-2005, the most recent years for which the IRS has developed its newest estimates of federal household (personal) income tax evasion.

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