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EFFECTS OF TAX AUDITING: DOES THE DETERRENT DETER?

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ABSTRACT

The literature on tax compliance agrees that tax audits have two effects, direct and indirect. Direct effects of auditing are additional revenue collected as the result of a tax audit. Indirect effects refer to the deterrence effects, i.e. auditing deters potential tax evaders from cheating on their taxes. The research is based on the data from the USA. The objective of the paper is to determine (1) whether federal individual income tax audits are effective in improving voluntary tax compliance (2) whether the deterrent effects of those audits spill over to compliance with state individual income taxes. The results of multiple regression indicate that higher Internal Revenue Service (IRS) audit rates improve state individual income tax compliance. Other findings include evidence that opportunities to evade taxes, complexity of the tax code, as well as higher educational achievement are correlated with higher non-compliance.

JEL CLASSIFICATION & KEYWORDS

■ H11 ■ H26 ■ H30 ■ H83 ■ TAX EVASION ■ TAX COMPLIANCE ■ AUDITS ■ DETERRENCE

INTRODUCTION

It's déjà vu for American states again. Recent economic recession caused great fiscal distress among states and opened sizable gaps in the budgets. To deal with this seemingly unprecedented shortfall in revenue states are raising taxes in addition to cutting spending. However, the situation is not new. Fiscal stress, increased spending responsibilities coupled with sharp economic downturn, has put pressure on states to establish new revenue sources since 1930s. Another way to ease pressure on budgets is to look for savings including the increased efficiency of tax administration and high levels of tax compliance.

The collection of taxes at a reasonable cost to society is a cardinal virtue of a well designed tax system. In the context of the US, states have a choice to take advantage of the opportunities offered by federalism. This is especially evident with individual income taxes. By designing state individual income taxes in all relevant ways similar to the federal individual income tax, states can rely on the infrastructure of federal tax administration for the collection of state individual income taxes.

At the heart of tax collection process is the assurance of a high level of tax compliance. Although most taxpayers voluntarily comply with income tax laws, the tax gap – the amount of taxes legally due but not paid in full and on time – persists at both federal and state levels at about 16 percent of total taxes due. (California Legislative Analyst's Office, 2005; Minnesota Department of Revenue, 2004; New York State Department of Taxation and Finance, 2005; U.S. Department of Treasury, 2009). Noncompliance reduces state revenue that could be used to provide services to its citizens. It also undermines equity and efficiency of the tax system by increasing the administrative costs and by unfairly shifting the tax burden on those who comply.

Tax administration has in its arsenal several tools to encourage voluntary tax compliance and close the gap. The most prominent of such tools are tax audits. By auditing taxpayer records, tax administrators detect taxpayers who fail to fulfill their tax obligations, and may impose penalties and fines. More than that, effective audit programs induce voluntary tax compliance. The possibility of being audited and caught at cheating deters potential tax evaders.

When facing a sizable tax gap, states must consider whether or not to audit taxpayers directly. The similarity of state individual income structures with the federal tax structure enables states to rely on federal tax audits and on the information gathered through those audits for enforcing state taxes. The following research question guided this study: Do individual income tax audits conducted at the federal level by the Internal Revenue Service (IRS) have deterrent effects[1] on state individual income tax compliance? In other words, this study attempts to find empirical evidence for spill-over effects of federal auditing activities on states' income tax collections. The positive relationship between federal tax audits and state income tax compliance would indicate that states gain significant savings in the administration of their taxes as well as enjoy a higher level of tax compliance than otherwise would be possible.

This article contributes to the previous research on individual income tax compliance in several ways. First, this study shifts focus from federal income tax to state individual income tax. The empirical work in this field has been mostly concentrated on the federal individual income tax. The second notable contribution of this article is that it investigates a peculiar practice of the U.S. tax administration system to share the enforcement burden between the federal government and the states.

In the times of ever tightening budgets, cooperation among various government levels may produce positive compliance results without the increase in administrative costs. The purpose of this paper is to examine (1) whether federal individual tax audits are effective in improving voluntary tax compliance (2) whether the deterrent effects of those audits spill-over to compliance with state individual income taxes. These questions are answered by analyzing panel data on states with broad – based individual income taxes during the 1997 – 2001 period. The next section provides a brief review of the considerable literature on the effects of audits on tax compliance. The paper then proceeds with the description of econometric model and regression results. Finally, the implications of the findings are discussed.

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[1] Deterrent effects (or indirect revenue effects) differ from direct auditing effects and are measured by revenue collected above the collections resulting directly from the action of an audit that may include assessments, interest, and/or penalties.

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Literature review

Effect of audits

Studies on the effects of audit rates on compliance present fairly consistent evidence that audit probabilities have some deterrent effects, although the magnitude of such effects is less clear. Estimation results suggest that higher audit rates lead to more income reported with an estimated income to audit elasticity ranging from 0.1 to 0.2 (Alm, 1999). The effects of audits on compliance have been researched using experiments, surveys, aggregated TCMP (Taxpayer Compliance Measurement Program) data, operational audit data, and pooled cross-section time series databases.

Experimental studies consistently show that probability of an audit has a positive effect on compliance although deterrent effects are small (Alm, Jackson, & McKee, 1992a, 1992b; Alm, McClelland, & Schulze, 1992). A typical result is that an increase of ten percent in the audit rate will increase compliance by two percent (Alm, Jackson, et al., 1992b). Kinsey (1992), and Sheffrin and Triest (1992) found that compliance increases with greater perceived probability of audit using survey data. However, both laboratory experiments and survey studies suffer from well-know limitations. It is hard to recreate real-world situations in a laboratory experiment, and subjects may not be representative of all taxpayers. The small scale limits the ability to generalize. Similarly, the accuracy of surveys is uncertain because of the recollection bias, reluctance to report past illegal behavior, or to appear dishonest. Individuals seek to present a rational, coherent image of themselves in surveys; those who report evasion provide beliefs to justify their evasion, while compliant taxpayers provide beliefs to justify their honesty (Andreoni, Erard, & Feinstein, 1998). It is also hard to distinguish whether people pay their taxes because they feel a social duty to pay them or due to the fear of an audit. Ninety-six percent of those surveyed by the IRS Oversight Board agreed that paying their fair share of taxes is a civic duty, and 62% also agreed that fear of an audit had a strong impact on whether they pay their taxes “honestly” (US. Department of Treasury, 2006).

The relationship between audit coverage and compliance is not linear. The return from extra coverage eventually declines as coverage increases (Alm, McClelland, et al., 1992). Also the impact of an audit is not uniform for all taxpayers. The deterrent impact of individual income tax auditing depends upon the income level. Studies have shown that the impact is greater for low and middle income class taxpayers (Beron, Tauchen, & Witte, 1992; Dubin & Wilde, 1988; Witte & Woodbury, 1985). Similarly, the threat of an audit has a positive impact on the compliance behavior of low- and middle-income class taxpayers but engenders a “perverse” reaction by high-income taxpayers as found in Minnesota compliance experiments (Slemrod, Blumenthal, & Christian, 2001). Low- and middle-income taxpayers responded to a certain probability of an audit as expected, by increasing their reported levels of income. Surprisingly, high-income taxpayers reduced their reported income, perhaps, in the expectation that auditors would not be able to detect a substantial portion of underreported income or that the outcome of the audit process can be manipulated.

Beron, Tauchen, and Witte (1992) revealed that increasing the odds of an audit significantly increases the reported AGI (Adjusted Gross Income) for two audit classes: low income returns taking a standard deduction and low-income proprietors. The magnitude of the effects was modest, with the elasticities for reported tax liability with respect to audit rate ranging from .19 to .31 (Beron, et al., 1992).

Although experimental research suggests that subjects are more compliant in later rounds following enforcement, a few available empirical studies are inconclusive regarding whether the experience of a prior audit changes the reporting behavior of the individual and induces him or her to report the true amount of income. Larger assessments in prior audits translate into more substantial improvements in compliance during subsequent examination (Erard, 1992). However, when other taxpayer characteristics, such as age, level of income and type of the return required to file, are taken into account, the positive effects of prior audit on subsequent reporting behavior become insignificant. Long and Schwartz (1987) examined IRS data on taxpayers whose returns were audited by TCMP in 1969 and, later, were subjected to TCMP 1971 audits. The authors found that the earlier audit was only marginally effective in reducing the frequency of non-compliance, but had no effect at reducing the average amount of evasion for those individuals who continued to evade (Long & Schwartz, 1987). This result might be explained by taxpayers’ knowledge that TCMP audits are random, and they were not expecting to be selected for another round of audits.

Research with aggregated data consistently found evidence for significant deterrence effects of audits. Dubin and Graetz (1990) used pooled cross-section time series for the states over the period from 1977 to 1986. They estimated that a decline of federal audit rates from approximately 2.5% in 1977 to 1% in 1986 reduced income tax collection by $41 billion; of this, $34 billion represent “spillover effects” or indirect effects of audits (Dubin, Graetz, & Wilde, 1990). Plumley (1996) also created a cross-section time series database for states from 1982 to 1991. His research revealed that audits significantly increase income reported. The “ripple effect” in terms of additional dollars induced as a function of audit rates was 11.6 times as large as the average adjustment directly proposed by audits. In addition, if audit rates in 1991 remained constant at its 1982 level of 1.62% instead of falling to actual 0.65%, the cumulative effect would have been additional $275 billion tax reported (Plumley, 1996). These findings point out that indirect revenue effects (e.g., deterrence, changed attitudes, etc.) of auditing activities are considerably greater than direct effects (e.g., collections directly from the action).

There is also evidence that some auditing programs may be more effective in encouraging compliance than others. For example, a comprehensive audit process, when an audit of one tax can lead to the audit of another tax, makes it less attractive for entities with multiple tax levies to evade a single item. Audits are costly for taxpayers even if no evasion is detected, so avoiding an audit itself is a considerable benefit (Alm, Jackson, & McKee, 2004). Similarly, the theory predicts that a practice to audit past reporting whenever the current period taxes are investigated may lead to more income reported than without the possibility to investigate the past compliance. This occurs because the accumulation of past underreporting becomes equivalent to an increase in the penalty for the noncompliance in the current period (Allingham & Sandmo, 1972).

State individual income tax compliance

Literature on compliance with state individual income taxes is very scarce. One of the more thorough and sophisticated studies of the relationship between state and federal tax audit was conducted by Alm, Erard, and Feinstein (1996). The authors found that the IRS and Oregon Department of

Revenue possess related, but not identical, information about noncompliance. Therefore, audit selection criteria used by the two agencies did not coincide. Oregon was chosen for the empirical analysis because it possesses an active independent enforcement program while some states do not undertake independent audit efforts at all. The authors suggested that a better sharing of information between federal and state agencies might improve their enforcement activities (Alm, Erard, & Feinstein, 1996).

Several important insights into tax compliance behavior were produced by the Minnesota income tax compliance experiment conducted by the Minnesota Department of Revenue with the assistance of several tax compliance experts from academia (Coleman, 1996).The experiment tested whether increased auditing of tax returns with prior notice to taxpayers improved voluntary compliance with state income taxes. The primary measures of compliance were change in reported federal taxable income (tax base for state individual income taxes), and change in state income taxes paid. The findings indicated that low- and mid-income taxpayers facing a tax audit reported more income and more taxes. The greatest effect of the audit threat was among mid-income, high-risk subgroup defined as taxpayers who claimed in excess of $8,000 in federal itemized deductions. The notice of tax audit had mixed effects on high-income taxpayers; some taxpayers responded positively, and some negatively leading to statistically insignificant results. The experiment concluded that focusing audit programs on high-risk, mid-income taxpayers is a cost-effective strategy to improve compliance with state income tax.

State audits

States generally conduct two kinds of audits: (1) audits based on information provided by the IRS, so called piggyback audits, and (2) independent audits based on internal sources within the department or other non IRS information. Though there is no data available on audit activities for all states with individual income taxes, a survey of 32 states revealed that states rely extensively on federal enforcement efforts (Alm, et al., 1996). Although there is great degree of variation in state tax enforcement efforts, averages across states show that state enforcement levels are quite low in comparison with federal enforcement levels. Some states undertake no independent audit efforts even if they have significant income tax programs. “A number of states have never employed large enough audit staffs to attempt anything more than the most routine review of returns, and their departments have depended on the activities of the IRS for audit coverage.” (Penniman, 1980 p.180).

Model estimation

Theoretical model

The empirical analysis is based on the theoretical model developed by Allingham and Sandmo (1972) and modified by Yitzhaki (1974).[2] According to this model, an individual chooses the amount of income to declare (X) that maximizes his expected utility (E [U]), given his total income (W), the tax rate (θ), the penalty rate (F), and the probability of being caught (p). This expected utility function can be represented with the following equation found in Yitzhaki (1974):

$$E[U] = (1 - p)\, U(W - \theta X) + pU(W - \theta X - F\theta(W - X)) \quad (1)$$

The actual income W is known to the taxpayer, but not to the tax authority. With some probability p the taxpayer can be selected for a tax audit, and his actual income will be disclosed. If this happens the taxpayer will have to pay a penalty rate F, in addition to the tax on the unreported amount, W-X. Clearly, the taxpayer is better off if he is not caught at underreporting his income.

The solution to this equation reveals that both the increase in the penalty rate and the increase in the probability of detection will unambiguously lead to larger declared income. The model does not generate any clear result concerning the relationship between income and tax evasion. The fraction of declared income may increase, stay constant or decrease depending on the relative risk aversion of the individual. The relationship between tax rate and evasion is ambiguous in Allingham and Sandmo’s specification, and positive in Yitzhaki’s modification of the model. Of particular relevance for the present research is that the solution to this problem shows an unambiguously positive relationship between the probability of being caught and declared income.

Data description

The sample is all states that levy a broad-based individual income tax. Thus, the initial sample is fully representative of the population. The data set covers 41 states and 5 years. Only 41 states are used in the analysis as some states (Alaska, Florida, Nevada, South Dakota, Texas, Washington, Wyoming) do not levy an individual income tax, and some states (New Hampshire, Tennessee) limit taxation to dividends and interest income only. The study covers years 1997 through 2001.[3]

Since theory of tax compliance is based on individual behavior, one might call into question if aggregate data is adequate to make predictions about tax compliance. A less aggregate data might better facilitate the type of analysis undertaken in this study. However, there is variety of constraints that limit the possibility to use less aggregate data sources. Probably the best data source would be a sample of individual income tax returns over time. However, under the Internal Revenue Code, access to individual income return data is severely limited. Nevertheless, IRS district level data merged with state level data from other sources enable exploring a wide array of questions. For example, only aggregate data enable one to infer indirect (or spillover) effects on tax revenue. Individual level data enable one to estimate only if an experience of an audit has deterrence effects on an individual’s subsequent reporting.

The data set is compiled from various sources. State individual income tax collections are taken from the Bureau of Census, Census of Governments. Tax collection dollars are deflated using CPI (Consumer Price Index) for all urban consumers (1982-84=100) that is estimated for the U.S. regions (Northeast, Midwest, South, and West) by Bureau of Labor Statistics (Bureau of Labor Statistics, 2008). Since regions cover several states, each state’s tax collections are deflated using the appropriate regional CPI(U).The number of returns filed in each state was obtained from state revenue departments.

[2] Yitzhaki makes a slight although significant change to the theoretical model postulated by Allingham and Sandmo. Whereas the latter posit a penalty rate π on undeclared income, the former sets forth a penalty rate F on the evaded tax, which appears to be the more realistic assumption. This change modifies some of the conclusions. Importantly, Allingham and Sandmo find that the partial slope of declared income with respect to the tax rate ($\partial X/\partial\theta$) is ambiguous; in contrast, Yitzhaki finds that it is unambiguously positive.

[3] The data set could not be updated to include more recent years, because the IRS ceased making district level data available to the public in 2001.

Table 1: Definition of variables and data sources

Variable name	Definition	Source
Tax per Return	Individual income tax collections per return in constant 1984 dollars.	Individual income tax collections for each state are taken from Bureau of Census.CPI(U) from Bureau of Labor Statistics. Number of returns filed was provided by state revenue departments
Audit Rate	Number of returns audited divided by the number of total returns	Transactional Records Access Clearing House (TRACFED)
Amnesty	Dummy indicating if a state has had an amnesty in years 1997 – 2001	Federation of Tax Administrators
Tax Rate	Average effective tax rate calculated by dividing individual income tax collections by personal income	Bureau of Census and BEA
Pop Age 65	Percentage of population over 65 in total population	Bureau of Census
Pop Age 18	Percentage of population under 18 in total population	Bureau of Census
BRC	Number of tax brackets	Federation of Tax Administrators, CCH "State Tax Book"
Services	Percent of labor force in services	BEA, Regional Economic Accounts
LPS	Percent of labor force in legal and professional services	BEA, Regional Economic Accounts
HSS	Percent of labor force in health and social services	BEA, Regional Economic Accounts
Sole Proprietors	Percent of sole proprietors in total employment	BEA, Regional Economic Accounts
Farm	Percent of farm self-employment in total employment	BEA, Regional Economic Accounts
Inc per Cap	Personal income per capita in constant 1984 dollars	BEA, Regional Economic Accounts, CPI (U) from Bureau of Labor Statistics.
Education	Percent of persons over 25 with Bachelor's Degree or higher	Statistical Abstract of the U.S.

Source: Author

Data on individual income tax audit rates are taken from the Transactional Records Access Clearing House (TRACFED) website, an organization associated with Syracuse University. Audit rate is a ratio of audited returns to total tax returns filed. Audit rates are given for each IRS district. Districts do not always coincide with state boundaries. In all the cases of multiple districts within a state (New York, California) the data are aggregated to the state level. In those cases, where one district covers two or more states, it is assumed that the same proportion of returns is audited in each state. The audit rate includes only face-to-face audit, and does not include correspondence contacts from IRS Service Centers. Data for other variables are taken from a variety of sources and are summarized in Table 1.

Empirical model

The Ordinary Least Squares (OLS) estimator is used to test a multiple regression model. The specification of the Tax Per Return equation is as follows:

$$TPR_{it} = \beta_0 + \beta_1 AuditRate_{it} + \gamma Z_{it} + T_t + \varepsilon_{it} \qquad (2)$$

Where *TPR* denotes tax collected per return, *AuditRate* represents the policy variable, *i* indexes states and *t* indexes time period, β_0 denotes a time-varying intercept, Z_{it} is an *n x m* vector of control variables (*m* is the number of controls) and where γ represents an *m x 1* vector of coefficients, *T* are dummy indicators for years 1998, 1999, 2000, and 2001 (1997 is a base year), and ε_{it} is an error term.

The state level data for years 1997 to 2001 are pooled to estimate the measure of compliance, Tax Per Return, as a function of audit rates and a vector of control variables that represent compliance efforts, characteristics of tax code, opportunities to evade, and socio-economic characteristics. The expectations regarding the effects of the chosen variables on state individual income tax collections per return are based on conventional theory and previous empirical work discussed in literature review. Descriptive statistics for variables is provided in Table 2.

Dependent variable

Since direct measures of voluntary compliance are unavailable Tax Per Return substitutes as an indirect measure of compliance. There are three distinct types of income tax compliance: reporting compliance (accurate reporting of income and of tax); filing compliance (the number of returns required to be filed that are actually filed); and payment compliance (the correct amount of tax reported actually paid). Tax Per Return is a measure of reporting compliance. Using reported tax per return filed as a dependent variable can make it difficult to interpret the results since the explanatory variables can have effect on both the numerator and denominator. For example, the average tax reported per return may increase due to policy variables but it may also increase because of the decreasing filing. However, the recent tax compliance study shows that noncompliance due to non-filing is a small fraction (7.8%) of total noncompliance. Most of noncompliance is due to underreporting of income (82.6%) (Internal Revenue

Table 2: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Tax Per Return	932.40	2 86.83	330.00	1,810.00
Audit Rate	0.32	0.19	0.08	1.28
Amnesty			0	1.00
Tax Rate	2.62	0.64	1.21	4.47
Pop Age 18	25.60	1.78	21.86	33.65
Pop Age 65	12.86	1.56	8.50	16.88
Brackets	4.65	2.70	1.00	10.00
Services	30.21	3.33	24.21	39.12
LPS	3.99	1.42	1.87	9.15
HSS	8.94	1.66	5.66	13.06
Sole Proprietors	15.26	2.29	11.86	21.61
Farm	1.94	1.64	0.11	7.60
Inc per Cap	15,837.74	2,330.32	11,842.00	23,299.00
Education	24.2	4.07	14.60	38.70

N = 205

Source: Author

Service, 2006). Although using Tax Per Return as a measure of compliance is vulnerable to criticism, it has been used previously by Dubin, Graetz, and Wilde (1990) in their seminal work on the effects of audits on the federal individual income tax. This study builds upon that previous research.

Policy variable

Audit Rate is the variable of policy. It represents the number of federal individual income tax returns audited divided by total returns filed. Audits used in calculating audit rate are defined in the data source as "traditional face-to-face audits which take place at an Internal Revenue Service (IRS) office, or at the taxpayer's place of business. These are conducted by IRS revenue agents and district tax auditors" (Transactional Records Access Clearinghouse, 2004). Thus, this audit rate does not include IRS Service Center audits or audits by correspondence.

Audit Rate is expected to have a positive sign. As suggested by the aforementioned basic economic model of tax compliance, the higher the probability of being caught at cheating, the less the tendency to underreport income. Taxpayers' perceptions about this probability are formed through the frequency of contacts with tax auditors, including public and private accounts of such contacts. Although it is impossible to determine exactly how taxpayers' awareness of the risk audit is formed, it was established that informal communications among taxpayers have stronger indirect effect on encouraging voluntary compliance than "official" communications. (Alm, et al., 2004). In any event, identified tax cheaters serve as a "signal" to the potential evaders that cheating does not pay and restrain them from participation in the evasion gamble. The natural log of Audits Rate is used to reflect the diminishing returns to enforcement efforts. Expected signs for other variables are shown in Table 3.

Table 3: Expected effects of independent variables on Tax per Return

Variables	Expected sign
Audit Rate (N. Log)	+
Amnesty	–
Tax Rate (N. Log)	–
Pop Age 18	–
Pop Age 65	–
Brackets	–
Services	–
LPS	–
HSS	–
Sole Proprietors	–
Farm	–
Inc per Cap (N. Log)	+
Education	–

Source: Author

Regression results and discussion

The results for the model estimated by OLS are presented in Table 4. The table lists variables included in the equations as well as the manner in which some explanatory variables were transformed (e.g., to logarithmic form to account for nonlinear relationships). The model has a fairly high predictive power. Explanatory variables explain about 92% of the variation in the dependent variable. Represented by F = 133.4, the overall significance is quite strong.

Audit rates

These results clearly indicate that audit rates have a positive and statistically significant impact on tax compliance

Table 4: Regression results for the dependent variable, Tax per Return

Variables	Coef.	Std. Err.	t	Sig
Audit Rate (N. Log)	174.302	21.810	7.99	***
Amnesty	11.160	33.489	0.33	
Tax Rate (N. Log)	862.541	28.639	30.12	***
Pop Age 18	-8.140	4.994	-1.63	*
Pop Age 65	8.563	7.356	1.16	
Brackets	-7.213	2.765	-2.61	***
Services	10.909	5.362	2.03	**
LPS	28.645	10.785	2.66	***
HSS	-24.498	7.820	-3.13	***
Sole Proprietors	-12.179	3.603	-3.38	***
Farm	1.752	6.301	0.28	
Inc per Cap (N. Log)	637.482	79.290	8.04	***
Education	-5.601	2.313	-2.42	**
N	205			
Adjusted R-sq	0.917			
Model Significance	F=133.4	p<0.01		

*p<.1, **p<.05, ***p<.01 (two-tailed tests)

Source: Author

(p = 0.01). A 1% increase in federal audit rate, on the average, increases individual income state tax collected per return by 1.74 dollars, holding other variables constant. Keeping in mind that actual audits rates are well below 1% (mean is 0.32% in this sample), these results indicate that increased audit coverage would translate into substantial additional dollars collected.

This finding provides strong evidence of the deterrent effect of audits on taxpayer non-compliance. In addition, it supports the proposition that federal audits have an impact that spills over to state individual income tax compliance. It is important to emphasize that these findings are indirect effects on individuals not audited for that tax. That indirect effect of audits (improved voluntary tax compliance) is significantly larger than direct effect (additional revenue recovered as a result of audit) has been found in previous research (Dubin, et al., 1990; Plumley, 1996). However, this study carries this finding further. Previous research established that federal audits have an indirect effect on compliance with the federal individual income tax. This study revealed that audits have an impact that goes beyond compliance with the tax that was audited, i.e., federal audits have a positive effect on compliance with state individual income tax.

How can we explain that federal audit rates have such a strong positive impact on state individual tax collections? After all, federal individual income tax is quite a distinct tax and is enforced by a separate tax agency. How do perceptions about the federal audit of federal tax influence the perceptions about the audit of state tax? There is considerable overlap between the information relevant for federal and state individual income tax computations. Some states even require attaching the federal tax return (so called "wraparound information") to the state tax return when filing for state tax. Whether taxpayers are aware or not of the federal-state exchange of information program, they are likely to perceive that there is a connection between the probability of audit for state and federal underreporting.

There is also a direct link between state auditing activities and federal audits. At the closure of a federal audit, if discrepancies are found, the taxpayer receives a notice to submit a corrected state tax return. If the taxpayer fails to act accordingly, state revenue departments may contact this

taxpayer with an assessment of state taxes owed. In addition, based on the federal data states are able to generate audit reports by computer without an individual auditor having to manually handle the return, i.e., assessments are generated without any action on the part of state tax agency. Furthermore, even so-called state independent audits may not be completely independent of federal tax enforcement efforts, as federal information indirectly contributes to state assessments through state tax audit selection formulas. Employees of Iowa and Minnesota state tax agencies indicate that almost all of the audit selection programs make use of federally processed information (B. Berg, personal communication, July, 10, 2008; P. Makousky, personal communication, July 25, 2008).

Therefore, in practice it is hard to separate the effects of state's enforcement actions on taxpayers from the effects of federal audits. However, the audit's data used in this study include only face-to-face audits. Federal tax auditors or revenue agents do not conduct face-to-face audits of state individual income taxes. If perceptions are formed through communications, as generally accepted, effects of audits estimated here are spill-over effects of field audits of federal income taxes on state compliance. Although it would be desirable to include a variable representing state individual tax audits, as discussed previously, many states do not have active audit programs, and only very few carry out field audits.

Variables related to tax code

The positive effect of Tax Rate on tax collection per return can be entirely attributed to the direct role tax rates play in the calculation of the tax. Unfortunately, it is impossible to disentangle the direct effect tax rates play in tax reported on returns from their potential influence on compliance propensities. Arguably, marginal rates may have a more powerful effect on taxpayer's compliance decisions. However, keeping in mind the great variation among state tax codes, calculating an effective marginal rate for each state for a five year period is a project in its own right. Nevertheless, the average effective rates used in this study (mean 2.62%) are close to the mean marginal effective tax rate of 3.03% as calculated by (Feenberg & Rosen, 1986). In addition, the effect of tax rate on tax compliance is ambiguous in theory, and it is hard to separate tax rate effects from effects of other parameters (such as income) in empirical research. In a similar study on aggregate state-level data, Plumley (2002) found that marginal rates at $15,000 taxable income have a positive effect on income reported, while marginal rates at $57,000 taxable income have negative impact on income reported. (Plumley, 2002).

Variable Pop Age 18 is only marginally significant at 0.1 level, but it has an expected negative sign. As percent of population in the age group that can be potentially claimed as dependents on tax returns increase, tax reported per return decreases. This finding can be attributed to the direct effect of exemptions on tax base.

Variable Brackets is highly significant and has an expected negative sign. In the model variable Brackets measures complexity. Empirical research on the effects of complexity on tax compliance indicates that complexity increases compliance costs, gives rise to the sense of unfairness, leads into frustration with tax system, creates opportunities to evasion, and thus contributes to lower tax compliance (Forest & Sheffrin, 2002; Slemrod, 1989; Vogel, 1974). However, unlike this research those previous studies did not use specific tax code provisions as a measure of complexity. The effect of number of brackets on tax compliance can be compared to the effect of multiple tax rates. It has been estimated that an additional tax rate in a VAT law increases tax evasion by 7% (Agha & Haughton, 1996). The number of brackets may reduce compliance by affording taxpayers the possibility to arrange their taxable income to fall into a lower tax bracket and, therefore, pay less. Although average taxpayers may not be fully aware of detailed provisions of the tax code (tax computation is facilitated by the use of tax tables), they generally encumber the job of the tax administrator. The multitude of tax brackets requires introduction of additional checks in tax administration process, and aggravates tax enforcement (D. Casey, personal communication, March 17, 2008).

Variables related to an opportunity to evade

The percent of employment in services (Services) is statistically significant but the sign is positive, contrary to the expected negative sign. An explanation might be that, in reality, the service sector has been replacing the manufacturing sector in the majority of the state economies. The growing importance of the service sector is accompanied by the consolidation of service providers, as well as more rigorous accounting and other business practices that were present in the manufacturing sector. At the same time, the growth of the service sector could hardly escape the attention of tax administration, which has to refocus its enforcement activities in accordance with the changing environment. The studies that found negative effects of employment in services on tax compliance are rather dated. For example, Dubin et al. (1990) conducted their analysis using 1977-1986 data, while Beron et al. (1992) used 1969 tax return data. Therefore, it can be argued that since then the changes introduced into the service sector have reduced the opportunities for evasion for this group of taxpayers.

However, disaggregating service sector employment reveals the differences in tax compliance behavior within the service sector. A greater percentage of employment in legal and professional services, *LPS*, is positively related to compliance, while employment in health and social services, *HSS*, is negatively related to tax compliance. This finding partially confirms the results of research on sales tax compliance. Compliance rate of firms engaged in the provision of health and legal services was found to be only about 10%, compared to the average compliance rate of 43% for all sampled firms (Alm&et al., 2004). The Washington Department of Revenue also reported that non-compliance in health and legal services is high although not as high as in other miscellaneous services (Gutmann & Williams, 2004). The findings do not coincide, partly due to two entirely different tax designs with quite different reporting and payment requirements, partly due to different unit of analysis. However, the finding that health services are found to be related to tax non-compliance with respect to both, sales and income, taxes is quite interesting and deserves closer attention.

The estimates confirm the preliminary hypothesis for another class of taxpayers, sole proprietors, with more opportunities to evade taxes than other classes of taxpayers, especially compared to salary and wage earners. The higher proportion of sole proprietors in total labor force reduces tax collections. The estimate is negative and statistically significant at less than 0.01 level. This result is consistent with previous findings by Beron, Tauchen, and Witte (1992), and Plumley (2002).

Socio-economic variables

As might be expected, the coefficient on Income Per Cap is one of the most significant of the estimated parameters

in explaining tax collections per return. It has a positive sign. This is not surprising because, in practice, noncompliance makes a rather small fraction of income for any taxpayer group considered here except, perhaps, for sole proprietors. The result should be interpreted as a direct effect income has in tax collections and not as a behavioral variable. However, the omission of income as a measure of true tax liability would leave too much of the variation in the dependent variable unexplained. This problem arises from the lack of a more precise measure of noncompliance and plagues every study of that kind.

Another statistically significant socio-economic variable important in explaining compliance behavior is educational attainment. Education has an expected negative sign and is highly significant. This result confirms similar findings in other studies (Dubin et al., 1990, Beron et al., 1992), that taxpayers in areas with a more educated population tend to underreport income and reduce the tax liability. The tendency of higher educated people to not comply may also be explained through lower tax morale associated with higher education. However, the mixed effects of lower tax morale, the ability to use the tax code to their advantage and of the lesser risk aversion among the more educated has not been disentangled (Feinstein, 1992). Moreover, educational achievement and income are highly correlated. However, omitting one of the variables compounds the effects of the other (Beron et al., 1992). For example, leaving income out of the equation makes the education variable positive and should be interpreted as a proxy for income.

Conclusion

The findings of the empirical model show that federal audits of federal individual income tax have a strong positive effect on tax compliance with state individual income taxes. This finding provides strong evidence of the deterrent effect of audits on taxpayer non-compliance. In addition, it supports the proposition that federal audits carried out by the IRS have an impact that spills over to state individual income tax compliance. Other important findings include evidence that opportunities to evade taxes, complexity of the tax code, as well as higher educational achievement are correlated with higher non-compliance. The positive relationship between federal tax audits and state income tax compliance suggests that states gain significant savings in the administration of their taxes as well as enjoy a higher level of tax compliance than otherwise would be possible.

The most important implication of the results pertains to audit coverage. Federal audit rate has been decreasing steadily over several decades, and reached a 10-year low of 0.11% in 2000 (Treasury Inspector General For Tax Administration, 2008). In response to the latest release of the estimated federal income tax gap (16.3%), recommendations have been made to close the gap (Internal Revenue Service, 2007; U.S. Department of the Treasury, 2006; U.S.Senate, 2006; United States Government Accountability Office (GAO), 2006). Among recommendations is a strong urge to increase resources for auditing (OMB Watch, 2008). However, when various factors are taken into account in estimating revenue to be obtained from increased funding, one relevant factor is overlooked. That factor is the crucial role federal auditing plays in enforcing state individual income taxes. This research provides evidence that federal audit rates have an impact that spills over to compliance with state individual income taxes. Although attention is focused on reducing the federal tax gap, inaction to provide more resources for auditing function of the IRS, would have grave results for tax state collections as well. Therefore, any deliberations about the efficiency and effectiveness of audit as a tax enforcement strategy should take into consideration the effect federal audits have on state tax collections.

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