Implication of Recent Federal Personal Income Tax Increases for Income Tax Evasion, Tax Revenues, and Budget Deficits

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Implications of the Recent Federal Personal Income Tax Increase for Income Tax Evasion

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Abstract

In this study, we present evidence which strongly suggests that personal income tax evasion has been an increasing function of the maximum marginal federal personal income tax rate over the period 1970-2008, which constitutes the most current data currently available on aggregate personal income tax evasion. This evidence leads us to conclude that the federal personal income tax increases implemented effectively in 2013 under provisions of American Taxpayer Relief Act of 2012 and the Patient Protection and Affordable Care Act of 2010 will result in increased tax avoidance behavior. Among other things, this public-policy-induced increase in personal income tax evasion implies that the federal budget deficits in coming years will be greater than projected by the CBO and various government agencies. We also find that tax avoidance activity is an increasing function of the unemployment rate, the interest rate yield on three year Treasury Notes, and per capita real GDP (adopted as a measure of per capita real income), and a decreasing function of the Tax Reform Act of 1986 (during its first two years of being implemented), the IRS audit rate, and the ratio of the tax free interest rate yield on high grade municipals to the interest rate yield on ten year Treasury Notes. Thus, there is also evidence that persistently high unemployment rates may increase tax evasion and the size of federal budget deficits, although increasing the audit rate by IRS personnel may raise tax compliance to some extent.

Introduction

In this study, we present evidence to suggest that personal income tax evasion is an increasing function of the maximum marginal federal personal income tax rate, for the period 1970-2008. This evidence leads us to logically conclude that the federal personal income tax increases implemented effectively in 2013 under provisions of American Taxpayer Relief Act of 2012 and the Patient Protection and Affordable Care Act of 2010 will result in increased tax avoidance behavior. Hence, it follows that this public-policy-induced increase in personal income tax evasion implies that the federal budget deficits in coming years will be greater than projected by the CBO and various government agencies. Interestingly, our analysis also suggests that tax avoidance activity is an increasing function of the unemployment rate, the interest rate yield on three year Treasury Notes, and per capita real GDP (adopted as a measure of per capita real income), and a decreasing function of the Tax Reform Act of 1986 (during its first two years of being implemented), the IRS audit rate, and the ratio of the tax free interest rate yield on high grade municipals to the interest rate yield on ten year Treasury notes. Consequently, there is also

evidence that persistently high unemployment rates may further continue to elevate tax evasion and the size of federal budget deficits, although increasing the audit rate by IRS personnel may raise tax compliance to some extent.

Income tax evasion effectively is the reduction of taxable income caused by unreported or underreported revenue or the inclusion of fictional tax deductions. Studies of income tax evasion behavior essentially fall into three categories. First, there are theoretical models of tax evasion behavior, such as Allingham & Sandmo (1972), Falkinger (1988), Klepper, Nagin, & Spurr (1991), Das-Gupta (1994), Pestieau, Possen, & Slutsky (1994), Caballe & Panades (1997). Second, there are a number of studies that either (a) use questionnaires or (b) undertake experiments, such as Spicer & Lundstedt (1976), Spicer & Thomas (1982), Baldry (1987), Alm, Jackson, & McGee (1992), Thurman (1991), and Alm, McClelland, & Schulze (1999). These studies are 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 to evade taxation by underreporting income provided by higher marginal income tax rates is also revealed in numerous studies.

Third, there are those studies that largely or in some cases exclusively adopt what is referred to as "official data," i.e., data obtained from the IRS (or its counterpart outside of the U.S.) and/or some other "official source," i.e., a government source, and/or from a publicly available source. Among, the types of information thusly obtained and analyzed are data on income tax evasion, income tax rates, and audit rates. Such studies endeavor typically either to estimate the aggregate degree of tax evasion or to identify the determinants thereof (Tanzi, 1982, 1983; Clotfelter, 1983; Carson, 1984; Long & Gwartney, 1987; Pyle, 1989; Feinstein, 1991; Erard & Feinstein, 1994; Feige, 1994, 1989, 1996; Cebula, 2001, 2004, 2008, 2011; Ali, Cecil, & Knoblett, 2001; Ledbetter, 2004; Alm & Yunus, 2009; Cebula & Coombs, 2009; Choi and Johnson, 2014).

In this literature, it is widely believed that the degree of federal personal income tax evasion in the economy as a whole is positively affected by income tax rates (Tanzi (1982); Clotfelter (1983); Feige (1994)). Interestingly, Yaniv (1994) characterizes Clotfelter (1983) as "the most relevant study" with respect to the impact of income tax rates on tax evasion. This perspective is simple: the higher the income tax rate, the greater the benefit (in terms of a reduced tax liability) from not reporting taxable income, *ceteris paribus*.

The maximum marginal tax rate was relatively high from 1970-1986 as can be seen in Table X. This table also shows that tax rates were lower from 1987 to 2014. The *Tax Reform Act of 1986* (TRA) initiated a period of lower tax rates and lowered the highest marginal tax rate from the 50% rate of 1986 to 38.5% for 1987 and 28% for 1988[1]. The 28% rate remained the highest rate through 1990. For 1991 and 1992, the highest rate was increased to 31%; followed by an increase to 39.6% for 1993 where it remained the highest rate through the year 2000. On January 1, 2001 the rate was reduced slightly to 39.1% and on January 1, 2002, it was reduced to 38.6%.

For the next full decade the individual income tax rate schedules remained the same with the highest marginal rate of 35% (2003-2012). This ten-year period was the longest period of

[1] The highest marginal rate of 28%, effective January 1, 1988, was the smallest top rate since 1931, a period of 58 years.

stability in the individual tax rates, from top to bottom brackets, since 1913. *The Economic Growth and Tax Relief Reconciliation Act of 2001* (EGTRRA), amplified and accelerated by the *Jobs and Growth Tax Relief Reconciliation Act of 2003* (JGTRRA) fixed the highest marginal tax rate at 35%[2]. The 2001 and 2003 tax acts made significant cuts in overall individual tax rates but were set to expire at the end of 2010.

There was significant speculation that tax rates would increase soon after the Obama administration took office in 2008; however, the 35% rate was extended as the highest marginal tax rate until 2011, along with all the lower bracket rates remaining the same, by the *Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010*. The *American Taxpayer Relief Act of 2012* increased the top marginal tax rate, effective January 1, 2013, back to 39.6%, the highest rate for the years 1993-2000 and the highest rate in the period of 1987-2014. This 2014 highest tax rate of 39.6% is effectively higher due to the increases in other taxes on income earners.

Effective January 1, 2013, a new additional tax was implemented as part of the *Patient Protection and Affordable Care Act (PPACA)*[3] intended to significantly increase the tax on the wealthy by adding an additional tax of 3.8% on the lower of net investment income or modified adjusted gross income over thresholds of $250,000 and $200,000 for married filing joint and single, respectively. This new tax is in addition to the regular income tax at the higher marginal rates of 2014 or the Alternative Minimum Tax (AMT), if the AMT is higher than the regular tax. Another provision of PPACA initiates an additional Medicare tax of .9% on wages and self-employment income over the $250,000/$200,000 thresholds. The additional Medicare tax increases rate on the higher income from 2.9% to 3.8%. In addition, if taxable income exceeds the 35% rate and falls into the 39.6% bracket, then capital gains are increased to 20%, rather than 15%. Consequently, after relative stability and expectations of lower tax rates brought about by the TRA 1986, the *American Taxpayer Relief Act of 2012 and the Patient Protection and Affordable Care Act* have caused a maximum marginal tax rate could range from 39.6% to as much as about 48%, a rate very close to the maximum rate before implementation of TRA 1986.

In this work, we add to the rich literature on income tax evasion by seeking to identify key determinants of federal personal income tax evasion using data up to and including the year 2008. We also show that the seemingly innocuous tax rate increases in 2013 and 2014 are quite debilitating when taken together and will, without doubt, after a significantly long period of stability of tax liabilities, result in an increase in the incentive to evade tax. By investigating tax evasion through 2008, the study period is more current than the existing published literature and provides a reasonable framework to analyze the Obama tax increases. The conclusions also generate significant implications for future federal budget deficits and the growth rate of the national debt

The model is presented in Section II. In Section III we provide the formal empirical analysis, whereas Section IV provides concluding observations.

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[2] The tax rates from this legislation were the lowest rates since the 28% top rate in the 1988-1990 tax years.

[3] "Public Law 111–148". 111th United States Congress. Washington, D.C.: United States Government Printing Office. March 23, 2010. Codified as amended at scattered sections of the Internal Revenue Code (26 U.S.C.) and in 42 U.S.C.

The Model

In this study, the *relative* probability that the *representative* economic agent will *not* report his/her taxable income to the IRS is treated as an increasing function of the expected gross benefits to the agent of not reporting income, *eb*, and as 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:

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

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

As already observed, the gross expected benefits from *not* reporting income to the IRS are hypothesized to be an increasing function of the federal personal income tax rate (Tanzi, 1982; Clotfelter, 1983; Feige, 1994). To reflect the federal personal income tax rate, this study adopts the maximum marginal federal personal income tax rate (*MAXT*). This measure of the income tax rate is adopted because it can be argued that it not only is an actual income tax rate but also reflects to some degree the degree to which income tax rates are progressive. Accordingly, it is hypothesized, *ceteris paribus*, that:

(2) $eb = g(MAXT), g_{MAXT} > 0$

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…" *TRA* did introduce a number of reforms, many of which are outlined in Barth (1991), Barth and Brumbaugh (1992), Ott and Vegari (2003), and Sanger, Sirmans, & 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 (1988) 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."

Because of the finding of previous researchers such as Musgrave (1987, p. 59) asserted that the *TRA* "…reversed these (high tax) trends, a major accomplishment that all reformers will welcome." Based on Musgrave's (1987) arguments, as well as the findings from Cebula, Coombs, and Yang (2009), and the obvious dramatic decline in tax rates starting in 1987, and the period of low tax stability from 2003-2008 as shown in Table X, it is expected that taxpayers will have favorably regarded the *TRA* and been less resentful of the Internal Revenue Service than before, at

least initially. Thus, it is hypothesized that at the time the *TRA* was enacted and becoming effective (1986-1987) and also received the greatest publicity, reduced taxpayer resentment of the federal income tax system/Internal Revenue Service *would*, at least *temporarily*, have resulted in a reduced degree of aggregate personal income tax evasion, *ceteris paribus*. Consequently, it is hypothesized here that, for the period when the *TRA* was initially implemented, 1986, through the year the *TRA* became "*de facto* fully effective," 1987 (Barth, 1991; Barth and Brumbaugh, 1992), the *eb* was reduced. Accordingly, (2) above is replaced by (3):

(3) $eb = j(MAXT, TRA), j_{MAXT} > 0, j_{TRA} < 0$

Next, as in Alm and Yunus (2009), it is expected that the higher the unemployment rate (*UN*), the greater the degree of aggregate income tax evasion, *ceteris paribus*. This is based on the reasoning that the higher the *UN* level, the greater the extent to which the unemployed work in the "underground economy" and do not report income. Moreover, this effect may be reinforced to the extent that higher unemployment creates an incentive to engage in income tax evasion even for still-employed people to the degree that they try to covet extra funds (by under-reporting income) in the event of a *possible* lay-off. Furthermore, the higher the real income level (*INC*), the greater the degree to which tax evasion is hypothesized in this study to occur, *ceteris paribus*, because higher income persons will tend to have greater access to and greater knowledge of ways in which to reduce income tax liabilities. For example, many individuals with higher income report income on one or more Schedule C forms, a practice which often-times provides an opportunity to under-report income (Ali, et al., 2001). Individuals with higher income arguably also have greater access to specialized tax lawyers and accountants who may enable them to more efficiently "limit" tax liabilities. Thus, equation (3) can be replaced by equation (4), as follows:

(4) $eb = j(MAXT, TRA, UN, INC), j_{MAXT} > 0, j_{TRA} < 0, j_{UN} > 0, j_{INC} > 0$

Next, following Cebula (2004), it can be argued that the greater the ratio of *tax free* interest rate yields on high grade municipals relative to *taxable* interest rate yields such as that on 10-year U.S. Treasury notes, *TFTEN*, the greater the benefits of *tax avoidance*, which is legal, and hence the less the expected benefits of *tax evasion*, which of course is illegal. Thus, (4) is replaced by (5):

(5) $eb = j(MAXT, TRA, UN, INC, TFTEN), j_{MAXT} > 0, j_{TRA} < 0, j_{UN} > 0, j_{INC} > 0, j_{TFTEN} < 0$

Finally, the higher the interest rate yield on bonds in the marketplace, the greater the *opportunity cost of tax compliance*. Alternatively stated, the higher the interest rate yield on 3-year Treasury notes (*THREE*), the greater the benefits that could be derived from investing funds not reported to the IRS Hence, *eb* is hypothesized to be an increasing function of *THREE*, so that:

(6) $eb = j(MAXT, TRA, UN, INC, TFTEN, THREE), j_{MAXT} > 0, j_{TRA} < 0, j_{UN} > 0, j_{INC} > 0, j_{TFTEN} < 0, j_{THREE} > 0$

This introduction of a variable to expressly represent the opportunity cost of tax compliance from

the expected benefit side of the tax evasion decision calculus is unique to tax evasion studies using official data for the U.S.

The expected gross costs of not reporting income to the IRS are hypothesized to be an increasing function of the expected *risks*/costs thereof (Pestieau, et al., 1994; Erard and Feinstein, 1994; Caballe and Panades, 1997). In this study, to the representative economic agent, the expected risks/costs 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/personnel, *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. This study adopts the probability of a formal audit as a measure of risk to the would-be tax evader. Ideally, IRS penalty assessments could also be adopted as a measure of the risk associated with tax evasion; unfortunately, a dependable and complete set of penalty data is not available for all the years in the study period. Thus, we have:

(7) $ec = j(AUDIT), j_{AUDIT} > 0$

Substituting from (6) and (7) into (1) yields:

(8) $pnr/(1\text{-}pnr) = eb = b(MAXT, TRA, UN, INC, TFTEN, THREE, AUDIT)$
$b_{MAXT} > 0, bj_{TRA} < 0, bj_{UN} > 0, bj_{INC} > 0, b\, j_{TFTEN} < 0, b_{THREE} > 0, b_{AUDIT} < 0$

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:

(9) $UAGI = (pnr)*AGI$

and

(10) $RAGI = (1\text{-}pnr)*AGI$

It then follows that:

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

From (7), (8), and (10), substitution for $pnr/(1\text{-}pnr)$ in (1) yields:

(12) $UAGI/RAGI = j(AEPT, TRA, UN, INC, TFTEN, THREE, AUDIT)$
$j_{MAXT} > 0, j_{TRA} < 0, j_{UN} > 0, j_{INC} > 0, j_{TFTEN} < 0, j_{THREE} > 0, j_{AUDIT} < 0$

Empirical Results

Based on the framework provided in (12) above, the following reduced-form equation was estimated:

(13) $(UAGI/RAGI)_t = a_0 + a_1\, MAXT_{t-1} + a_2\, TRA_t + a_3\, UN_{t-1} + a_4\, INC_{t-1} + a_5\, TFTEN_{t-1} + a_6\, THREE_{t-1} + a_7\, AUDIT_{t-1} + u$

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;
$MAXT_{t-1}$ = the maximum marginal federal personal income tax rate in year *t-1*, expressed as a percent;
TRA_t= a binary (dummy) variable for the years 1986 and 1987: TRA_t=1 for the years 1986, 1987 and TRA_t =0 otherwise;
UN_{t-1}= percentage unemployment rate of the civilian labor force in year t-1;
INC_{t-1} = per capita real GDP in year t-1 (expressed in year 2000 dollars);
$TFTEN_{t-1}$ = the ratio of the average interest rate yield on high grade tax free municipal bonds in year t-1 to the average interest rate yield on 10-year Treasury notes in year t-1, expressed as a percentage;
$THREE_{t-1}$ = the average interest rate yield on 3-year Treasury notes in year t-1, expressed as a percentage;
$AUDIT_{t-1}$ = the percentage of filed federal personal income tax returns in year *t-1* that was subjected to a formal IRS audit involving IRS examiners; and
u = stochastic error term.

The study period runs from 1970 through 2008, reflecting availability of the data used in the analysis. The first estimation is an OLS (Ordinary Least Squares) estimation, is expressed in log-log form; the log-log specification has the advantage of being very easily interpreted. In the interest of testing for robustness and consistency of the initial results, as well as in the quest for potential additional insights, two additional (alternative) estimates of the model are provided for the 1970-2008 period, the first a GLM (Generalized Linear Model, Gamma family) and the second a GLM (Normal Family).

The data are annual. The data for *MAXT* were obtained from the Internal Revenue Service (2010, Table 6). The *AUDIT* 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; 2010, Table 469). The *TRA* variable is a dummy variable; the Tax Reform Act of 1986 was actually signed into law by President Reagan in 1986. The data for the variables *UN, INC, TFTEN,* and *THREE* were obtained from the Council of Economic Advisors (2009, Tables B-42, B-41, B-73).The series adopted to measure income tax evasion, in this case represented by the variable (*UAGI/RAGI*), were obtained from Feige (2012). Based on the General Currency Ratio (*GCR*) model, Feige (2009) estimated the ratio of aggregate *unreported* adjusted gross income to aggregate *reported* adjusted gross income, using a 1973 IRS estimate for this ratio as the baseline in

his computations. These data are provided in Table 1. For the interested reader, descriptive statistics for the study period for each of the variables are found in Table 2.

The log-log OLS estimate of equation (13) is provided in the first column of Table 3. In this estimate, all seven of the estimated coefficients exhibit the expected signs. Furthermore, three of these estimated coefficients are statistically significant at the one percent level, one is statistically significant at the 2.5 percent level, two are statistically significant at the five percent level, and one (*TFTEN) is* statistically significant at the ten percent level. The coefficient of determination (R^2) is 0.68, so that the model explains nearly seven-tenths of the variation in the independent variable. Based on the *DW* and *Rho* statistics, there is little concern regarding autocorrelation. Finally, the F-statistic is statistically significant at the one percent level, attesting to the overall strength of the model.

According to the results provided in Table 3, the coefficient/elasticity on the maximum marginal federal personal income tax variable (*MAXT*) is positive and statistically significant at the one percent level. Thus, as expected, the higher the maximum marginal federal personal income tax rate, the greater the expected benefits of tax evasion and hence the greater the extent of that income tax evasion. This finding is consistent with most previous studies of income tax evasion using official data (Ali, et al., 2001; Cebula, 2004; Klepper, et al., 1991; Tanzi, 1982, 1983). Quantitatively speaking, a ten percent increase in the maximum federal marginal tax rate (i.e. from 30% to 33%) would be expected to increase federal personal tax evasion (as measured) by about 2.8 percent.

Consistent with the arguments in Musgrave (1987) and findings in Cebula, et al. (2009), the results for *TRA* variable are compelling. In particular, the estimated coefficient is negative and statistically significant at the one percent level. Thus, there is evidence that the Tax Reform Act of 1986 is shown to have reduced federal personal income tax evasion in the U.S., albeit only briefly. Given the specification of TRA as applying to the short-term period of just 1986 and 1987, these results would seem to confirm the prior findings by Cebula, et al. (2009), who argue that it would take at least some time for taxpayers to understand the revisions in the Internal Revenue Code and to adjust to those revisions. For the years 1986 and 1987, it appears that federal personal income tax evasion fell by 17 percent, *ceteris paribus*.

The estimated elasticity on the unemployment variable is positive, as hypothesized, and statistically significant at the one percent level. Thus, there is strong evidence that the higher the unemployment rate, the greater the extent of aggregate federal personal income tax evasion. This finding is compatible with the recent findings in Alm and Yunus (2009). The present findings imply that a ten percent increase in the unemployment rate (i.e. from 10% to 11%) elevates federal personal income tax evasion by nearly 1.9 percent.

Next, the estimated elasticity on the per capita real GDP variable *(INC*) is positive, as hypothesized, and statistically significant at the one percent level. This finding appears to confirm our hypothesis that the degree of aggregate federal personal income taxation is greater at higher levels of taxable income. In other words, the higher the real income level (INC), the greater the degree to which tax evasion is expected to occur, *ceteris paribus*, plausibly because individuals with higher income will tend to have greater access to and knowledge of ways in which to avoid income taxes. For example, many individuals with higher income report income on one or more Schedule C forms, which often-times provide an opportunity to under-report income and/or over-

report expenses (Ali, et al., 2001). In addition, higher income persons also may have greater access to specialized tax lawyers and accountants who may enlighten them as to how to more efficiently both avoid (and evade) tax liabilities. A ten percent increase in *INC* would appear to raise income tax under-reporting by about 5.2 percent.

The estimated elasticity on the tax free/taxable interest rate variable, *TFTEN*, is negative, as expected, and statistically significant at the eight percent level, providing modest evidence that the greater the rewards for legal tax avoidance (as measured here), the less the degree of illegal tax evasion (Cebula, 2004). In this estimate, a ten percent increase in the *TFTEN* ratio would reduce under-reported income by about 2.7 percent. Interestingly, the estimated coefficient on *TFTEN* is statistically significant at beyond the five percent level in the two GLM estimates shown in Table 3.

The elasticity on the variable *THREE* is positive and statistically significant at the five percent level. Thus, it appears that the greater the opportunity cost of personal income tax compliance, as measured by a higher taxable interest rate (in this case, the annual federally taxable interest rate yield on 3-year Treasury notes), the greater the degree of income tax evasion. Such a finding is unique in studies of aggregate income tax evasion in the U.S. In any case, the results indicate that a ten percent rise in the 3-year Treasury note yield would raise income under-reporting by about 1.1 percent.

Finally, there is the audit variable. As shown in the first column of Table 3, the estimated elasticity on this variable is negative and statistically significant at beyond the five percent level. Thus, it appears that the audit rate (*AUDIT*) variable, of and in itself, may be viewed as an effective deterrent to federal personal income taxation. This finding is consistent with previous studies such as Cebula (2001), who suggests that IRS policies such as penalties and interest charges, as well as improving income-detection technology, are important tax-evasion disincentives. In this case, a ten percent increase in the audit rate (by IRS personnel) would be expected to reduce under-reporting of income by about 1.3 percent.

In econometrics, the Generalized Linear Model (GLM) is a flexible generalization of the ordinary least squares (OLS) regression model that allows response variations that have error distribution models other than a normal distribution. The GLM generalizes linear regression models by allowing the linear model to be related to the response variable by way of a link function and permitting the magnitude of the variance of each measurement to be a function of its predicted value. In effect, GLS models are an iteratively reweighted least squares method for maximum likelihood estimation of the parameters of a regression model; GLS modeling allows for a broader version of linear regression.

To test the robustness of the conclusions of the model developed above, that model was estimated using the GLM, first with the family category "Gamma" and then with the family category "Normal." Dispersion was computed using the Pearson Chi-Square, whereas coefficient variance was computed using the observed Hessian. In the Gamma case, convergence was achieved after six iterations, whereas in the Normal case, convergence was achieved following only one iteration. As shown in the second and third columns of Table 3, qualitatively speaking, the results from the two GLS estimations are entirely compatible with the log-log OLS estimation results. Indeed, the results for the *TFTEN* variable are arguably even stronger (more robust) in the GLM estimates.

Conclusion

In 2013, federal personal income tax increases were implemented under provisions of *American Taxpayer Relief Act of 2012 and the Patient Protection and Affordable Care Act of 2010*. Based on our analysis of the data for the time period 1970-2008, we believe the incentive to engage in tax evasive activities will have increased as a direct consequence of public policy. Using data for the time period 1970-2008, we have strong evidence to suggest that federal personal income tax evasion is an increasing function of the maximum marginal federal personal income tax rate.

Tax evasion is also an increasing function of the percentage unemployment rate of the civilian labor force, per capita real income, and the annual interest rate yield on 3-year Treasury notes (as a measure of the opportunity costs of tax compliance). The study also finds, somewhat surprisingly, that the Tax Reform Act of 1986 acted to briefly discourage tax evasion, whereas it was not a surprise that a higher IRS audit rate by IRS personnel acted to discourage tax evasion. Furthermore, the greater the benefits of legal tax avoidance, as measured by the ratio of the tax free interest rate yield on high grade municipals to the taxable interest rate yield on 10-year Treasury notes, the less the degree of illegal tax evasion. Subsequent related research might seek to identify additional factors influencing income tax evasion in the U.S., as well as to investigate the possibility of simultaneity issues between tax evasion and other variables.

In any event, the persistence of high unemployment rates (although they appear to have abated somewhat in recent months), in conjunction with implemented higher federal tax rates (and President Obama has vowed to raise those income tax rates further so that the "wealthy will pay their fair share"), will realistically lead to a pattern of increased federal budget deficits and a more rapidly growing national debt. Ultimately, the impacts of these latter phenomena will lead to higher real interest rates and diminished private sector investment in new plant and equipment. Our expectation is a reduction in economic growth, and an increase in unemployment due to the lost productive efficiency.

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Table 1. *Data for Dependent Variable, UAGI/RAGI, by Year, 1960-2008*

Year	UAGI/RAGI	Year	UAGI/RAGI
1960	16.10	1985	21.11
1961	15.47	1986	18.89
1962	15.86	1987	17.42
1963	16.44	1988	18.74
1964	15.88	1989	21.06
1965	14.62	1990	21.06
1966	14.86	1991	21.39
1967	15.36	1992	19.04
1968	15.21	1993	17.70
1969	15.32	1994	17.98
1970	16.30	1995	20.01
1971	16.04	1996	18.64
1972	16.16	1997	18.66
1973	16.27	1998	18.30
1974	17.47	1999	20.55
1975	18.81	2000	22.29
1976	20.17	2001	22.73
1977	20.37	2002	23.94
1978	20.63	2003	23.17
1979	21.14	2004	21.57
1980	22.84	2005	21.98
1981	22.25	2006	23.85
1982	22.93	2007	24.90
1983	21.46	2008	23.94
1984	21.86		

UAGI/RAGI is expressed as a percentage.

Table 2. *Descriptive Statistics*

Variable	Mean	Standard Deviation
Period: 1970-2008:		
(*UAGI/RAGI*)	20.159	2.423
MAXT	47.56	15.53
TRA	0.0513	0.224
UN	6.132	1.35
INC	27,833	6,181
TFTEN	89.9	10.9
THREE	6.87	2.85
AUDIT	1.362	0.54

Table 3. *Empirical Estimates, 1970-2008*

Variable	OLS (Log-log)	GLM (Family: Gamma)	GLM (Family: Normal)
a_0	-5.93	-------	-------
MAXT	0.281***	0.119***	0.535**
	(3.89)	(4.01)	(2.35)
TRA	-0.17***	-2.76***	-2.72***
	(-2.98)	(-2.99)	(-2.73)
UN	0.189**	0.526**	0.535**
	(2.58)	(2.41)	(2.35)
INC	0.518***	0.00058***	0.00059***
	(5.52)	(8.97)	(8.80)
TFTEN	-0.268#	-5.658*	-5.786*
	(-1.72)	(-2.01)	(-2.03)
THREE	0.111*	0.405***	0.374***
	(2.00)	(3.65)	(3.37)
AUDIT	-0.133*	-1.586*	-1.68*
	(-2.07)	(-2.01)	(-2.04)
R^2	0.68	-------	-------
AdjR^2	0.61	-------	-------
F	9.18***	-------	-------
DW	1.88	-------	-------
Rho	0.05	-------	-------
Convergence after Iteration	-------	6	1

Terms in parentheses are t-values. ***indicates statistical significance at the one percent level; **indicates statistical significance at the 2.5 percent level; *indicates statistical significance at the five percent level; # indicates statistically significant at the ten percent level.

Table 4.

Income Tax Rates

Year	Maximum	Minimum
1970	71.75	0.0%
1971[4]	70.0%	0.0%
1972	70.0%	0.0%
1973	70.0%	0.0%
1974	70.0%	0.0%
1975	70.0%	0.0%
1976	70.0%	0.0%
1977	70.0%	0.0%
1978	70.0%	0.0%
1979	70.0%	0.0%
1980	70.0%	0.0%
1981	69.125%	0.0%
1982	50.0%	0.0%
1983	50.0%	0.0%
1984	50.0%	0.0%
1986	50.0%	0.0%
1987	38.5%	11.0%
1988	28.0%	15.0%
1989	28.0%	15.0%
1990	28.0%	15.0%
1991	31.0%	15.0%
1992	31.0%	15.0%
1993	39.6%	15.0%
1994	39.6%	15.0%
1995	39.6%	15.0%
1996	39.6%	15.0%
1997	39.6%	15.0%
1998	39.6%	15.0%
1999	39.6%	15.0%
2000	39.6%	15.0%
2001	39.1%	15.0%
2002	38.6%	10.0%
2003	35.0%	10.0%
2004	35.0%	10.0%
2005	35.0%	10.0%
2006	35.0%	10.0%
2007	35.0%	10.0%
2008	35.0%	10.0%
2009	35.0%	10.0%
2010	35.0%	10.0%
2011	35.0%	10.0%
2012	35.0%	10.0%
2013	39.6%	10.0%
2014	>39.6%[5]	10.0%

[4] From 1971 – 1980, although the highest marginal rate was 70%, the highest rate on "earned income" varied considerably. Thus the was not the stability of the decade 2003 through 2012.
[5] The highest marginal rate for 2014 will be higher than 39.6% due to the additional tax provision on the Affordable Care Act of 2010 which are effective January 1, 2014.