An Empirical Note on Tax Auditing and the Size of the Underground Economy in the United States, 1962-1980

Cebula, Richard and Saltz, Ira

Jacksonville Univesity, Penn State University

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by

RICHARD J. CEBULA[*] and IRA S. SALTZ[**]

1. *Introduction*

For the period prior to the passage of the Tax Reform Act of 1986, whose provisions introduced inflation indexing into the Internal Revenue Code of the United States, it was generally argued that the size of the underground economy, i.e., the degree of aggregate income tax evasion, which consists essentially of economic transactions that are not reported to the government tax-collection authority, was affected significantly by income tax rates and inflation. Clearly, the higher the marginal tax rate, the greater the benefit, in terms of a reduced tax liability, from not reporting taxable income. In addition, since inflation tended to create "bracket creep", i.e., to move taxpayers into higher income tax brackets within the context of a progressive tax system, greater inflation created an incentive to not report income to the tax authority. On the other hand, it is also argued in this study that the greater the risk associated with participating in the underground economy, the smaller the degree to which economic agents will choose to either not report or to under-report their taxable income.

While controlling for income tax rates and inflation, this brief study seeks

[*] Department of Economics, Armstrong Atlantic State University, Savannah, GA (U.S.A.).

[**] College of Business Adminstration, University of Central Arkansas, Conway, AR (U.S.A.).

to determine empirically the impact of tax audits by the central government income-tax-collecting authority (as a measure of expected risk) on the *relative* size of the underground economy (i.e., the underground economy as a percent of GDP) in the United States. For the period 1962 through 1980, we use figures derived by Tanzi (1983) to measure the *absolute* size of the underground economy for each year of the study period. Based on the empirical analysis, this study seeks to identify policies, including IRS (Internal Revenue Service) tax auditing rates, that can effectively reduce the *relative* size of the underground economy and potentially thereby raise tax collections and reduce government budget deficits.

2. *The Model*

The economy consists of a large number of economic agents who generate economic value and receive payment (income) for doing so. These economic agents make choices regarding the extent to which they report their income *to* the IRS. To the extent that income is reported to the IRS, a tax liability is generally incurred.

The probability that the representative economic agent will not report taxable income to the tax authority, *pnr*, is an increasing function of the expected gross benefits of not reporting income, *eb*, and a decreasing function of the expected gross costs of not reporting income, *ec*. Thus, the ratio of the probability of not reporting income, *pnr*, to the probability of reporting income, $(1 - pnr)$, is described for the representative economic agent by:

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

In turn, the expected gross benefits from not reporting income are anticipated to be an increasing function of the income tax rate, T (Cagan, 1958; Bawley, 1982; Tanzi, 1982, 1983). In addition, within the context of a graduated income tax system, since inflation may act to elevate taxable income into higher marginal tax brackets, i.e., to create "bracket creep", the expected gross benefits from not reporting income may be an increasing function of the inflation rate, I (Bawley, 1982; Tanzi, 1982):

$$(2) \qquad eb = g(T, I) \quad g_T > 0 \quad g_I > 0$$

Furthermore, the expected gross costs of not reporting income are likely to be an increasing function of the risks thereof, which can include penalties such as fines, interest on unpaid past tax liabilities, an increased likelihood of tax audits in the future, and/or imprisonment, as well as potential fees resulting from legal and/or other representation. In the United States, these risks are clearly enhanced by an increase in *AUDIT*, the percentage of filed federal income tax returns that are audited by the IRS. Thus, it is expected that:

$$(3) \qquad ec = h(AUDIT) \qquad h'(AUDIT) > 0$$

Substituting from equations (2) and (3) into equation (1) yields:

$$(4) \qquad \frac{pnr}{(1-pnr)} = b(T, I, AUDIT) \quad b_T > 0 \quad b_I > 0 \quad b_{AUDIT} < 0$$

Let Q be the actual value of total output, i.e., $Q = UGE + GDP$, where *UGE* represents the size of the underground (unreported) economy (in dollars) and *GDP* (gross domestic product) represents the reported size of the economy (in dollars). Thus, it follows that:

$$(5) \qquad UGE = pnr * Q$$

and

$$(6) \qquad GDP = (1 - pnr) * Q$$

It then follows that:

$$(7) \qquad \frac{UGE}{GDP} = \frac{pnr * Q}{(1 - pnr) * Q} = \frac{pnr}{(1 - pnr)}$$

From (4) and (7), we get:

$$(8) \qquad \frac{UGE}{GDP} = b(T, I, AUDIT) \quad b_T > 0 \quad b_I > 0 \quad b_{AUDIT} < 0$$

3. *Empirical Estimation*

Based on equation (8), we now estimate the following reduced-form equation to identify determinants of the relative size of the underground economy:

$$(9) \qquad \left(\frac{UGE}{GDP}\right)_t = a_0 + a_1 T_{t-1} + a_2 \Delta I_{t-1} + a_3 AUDIT_{t-1} + u$$

where

$(UGE/GDP)_t$	= ratio of the size of the underground economy to the *GDP* level, expressed as a percentage, year t;
a_0	= constant;
T_{t-1}	= average effective federal personal income tax rate in year $t-1$ (as computed by the IRS), expressed as a percentage;
I_{t-1}	= inflation rate of the consumer price index, year $t-1$, as a percent per annum;
$AUDIT_{t-1}$	= percentage of filed federal income tax returns that was audited by the central/federal government tax-collection authority in year $t-1$;
u	= stochastic error term.

The time period studied runs from 1962-1980, which was the longest period for which *all* of the annual data were available. The data on *UGE* come from Tanzi (1983) for the years 1962-1980. The *GDP* and inflation figures come from the *Economic Report of the President, 1993*, Tables B-2 and B-63. The variables *AUDIT* and *T* were obtained from the IRS (1961,...,1980).

The Augmented Dickey-Fuller (ADF) test reveals that three of the four variables in the system are stationary in levels over the study period: $(UGE/GDP)_t$, T_{t-1}, and $AUDIT_{t-1}$. However, the inflation variable, I_{t-1}, is stationary only in first differences over the period. Hence, in the OLS estimation provided below, I_{t-1} is expressed in first differences whereas the remaining variables are expressed in levels.

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

$$(10) \quad \left(\frac{UGE}{GDP}\right)_t = 0.2 + \underset{(3.50)^*}{0.17} \, T_{t-1} + \underset{(2.38)^{**}}{0.1} \, \Delta I_{t-1} - \underset{(-3.24)^*}{0.2} \, AUDIT_{t-1}$$

$R^2 = 0.89, \quad DW = 1.80, \quad Rho = 0.09$

where terms in parentheses are t-values and Δ is the first-differences operator. * indicates statistical significance at the one percent level and ** at the five percent level.

As shown in equation (10), all three of the estimated coefficients exhibit the expected signs and are significant at the five percent level or beyond; indeed, two of the three coefficients are significant at the one percent level. In addition, the coefficient of determination indicates that the model explains nearly nine-tenths of the variation in the dependent variable. Thus, it appears that the underground economy, as a percentage of GDP, is an increasing function of both the federal personal income tax rate and the inflation rate. Moreover, the underground economy as a percent of GDP also appears to be a decreasing function of the percent of filed federal income tax returns that is audited by the IRS. Thus, among other things, it appears that more aggressive auditing of federal income tax returns may lead to a smaller underground economy, at least for the case of the United States.

4. Conclusion

For the period 1962-1980, it appears that the underground economy in the United States was sensitive to the federal personal income tax rate, inflation, and the percentage of filed tax returns audited by the IRS. Presumably, the problem associated with inflation has been effectively eliminated by the inflation-indexing provisions of the Tax Reform Act of 1986. Regarding federal personal income taxation, the relative size of the underground economy could presumably have been diminished by a lower effective tax rate. Furthermore, a more aggressive tax auditing policy might also have induced increased reporting of earned income.

On the other hand, in a contemporary (year 2000) setting, whereas tax rate reductions would undoubtedly be well received, higher IRS audit rates – given the existing high level of taxpayer resentment towards various IRS practices – would likely not be politically feasible.

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ABSTRACT

This study empirically investigates the impact of Internal Revenue Service (IRS) tax auditing rates on the relative size of the underground economy in the United States. Using data derived by Tanzi on the size of the underground economy for 1962-1980, it is found that the higher the percentage of tax returns that is audited by the IRS, the smaller the relative size of the underground economy. For the study period, it also is found that both higher marginal income tax rates and inflation (which led to "bracket creep") acted to increase the size of the underground economy.