Research, Applied Analytics, and Statistics

TAX POLICY CENTER
URBAN INSTITUTE & BROOKINGS INSTITUTION

10th Annual IRS/TPC Joint Research Conference on Tax Administration

June 18, 2020

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10th Annual IRS/TPC Joint Research Conference on Tax Administration

Welcome

Eric Toder — Institute Fellow, Urban Institute, and Codirector, Urban-Brookings Tax Policy Center

Barry Johnson — Acting Chief Research and Analytics Officer, IRS

Session 1. Behavioral Responses to Audits

Moderator:	***Robert McClelland*** *Tax Policy Center*
The Specific Deterrence Implications of Increased Reliance on Correspondence Audits	***Brian Erard*** *B. Erard & Associates*
The Specific Indirect Effect of Correspondence Audits: Moving from Research to Operational Application	***Leigh Nicholl*** *MITRE Corporation*
The Effect of Audit Risk and Detection Risk on Tax Compliance	***Matthias Kasper*** *Tulane University*
Discussant:	***Janet Holtzblatt*** *Tax Policy Center*

The Specific Deterrence Implications of Increased Reliance on Correspondence Audits

Brian Erard
Erich Kirchler
Jerome Olsen

Types of deterrence from audits

- General
  - The general taxpayer population is discouraged from cheating by the threat of audit and punishment
- Specific **(focus of this study)**
  - The actual experience of an audit discourages a taxpayer from engaging in future noncompliance

Existing literature on specific deterrent effect of an audit

- Mostly based on random audits in a laboratory or field setting
  - Many of these studies find evidence of specific pro-deterrent effect that attenuates over time
  - But some studies have reported instances of a counter-deterrent effect
- Such studies do not distinguish between types of audits

Motivation for this study

- IRS has become heavily reliant on correspondence audits
  - The overall audit rate has declined from 1 percent of all returns in 1990 to 0.6 percent in 2017
  - Whereas face-to-face audits accounted for 62% of all audits in 1990, correspondence audits accounted for the lion's share of all examinations (81%) in 2017

Face-to-face vs. correspondence audit

- Compared to face-to-face examinations, correspondence audits:
  - have a narrower scope
  - are more impersonal
  - are less likely to be perceived as real audits
  - are much less likely to result in a response from the taxpayer

Implications of these differences

- Correspondence and face-to-face audits may have different implications for:
  - taxpayer perceptions regarding:
    - future audit risk
    - the capacity of the tax administration to uncover evasion when it is present
    - the level of certainty about true tax liability
  - tax morale

Data for study

- Very large samples of audited and unaudited self-employed taxpayers
  - TY2010: 53,000 audited taxpayers and comparison sample of 421,000 unaudited taxpayers
  - TY2014: 17,000 audited taxpayers and comparison sample of 377,000 unaudited taxpayers
- Various exclusion restrictions on both samples to isolate audit effect

Estimating impact of audit on future tax reporting

- We observe the post-audit change in reported tax among those who received a face-to-face or correspondence audit.
- But we have to infer the counterfactual response:
  - What would the change have been if there had not been an audit?

Estimating the counterfactual

- Inverse probability of treatment weighting (IPTW)
  - Compute separate weighted average of the change in reported tax among unaudited taxpayers
    - Different weighted average for face-to-face and correspondence audit counterfactuals
  - Put more weight on unaudited taxpayers who had a higher relative likelihood of receiving the relevant type of audit

Counterfactual weighting

Let π_c, π_f, π_{na} represent the respective probabilities of a correspondence audit, a face-to-face audit, and no audit from a multinomial logit analysis.

Correspondence audit counterfactual:

$$\frac{1}{N_c}\sum_{i=1}^{N_{na}}\left(\frac{\pi_{c,i}}{\pi_{na,i}}\right)\Delta\ln(T_i)$$

Face-to-face audit counterfactual:

$$\frac{1}{N_f}\sum_{i=1}^{N_{na}}\left(\frac{\pi_{f,i}}{\pi_{na,i}}\right)\Delta\ln(T_i)$$

Strategy

- Apply IPTW to estimate the specific deterrent effects over the next two tax years
- Some audits did not start until after the taxpayer had filed the subsequent year's return.
  - For these cases, the tax report one year later was not influenced by the audit
  - So, we use the estimated one-year effect for this group as a "placebo test"

Specific deterrent effect: Audit after next return filed

Change in ln(Reported Tax)

Audit Type	Placebo Impact	1st Year Impact
Tax Year 2010 Audit Results		
Correspondence	-0.0125 (0.62)	0.3187* (14.98)
Face-to-Face	0.0406 (1.17)	0.3184* (8.88)
Tax Year 2014 Audit Results		
Correspondence	0.0897* (2.58)	0.4766* 12.15)
Face-to-Face	0.0906 (1.31)	0.4809* (6.57)

(Absolute value of t-statistic)

Specific deterrent effect
Audit after next return filed:
1st return filed after audit

% Change in Reported Tax

Audit Type	Tax Year 2010	Tax Year 2014
Correspondence	37.53%	61.06%
Face-to-Face	37.49%	61.75%

Specific Deterrent Effect
Audit Before Next Return Filed:
1st & 2nd Returns Filed After Audit

% Change in Reported Tax

Audit Type	Tax Year 2010	Tax Year 2014
First Year After Audit		
Correspondence	-7.32%	-5.68%
Face-to-Face	40.82%	95.34%
Second Year After Audit		
Correspondence	-8.32%	-14.97%
Face-to-Face	27.30%	97.31%

What's going on with correspondence audits?

- Results show a counter-deterrent effect for correspondence audits before next return filed and pro-deterrent effect for later-starting audits.
- Possible explanations:
  - types of issues or taxpayers examined by mail earlier and later in the audit cycle (but not an EITC issue)
  - Or might be due to the lapse of time between filing and audit (although this run's counter to Jeremy Bentham's (1781) theory regarding "celerity")

Validation of estimates

- Comparable results obtained using other methods
  - IPTW with Regression Adjustment (a “doubly-robust” estimator)
  - Newly developed multi-treatment approach involving statistical matching on the vector of propensity scores
- Comparable results obtained using samples from other audit years (2011,2012,2013)

Concluding remarks

- This is of only a few studies that focus on operational audits and first to distinguish between audit types
- Correspondence audits are not a perfect substitute for face-to-face audits
  - More narrowly targeted
  - More impersonal
  - Less consistent with regard to specific deterrence impact (more research needed to understand reason for this)
- Further research is needed to evaluate whether IRS has struck the right balance between face-to-face and correspondence audits

The Specific Indirect Effect of Correspondence Audits: Moving from Research to Operational Application

Leigh Nicholl[1], Max McGill[1], Lucia Lykke[1], and Alan Plumley[2]

June 18, 2020

[1]The MITRE Corporation
[2]Internal Revenue Service

Internal Revenue Service

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What is the indirect effect of tax enforcement?

Specific Indirect Effect

Experiencing an enforcement activity increases subsequent compliance for that same taxpayer

General Indirect Effect

Experiencing an enforcement activity increases subsequent compliance for other taxpayers around the audited taxpayer

What is the indirect effect of tax enforcement?

Specific Indirect Effect

Experiencing an enforcement activity increases subsequent compliance for that same taxpayer

General Indirect Effect

Experiencing an enforcement activity increases subsequent compliance for other taxpayers around the audited taxpayer

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Research Questions

1. How do taxpayers respond to various types of audits in terms of their total tax reporting?

Investigate whether audited taxpayers differ in terms of their contributions to IRS revenue over time compared to not audited taxpayers

2. How can we use this knowledge to improve IRS audit operations?

Generate dollar-value estimates of the indirect effect for many categories of correspondence audit for operational use in resource allocation decisions

Using Indirect Effects for Improving Audit Operations

- Different types of audits differ in their direct revenue (additional tax owed from the audit adjustment)
- We should therefore expect they also differ in their indirect revenue

- Using indirect effects means allocating IRS resources to audits that have the best “bang for the buck” in terms of both direct and indirect revenue
  - Indirect revenue cannot be directly observed, in the absence of repeat audits
  - We therefore use estimated differences in total tax between audited/not audited groups as the proxy for indirect revenue

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Operational Context: Correspondence Audits

Audit Category 1

Examines some **Schedule C**

Audit Category 2

Examines some **Schedule A**

Audit Category 3

Examines some **Schedule SE**

Audit Category 4

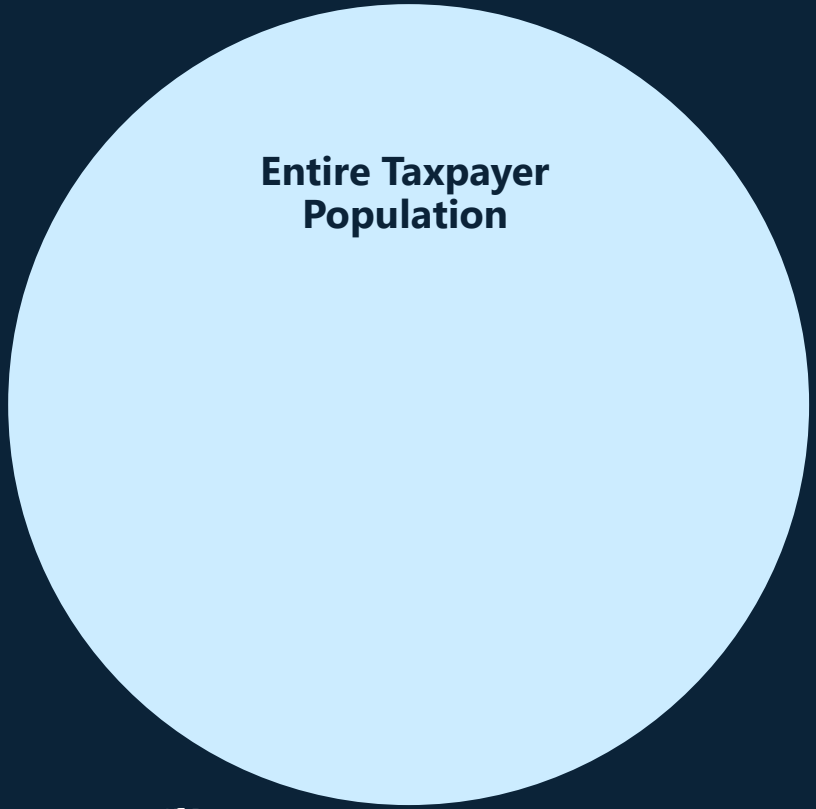
Examines some **education credits**

Audit Category 5

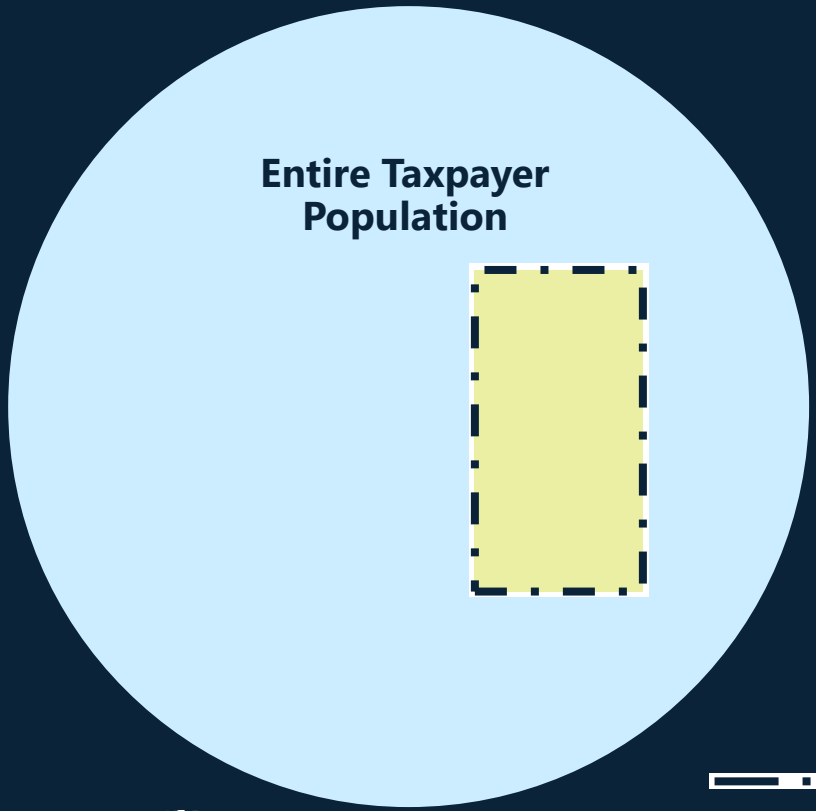
Examines some **Schedule E items** (passive activity loss)

Non-random Operational Audit Selection: We know the business rules used operationally and control for these reduce selection bias

Correspondence Audit Selection



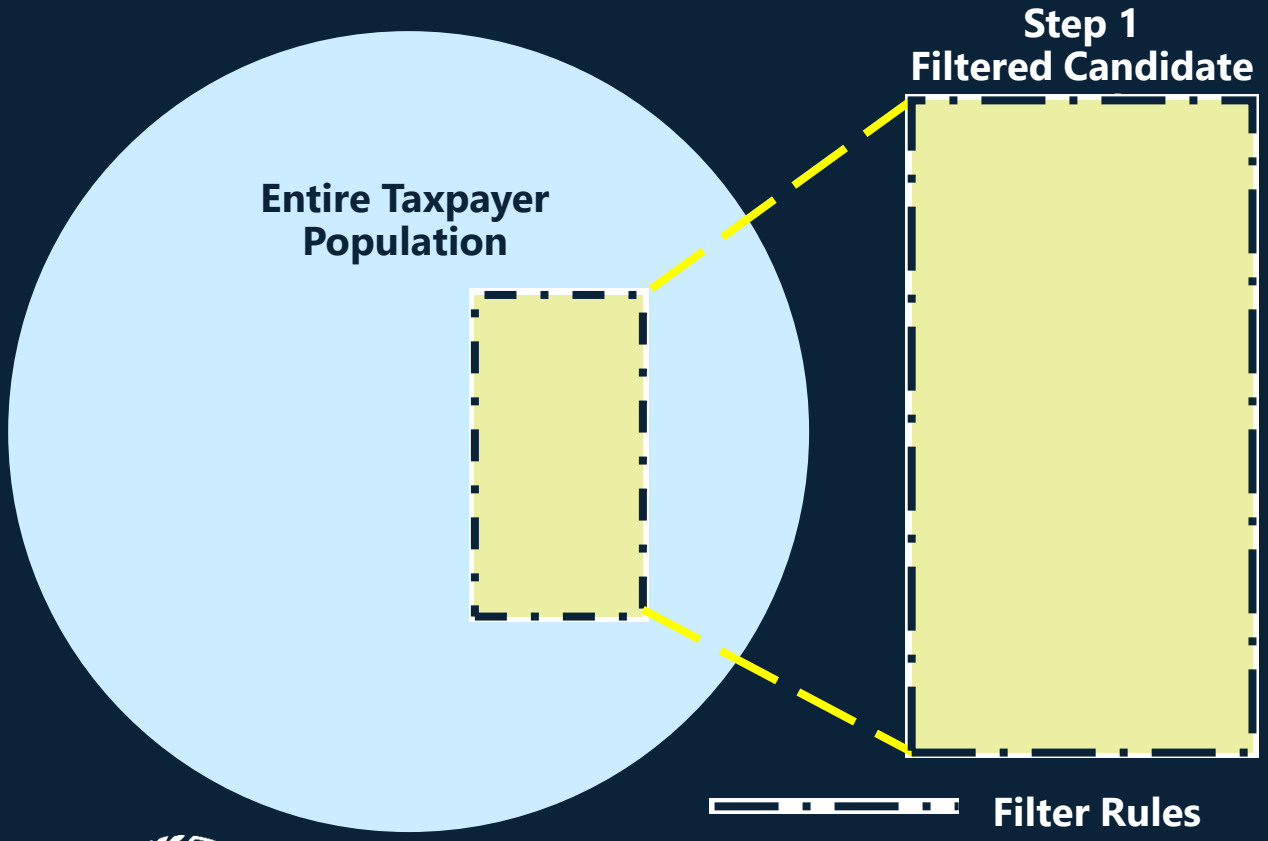
Correspondence Audit Selection



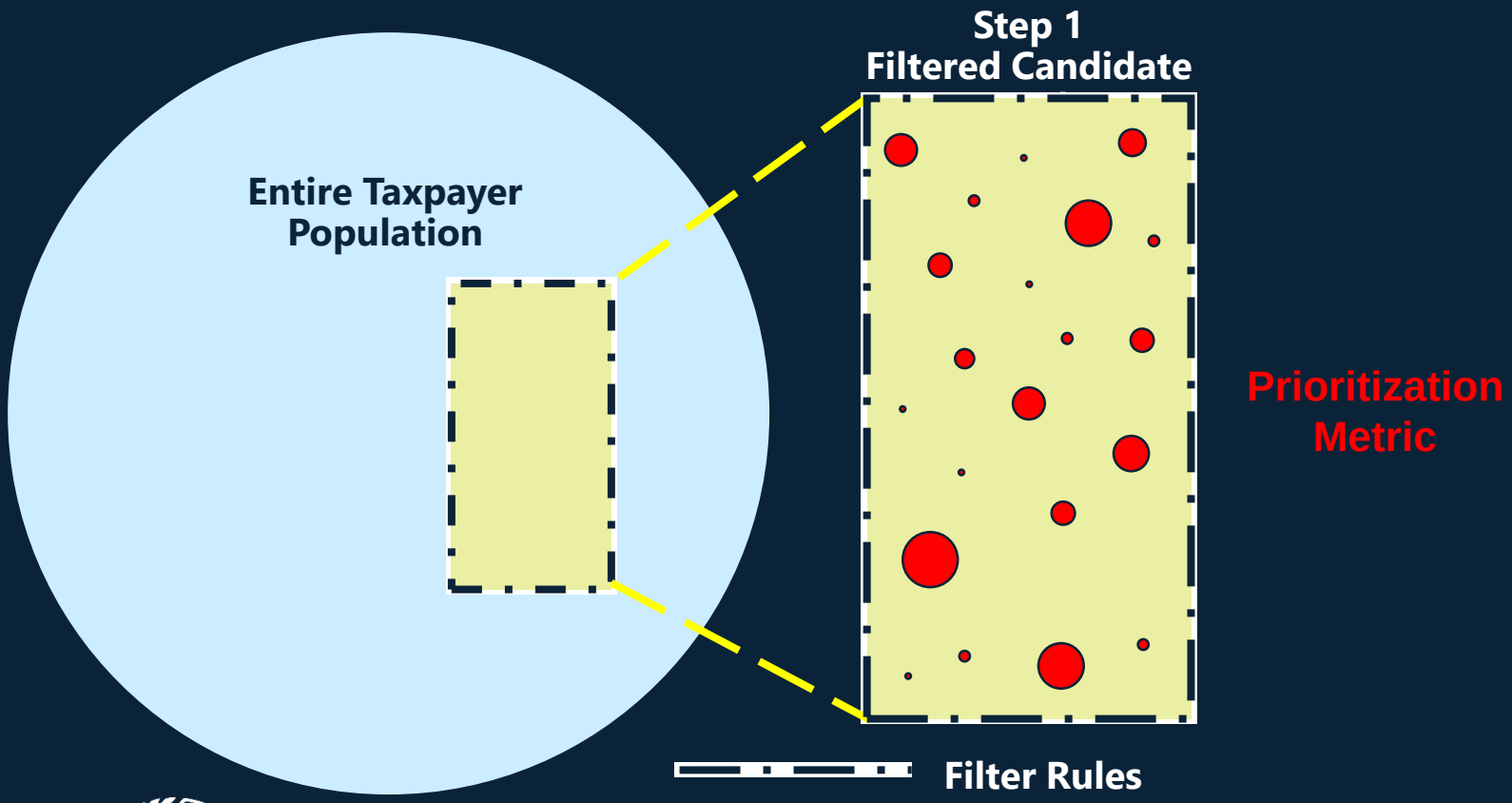
Step 1
Filtered Candidate Pool

Filter Rules

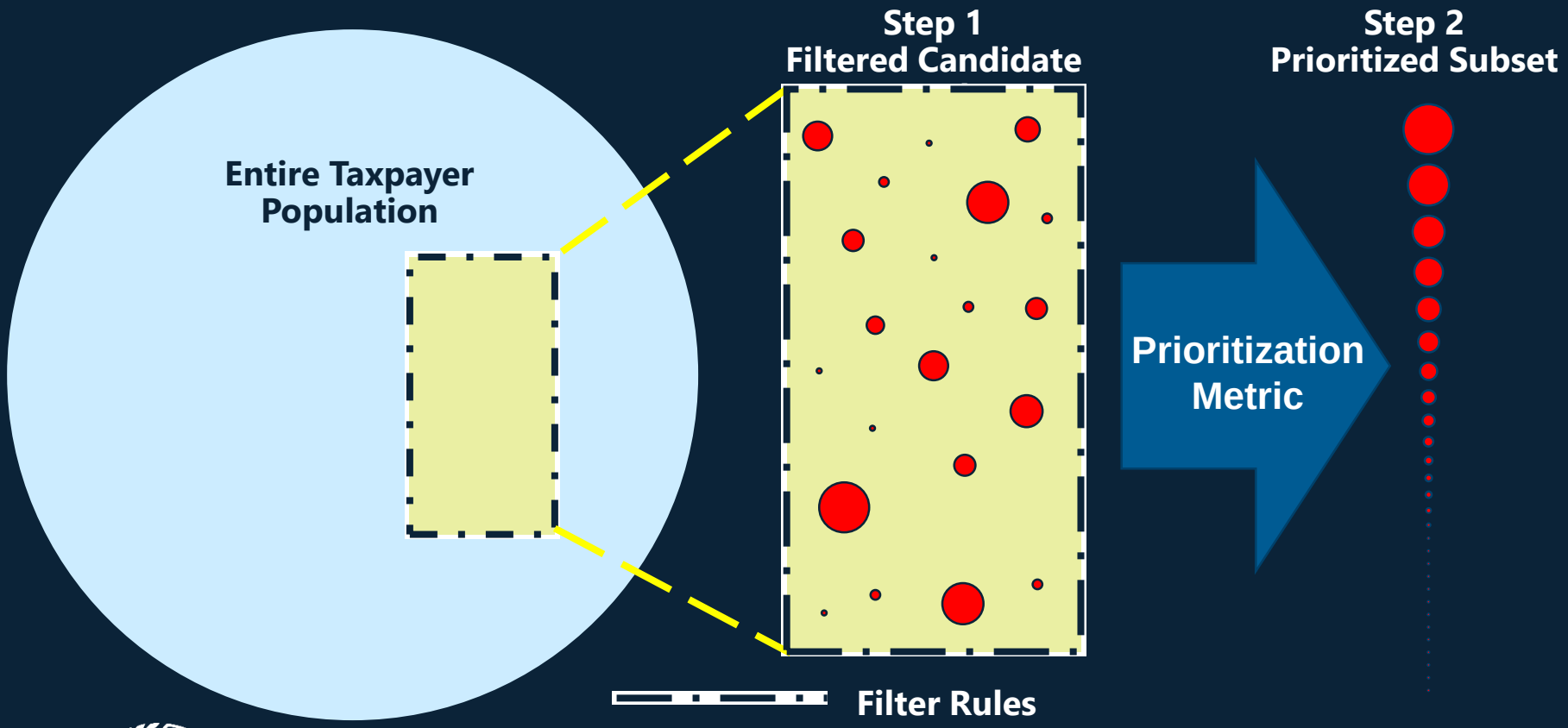
Correspondence Audit Selection



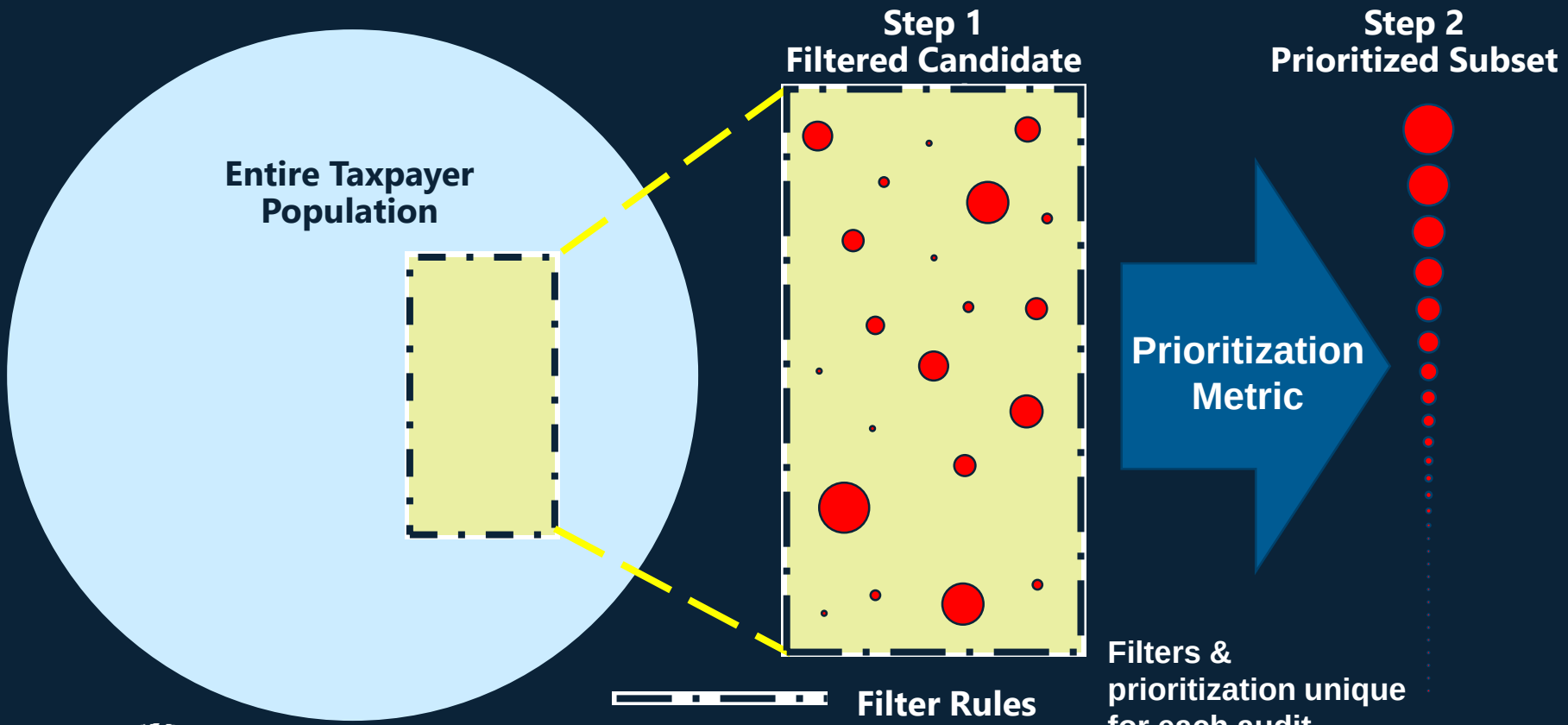
Correspondence Audit Selection



Correspondence Audit Selection



Correspondence Audit Selection



Analytical Sample

- Primary taxpayer information drawn from the Compliance Data Warehouse (CDW)
- *Baseline year* = Tax Year (TY) the taxpayer entered the sample, due to audit or eligibility
- For all groups, we examine reporting behavior up to 8 TYs after the baseline year

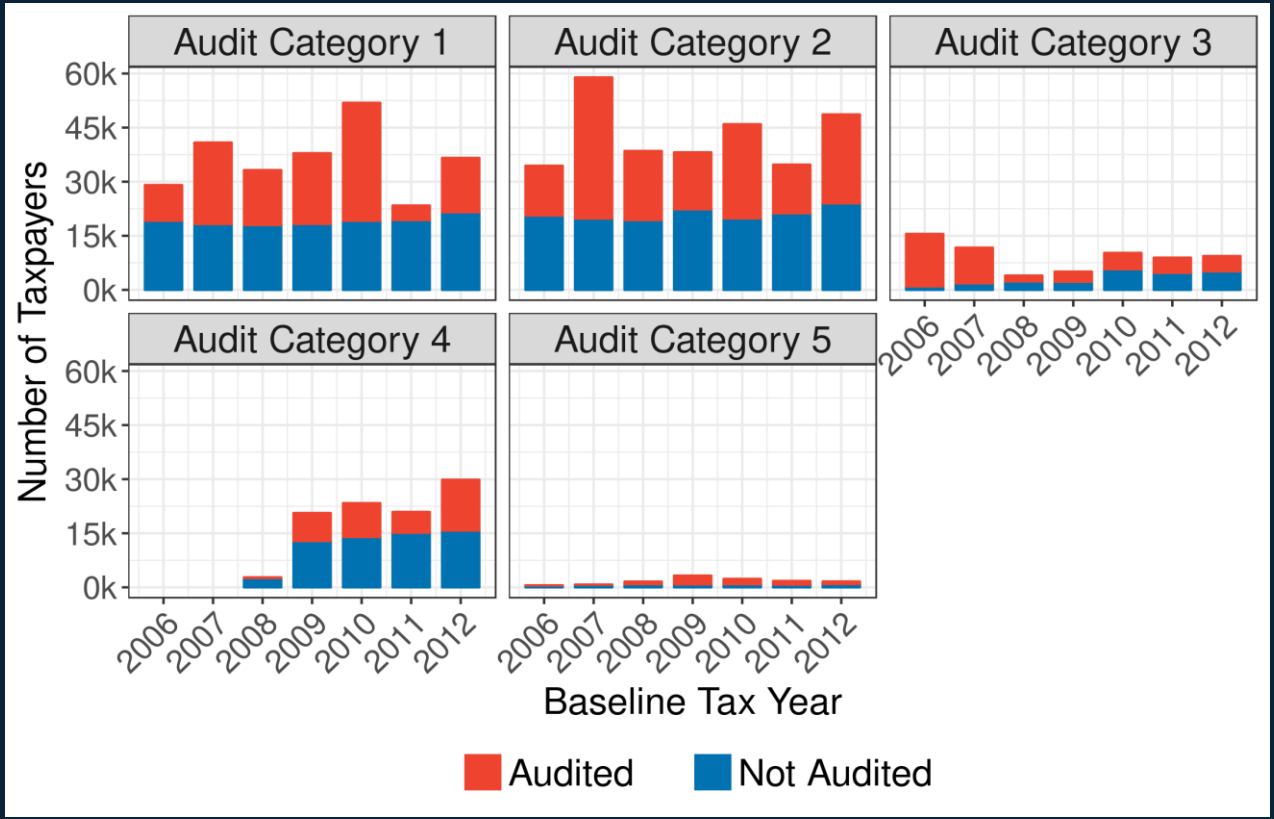
Treatment Group

All taxpayers **audited** for a given audit category in Tax Years (TYs) 2006-2012

Control Group

Random sample of taxpayers who were NOT audited but were **eligible based upon operational business rule filters** for the audit category in TYs 2006-2012

Sample Size by Tax Year



- Variation in size of audit categories
- Variation in audit volume year over year within audit categories
- Audit Category 4 did not start until TY 2008

Linear Mixed Effects Model: *Total Tax*

$$\ln(\text{total tax} + 1)_{ij} = \beta_0 + \gamma_{0i} + \beta_1 audited_i + \beta_{2-9} year\ after\ baseline_{ij} + \ldots$$

Where:

- i = 1, ..., n taxpayer
- j = 0, …, t years after baseline
- Random intercept (γ_{0i}) for taxpayer included
- All dollar amounts are adjusted for inflation to 2018 USD

Linear Mixed Effects Model: *Total Tax*

$$\ln(\text{total tax} + 1)_{ij} = \beta_0 + \gamma_{0i} + \beta_1 audited_i + \beta_{2-9} year\ after\ baseline_{ij} + \beta_{10-17} audited_i * year\ after\ baseline_{ij} + \beta_{18} priority_i + \ \ldots$$

Where:

- i = 1, ..., n taxpayer
- j = 0, …, t years after baseline
- Random intercept (γ_{0i}) for taxpayer included
- All dollar amounts are adjusted for inflation to 2018 USD

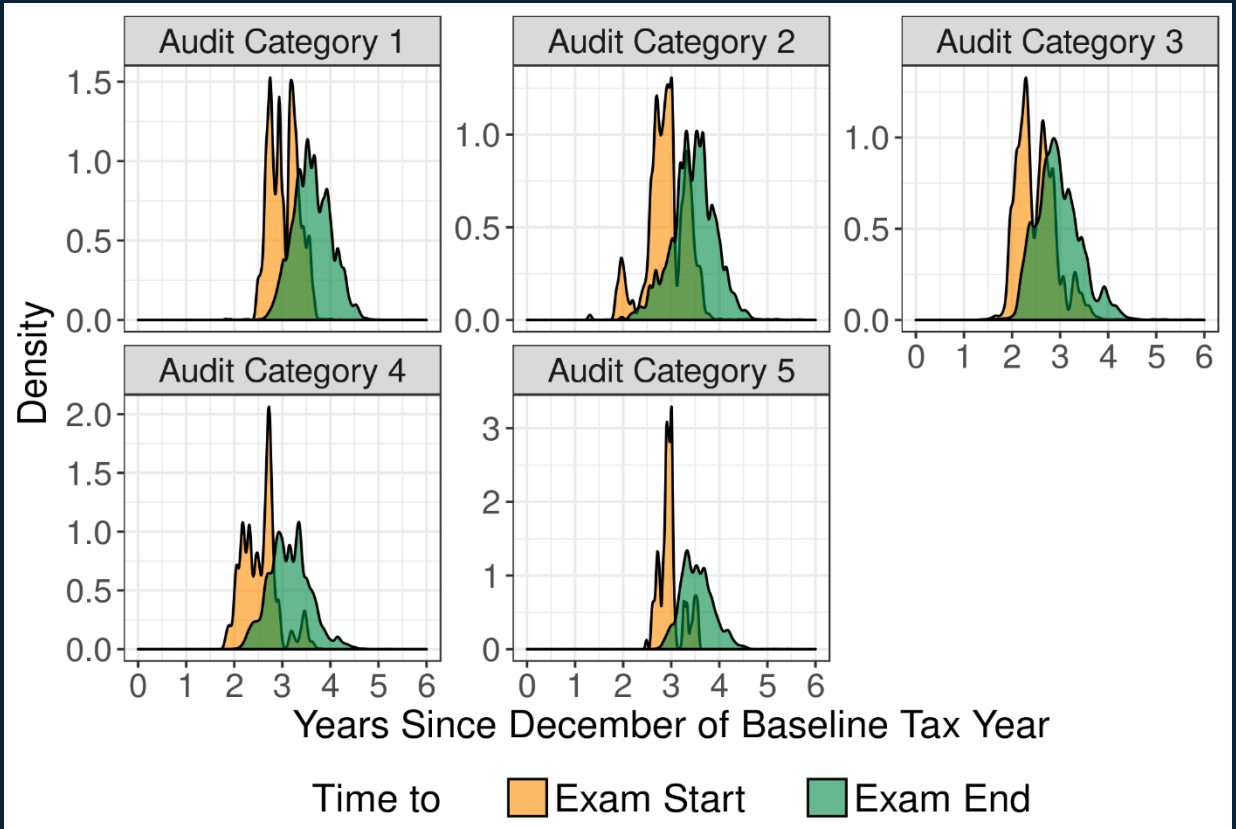
Linear Mixed Effects Model: *Total Tax*

$$\ln(\text{total tax} + 1)_{ij} = \beta_0 + \gamma_{0i} + \beta_1 audited_i + \beta_{2-9} year\ after\ baseline_{ij} + \beta_{10-17} audited_i * year\ after\ baseline_{ij} + \beta_{18} priority_i + \sum_{k=19}^{28} \beta_k C_k + \varepsilon_{ij}$$

Where C includes:

Variable	
Filing status	Any mortgage interest
Tax Year	Any Child Tax Credit
Total Positive Income	Any audit in last 10 TYs
Urban zip code	Preparer used
Any wage income	Itemized deductions
Number of exemptions	Total tax in (baseline year - 1)

Audit Timing

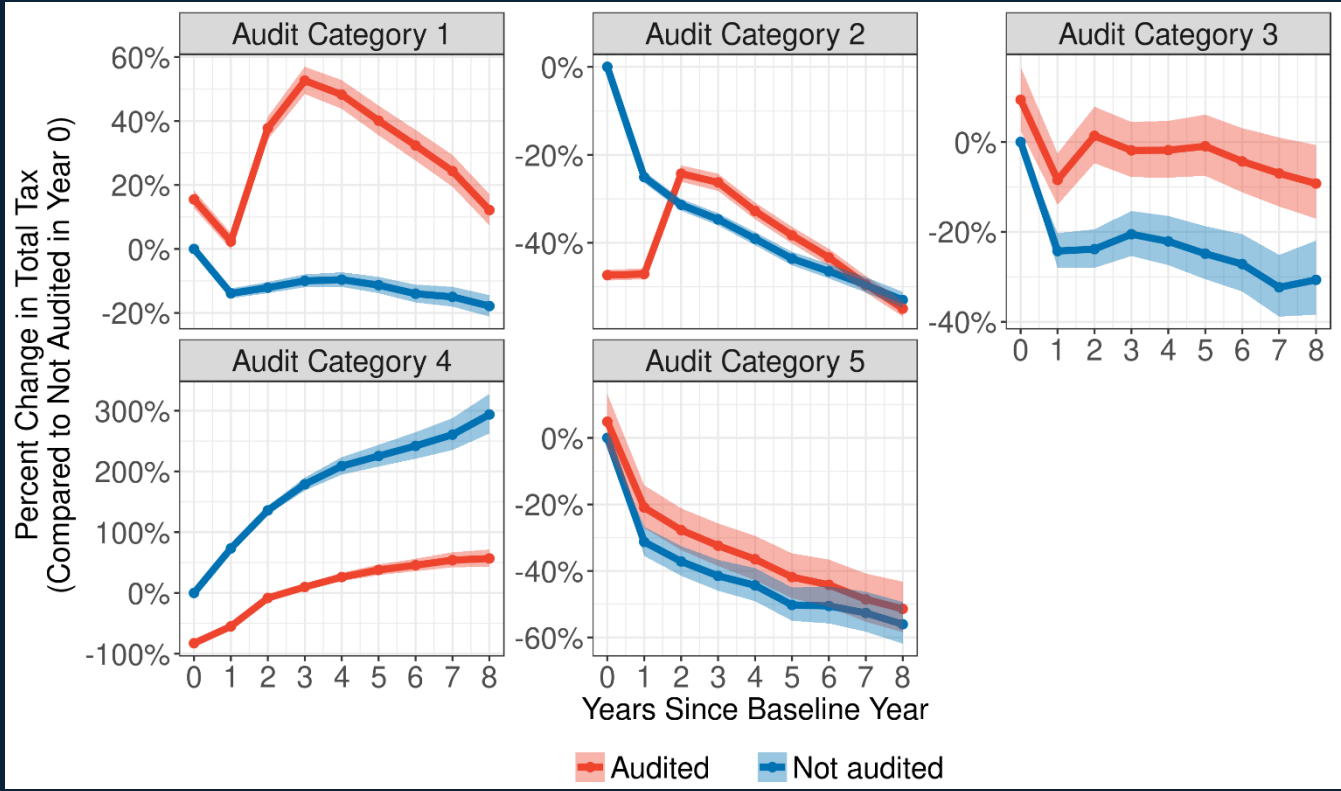


- Most audits begin 2-3 years after filing
- Most audits close by 5 years after filing
- Would not expect to see evidence of indirect effect before year 2

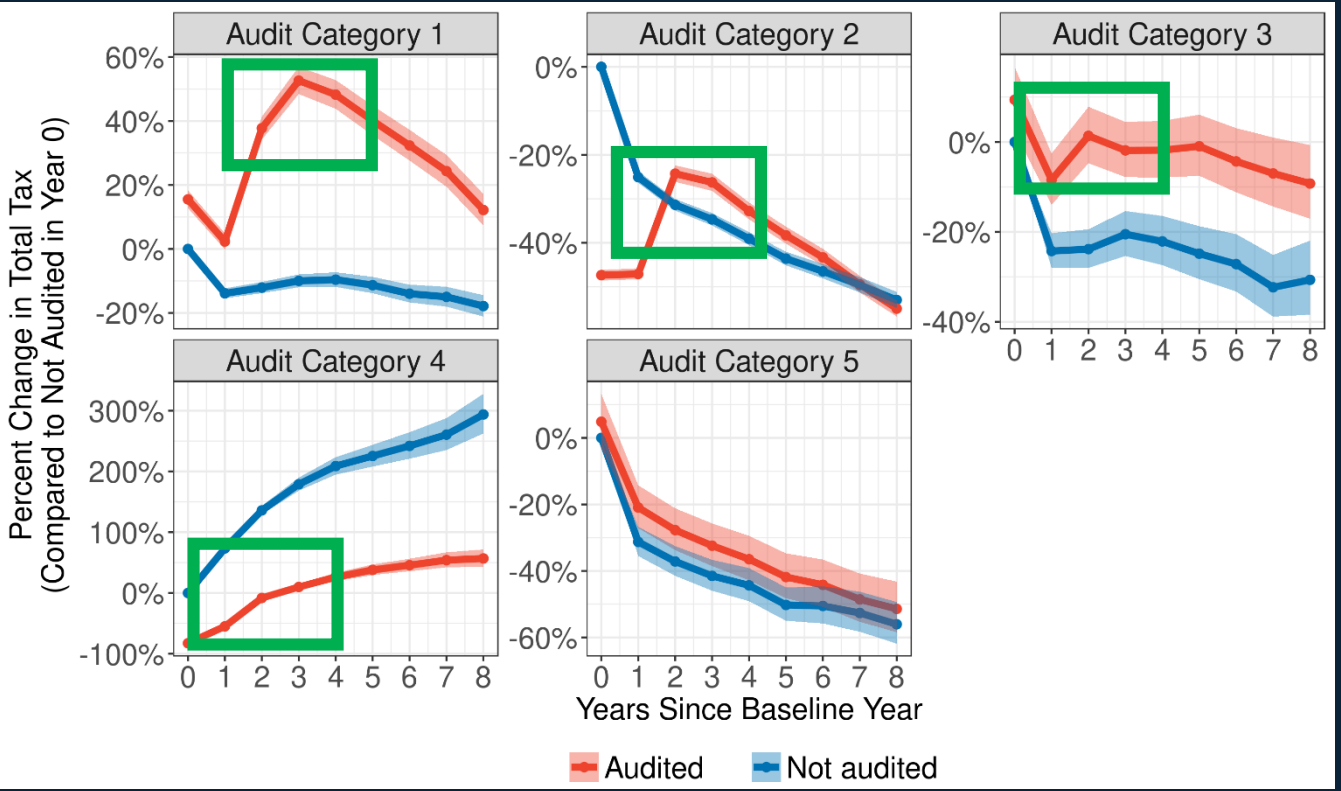
Results

TOTAL TAX MODELS

Results: Estimated Total Tax



Results: Estimated Total Tax



- Audited group increases total tax reporting in years 2-3 for categories 1-4
- Trajectories vary by audit category, even for control groups
- Insufficient evidence for audit category 5

Results

DOLLAR ESTIMATES FOR RESOURCE ALLOCATION

Translating Results to Operational Use

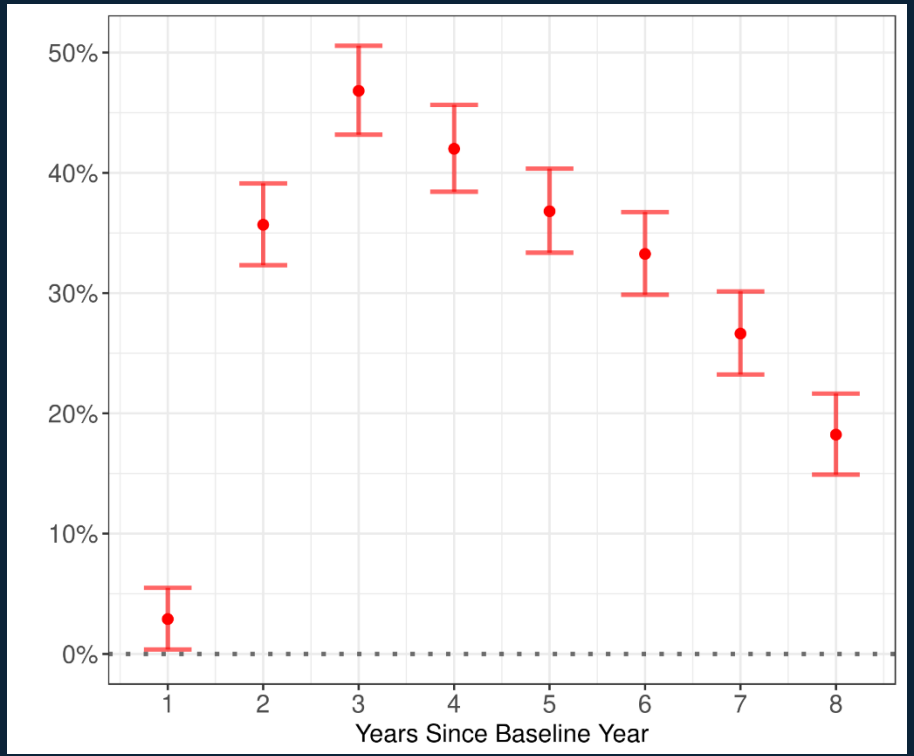
- Objective: Translate estimates from multiplicative scale to USD, such that they can be combined with direct effect revenue

- Done at the aggregate level (e.g., an average indirect effect for the entire Audit Category – our current approach) rather than the micro level (e.g., predicted indirect effect for individual taxpayers)

Translating Results to Operational Use

- Interaction estimates are transformed and combined with estimates of the total tax reported by audited individuals of each audit category at time ***j***

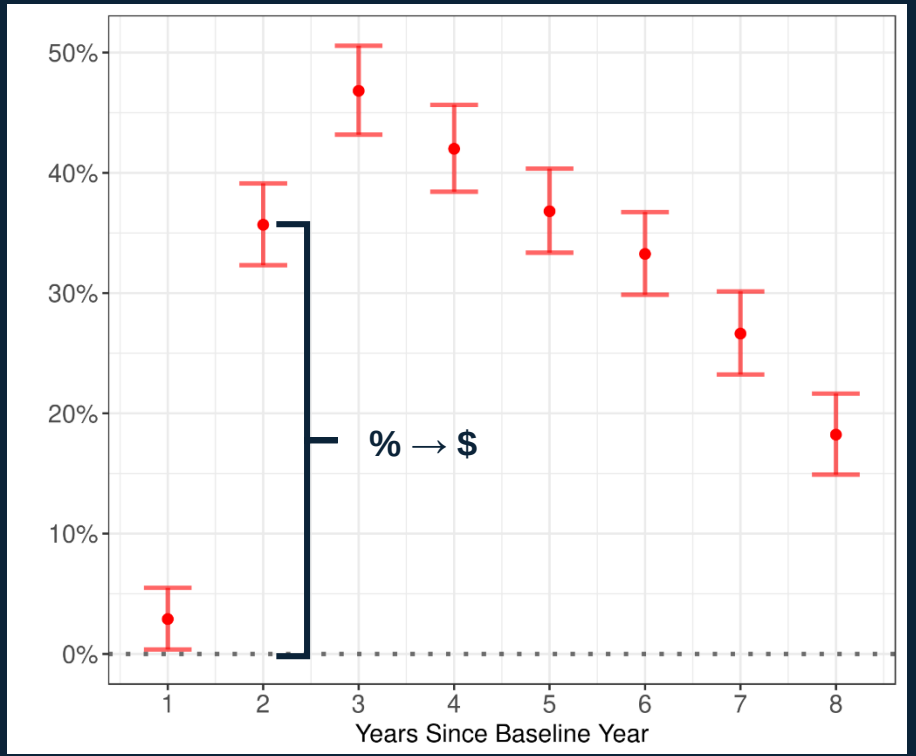
$$\left(\exp\left(\beta_{Audit*Year_j}\right) - 1\right) * 100\%$$



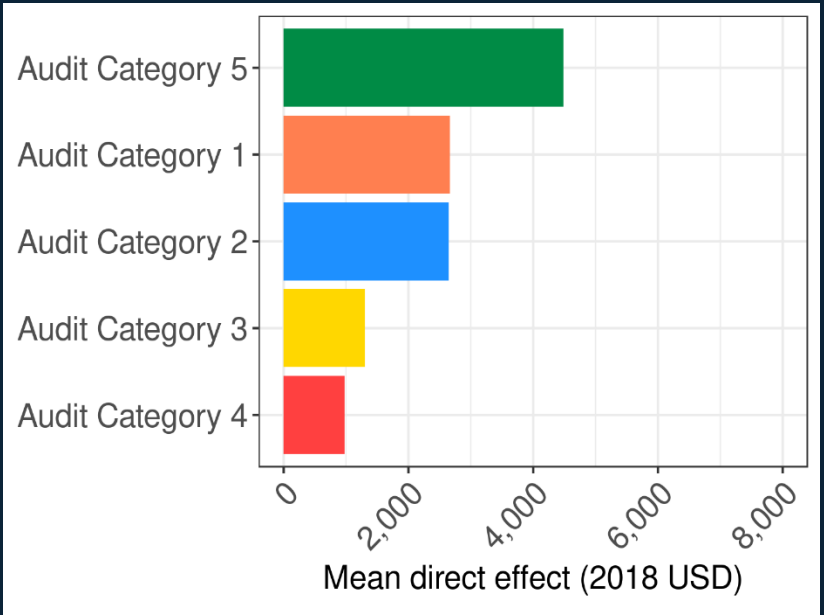
Translating Results to Operational Use

- Interaction estimates are transformed and combined with estimates of the total tax reported by audited individuals of each audit category at time $\boldsymbol{j}$
- For each audit category, we sum these values for $\boldsymbol{j} = [\mathbf{1}, \mathbf{5}]$

$$\left(\exp\left(\beta_{Audit*Year_j}\right) - 1\right) * 100\%$$



Results: Direct Revenue + Indirect Revenue



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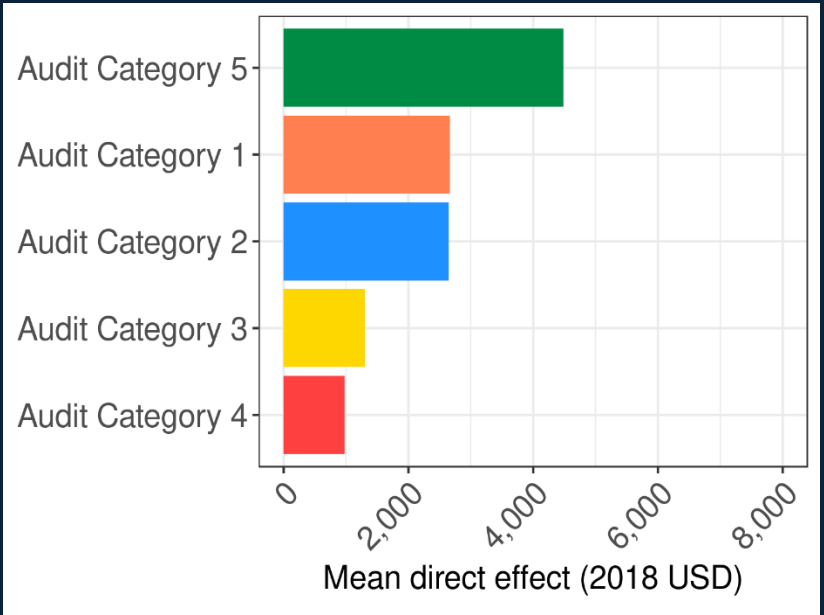

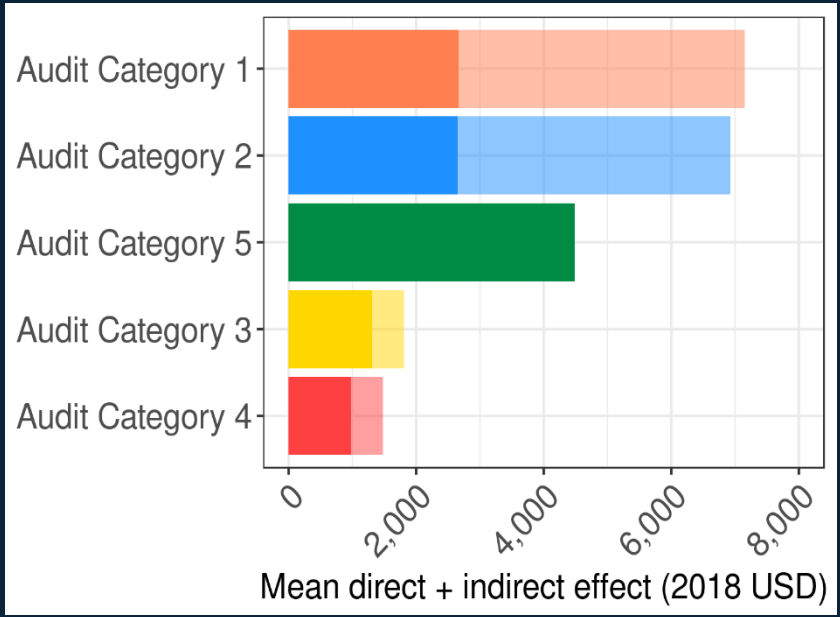

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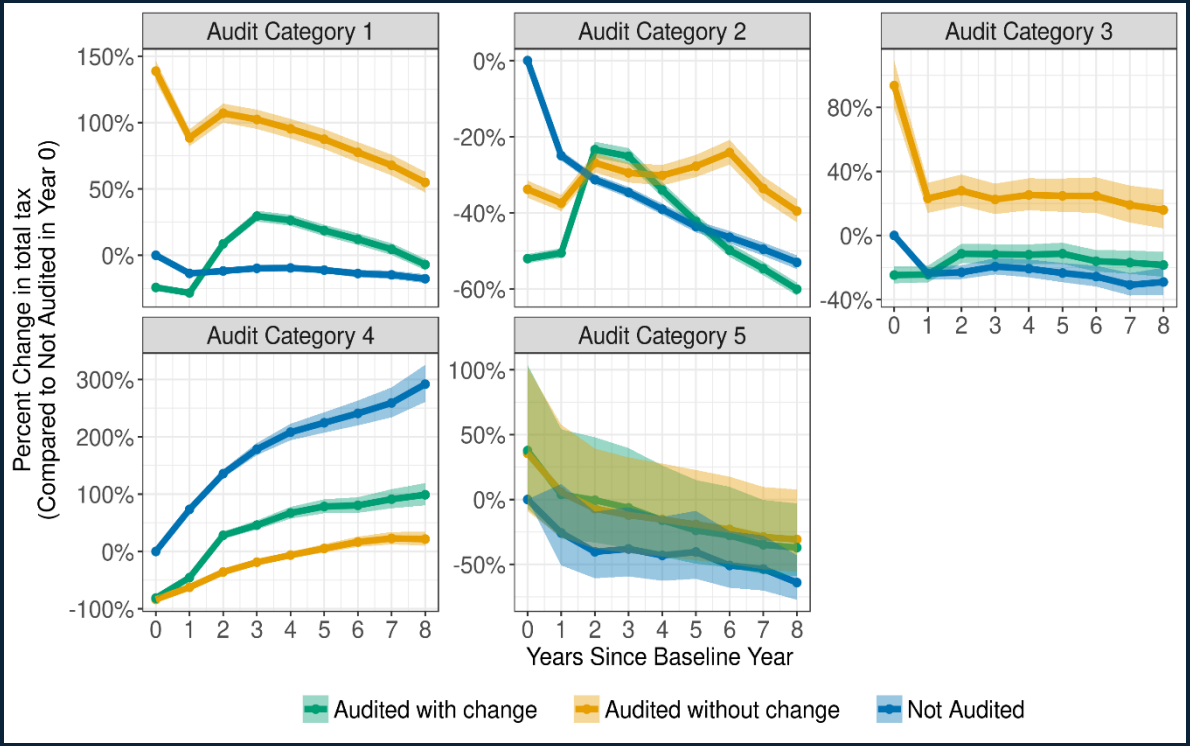
Discussion

Discussion

- Evidence of indirect effect on total tax reporting observed for four of the five audit categories
  - Differences in magnitude of effect
- Audit Category 5 has largest mean direct effect, but when considering indirect effect, Audit Category 1 has largest overall return on investment for direct revenue + predicted indirect total tax
- Audit Category 2 also has significant return on investment

Discussion



- We can disaggregate the audited group into "change outcome" versus "no-change outcome" audits
- However, current operational practice necessitates estimates of two-group models (audited versus not audited)

Limitations

- Audited and not audited populations differ in their underlying characteristics, even after accounting for eligibility and prioritization
- Eligibility and prioritization criteria may have shifted over time

Future Research

- Sensitivity testing with additional methods to handle selection bias
- Randomized controlled trial underway for one audit category

Contact us:

Leigh Nicholl lnicholl@mitre.org
Max McGill mmcgill@mitre.org
Lucia Lykke, Ph.D. llykke@mitre.org
Alan Plumley, Ph.D. Alan.Plumley@irs.gov

Internal Revenue Service

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Audits, Audit "Efficiency", and Post-audit Tax Compliance

Matthias Kasper
(Tulane University & University of Vienna)

James Alm
(Tulane University)

Washington DC, June 18, 2020

Introduction
Deterrence and Tax Compliance

- **Standard expected utility models: Taxpayers comply because they fear detection and punishment** (Allingham and Sandmo, 1972; Srinivasan, 1973; Yitzhaki, 1974)
  - Audits do not affect post-audit tax compliance, because all relevant parameters are fixed and known
- **Taxpayers respond to enforcement threat**
  - Threatening "close inspection" increases compliance (Slemrod et al., 2001)
  - More compliance when audit probabilities and fines increase (Alm et al., 1992)
- **"Tax compliance puzzle": Observed compliance rates are higher than the standard theory predicts**
  - Overestimation of detection risk - Rank-dependent utility models (Bernasconi, 1998, Yaniv, 1999; Alm and McKee, 2006)
  - Taxpayers are not motivated by financial incentives alone (Erard & Feinstein, 1994)

Prior work finds ambiguous effects of audits on past-audit compliance

- **Studies find positive revenue effects of random tax audits, e.g. in the US, the UK, and Denmark** (Advani et al., 2017; DeBacker et al., 2018; Kleven et al., 2011)
- **Other studies in the US and the UK suggest that post-audit compliance depends on the audit outcome**
  - Randomly audited UK taxpayers who were found to be compliant report less income in subsequent years (Gemmell & Ratto, 2012)
  - Self-employed US taxpayers who experienced an operational tax audit report more when they are caught cheating and less when they are not (Beer et al., 2020)
- **Several laboratory experiments find a decline in post-audit compliance** (Guala and Mittone, 2005; Mittone, 2006; Maciejovsky et al., 2007)

What Drives Behavioral Responses to Tax Audits?

- **The standard expected utility perspective: Audits provide new information that affects the perceived risk of future audits**
  - Audits increase (decrease) post-audit compliance if the audit detects more (less) noncompliance than expected (Slemrod, 2019)
- **The behavioral perspective: Taxpayers use heuristics to assess the risk of future audits (little knowledge of true parameters)**
  - Taxpayers underestimate the risk of future audits (Mittone et al., 2017)
  - Taxpayers want to make up for incurred "losses" (Maciejovsky et al., 2007)
  - Audits might "crowd-out" the intrinsic motivation to comply (Mendoza et al., 2017; Hu et al., 2020)
  - Experiencing punishment affects behavior, even absent changes in the underlying parameters (Haselhuhn et al. 2012; Earnhart and Fries, 2013)
  - "Availability heuristic": Assess the probability of a future audit based on the ease of recalling the past audit experience (Kahneman & Tversky, 1973)

This Study investigates how Audits affect Post-audit Compliance

- **What is the effect of "audit efficiency", the share of noncompliance that the agency detects, on post-audit compliance?**
- **How do audits affect truly compliant and noncompliant taxpayers?**
  - (Non) compliant: Report all (zero) income in the round that is audited
- **Do audits "crowd-out" compliance among honest taxpayers**
  - Honest: Report all income in all rounds prior to first audit
- **Why a laboratory experiment?**
  - **Allows to introduce variation in audit probability, audit efficiency, and to observe true compliance levels**

Research Design
A Variation of the Standard Tax Compliance Game

- **Participants receive income and must decide how much they declare (28 Rounds)**
- **Variation in audit probability (.18 - .70) & audit efficiency (0.30 - 1)**
- ***t* = 0.25, *f* = 2; Income varies between 2,000 and 3,500 ECU**

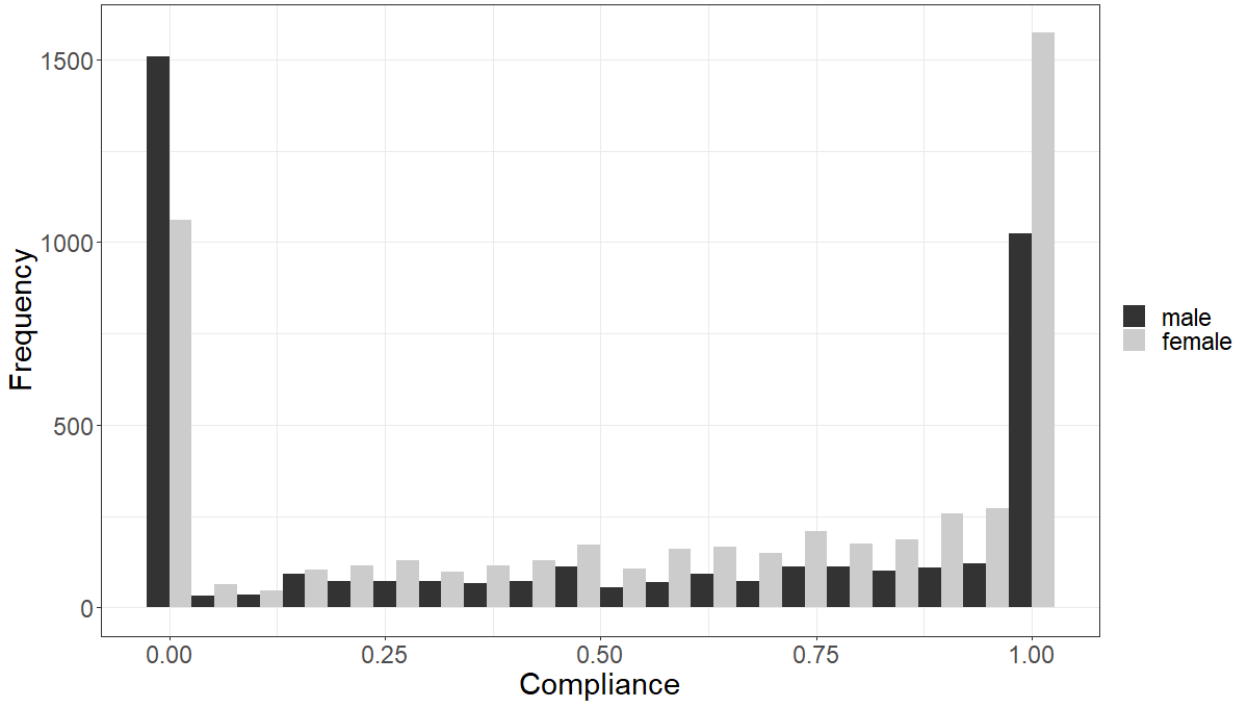
Sample:

- **333 participants, 9,324 compliance decisions, 44% audited**
- **Mean age = 26 years (sd = 6.1, range: 18 – 59); 57% female**
- **51 % Bachelor or higher; 29% prepared own taxes in the past**

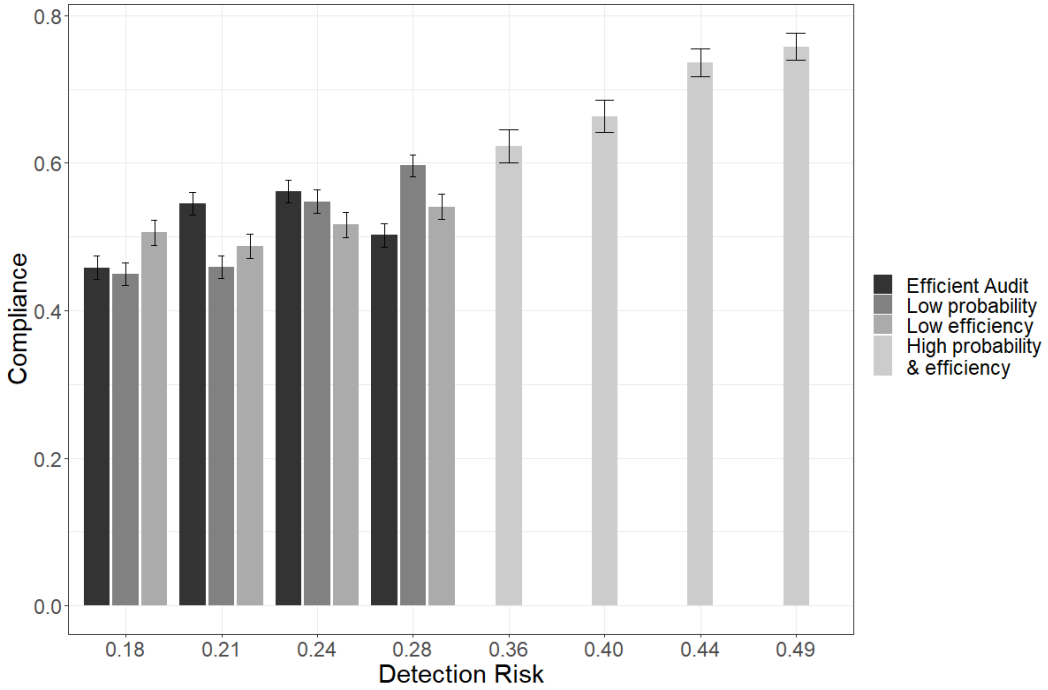
Experimental Parameters: 28 Rounds in Random Order

Task	Type	Order	Audit Probability	Audit Efficiency	Detection Risk
1	Efficient audit (e = 1)	p first	0.18	1.00	0.18
2			0.21	1.00	0.21
3			0.24	1.00	0.24
4			0.28	1.00	0.28
5		e first	0.18	1.00	0.18
6			0.21	1.00	0.21
7			0.24	1.00	0.24
8			0.28	1.00	0.28
9	Low audit probability (p)	p first	0.30	0.60	0.18
10			0.33	0.63	0.21
11			0.37	0.67	0.24
12			0.40	0.70	0.28
13		e first	0.30	0.60	0.18
14			0.33	0.63	0.21
15			0.37	0.67	0.24
16			0.40	0.70	0.28
17	Low audit efficiency (e)	p first	0.60	0.30	0.18
18			0.63	0.33	0.21
19			0.67	0.37	0.24
20			0.70	0.40	0.28
21		e first	0.60	0.30	0.18
22			0.63	0.33	0.21
23			0.67	0.37	0.24
24			0.70	0.40	0.28
25	High audit probability	p first	0.60	0.60	0.36
26	(p) and efficiency (e)		0.63	0.63	0.40
27			0.67	0.67	0.44
28			0.70	0.70	0.49

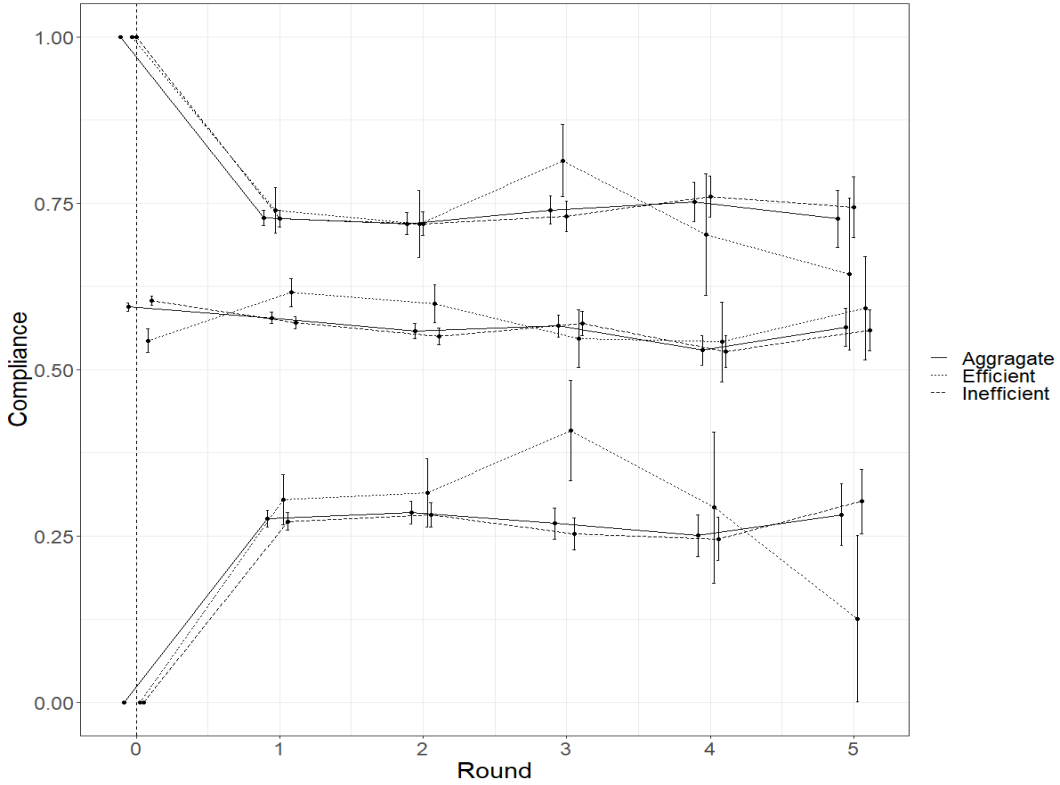
Bimodal Compliance Distribution



Compliance and Detection Risk



Effect of Audits on Post-audit Compliance



Main Results

Dependent variable: Compliance rate				
Independent variable	(1)	(2)	(3)	(4)
Income	-0.0145 ***	-0.0145 ***	-0.0108 ***	-0.0140 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Detection risk	0.0086 ***	0.0087 ***	0.0072 ***	0.0072 ***
	(0.001)	(0.0004)	(0.001)	(0.001)
Audit probability first	-0.0036	-0.0036	-0.0032	-0.0038
	(0.006)	(0.006)	(0.006)	(0.006)
Round after audit	0.0043	-0.0360 **	0.0499 ***	-0.1496 ***
	(0.006)	(0.016)	(0.018)	(0.018)
Efficiency		-0.0001	0.0003	-0.0011 ***
		(0.001)	(0.001)	(0.001)
Round after audit x Efficiency		0.0007 ***	0.0005 *	0.0013 ***
		(0.001)	(0.001)	(0.001)
Compliant			0.4905 ***	
			(0.027)	
Round after audit x Compliant			-0.2877 ***	
			(0.036)	
Efficiency x Compliant			-0.0011 **	
			(0.001)	
Round after audit x Efficiency x Compliant			0.0000	
			(0.001)	
Noncompliant				-0.5735 ***
				(0.025)
Round after audit x Noncompliant				0.3315 ***
				(0.033)
Efficiency x Noncompliant				0.0006
				(0.001)
Round after audit x Efficiency x Noncompliant				-0.0009
				(0.001)
Intercept	0.3194 ***	0.3261 ***	0.2182 ***	0.5707 ***
	(0.024)	(0.026)	(0.023)	(0.021)
Observations	8,147	8,147	8,147	8,147
n	333	333	333	333
R^2	0.681	0.681	0.638	0.633

Effect of First Audit on Honest and Dishonest Taxpayers

Dependent variable: Compliance rate		
Independent variable	(5)	(6)
Income	0.0002 (0.013)	0.0001 (0.013)
Detection risk	0.0102 *** (0.002)	0.0097 *** (0.002)
Audit probability first	0.0145 (0.029)	-0.0050 (0.027)
Round after first audit	0.0343 (0.023)	-0.0060 (0.022)
Honest	0.4738 *** (0.064)	
Round after first audit x Honest	-0.0987 (0.061)	
Dishonest		-0.6476 *** (0.065)
Round after first audit x Dishonest		0.1861 *** (0.065)
(Intercept)	0.2082 *** (0.054)	0.4043 *** (0.052)
Observations	666	666
N	333	333
R^2	0.615	0.612

Summary

- **Differential effects of random tax audits on post-audit compliance**
- **Efficient audits improve post-audit compliance (+ 3.4%), inefficient audits have the opposite effect (- 3.6%)**
- **Inefficient audits increase compliance of "noncompliant" taxpayers (+ 18%) and decrease compliance of "compliant" taxpayers (- 24%)**
- **No support for "crowding-out" hypothesis and misperception of compound audit lotteries (where detection is uncertain)**
- **In sum, the audit experience (efficient or not) and the audit outcome (found cheating or not) determine post-audit compliance**

Implications and Scope for Future Work

Implications

- Ambiguous nature or lenient interpretation of tax laws might undermine audit effectiveness
- Understanding psychological determinants of behavioral responses to audits might improve collection
- Can post-audit communication improve specific deterrence effect?

Future Work

- Different behavior when audit selection is non-random?
- Different behavior when relevant parameters are unknown**?**

Thank you for your attention!

Matthias Kasper

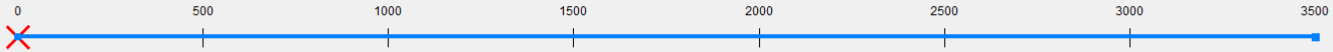
mkasper1@Tulane.edu

Decision

- **Your income is 2300 ECU**
- The tax rate is 25 %
- **The audit efficiency is 67 %**
- **The audit probability is 37 %**
- The fine is 100% of the evaded amount that is detected

Please indicate how much income you declare by clicking on the bar below!

You can use a calculator to decide how much income you want to declare!



Declared income 0

Audit	No	Yes
Audit efficiency	--	67%
Declared income	0	0
- Taxes paid	0	0
= After tax income	2300	2300
- Fine	--	771
Income after taxes and fines	2300	1530

Calculator

Declare income

Feedback

Your tax declaration is being audited!

Proceed

Feedback

You did not declare 2300 ECU of your income.

The tax agency detected 67% of that amount!

Your income in this round is 1530 ECU.

Proceed

Session 1. Behavioral Responses to Audits

Moderator:	***Robert McClelland*** *Tax Policy Center*
The Specific Deterrence Implications of Increased Reliance on Correspondence Audits	***Brian Erard*** *B. Erard & Associates*
The Specific Indirect Effect of Correspondence Audits: Moving from Research to Operational Application	***Leigh Nicholl*** *MITRE Corporation*
The Effect of Audit Risk and Detection Risk on Tax Compliance	***Matthias Kasper*** *Tulane University*
Discussant:	***Janet Holtzblatt*** *Tax Policy Center*