An Empirical Note on Determinants of Income Tax Evasion, 1973-1997

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28 September 2000

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Abstract

This note empirically investigates the impact of various factors on income tax evasion in the U.S. over the 1973-1997 period. The estimate indicates that income tax evasion is an increasing function of the average effective federal personal income tax rate and the public's dissatisfaction with government and a decreasing function both of penalties imposed by the IRS on unpaid taxes and IRS audit rates. However, the average effective social security tax rate appears not to significantly affect tax evasion. A trend variable that may to some extent crudely reflect the impact of improved IRS income detection technologies over time exhibits a negative and significant coefficient.

Introduction

The underground economy and tax evasion remain timely issues, as evidenced by such recent studies as Alm, Jackson, and McKee (1992), Atkins (1999), Cebula (1997), Feige (1994), Panteghini (2000), and Pestieau, Possen, and Slutsky (1994). The present study seeks empirically to contribute to the literature by providing updated and added insights into determinants of the relative DTE (degree of aggregate income tax evasion) in the U.S. using the most recent data currently available. The study focuses on the impact on the relative DTE of: the federal personal income tax rate, the public's dissatisfaction with government, IRS (Internal Revenue Service) audit rates, IRS penalty assessments (including interest) on detected unreported income, and social security tax rates.

The Basic Model

The economy consists of agents who generate economic value that is reflected in the form of income and choose whether or not to report none, some, or all of their income to the IRS.

The relative probability that the **representative** economic agent will not report 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 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:

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

Expressing probabilities in relative terms such as shown in equation (1) reflects the form of the data, i.e., data where the DTE in the economy is expressed in relative terms.

The expected gross benefits from not reporting income to the IRS are anticipated to be an increasing function of income tax rates. This study focuses on the federal personal income tax rate (PT) and the social security tax rate (SST), such that:

$$eb = g(PT, SST),\ g_{PT} > 0,\ g_{SST} > 0 \qquad (2)$$

It also is hypothesized that a growing or high level of public dissatisfaction with the performance of government and/or a growing or high level of public distrust and resentment of government may contribute to the DTE

in the economy. It might, for example, be argued that the more the public resents government, the more benefit (utility) people derive from avoiding taxes through the underreporting of income to the IRS, i.e., the greater will be the subjective benefits of tax evasion. Hence, equation (2) can be expanded to:

$$eb = h(PT, SST, DIS),\ h_{PT}, h_{SST}, h_{DIS} > 0 \qquad (2')$$

The expected gross costs of not reporting income to the IRS are hypothesized to be an increasing function of the risks thereof. In this study, to the representative economic agent in the society, the expected penalty from not reporting taxable income to the IRS, if said activity is detected by the IRS, is measured by the total pecuniary penalty (including both penalties and interest) previously assessed by the IRS (aside from added tax liabilities per se) per audited tax return (PEN). Furthermore, these risks (potential costs) are presumably enhanced by an increase in AUDIT, the percentage of filed federal income tax returns that is audited by the IRS. Thus, we have:

$$ec = j(AUDIT, PEN),\ j_{AUDIT} > 0,\ j_{PEN} > 0 \qquad (3)$$

Substituting from (2') and (3) into (1) yields:

$$pnr/(1\text{-}pnr) = b(PT, SST, DIS, AUDIT, PEN),$$
$$b_{PT} > 0,\ b_{SST} > 0,\ b_{DIS} > 0,\ b_{AUDIT} < 0,\ b_{PEN} < 0 \qquad (4)$$

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

$$UAGI = (pnr)*AGI \qquad (5)$$

and

$$RAGI = (1\text{-}pnr)*AGI \qquad (6)$$

since (pnr)*AGI + (1-pnr)*AGI= UAGI+RAGI=AGI. It then follows that:

$$UAGI/RAGI=(pnr)*AGI/(1\text{-}pnr)*AGI=(pnr)/(1\text{-}pnr) \qquad (7)$$

From (4) and (7), we obtain, by substitution for pnr/(1-pnr):

$$UAGI/RAGI=b(PT, SST, DIS, AUDIT, PEN),$$
$$b_{PT} > 0,\ b_{SST} > 0,\ b_{DIS} > 0,\ b_{AUDIT} < 0,\ b_{PEN} < 0 \qquad (8)$$

Observations on Two of the Time Series

The investigation provides empirical estimates based on the model represented in (8) above. At the outset, it is noted that the variable DIS is represented by the "dissatisfaction index." This index is constructed as an equally weighted average of three normalized indices reflecting answers to the University of Michigan's Insitute for Social Research (ISR) surveys concerning whether government officials can be trusted (to honor obligations to the public), whether they are dishonest, and whether government wastes tax dollars. Values for this index of dissatisfaction lie within a range of (-1.5), which corresponds to least dissatisfied, to (+1.5), which corresponds to most dissatisfied; thus, the algebraic value of this index is higher as the public becomes more dissatisfied with government.

It is also observed that, in order to measure the DTE in the economy as a whole, the series generated by Edgar Feige is adopted. Feige has generated revised and updated estimates of aggregate unreported income (UAGI) as a percent of reported aggregate adjusted gross income (RAGI) based on the GCR (General Currency Ratio) model, employing an IRS estimate of unreported income for 1973 as the base year. Since revised and updated data are available for the years 1973-1997 and since these appear to be the most up-to-date such data set presently available for the U.S.,

they are used as the dependent variable (UAGI/RAGI) in the analysis.

Empirical Estimates

Based on the model in equation (8) and in part on data as described in Section III, we investigate the following reduced-form equation:

$$(UAGI/RAGI)_t = a_0 + a_1\, AEPIT_{t-1} + a_2\, AUDIT_{t-1} + a_3\, PEN_{t-1} + a_4\, DIS_{t-1} + a_5\, AESST_{t-1} + a_6\, TREND + u \qquad (9)$$

where:

a_0 = constant term;
$(UAGI/RAGI)_t$= aggregate unreported adjusted gross income as a percentage of aggregate reported adjusted gross income in year t, t = 1973,...,1997, as estimated by Feige;
$AEPIT_{t-1}$ = the average effective federal personal income tax rate in year t-1, i.e., total federal personal income tax collections in year t-1 divided by the total reported AGI in year t-1, as a percent;
$AUDIT_{t-1}$ = the percentage in year t-1 of filed federal personal income tax returns that was subjected to an IRS audit;
PEN_{t-1} = the average penalty from underreporting income to the IRS in year t-1, computed as the total pecuniary penalty, including net interest charges, on detected unreported taxable income, as assessed by the IRS per audited personal income tax return in year t-1;
DIS_{t-1} = the dissatisfaction index for year t-1 derived by the University of Michigan's Institute for Social Research (ISR); DIS values lie within a range of (-1.5) up to (+1.5);
$AESST_{t-1}$ = the average effective social security tax rate in year t-1, computed as the total social security tax payments by individuals in year t-1 divided by the total reported AGI in year t-1, as a percent;
TREND = a simple linear trend variable;
μ = stochastic error term.

The time series examined in this study are annual and cover the 1973-1997 period. Following Feige (1994), the personal income tax rate is an average effective personal tax rate, which contrasts to Cebula (1997), where the maximum marginal personal tax rate is adopted. It is argued here that the maximum marginal tax rate applies to only a very small segment of the population, whereas--as in Feige (1994)--the average effective income tax rate may better reflect tax rates across a broader spectrum of the population. Interestingly, however, the results are not very sensitive to the choice between these two alternative measures of the personal income tax rate.

The Phillips-Perron (P-P) test statistics indicate that three of the variables in equation (9) are stationary only in first differences: AESST, PEN, and AUDIT. The remaining explanatory variables are stationary in levels, with (UAGI/RAGI) stationary in levels with a trend. Consequently, in the estimation provided in equation (10), variables AESST, PEN, and AUDIT are expressed in first differences, and the estimate includes a linear trend variable, TREND. In addition to the data sources already identified for (UAGI/RAGI) and DIS, data were obtained from the IRS (1970-1997) and the Council of Economic Advisors (1999).

The variable TREND may well be serving at least two functions in the model: (1) addressing the fact that the dependent variable is stationary in levels only with a trend; and (2) reflecting the fact that, over time, technology has increasingly improved the ability of the IRS to detect earned income and has, as a result, increasingly restricted the ability of individuals to engage in income tax evasion ("income matching programs"). Ideally, the technology in question would be represented by a more precise variable; unfortunately, at this time there appears to be no clear way to quantify this technology. Nevertheless, given that the effects of this technology have been rising over time, variable TREND might be a potentially helpful way to crudely help capture these effects.

Estimating equation (9) by OLS, using the White (1980) correction for heteroskedasticity, yields:

$$(UAGI/RAGI)_t = 8.51 + 1.154\, AEPIT_{t-1} - 7.582\, \delta AUDIT_{t-1} - 0.001\, \delta PEN_{t-1}$$
$$(+2.84) \qquad (-3.93) \qquad (-3.12)$$

$$+ 3.084\ DIS_{t-1} - 0.93\ \delta AESST_{t-1} - 0.254\ TREND \qquad (10)$$
$$(+2.79) \qquad (-1.00) \qquad (-4.54)$$

$R^2 = 0.81$, DW = 1.75, Rho = 0.11, F = 11.28**

In equation (10), "δ" is the first-differences operator, and terms in parentheses are t-values. Except for the AESST variable, all of the explanatory variables are significant at the two percent level or beyond, and the F-ratio is significant at the one percent level. The R^2 indicates that the model explains over four-fifths of the variation in the dependent variable.

As shown in equation (10), the estimated coefficient on the AEPIT variable is positive and significant at the two percent level. Thus, it appears that the higher the average effective federal personal income tax rate, the larger the relative DTE. This finding is consistent with the study of data from audits of individual tax returns by Clotfelter (1983), who finds underreporting of income to be an increasing function of marginal tax rates. The results in the present study are also consistent with the findings based on "official data" in Cebula (1997), Slemrod (1985), and Pommerehne and Weck-Hannemann (1989), as well as the findings based upon experimentation in Baldry (1987), Alm, Jackson and McKee (1992), and Benjamini and Maital (1985). Finally, these results are also consistent with the regression estimate in Feige (1994, p. 135, n. 19), where the relative DTE is regressed in levels against a lagged tax variable. In any case, by contrast, the social security tax rate fails to be significant at an acceptable level.

The estimated coefficient on the AUDIT variable is negative and statistically significant at the one percent level, a result which is in sharp contrast to the findings in studies of alternative data sets for earlier periods [Cebula (1997); McLeod (1997)]. In addition, the estimated coefficient on the PEN variable is negative and significant at the one percent level. Thus, as tax evasion theory predicts [Pestieau, Possen, and Slutsky (1994)], the greater the risk and penalty from underreporting income, as measured here by variables AUDIT and PEN, the smaller the relative DTE.

The estimated coefficient on the DIS variable is positive and significant at the two percent level. Thus, there is evidence that dissatisfaction with government impacts positively on the relative DTE: the more dissatisfied the public is with government, the greater the extent to which the public underreports income.

Finally, the coefficient on the linear TREND variable is negative and statistically significant at the one percent level. As suggested above, this negative coefficient might, at least in part, be reflecting the impact of technology that results in increasing the efficiency of the IRS's detection of earned income. In other words, as the IRS becomes increasingly aware of sources and amounts of earned income because of technology changes over time, the public's ability to underreport income declines and the relative size of the underground economy diminishes, *ceteris paribus*.

Conclusion

Based on this study of the period 1973-1997, it appears that the relative DTE is an increasing function of the average effective federal personal income tax rate and the public's level of dissatisfaction with government. It also appears that the relative DTE is a decreasing function of IRS penalty assessments (penalties plus interest) on detected unpaid taxes (i.e., on detected unreported taxable income) and IRS audit rates. However, the average effective social security tax rate appears not to significantly impact the relative DTE. The significant and negative coefficient on the TREND variable might to some degree be indicative of a negative impact on the DTE of technology that over time has increasingly provided the IRS with improving information on sources and amounts of earned income.

Among other things, it appears that growth in the relative DTE might, at least in theory, be diminished by increased IRS penalties on detected unreported income as well as by increased IRS audit rates. Of course, it remains to be seen whether such actions are politically feasible. Moreover, such policy actions must also be carefully evaluated in a general equilibrium cost-benefit framework. However, it also appears that restraint from further increases in federal personal income tax rates might help to at least limit the relative DTE in the U.S. Indeed, it may well be that reductions in such rates could lead to increased tax revenues.

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