Once Bitten, Twice Shy?
The Lasting Impact of IRS Audits on Individual Tax Reporting*

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Abstract

This paper studies the impact of tax enforcement activity on subsequent individual taxpaying behavior. We exploit four waves of randomized Internal Revenue Service (IRS) audits of individual income tax filers during the 2006-2009 period to study both the short and long run effects of audits on taxpaying behavior. Rich and confidential IRS data allow us to show the differential impact of audits across sources of income and deductions. The results highlight how the effects of audits on subsequent compliance behavior are impacted by other aspects of tax policy. The results also show how the lasting impact of audits results in a long-run revenue gain that is about two times as large at the static gain in revenue from an audit.

Keywords: individual income tax, tax audit, tax evasion, tax avoidance

JEL Classifications: H24, H26

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1. Introduction

According to the Internal Revenue Service, the tax gap (the difference between taxes paid and what taxpayers should be paying under law) was approximately $385 billion in 2006 (IRS 2012). The majority of the tax gap came from the individual income tax. To increase tax compliance, the IRS audits about 1% of individual filers each year (TRAC Reports, Inc. (2014)). Audits of individuals have at least two types of effects. The direct effect is the changes in taxes paid that result from the IRS auditing a filer and uncovering reporting inconsistencies that lowered the filers tax liability. In addition, there are indirect effects of audits. For example, audits influence the behavior of the non-audited through deterrent effects (i.e., individuals reporting correctly in order to avoid the costs associated with audit and/or being in violation). Another indirect effect is that upon the audited themselves; do these individuals change their future tax paying behavior as a result of audit? Little is known about these indirect effects and we seek to address the latter- how do audits impact subsequent tax paying behavior among individuals?

Our focus is thus on the tax reporting behavior of individuals following audit. Kleven et al. (2011) use audits in Denmark to understand the determinants of tax non-compliance. They also consider the effects of deterrence (via threat of audit letters) on compliance. We extend their analysis in several ways. First, we focus on the response to audit over the short and long run (by observing tax reporting behavior for up to six years following audit). Second we decompose the effects by income source and type of deduction and thus are able to identify those income sources that have a more persistent response to audit and those whose response is more fleeting. Finally, using detailed data on the audits themselves, we are able to consider the importance of audit stringency on subsequent tax reporting behavior.

To understand the impact of audits, we use data from the Internal Revenue Service's (IRS) National Research Program, which began conducting random audits of individual tax filers starting in tax year 2001. To these data, we merge returns from the universe of filers from 2000 to 2012, allowing us to examine the impact of audits[1] on individual taxpaying behavior for a period of up to six years after an audit. These data are useful for addressing the impact of legal enforcement on subsequent behavior for several reasons. First, the IRS conducts intermittent audits and keeps systematic records of them. Second, the IRS also provides accurate data on subsequent tax payments every year, even when there is no audit. Third, these data comprise a panel of the entire population of individual taxpayers over time, allowing for rigorous empirical analysis. Furthermore, studying patterns of tax noncompliance is important in itself because of the importance of both taxation as a source of government revenue and the large (and growing) "tax gap".

Our empirical strategy is relatively straightforward since the treatment (i.e., audits) are randomized by the IRS. Using the sampling weights that IRS used to select individuals to audit, we construct a nationally representative sample of audited individuals. We pair this with a random sample of individuals draw from the same sampling pool. Then, we compare the tax filings of these two groups before and after the audit year.

Our results indicate that auditing has a long-term effect on tax auditing. An audit increases reported adjusted gross income by $603 per year, or equivalent to 1.15% of the average adjusted gross income. To put this in perspective, the average adjustment to adjusted gross income following an audit is $5,063. When we consider the impact of audit over the five subsequent years, we find that audits raise adjusted gross income by an average of

[1] The IRS defines an audit as "a review/examination of an organization's or individual's accounts and financial information to ensure information is being reported correctly, according to the tax laws, to verify the amount of tax reported is correct." (Internal Revenue Service (2014)).

$5,075 (or $4,349 in present value terms). Thus the static revenue gain from the audit understands the true revenue gain by about half when considering the five-year window aften an audit. The effect of audit is 0.45% for wage income but is 7.51% for Schedule-C income. This indicates that it is easier to underreport self-employment income than wage, which can be crosschecked with employers and often subject to withholding. Further, we find that the impact of auditing on reported wage lasts over time while it is fleeting on Schedule C income.

The effect of auditing appears to be weaker in certain audit waves. However, when we include stringency measures in the analysis, this difference goes away, indicating the importance of audit stringency.

The modern economic study of law enforcement emerged with Gary Becker's (1968) work on the economics of crime[2] and was applied to tax evasion in a well-known paper by Allingham and Sandmo (1972). Their key argument is that illicit tax behavior is shaped by audit probability and penalty. Since then, the Allingham-Sandmo model has been extended and tested in many ways.[3]

Yet, this literature has not satisfactorily addressed the post-audit behavior of taxpayers, and two opposing expectations about the after-effects of tax audits have emerged. The first and perhaps more intuitive expectation is that experiencing an audit leads taxpayers to revise their perceived audit probability up and therefore reduce their subsequent noncompliance. Afterwards, for each year they do not experience another audit, taxpayers revise down their perceived audit probability and thus increase noncompliance. Therefore the post-audit tax payment trend would consist of an immediate rise followed by a decrease. Intriguingly, the second expectation is completely opposite. Taxpayers may, correctly or incorrectly, perceive

[2] Earlier treatments include Montesquieu (1748), Beccaria (1764), and Bentham (1789).
[3] For a review of tax evasion literature see Slemrod (2007), and for a critique of this literature see Alm (2010).

that auditors rarely come back immediately after an audit, and that it is safest to evade taxes right after an audit. As years pass, the risk that auditors come back increases and thus it is best to reduce noncompliance. In this case, the post-audit tax payment trend would be an immediate fall followed by an increase.

Some interesting laboratory experiments lend some support to the second possibility. Guala and Mittone (2005) and Mittone (2006) find that lab subjects increase tax evasion immediately following an audit. Maciejovsky et al. (2007) also find their lab subjects to increase tax evasion following an audit, but to decrease it gradually over time to the pre-audit level. Kastlunger et al. (2009) show that this behavior is caused mostly by misperception of audit probability.

The negative relationship between income tax reporting and audits also has support from the field. DeBacker et al. (forthcoming) consider the response of corporations to IRS audits. They find that corporations show an increase in aggressive tax reporting (measure through changes in effective tax rates) following audit. The trend in effective tax rates continues for several years after audit before returning to its pre-audit level.

Related empirical studies of individual tax compliance include that of Kleven et al. (2011) who use Danish tax data to study who evades tax and what types of income they misreport. The authors look at income before and after audit to find the elasticities of evasion and avoidance. They also conduct a field experiment, sending threat of audit letters. They find that threat of audit and having a past audit both positively affect reported income. In contrast, Gemmell and Ratto (2012) use UK data and find a mixed effect of audits on subsequent tax paying behavior. They find that following an audit, those who were compliant increase their non-compliance. While those who were non-compliant increase their compliance.

Several studies consider the impact of audit rates on indivudal tax payer compliance. These include Tauchen, Witte, Beron (1989), Dubin, Graetz, and Wilde (1990), and Witte and Woodbury (1985), all of whom find that increases in audit rates increase compliance. Marginal tax rates also impact evasion since they affect the value of misreported income. Evidence of this has been provided by Clotfelter (1983) and Feinstein (1991). In addition, Feldman and Slemrod (2007) find that documented income is much less likely to be evaded, which has been corroborated in other studies such as Kleven et al (2011).

Additional related studies are those that show evidence of the indirect effects of audits that we are interested in. These include Alm and Yunus (2009), who find a role for norms and learning in tax evasion in the US, and Dubin (2007), who calculate the deterrent effect of audits.

The paper is organized into six sections. Following this introduction, Section 2 provides a simple conceptual framework. Section 3 describes the data and Section 4 presents information on tax compliance in our data. Section 5 presents our main empirical results, and Section 6 reports results for particular income and deduction items and subsample. Section 7 concludes.

2. Data

Our data come from three sources. We discuss each data source in turn and then the process by which we merge the data and create our final sample.

First, we use data on audits from the IRS's National Research Program (NRP). Specifically, we use the taxpayer information generated by the audits conducted as part of

the NRP's 2006 through 2009 waves.[4] Taxpayer information includes tax payer identifiers (the social security number (SSN) of the primary filer), year of the audited return, and the resulting adjustment to the tax return by line on the Form 1040. The NRP conducts audits on a stratified, random sample of the filing population and includes in their data weights to allow researchers to create population-representative statistics. Each of the 2006-2009 waves have approximately 15,000 observations.

Second, we use the IRS's Compliance Data Warehouse (CDW), which includes the universe of tax returns. The CDW data include many items from the filer's Form 1040 and the associated forms and schedules, including all items on the front page of Form 1040 and the main line items from most associated schedules. We use CDW data from the years 2000 to 2012.

Finally, we use data from the IRS's Audit Information Management System (AIMS). The AIMS data contain detailed information on all IRS audits from 1996 to present. We use these data to augment the audit data from the NRP. In particular, the AIMS data allow us to observe variables such as the date the audit began and ended, the hours of examiner time put towards the audit, and examiner characteristics.

Our sample is constructed in the following way. We create a control group by randomly selecting a 0.1% sample of filers by choosing a different set of 10 four-digit SSN endings for each year from 2006 to 2009.[5] For each of these four years, we then select all primary filers who had one of these 10 four-digit endings from the universe of returns filed that year. Finally, for each individual we have selected for each of these four years, we include all returns they file from 2000 through 2012. We create our treatment group by

[4] Note we exclude the first NRP wave from 2001. Documentation suggests that the sampling frame and intent of this wave is sufficiently different from later waves, and so we exclude it.
[5] The sample size is dictated by computational constraints.

finding the SSN of all primary filers in all NRP waves 2006-2009. We then pull returns from the CDW for the years 2000-2012 for returns where the primary filer's SSN is in this set. Our final panel is thus comprised of a control group or randomly selected filers from the years of the NRP waves (followed over time) and a treatment group of randomly audited filers from the NRP waves (who are also followed over time). Creating our control group in this way (by ensuring that that those in the control group filed a return in the year the treatment group was audited) allows us to match the attrition rates across treatment and control groups. Note that constructing the control group for the 2007 NRP wave is slightly complicated by the stimulus rebate checks sent out in 2008. To be eligible for a stimulus check, one must have files a year 2007 tax return. Thus, the population of filers for tax year 2007 (who filed taxes in early 2008) was much different than in other year and is not the sample which the NRP weighting reflect. In particular, there was an increase in the number of people who typically did not file a tax return. We address this by using the methodology of Ramnath and Tong (2014) to identify those who filed to claim the stimulus check, but who would not have otherwise filed. We then drop these filers from our control group for the 2007 wave. Thus we have panels for both the treatment and control group that will very similar except for the treatment.

Using the SSN of the primary filer, we are able to link returns across the three data sources, the CDW, NRP, and AIMS. Thus in our final panel, we have detailed information on each tax return filed from 2000-2012. For the treatment group, we also have detailed information on the characteristics of the audit and the adjustments to tax returns following audit. We do lack information on audits that are not closed by the time we pull data from the AIMS database. Information from audits not closed by October 2014 is missing in our sample. However, well over 95% of audits are closed within two years. Given that our last

NRP wave is from 2009, almost all audits have been closed. Table 1 summarizes our sample, noting weighted observations in the base year (i.e., NRP wave year) and across all years 2000-2012.[6]

[Table 1 about here]

While we do observe the date an audit was opened and closed, we do not know when the filer was notified of the audit or the results of the audit. Thus we use as our timing convention the number of years since the audited return was filed. For example, for the 2006 NRP wave, their tax year 2006 return was audited. Thus we consider their tax year 2007 return as being one year since the audited return was filed. We use this convention throughout the paper. As a result, one would not expect a sharp increases in reported income for all filers in a given NRP wave in a specific year since audit, since the duration of audits and the timing filers were notified varies. However, since the vast majority of audits are closed within two years, we do expect the effects of audits to fully materialize two to three years after the audited tax year.

Throughout, all monetary variables are deflated to 2005$ and 99% Winsorized. Winsorization of the data is necessary for dealing with outliers. The IRS does not edit the CDW data we use in any way, and thus data entry and calculation errors by the filers or the IRS agent entering the data are not uncommon. Winsorizing data inevitably removes some genuine variation from the sample. However, we think that Winsorization is acceptable since our purpose is to study the impact of audits on subsequent tax paying behavior. Further, the results reported in this paper are robust to different levels of Winsorization.[7]

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[6] We use weights for both our randomly sampled control group and the treatment group. We weight the control group by giving each filer equal weight to sum to the total population of filers in the base year. We weight the treatment groups using the NRP sampling weights. This gives us a number of weighted observations approximately equal to the population of filer in the base year for the NRP sample. We then apply these weights to the filing units for each year they are in the panel.

[7] Results with different levels of Winsorization are available from the authors by request.

3. Tax Compliance in the U.S.

The IRS's tax gap measure summarizes aggregate compliance with the U.S. income tax.[8] In 2006, the last year for which the IRS reports the tax gap, the net gap was $385 billion (Internal Revenue Service (2012)). This represents a compliance rate of 85.5%. Non-compliance with the individual income tax code represents the largest source of noncompliance, accounting for $235 billion of the $385 billion gap.

Within the individual income tax, Internal Revenue Service (2012) shows that the lowest compliance rates come from income with less documentation. For example, the underreporting of business income, and in particular income from sole proprietors (as reported on Schedule C of Form 1040), accounts for about half of the individual income tax gap ($122 of $235 billion). Looking across income and deduction items, one can see the pattern that compliance rates fall as withholding and third party verification decline. Such a pattern is also documented in Danish data by Kleven et al. (2011).

Our NRP data allow us to delve more deeply into the data than the tax gap statistics provided by IRS. Table 2 documents the measures of compliance found in our NRP data. Column 1 reports means by income and deduction sources and the fractions with those sources of income. Columns 2-4 report audit adjustments. Column 2 shows the average audit adjustment by income/deduction item and the fraction of those who report non-zero values of that item for which there is a non-zero adjustment. Column 3 and 4 decompose the adjustments in Column 2 into underreporting of income (which results in upward adjustments in income/downward adjustments in deductions) and over reporting of income (which results in downward adjustments of income/upward adjustment of deductions).[9]

[8] Note that the NRP data we use plays a large role in the IRS's estimation of the individual income tax gap.
[9] Note that Column 2 is the sum Columns 3 and 4.

[Table 2 about here]

We find that non-compliance rates (measured by the fraction with adjustments) are largest for Schedule C income, which is adjusted for about 13% of those filers who are audited. The rate is lowest for wage and salary income, which is adjusted for about 5% of audited filers. Underreported income is more frequent than over reporting of income for all sources and is highest for Schedule C income. The average amount of underreported Schedule C income is $9,357. This compares to a mean of $8,460 for reported Schedule C income. Wage income is underreported by an amount of $3,007 this is in comparison to an average of $42,637. Looking across sources, the pattern that emerges is that those sources with the most documentation show the lowest compliance rates. For example, compliance rates are highest for wage income, which has a high withholding rate. Compliance rates are also high for capital income (both capital gains reported on Schedule E and capital income reported elsewhere) which has third party reporting on most items, but not withholding. And the sources with the lowest compliance rates, Schedule C income and deductions have no withholding and little third party verification. This is consistent with the compliance results seen the aggregate IRS tax gap reports.

4. Effects of audit on reported income

With an understanding of our data and tax compliance in the U.S., we now turn to our research question. The objective of the paper is to understand changes in individual tax paying behavior in response to audit. We answer this question in two ways. First, in this section, we address how the reporting of income changes after an audit using simple, non-

parametric estimators. In the next section, we examine whether these results persist when a more rigorous identification strategy is used.

4.1 Difference-in-difference estimates of the effects

The randomized controlled trial nature of the NRP allows us to consider the effects of audit on tax paying behavior using simple, non-parametric estimators. Here we employ a difference-in-difference estimator to understand how audits affect taxpaying behavior. In particular, we look at the reporting of adjusted gross income (AGI), wage income, and Schedule C income. These three measures provide a nice contrast in terms of the amount of information the IRS has in each income source (e.g., most wages are subject to withholding, Schedule C income has very little documentation, and AGI is the most broad measure, composed of income with different reporting requirements.) Our difference-in-difference estimator of the effect of audit is thus:

$$Effect\ of\ audit = \left(\bar{Y}_{B,2} - \bar{Y}_{B,1}\right) - \left(\bar{Y}_{A,2} - \bar{Y}_{a,1}\right) \qquad (1)$$

where B denotes the treatment group (i.e., the NRP sample) and A the control group. The subscripts 1 and 2 denote the pre-audit and post-audit periods respectively. For each, we consider the mean over a span of 3 years. Thus the $\bar{Y}_{B,2}$ is calculated as the mean of the income source of interest for the NRP sample over the three years after audit and $\bar{Y}_{B,1}$ is calculated as the mean of the income source of interest for the NRP sample over the three years prior to audit. The variables for the control group follow an analogous method.

[Table 3 about here]

Table 3 reports these difference-in-differences results. We present the results in percentage terms because the income sources have very different mean amounts. Note that

the sample here includes all filers in all years. That is, the sample means by income source here will differ from those in Table 2 because these means include those who have zero income for a given income source, whereas the means in Table 2 exclude these zeros in the their calculation.

The top panel of the table shows that (reported) Adjusted Gross Income of the audited group by 2.2% when comparing the post-audit period to the pre-audit period, while that of the control group increase on 1.1%. These figures imply that audits increase AGI by 1.2% on average ($603 per year).

In the second panel of Table 3, however, the effect of audits on reported wage income is only 0.4% on average ($309 per year). This effect is consistent with the idea that it is more difficult to misreport income that is also subject to withholding and third party verification (Kleven et al. (2011)).

The largest effect of audits, in percentage terms, is on Schedule C income. The third panel in Table 3 shows this effect to be 7.5% ($107 per year). This large effect supports the view that it's relatively easier to manipulate Schedule C income than wage income.

Since it is difficult for filers to underreport wage income and easier to do so with Schedule C income, we can use wage income change to do a 'rough' triple-difference estimation of the effect of audits on Schedule C income. The last row of Table 3 shows this estimate. This indicates that after an audit, filers increase reported Schedule C income by 7.1%.

Given these results, a further interesting question is how individuals change tax reporting *over time* after audit: do they increase reported income permanently, or does the initial effect decline as time passes? Panel A of Figure 1 plots the difference between the average reported incomes of the audited and control group. Reported AGI seems to increase

in the first and second years and after an audit and remain elevated even after six years. Panel B of Figure 1 shows that audits on wage income result in continuously increasing reported wage income over time. Thus the effect over three years as reported in the difference-in-difference results in Table 3 understates the longer-term impact of audits on reported wage income. Note that Panels A and B of Figure 1 show that the 2007 NRP wave follows a substantially different pattern in the post-audit period than do other waves. We will discuss this pattern further in the next section.

The effect of audits on Schedule C income is strong in the first couple of years after audit, as Panel C of Figure 1 shows. Following the initial upswing in reported Schedule C income, it then turns downward toward the pre-audit level. This result is interesting and in contrast to the trends in AGI and wage income. We thus delve into the responses of Schedule C filers to audit further in Section 5.

In each of the three panels, it is clear that the pre-audit trends are similar across the NRP and non-NRP samples. Thus the common trends assumption needed for identification is satisfied. The level differences between the treatment and control groups appear persistent, even in the pre-audit years. Although the differences in levels of income are not generally statistically significant, one might worry about the similarity between the treatment and control groups. Thus, we next consider models with individual fixed effects, which will control for differences in levels of income between the treatment and control groups.

[Figure 1 about here]

4.2 Within-filer estimates of the effects

Because we have a panel of tax returns, we can examine changes in individuals' behavior after an audit while controlling for time-invariant unobserved individual characteristics. We first estimate an equation of the form

$$Income_{it} = \beta PostAudit_{it} + \gamma_i + \eta_t + \varepsilon_{it}, \qquad (2)$$

where $Income_{it}$ denotes a measure of income for individual (taxpayer) *i* in year *t*; and $PostAudit_{it}$ denotes that the individual was audited during our sample period prior to year *t,* γ_i denotes an individual (taxpayer) fixed effect, and η_t denotes a year fixed effect. In this specification, identification of the effects of audit come from within filer changes in reported income between the pre and post audit periods, net of trends in income common across the treatment and control groups (with are picked up by the year fixed effects).

[Table 4 about here]

Table 4 reports the results from regressions that estimate the effect of audits on Adjusted Gross Income. The effects of the 2006, 2007, 2008 and 2009 audit waves are reported separately in columns 1-4, while the final column shows the pooled effect of all the waves.[10] Column 5 shows that audits increase reported Adjusted Gross Income by $953, which is statistically significant at the 1% level. The effects of the individual waves are all positive, but vary significantly in magnitude, with the effects of 2006 and 2008 the largest and strongly significant, while the effect of 2007 and 2009 are smaller and not statistically significant.

The difference in responses across waves is interesting and not immediately obvious. As noted in Section 2, we took steps to control for the stimulus filers from tax year 2007, which would have otherwise tainted our control group. In addition, we estimate the models

[10] Because the simple difference-in-differences estimates appeared to be substantially different for the 2007 waves than for the other waves, in the pooled regressions presented here and below, we omit the 2007 treatment and control observations.

separately for high-income individuals (who are likely to file in other years and not likely to have a strong filing response as a result of the stimulus checks) and find similar results to those for the full sample. It is possible that the stringency of audits varies across waves due to available IRS resources or other reasons. In Table 5, we include nine measures of audit stringency in the regression model. It should be noted that some measures of stringency are not perfectly orthogonal with filers' behavior so we need to treat the results as suggestive (and thus these measures are not control variables in our other regression models). However, when the measures of audit stringency are controlled for, the estimated effects of audits in different waves become positive, strongly significant and very similar to each other. This indicates that the weaker effects of certain waves are likely to be due to difference in stringency across audit waves.

Taken together, these results imply that, consistent with the simple difference-in-differences tabulations above individuals tend to report more income after audit.

Table 6 examines whether, in our estimation framework, the effects of audit differ with the number of years since the individual was audited by estimating equations of the form

$$Income_{it} = \sum_{k=1}^{K} \beta_k \, (PostAudit_{it}) * (k \; Years \; Since \; Audit) + \gamma_i + \eta_t + \varepsilon_{it} \quad (3)$$

In this specification, the key explanatory variables are a series of dummies that show the difference between the audited and control group from Year 1 through (at most) Year 6 after the audited tax year. Columns 1-4 again show the separate effect of each individual audit wave, while Column 5 pools all the 2006, 2008, and 2009 waves together. This final column shows that reported total income increases quickly during the first two years after the audit, reaching around a $1,000 increase, and stays at this level until at least Year 6, with all of the effects being statistically significant. Looking at the effect of each wave, we can

see that the effect of 2006 and 2008 waves is strongly positive while that of 2007 and 2009 is less significant, with the reasons for these differences similar to those we discuss above (and likely related to differences in audit stringency across years).

5. Subsample Results

5.1 Differential impacts by income/deduction source

We now use our regression models to examine whether the effects of an audit differ by the source of income or the type of deduction that is being claimed. In Table 7, we estimate versions of Equation 3 above on a pooled sample, but the dependent variable is now income of a particular type. We also restrict our sample to those who had non-zero amounts of income of that particular type in the year of the audit, so these can be considered intensive-margin results. Note that due to the very different post-audit behavior of the 2007 NRP wave (when not conditioning on measures of audit stringency), our pooled sample excludes this wave.

In Column 1, we repeat the results from Table 6, in which the dependent variable is AGI. Column 2 presents results for Total Income.[11] The results in this column are slightly larger than, though similar to, those for AGI. This is not surprising due to the similarities between these two income measures.

In Column 3, the dependent variable is wages and salaries. Similar to the results found above in the simple tabulations, this specification finds a small positive effect of an audit on reported wages, with an increase of $300-600 in the first three years after audits that dies out thereafter.

[11] Total Income is from Form 1040, Line 22. It AGI with the above the line deductions added back in.

Column 4 presents results when the dependent variable is Schedule C sole proprietorship income. As noted above, this source of income is not subject to third party reporting, and so may be easier for taxpayers to manipulate. Consistent with this, the estimation results suggest that Schedule C income increases substantially after audit, by over $1,000 in the first two years. Interestingly, that effect diminishes 3 years after the audit, and is insignificant after four years. Further, in years 5 and 6, the estimated impact is actually negative. These results suggest that taxpayers with sole proprietorship income may be more careful in reporting income right after an audit, but may become more aggressive than they were in the years prior to the audit.

In Column 5, which presents results for Schedule D income (capital gains and losses), no significant effects of audits are found in any year. However, the results in Column 6 for Schedule E income, which includes partnership, S corporation, and rental income, mirror that for Schedule C income. A significant positive impact of audits is found in the first two years, with the effect diminishing in the third year, and no longer significant in the fourth year. In years 5 and 6, the estimates turn negative, but (unlike for Schedule C income) are not statistically significant in those years. Schedule E income, like Schedule C income, is largely self-reported. These results are consistent with those of Kleven et al. (2011) who point out that taxpayers compliance sis strongly related to the ability to cheat. This ability is greatest with self-reports income such as that on Schedules C and E.

We next estimate variants of Equation 3 in which the dependent variables denote the amounts of particular types of deductions that filers claim. Column 1 presents the results for above the line deductions (i.e., deductions that figure into AGI) and Column 2 the results for total itemized deductions. Columns 3-5 present results for individual types of itemized deductions (charitable contributions, state and local income taxes, and mortgage interest).

Columns 1 and 2 show that both types of deductions decrease after an audit (which implies higher taxable income), with a bigger decrease for itemized deductions. For both types of deductions, the effects continue at a high level for up to six years after the audited return was filed. As with the income source results, the results for deductions are consistent with the story that taxpayers manipulate their tax reporting where they are able to do so. Thus we see larger effects of audit on the more malleable, and less documented, itemized deductions category. Charitable contributions are estimated to fall by around $300-400 after an audit, with the size of the impact being consistent across years. Interestingly, although they are both subject to third party reporting, state and local taxes and mortgage interest are also estimated to fall after an audit, though the effect appears to increase over time.

5.2 Differential impacts by filer characteristics

To examine whether different types of taxpayers respond differently to audits, we split the sample according to a number of filer characteristics, and estimate a version of Equation 3 where the dependent variable is AGI. We consider the response to audit of filers with Schedule C income, filers who claim the earned income tax credit (EITC), and filers of different ages or income levels. The results are reported in Figure 2, Panels A-D.

5.2.1 Filers with Schedule C Income

In Figure 2, Panel A splits the sample according to whether the taxpayer reported any Schedule C income in the year of the audit.[12] These two lines show that Schedule C filers appear to be much more responsive than taxpayers who do not file Schedule C, with

[12] For observations in the control group, we split based on whether they reported Schedule C income in the tax year for which they were drawn as a control observation.

estimated increases in income that are generally three times as large as those who did not report Schedule C. income From these results, we cannot decompose this effect into that driven by the ability to manipulate Schedule C income and that due to differences in the disposition towards tax compliance between Schedule C filers and those that do not file a Schedule C. However, our previous results support both of these effects. That is, when we use a differences-in-differences or fixed effect regression to look at the effect of audit on Schedule C income, we find a strong responsiveness in Schedule C income for those who are audited as compared to the control group who was not audited, but did report Schedule C income. However, the size of the change in Schedule C income alone (as Table 7 reports) is much smaller than the change in AGI we find for Schedule C filers here. There is also a different post-audit pattern for Schedule C income and AGI for these filers. Taken together, these results show that Schedule C filers are also changing other income sources in response to audit and not just Schedule C income.

5.2.2 Responses by EITC Recipients

Compliance problems with the EITC have been well documented (see, e.g., Blumenthal, Erard, and Ho (2005)). Thus, we consider the differential responses to audit between filers who claim the EITC in the year of audit and those who do not. These responses are documented in Panel B of Figure 2. Following an audit, EITC recipients show much larger increases in AGI than their non-EITC counterparts. Since EITC claimants have lower income than non-claimants on average ($19,000 compared to $59,000), the percentage changes are even larger. Also, note that these results are not an artifact of mean reversion in income. The post-audit trends already net out trends in AGI between EITC claimants who were audited and those who weren't via the year fixed effects in the

regression models (and similarly for non-claimants). The post-audit effects thus show the trend in reported AGI following an audit, net of the trend in AGI for EITC claimants and non-claimants. The incentives of income misreporting for EITC claimants (and other low income filers) are such that one might expect strong responses to audit. For example, if incomes are rising each year and if low-income filers' incentives are to report a steady income every year (for example, to stay below a program's cutoff at near its maximum benefit level), then we would expect a strong divergence between reported income between the treatment and control groups following audit. This is consistent with the pattern observed.

However, these results do warrant more discussion. First, for filers reporting very low AGI, there is less room to under-report and still have non-zero income. If filers still retain some non-compliance behavior after audit, this would tend to make the changes in reported income following audit move more in the upward direction than for those with more income in the year of audit. Second, while income over-reporting is not very large or frequent (see Table 2), it is more likely that those with higher reported income in the year of audit make an error and over-report income than those who report less income in the year of audit. If audits help filers to correct this over-reporting, that would tend to push up the effects of audit on the low-income group relative to the high-income group.

5.2.3 Responses by Filer Age

Panel C in Figure 2 splits the sample according to the age of the primary filer in the year of the audit. [13] Here, the two middle age groups (35-44 and 45-54) appear to be the

[13] For observations in the control group, we split based on age in the tax year for which they were drawn as a control observation.

most responsive after an audit, with estimated effects two years after audit in excess of $1,500, while the impact for the youngest and oldest group are both between $900 and $1,000. These results are in contrast to Kleven, et al. (2011) who find that the propensity to underreport income falls with age.

Considering the long-term patterns, we see that the youngest age group (25-34) responds significantly differently than the older age groups to audit. In particular, this age group does not show a return to the pre-audit trend in income reporting. Following an audit, those aged 25-34 report higher income and this effect persists over the next six years with no decline. In contrast, the older age groups show an increase in reported AGI in years two and three after the audit, but a decline after that. Thus we find evidence that audits have stronger deterrent effects on those who are relatively new tax filers.

5.2.4 Responses by Filer Income

Finally, we show how the responses to audit differ across income groups. These results are shown in Figure 2, Panel D. Income quintiles 1-4 show similar responses to audit, with persistent increases in reported AGI following audit. The top income quintile shows the opposite trend, with a persistent decline in reported income after the initial increase in income in the year after the audited return was filed. Note also that many of the caveats to the results in 5.2.2 apply to these results as well. In particular, individuals reporting particularly low incomes are unlikely to have true incomes much below what they report, and vice-versa for individuals with particularly high incomes.

6. Conclusion

Tax evasion is estimated to be around 18% of the global tax collections and it costs public funding nearly three trillions dollars around the world (Murphy 2011). Among all countries, the U.S. suffers the largest loss in absolute terms because of the sheer size of the economy. One way to deal with this problem is through audits of tax returns. Auditing affects tax compliance through deterrence effect, which impact all filers. Auditing also have more direct effects on the audited. First, there is a static revenue gain when the auditors discover noncompliance. Second, those audited tend to report higher taxable income in subsequent years, resulting in further revenue gains. This study provides a rigorous evaluation of the effectiveness of tax audits in reducing tax evasion, in the short and long term.

We examine the impact of audits on subsequent individual taxpaying behavior using data from the Internal Revenue Service (IRS) National Research Program on random audits on tax returns from 2006-2009 matched to returns from the universe of filers from 2000 to 2012. It is worth noting that the effects we measure of the effects of a random audit. Filers may respond differently to non-random audit since in those cases they can make some inferences about the auditing process from the fact that they were selected. However, because of this selection, the effects of non-random audits are more difficult to measure. One argument that suggests the effects of non-random and random audits may not be far apart is made by Manoli and Turner (2014). They provided evidence from a randomized field experiment showing that the content of contact between the IRS and tax filers is much less important than the existence of this contact.

The results from a simple difference-in-differences specification indicate that an audit increases reported AGI $603 per year, or equivalent to 1.2% of the average income. This effect is only 0.4% for wage income but is 7.5% for Schedule C income. Further, we find that the impact of auditing on reported wage lasts over time while it is fleeting for Schedule C income.

Similar results are found when controlling for individual fixed effects. These results suggest that Adjusted Gross Income increases for at least 6 years after an audit. Contributing to this increase, Schedule C and Schedule E income (which are not subject to third-party reporting or withholding) tends to sharply increase after an audit, but this increase diminishes (and turns negative) 5 or more years after audit, while the increase in wage and salary (which is subject to third-party reporting and withholding) is considerably smaller. In addition, above the line and itemized deductions both decrease significantly after audit, and the decrease in deductions is apparent even among deductions (like state and local taxes and mortgage interest) that are subject to third-party reporting.

We believe this paper to have several clear implications. First, an audit a randomly-selected individual tax filer increases reported AGI by an average of $952, and this effect appears to persist for at least six years. Second, audits produce longer-lasting effects on wage income than on other sources of income.. Third, audit stringency has a noticeable effect on the lasting effects of the audit. Fourth, different demographic groups respond differently to audits. All of these results refer solely to the direct effects of the audit, and not to deterrence effects that may impact non-audited individuals. We believe that extending this research to encompass both the direct and indirect effects of audit is an important topic for future work.

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Table 1. Number of observations

	Total observations
NRP Sample	
All Years	5,833,237,746
Base Year	540,202,087
Postive Adj to Tax Liability	220,653,542
Negative Adj to Tax Liability	40,313,613
Random Sample	
All Years	5,813,346,000
Base Year	544,286,000

Note: Observations are weighted to reflect population

Table 2. Summary of adjustments

	Pre-audit Income	Audit Adjustment	Underreported Income	Overreported Income
Adjusted Gross Incor	$48,920	$5,063	$6,729	-$2,376
Fraction Non-zero	0.998	0.436	0.817	0.183
Deductions	$2,418	$8	$820	-$1,244
Fraction Non-zero	0.254	0.471	0.607	0.393
Wages and Salaries	$42,637	$906	$3,007	-$6,581
Fraction Non-zero	0.845	0.065	0.781	0.219
Schedule C Income	$8,460	$7,718	$9,357	-$3,094
Fraction Non-zero	0.156	0.739	0.868	0.132
Schedule D Income	$4,078	$3,492	$7,818	-$4,903
Fraction Non-zero	0.176	0.173	0.660	0.340
Schedule E Income	$11,230	$5,795	$9,332	-$5,960
Fraction Non-zero	0.117	0.493	0.769	0.231

Note: NRP, waves 2006-2009.

Table 3. Double and triple difference with percentage changes

	NRP Sample	Non-NRP, Random Sample	% Difference
Adjusted Gross Income			
Pre-audit	52,094.48	51,895.43	0.004
Post-audit	53,252.62	52,451.03	0.015
% Diff	0.022	0.011	0.012
Wage Income			
Pre-audit	39,208.78	38,899.76	0.008
Post-audit	38,988.51	38,507.23	0.012
% Diff	-0.006	-0.010	0.004
Sch C Income			
Pre-audit	1,440.05	1,427.75	0.009
Post-audit	1,492.86	1,372.80	0.087
% Diff	0.037	-0.038	0.075
Sch C - Wage			
% Diff	0.042	-0.028	0.071

Note: Pool all waves 2006-2009. Calculate means over three years before and three years after audit (to define pre and post-audit period)

Table 4. Effect of auditing on reported adjusted gross income

	2006 Wave	2007 Wave	2008 Wave	2009 Wave	Pooled*
Post Audit	1076.102***	102.383	1318.948***	304.263	952.868***
	(399.611)	(400.621)	(405.245)	(392.272)	(208.170)
Individual FE	yes	yes	yes	yes	yes
Year of Tax Return Dummies	yes	yes	yes	yes	yes
Constant	yes	yes	yes	yes	yes
R-squared	0.008	0.006	0.008	0.008	0.008
N	1,589,657	1,631,613	1,618,769	1,561,694	4,770,120

Note: "Pooled" exclude 2007 wave. * p<0.10, ** p<0.05, *** p<0.01

Table 5. Effect of audit stringency on subsequent adjusted gross income

	2006 Wave	2007 Wave	2008 Wave	2009 Wave	Pooled
Post Audit	2418.476***	1782.460***	2519.263***	1199.658**	2079.013***
	(519.525)	(500.940)	(514.421)	(488.233)	(238.433)
Time Spent on Audit	-96.422***	-129.294***	-105.784***	-94.044***	-107.149***
	(24.914)	(22.357)	(22.081)	(26.839)	(11.891)
Positive Wage Adjustment	1.781***	1.334	2.822***	0.609	1.915***
	(0.631)	(1.248)	(1.008)	(1.130)	(0.527)
Negative Wage Adjustment	0.954	-6185.679**	4.509	-25.876	-2.362
	(25.641)	(2738.278)	(14.137)	(38.943)	(12.043)
Positive Sch C Adjustment	0.129	0.188	-0.102	0.212*	0.108*
	(0.096)	(0.156)	(0.111)	(0.121)	(0.062)
Negative Sch C Adjustment	-0.483	0.461	1.335	-0.256	0.216
	(1.674)	(1.903)	(1.781)	(1.426)	(0.905)
Positive AGI Adjustment	-0.129**	-0.181	-0.123	-0.304***	-0.172***
	(0.063)	(0.117)	(0.092)	(0.091)	(0.046)
Negative AGI Adjustment	0.188	1.530***	-1.129	1.946***	0.568*
	(0.624)	(0.543)	(0.707)	(0.619)	(0.330)
Positive Tax Adjustment	0.627*	1.331***	1.173***	1.822***	1.147***
	(0.328)	(0.417)	(0.373)	(0.382)	(0.193)
Negative Tax Adjustment	6.043**	3.759	3.237	-8.286***	2.762*
	(3.015)	(2.865)	(3.941)	(2.931)	(1.619)
Individual FE	yes	yes	yes	yes	yes
Year of Tax Return Dummies	yes	yes	yes	yes	yes
Constant	yes	yes	yes	yes	yes
R-squared	0.009	0.008	0.009	0.009	0.008
N	1,589,657	1,631,613	1,618,769	1,561,694	6,401,733

Note: "Pooled" exclude 2007 wave. * p<0.10, ** p<0.05, *** p<0.01

Table 6. Effect of auditing on reported adjusted gross income

	2006 Wave	2007 Wave	2008 Wave	2009 Wave	Pooled*
1 Year Since Audit Year	586.980	301.411	1037.154***	-113.892	571.851***
	(357.788)	(384.789)	(389.563)	(393.372)	(200.534)
2 Years Since Audit Year	1149.564***	240.297	1318.855***	259.649	999.101***
	(403.236)	(442.927)	(418.313)	(429.655)	(220.738)
3 Years Since Audit Year	1379.856***	-50.414	1513.112***	808.272	1259.876***
	(495.553)	(473.774)	(510.728)	(494.396)	(274.685)
4 Years Since Audit Year	1037.666**	148.093	1436.614***		1320.898***
	(497.541)	(538.331)	(546.448)		(363.821)
5 Years Since Audit Year	1001.698*	-168.417			926.048*
	(533.581)	(566.951)			(495.779)
6 Years Since Audit Year	1387.442**				1125.651*
	(597.626)				(585.414)
Individual FE	yes	yes	yes	yes	yes
Year of Tax Return Dumm	yes	yes	yes	yes	yes
Constant	yes	yes	yes	yes	yes
R-squared	0.008	0.006	0.008	0.008	0.008
N	1,589,657	1,631,613	1,618,769	1,561,694	4,770,120

Note: "Pooled" exclude 2007 wave. * p<0.10, ** p<0.05, *** p<0.01

Table 7. Effect of auditing on difference sources of income, for the pooled sample

	Adjusted Gross Income	Total Income	Wages	Schedule C	Capital Gains - Schedule D	Part/S Corp Income/Rent Royalties - Schedule E
1 Year Since Audit Year	571.851***	606.548***	332.138*	1172.628***	-234.575	1010.915***
	(200.534)	(202.395)	(181.735)	(129.593)	(146.603)	(277.358)
2 Years Since Audit Year	999.101***	1036.796***	452.987**	1035.767***	-86.199	1497.964***
	(220.738)	(222.510)	(220.243)	(146.684)	(118.594)	(305.334)
3 Years Since Audit Year	1259.876***	1281.889***	523.203**	477.580***	137.166	845.295***
	(274.685)	(277.180)	(262.242)	(154.880)	(131.856)	(313.158)
4 Years Since Audit Year	1320.898***	1361.927***	103.678	4.237	284.312	356.848
	(363.821)	(367.748)	(355.915)	(196.377)	(178.548)	(417.354)
5 Years Since Audit Year	926.048*	940.465*	-41.402	-723.970***	144.546	-404.697
	(495.779)	(500.427)	(505.163)	(261.952)	(212.227)	(518.883)
6 Years Since Audit Year	1125.651*	1156.375*	5.038	-745.681***	133.981	-288.138
	(585.414)	(591.497)	(588.443)	(284.963)	(249.456)	(584.565)
Individual FE	yes	yes	yes	yes	yes	yes
Year of Tax Return Dummies	yes	yes	yes	yes	yes	yes
Constant	yes	yes	yes	yes	yes	yes
R-squared	0.008	0.008	0.009	0.008	0.040	0.006
N	4,770,120	4,761,866	3,995,942	849,505	955,894	695,074

Note: "Pooled" exclude 2007 wave. * p<0.10, ** p<0.05, *** p<0.01

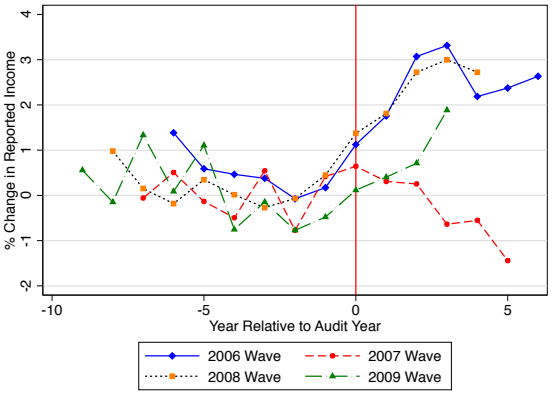
Table 8. Effect of auditing on deductions

	Above the line deductions	Itemized Deductions	Charitable Contributions	State and Local Taxes	Mortgage Interest
1 Year Since Audit Year	12.330	-563.093***	-267.347***	-39.402	82.206
	(26.786)	(119.833)	(26.917)	(28.098)	(70.718)
2 Years Since Audit Year	-75.111**	-1406.751***	-358.475***	-91.219***	-415.796***
	(30.061)	(128.418)	(29.490)	(32.040)	(76.330)
3 Years Since Audit Year	-132.358***	-1690.264***	-361.673***	-119.008***	-636.297***
	(31.949)	(139.139)	(31.396)	(37.641)	(78.952)
4 Years Since Audit Year	-169.028***	-1845.454***	-356.900***	-119.253**	-785.092***
	(42.228)	(172.254)	(40.352)	(52.516)	(95.296)
5 Years Since Audit Year	-261.041***	-2508.008***	-463.829***	-337.813***	-1069.261***
	(57.611)	(234.795)	(55.964)	(67.111)	(127.861)
6 Years Since Audit Year	-290.210***	-2012.413***	-436.074***	-252.994***	-920.864***
	(58.739)	(255.434)	(60.480)	(78.816)	(132.120)
Individual FE	yes	yes	yes	yes	yes
Year of Tax Return Dummies	yes	yes	yes	yes	yes
Constant	yes	yes	yes	yes	yes
R-squared	0.031	0.064	0.012	0.021	0.076
N	1,323,777	1,931,615	1,607,461	1,859,363	1,551,198

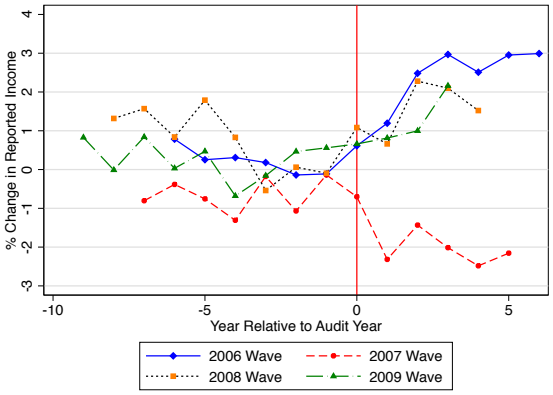
Note: "Pooled" exclude 2007 wave. * p<0.10, ** p<0.05, *** p<0.01

Figure 1: Difference-in-Difference Estimates of Effects of Audit on Reported Income

(a) Adjusted Gross Income



(b) Wage Income



(c) Schedule C Income

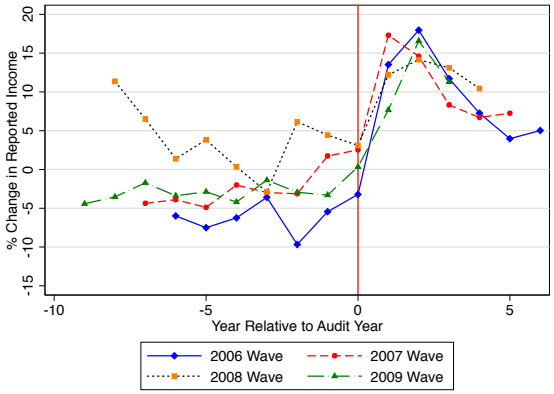
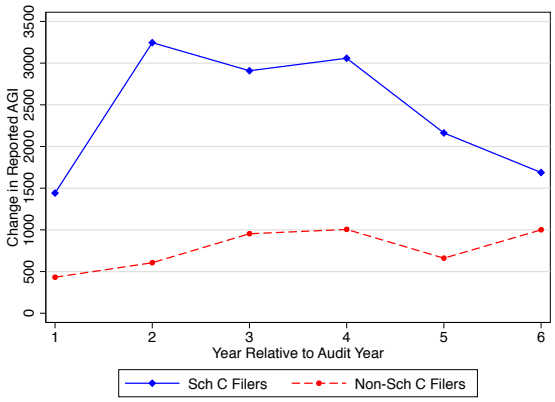
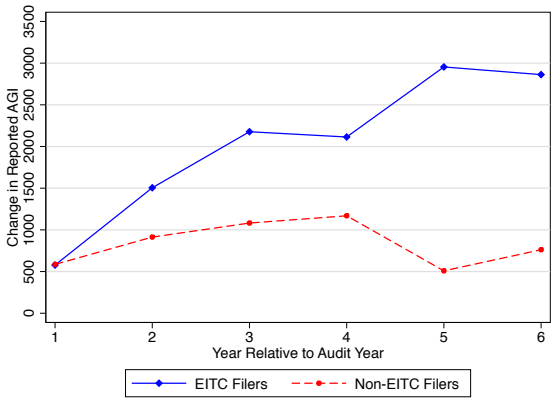


Figure 2: Effects of Audit on Reported AGI by Filer Characteristics

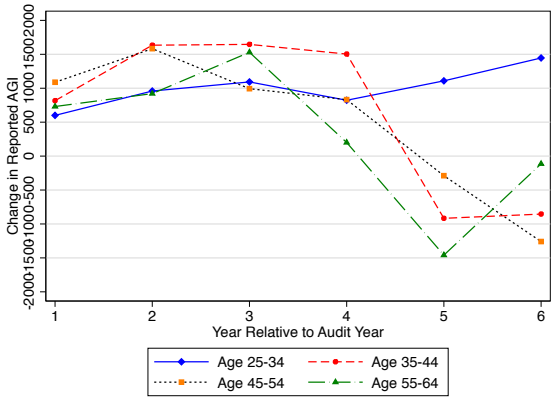
(a) Schedule C vs. Non-Schedule C Filers



(b) EITC vs. Non-EITC Filers



(c) By Age at Time of Audit



(d) By Income Quintile at Time of Audit