9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Welcome

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

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Acting Chief Research and Analytics Officer, IRS

Chuck Rettig
Commissioner of Internal Revenue
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
# Research, Applied Analytics, and Statistics

## Session 1. Estimating the Effects of Tax Administration on Compliance

| Moderator: | Robert McClelland  
Urban-Brookings Tax Policy Center |
| Estimating the Specific Indirect Effect for Multiple Types of Correspondence Audits | Lucia Lykke  
MITRE Corporation |
| Enforcement vs. Outreach – Impacts on Tax Filing Compliance | Anne Herlache  
IRS:RAAS |
| Assessing the Impact of Exchange of Information | Pierce O’Reilly  
OECD |
| Discussant: | Michael Udell  
District Economics Group |
9th Annual IRS/TPC Joint Research Conference on Tax Administration

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Estimating the Specific Indirect Effect of Multiple Categories of Correspondence Audit

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June 20, 2019

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What is the indirect effect of tax enforcement?

TWO TYPES OF INDIRECT EFFECT

Specific Indirect Effect
Experiencing an enforcement activity increases subsequent year compliance for that taxpayer.

General Indirect Effect
When taxpayers experience an enforcement activity, other taxpayers around them will increase compliance.
What is the indirect effect of tax enforcement?

**TWO TYPES OF INDIRECT EFFECT**

**Specific Indirect Effect**
Experiencing an enforcement activity increases subsequent year compliance for that taxpayer

**General Indirect Effect**
When taxpayers experience an enforcement activity, other taxpayers around them will increase compliance

MITRE
Research Objectives

Investigate whether audited taxpayers differ in their contributions to IRS revenue over time compared to unaudited taxpayers.

Explore whether these trends vary by category of audit.

Implications for IRS resource allocation decisions
Evidence for specific indirect effect seen in both random (NRP) and operational U.S. taxpayer data

- Experiencing an NRP audit is associated with a 1.2% increase in wage income reporting and a 14.2% increase in self-employment income (DeBacker et al. 2015)
- Audited taxpayers who were assessed an adjustment increased Schedule C net profit and taxable income reporting (Beer 2015)

Attenuation of indirect effect ~3-5 years after audit (DeBacker et al. 2015; Beer 2015; Datta et al. 2015; Nestor and Beers 2014)
• Does the type of population audited or characteristics of the audit matter?

• Evidence that self-employment income is more sensitive to indirect effects than other types of income, including wage income and Schedule D income (DeBacker et al. 2015; Kleven et al. 2011)

• Audits focused on Earned Income Tax Credit (EITC) claimants and nonfilers show evidence of indirect compliance effects (Datta et al. 2015; Guyton et al. 2018)
<table>
<thead>
<tr>
<th>Audit Category 1</th>
<th>Audit Category 2</th>
<th>Audit Category 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examines some <strong>Schedule C expenses</strong> among taxpayers who file a Schedule C and meet other category-specific eligibility criteria.</td>
<td>Examines some <strong>Schedule A deductions</strong> among taxpayers who itemize deductions and meet other category-specific eligibility criteria.</td>
<td>Examines <strong>Schedule SE (self-employment tax)</strong> among taxpayers who meet other category-specific eligibility criteria.</td>
</tr>
</tbody>
</table>

**Prioritization methods:** Each audit category relies on different metrics to prioritize which returns to audit. These are known to us and used as control variables to account for selection into the audited “treatment” versus unaudited “control” group.
Analytical Sample

TWO GROUPS:
1. Audited
2. Not Audited, Eligible

• Primary Taxpayer Identification Number (TIN) data drawn from Compliance Data Warehouse (CDW) for Tax Years (TY) 2006-2018

  • **Audited group**: All primary TINs audited under audit categories 1, 2, or 3 for returns filed in TYs 2006 through 2012
  
  • **Eligible/not audited group**: Random sample of up to 25,000 TINs/year who met the eligibility requirements for the audit category for TYs 2006 through 2012
  
  • Reporting on subsequent F1040, Schedule A, Schedule C, and Schedule SE tracked for both groups for **up to eight TYs** after baseline

  • Baseline year = TY taxpayer entered the sample, due to audit or eligibility
Sample Size by Tax Year (2006-2012)

- Variation in size of audit categories
- Variation in audit volume year over year within audit categories
\[ \ln(\text{total tax} + 1)_{ij} = \beta_0 + \beta_1 priority_i + \beta_2 \text{audited}_i + \beta_3 \text{year. after. baseline}_ij + \beta_4 \text{audited}_i \times \text{year. after. baseline}_ij + \beta_k C_k + \epsilon_{ij} \]

Where
- \( C \) represents time-varying control variables filing status, tax year, and AGI
- \( i = 1, \ldots, n \) taxpayer
- \( j = 0, \ldots, t \) years after baseline
- Random intercept for taxpayer included

*All dollar amounts are adjusted for inflation to 2018 USD*
Linear Mixed Effects Model 2 (Audit-specific relevant items)

\[
\ln(\sum_{\text{relevant items}} + 1)_{ij} = \beta_0 + \beta_1audited_i + \beta_2year\cdot after\cdot baseline_i + \beta_3audited_i \\
* year\cdot after\cdot baseline_i + \beta_kC_k + \epsilon_{ij}
\]

Where

- \( C \) represents time-varying control variables filing status, tax year, and AGI
- \( i = 1, \ldots, n \) taxpayer
- \( j = 0, \ldots, t \) years after baseline
- Random intercept for taxpayer included

*All dollar amounts are adjusted for inflation to 2018 USD*
Timing of Audits

Timing of Exam Start and End by Audit Category

Years Since December of Baseline Year

Density

Audit Category 1
Audit Category 2
Audit Category 3

Time to  
Exam Start  
Exam End

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Results

TOTAL TAX MODELS
Results: Predicted Total Tax, Audit Category 1

Estimated Changes in Total Tax over Time

Percent Change in Total Tax (Compared to Not Audited in Year 0)

Years Since Baseline Year

- Audited
- Not Audited
Results: Predicted Total Tax, Audit Category 2

Estimated Changes in Total Tax over Time

Percent Change in Total Tax (Compared to Not Audited in Year 0)

Years Since Baseline Year

Audited vs. Not Audited
Results: Predicted Total Tax, Audit Category 3

Estimated Changes in Total Tax over Time

Percent Change in Total Tax (Compared to Not Audited in Year 0)

- Audited
- Not Audited

Years Since Baseline Year

0 1 2 3 4 5 6 7 8
Results

RELEVANT LINE ITEM MODELS, AUDIT CATEGORIES 2 & 3
Predicted Sum of Schedule A Items, Audit Category 2

Estimated Changes in Relevant Items over Time

Percent Change in Relevant Items ( Compared to Not Audited in Year 0 )

Years Since Baseline Year

Audited  Not Audited
Estimated Changes in Relevant Items over Time

Percent Change in Relevant Items (Compared to Not Audited in Year 0)

Years Since Baseline Year

Audited
Not Audited

MITRE
Conclusions
DISCUSSION, LIMITATIONS, FUTURE WORK
• Evidence of indirect effect on total tax reporting observed for three audit categories with attenuation after roughly year 3

• Audited and unaudited populations show different baseline characteristics

• Specific indirect effect is observed on reporting of self-employment tax (audit category 3)

• Some evidence of specific indirect effect on Schedule A deduction reporting (audit category 2)
• Audit category 1 (Schedule C expenses) suggests **different shape** to the total tax trajectory - total tax trajectories for audit and control groups cross, then diverge

• Audit category 2 (Schedule A deductions) shows **largest magnitude** of total tax reporting changes among audited group

• Evidence for indirect effect on specific line item reporting is less clear, and **differs by audit category**
  - Some evidence that audit category 2 taxpayers decrease deduction reporting more than control group between years 1-2
  - Strongest evidence for audit category 3 – may indicate taxpayers have been “**educated**” on self-employment tax reporting
• Results suggest that indirect effects may vary in magnitude and trend for different categories of audit; implications for IRS resource allocation decisions

Limitations

• Audited and not audited population differ in their underlying characteristics, even after accounting for eligibility and prioritization

• Eligibility and prioritization criteria may have shifted over the past few years, or some returns may have been excluded for audit

• Incorporate additional control variables that may be correlated with prioritization; sensitivity testing with alternative methods to handle selection bias

• Expand to more categories of correspondence audit, and other types of audit (e.g., Field audits)

• Experimentation underway for one audit category
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Leigh Nicholl licholl@mitre.org
Alan Plumley, Ph.D. alan.plumley@irs.gov

References
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
ENFORCEMENT VERSUS OUTREACH: IMPACTS ON TAX FILING COMPLIANCE

IRS TPC RESEARCH CONFERENCE – JUNE 20TH, 2019

Presented by: Anne Herlache (anne.d.herlache@irs.gov)
With Stacy Orlett, Ishani Roy, Alex Turk, & Rizwan Javaid

Internal Revenue Service

DISCLAIMER: The views and opinions presented in this presentation reflect those of the authors. They do not necessarily reflect the views or the official position of the Internal Revenue Service.
PRESENTATION OUTLINE

- Background
- Design
- Results
- Conclusions and Future Directions
Questions Addressed by the Pilot

- Type, timing, and sequence of low-cost outreach
- Case identification closer to the filing deadline
- Past noncompliance vs. encouraging future compliance
- Costs of not starting or delaying nonfiler treatment
**Design**

- Randomized control trial
- Field experiment conducted during the 2018 filing season

**Primary outcomes**
- Filing Tax Year 2017 return
- Filing Tax Year 2016 delinquent return

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**Wave 1**
- TY 2017 filing reminder letters and postcards
- TY 2016 Return Delinquency Notice Process

**Wave 2**
- Soft letter contacts around extension deadline

**Wave 3**
- Soft letter contacts
- TY 2017 Return Delinquency Notice Process

- Early April, 2018
- Mid October, 2018
- Mid December, 2018
## Design

### Wave 1 Reminders:
- 7,500 Simple Letter
- 7,500 Simple Postcard
- 7,500 Complex Letter
- 7,500 Complex Postcard
- Randomly assigned among groups 2, 6, 7, & 8

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>5,000</td>
<td>TY 2016 RD Notice*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5,000</td>
<td>Reminder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5,000</td>
<td></td>
<td>Soft Letter</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5,000</td>
<td></td>
<td></td>
<td>Soft Letter</td>
</tr>
<tr>
<td>5</td>
<td>5,000</td>
<td></td>
<td></td>
<td>TY 2017 RD Notice*</td>
</tr>
<tr>
<td>6</td>
<td>5,000</td>
<td>Reminder</td>
<td>Soft Letter</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>10,000</td>
<td>Reminder</td>
<td>Soft Letter</td>
<td>Soft Letter</td>
</tr>
<tr>
<td>8</td>
<td>10,000</td>
<td>Reminder</td>
<td>Soft Letter</td>
<td>TY 2017 RD Notice*</td>
</tr>
<tr>
<td>9 (Control)</td>
<td>15,000</td>
<td>PSA Postcard</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total 65,000**

*RD Notice: Return Delinquency Notice Process, beginning with CP59*
WAVE I
REMINDERS

Simple

Complex

If you have not already done so, remember to file your 2017 tax return by April 17th, 2018.

- Did you know the average tax refund in 2016 was approximately $2,800?
- You could be eligible for valuable tax benefits, but you must file to receive them.
- For more information about filing, or getting an extension to file, go online to www.irs.gov/filing.

It’s not too late to file returns for prior tax years.
- You can file late tax returns at any time. You can generally claim refunds for up to 3 years after the date of the return, if you file within 3 years of the due date of the return.
- To request information on prior tax years, contact the IRS at 1-800-829-1040.
**Soft Letter & Traditional Notice**

### Soft Notice
- 1 page
- Wave 2
- Wave 3

This is a reminder to file your [xxxx] Form 1040 tax return.

**What you need to know**
- The due date for filing your return has passed and we don't have record of receiving your [xxxx] federal income tax return. If you're required to file this tax return, please do so immediately.
- There are many options for electronically filing your return. Please visit www.irs.gov for information on electronic filing.
- For information about mailing your return, consult your state filing instructions.
- If you need help or have questions, visit www.irs.gov or call 1-800-TAX-FORM.
- If you're already filed the return, please check the resolution.

**If you don’t file your return**
- If you're required to file a return, you may file the return to claim the refund. If you're required to file and you don't file, you may not receive what you're entitled to because the Internal Revenue Code sets deadlines for claiming tax refunds.
- If you make the payment, you file and pay the tax on time or later after the due date, you may file for a payment plan. If you're due to file, please see "Payment options" below.

**Payment options**
- For new taxpayers, you may file and pay the tax directly from your bank account. When you file electronically, you can:
  - Securely pay online and receive your payment confirmation immediately.
  - Avoid late fees and penalties.
  - Make or cancel a payment before the due date.

You can file and pay by credit or debit card for a small fee. To see all of our payment options, visit www.irs.gov or call 1-800-TAX-FORM.

[Late 2008 (1-2018) calling numberavel]

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### Traditional Notice
- 4 pages
- Wave 1 (TY 16)
- Wave 3 (TY 17)
Wave 2: TY 2017 Filing Overtime

- Cumulative TY 2017 filing by week
- April through December 2018
- Spikes correspond to the April filing deadline & October extension deadline
- Dashed lines represent Waves 1 & 2 mailings
Wave 2: TY 2016 Filing Overtime

- Cumulative TY 2016 filing by week
- April through December 2018
- Dark blue dashed lines represent Waves 1 & 2 mailings
- Dark red line represents additional RD Notice Process contact among some RD Notice starts
Dealing with Undeliverable Mail

Control: CDC / ATSDR PSA Postcard

- Intended to track undeliverable mail in the control condition
- Differences in how addresses were updated led to different undeliverable mail rates
  - Used statistical controls

Lessons learned:

- Ensure all addresses are updated with the same process
- Consider methods to track undeliverables at a single point in time
**Estimated Treatment Effects: Waves 1 & 2**

- Wave 1 outcomes: cumulative filing or filing for an extension through August 2018
- Wave 2 outcomes: cumulative filing through December 2018

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Wave 1 TY 2017</th>
<th>Wave 2 TY 2017</th>
<th>Wave 1 TY 2016</th>
<th>Wave 2 TY 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple letter</td>
<td>.046*</td>
<td>.034*</td>
<td>.007</td>
<td>.008</td>
</tr>
<tr>
<td>Simple postcard</td>
<td>.014*</td>
<td>.007</td>
<td>- .006</td>
<td>- .012</td>
</tr>
<tr>
<td>Complex letter</td>
<td>.030*</td>
<td>.020</td>
<td>.011*</td>
<td>.005</td>
</tr>
<tr>
<td>Complex postcard</td>
<td>.010</td>
<td>.006</td>
<td>.003</td>
<td>.003</td>
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<tr>
<td>Return Delinquency Notice</td>
<td>.009</td>
<td>.027*</td>
<td>.027*</td>
<td>.060*</td>
</tr>
<tr>
<td>Soft Notice Only</td>
<td>NA</td>
<td>.027*</td>
<td>NA</td>
<td>.009</td>
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<td>Additional from Soft Notice after Wave 1 Letter (either version)</td>
<td>NA</td>
<td>.005</td>
<td>NA</td>
<td>.003</td>
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<tr>
<td>Additional from Soft Notice after Wave 1 Postcard (either version)</td>
<td>NA</td>
<td>.007</td>
<td>NA</td>
<td>.006</td>
</tr>
</tbody>
</table>
**Estimated Treatment Effects: Projected to 100k Contacts**

- RD Notice Process securing the most returns overall
  - Primarily driven by TY 2016 returns
- A simple reminder letter is effective at encouraging a return to filing compliance

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Increase in TY 2017 Returns</th>
<th>Increase in TY 2016 Returns</th>
<th>Total Increase in Returns Filed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Letter</td>
<td>3,400</td>
<td>800</td>
<td>4,200</td>
</tr>
<tr>
<td>Simple Postcard</td>
<td>700</td>
<td>-1200</td>
<td>-500</td>
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<tr>
<td>Complex Letter</td>
<td>2,000</td>
<td>500</td>
<td>2,500</td>
</tr>
<tr>
<td>Complex Postcard</td>
<td>600</td>
<td>300</td>
<td>200</td>
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<tr>
<td>Return Delinquency Notice</td>
<td>2,700</td>
<td>6,000</td>
<td>8,700</td>
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<td>2,700</td>
<td>900</td>
<td>3,600</td>
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<tr>
<td>Additional from Soft Notice after Reminder Letter (either version)</td>
<td>500</td>
<td>300</td>
<td>800</td>
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<tr>
<td>Additional from Soft Notice after Reminder Postcard (either version)</td>
<td>700</td>
<td>600</td>
<td>1,300</td>
</tr>
</tbody>
</table>
CONCLUSIONS FROM WAVES 1 & 2

- Postcards are not effective
- Repeated “soft” contact was not effective
- Timing and focus matter
  - Simple reminder at the appropriate time has a lasting impact
  - Additional information about filing the prior year return may “crowd out” the effect on filing the current year
- May not get “two birds with one stone”
  - Tradeoffs between past and current compliance.
Direct comparison of TY 2017 RD Notice start and additional soft contact

Segmentation: Behavior among extension filers who filed to file by the October deadline

The effect of treatment on subsequent filing behavior (TY 2018)
Avoid “double-barreling” the taxpayer with issues to resolve

Timing, format, and message matter
- Capitalize on natural points of salience in the tax season
- Among prior nonfilers, letters outperform postcards
- Use straightforward, simple messaging where possible
THANK YOU

CONTACT: ANNE.D.HERLACHE@IRS.GOV

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Selected References


- Evidence that outreach can prompt voluntary compliance even among taxpayers with a tax liability
- Evidence of recidivism – repeated reminders showing positive impacts on subsequent year filing


- Current study built upon this design – preemptive outreach was effective at promoting future compliance
- Some evidence that letters may be more effective than postcards
<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Wave I Treatment</th>
<th>Filed TY17 After Treatment</th>
<th>Filed TY16 After Treatment</th>
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</thead>
<tbody>
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<td>1</td>
<td>RD Notice</td>
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<td>Simple Letter</td>
<td>24% 55% 45%</td>
<td>14% 43% 57%</td>
</tr>
<tr>
<td>3</td>
<td>Complex Letter</td>
<td>28% 55% 45%</td>
<td>16% 46% 54%</td>
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<td>13% 40% 60%</td>
</tr>
<tr>
<td>5</td>
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<td>23% 50% 50%</td>
<td>14% 48% 52%</td>
</tr>
<tr>
<td>6</td>
<td>Simple Letter</td>
<td>24% 54% 46%</td>
<td>14% 44% 56%</td>
</tr>
<tr>
<td>7</td>
<td>Simple Postcard</td>
<td>22% 54% 46%</td>
<td>13% 48% 52%</td>
</tr>
<tr>
<td>8</td>
<td>Simple Letter</td>
<td>21% 54% 46%</td>
<td>14% 46% 54%</td>
</tr>
<tr>
<td>9</td>
<td>Simple Letter</td>
<td>25% 48% 52%</td>
<td>14% 47% 53%</td>
</tr>
<tr>
<td>10</td>
<td>Complex Letter</td>
<td>24% 57% 43%</td>
<td>15% 49% 51%</td>
</tr>
<tr>
<td>11</td>
<td>Simple Postcard</td>
<td>21% 56% 44%</td>
<td>13% 45% 55%</td>
</tr>
<tr>
<td>12</td>
<td>Complex Postcard</td>
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<td>24% 49% 51%</td>
<td>14% 49% 51%</td>
</tr>
<tr>
<td>21</td>
<td>Control Postcard</td>
<td>23% 53% 47%</td>
<td>14% 46% 54%</td>
</tr>
</tbody>
</table>
# Filing Behavior After Wave 1 (TY 2016) RD Notice

<table>
<thead>
<tr>
<th></th>
<th>TY 2017 Filer</th>
<th>TY 2017 Nonfiler</th>
<th>Filed TY 2017 Prior to Wave 1 Treatment</th>
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<tbody>
<tr>
<td>TY 2016 Filer</td>
<td>637</td>
<td>249</td>
<td>80</td>
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<tr>
<td>TY 2016 Nonfiler</td>
<td>330</td>
<td>3144</td>
<td>158</td>
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<tr>
<td>Filed TY 2016</td>
<td>234</td>
<td>100</td>
<td>68</td>
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<td>Prior to Wave 1</td>
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</table>
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#LiveAtUrban
ASSESSING THE IMPACT OF EXCHANGE OF INFORMATION

Pierce O’Reilly & Michael A. Stemmer
Centre for Tax Policy and Administration, OECD
Kevin Parra-Ramirez
Banque de France

Presentation to IRS-TPC Research Conference
Washington D.C., 20 July 2019
Overview

1. Introduction
2. Exchange of Information Expansion
3. Data
4. Results
5. Conclusion and Future Work
In 2009, the G20 declared that ‘the era of bank secrecy is over’ (G20 Leaders Statement).

To increase global tax transparency, the OECD implemented exchange of information mechanisms:

– Exchange of Information on Request (EOIR), with information exchanged since 2009
– Automatic Exchange of Information (AEOIR), with information exchanged since 2017

This ongoing exchange of information requires an assessment of its effectiveness to ensure continued momentum behind global efforts in increasing tax transparency.

Estimated costs in complying with the exchange of information standards by market actors and authorities demand a well-functioning mechanism (Finér & Tokola, 2017; HMRC, n.d.)
Existing research on EOI and key contributions

Existing research

– Bank liabilities (Johannesen & Zucman, 2014; Menkhoff & Miethe, 2017; Casi et al., 2018; Beer et al., forthcoming)

– Portfolio investment (Zucman, 2013; Pellegrini et al., 2017; Hanlon et al. 2015; Heckemeyer & Hemmerich, 2018)

– FDI (Blonigen et al., 2013)

Key contributions of this paper

1. More years, more EOI – fewer places for money to hide
2. Expanded country coverage, inclusion of broader set of EOI agreements
3. Disaggregation of results into corporates and households (in progress)
Overview

1. Introduction

2. Exchange of Information Expansion

3. Data

4. Results

5. Conclusion and Future Work
What is EOI and why is it useful?

What is EOI?

• To increase global tax transparency, the OECD implemented two important exchange of information mechanisms:
  – Exchange of Information on Request (EOIR) since 2009; information exchanged if “foreseeably relevant”
  – Automatic Exchange of Information (AEOI), with commitments by Global Forum member countries in 2014 to engage in automatic exchange of information under the Common Reporting Standards (CRS); first exchanges started in 2017

• Information covered consists of different kinds of investment income (such as interest and dividends), sales proceeds of assets or information on account balances

Why is it useful?

• To date, more than 4500 information agreements are in force with 90 jurisdictions implementing the CRS
• 47 million offshore accounts with a total value of EUR 4.9 trillion have been exchanged for the first time
• These initiative have resulted in over EUR 95 billion in additional revenue (tax, interest, penalties)
• This makes the EOI initiatives the most comprehensive network to fight global tax evasion
The network of EOI agreements has steadily expanded since 2012.

A broad EOI network means fewer places to hide assets.

A key means of EOI expansion has been MAC signature.

MAC-based EOI is a large share of all EOI relationships, especially for IFCs.

As far as we are aware, no existing study has included EOI based on MAC into analysis of bank deposits.
Overview

1. Introduction
2. Exchange of Information Expansion
3. Data
4. Results
5. Conclusion and Future Work
Why use international investment statistics to investigate offshore financial activity?

- An expected taxpayer response to EOI could be to move or disclose previously undisclosed assets held in international financial centres (IFCs).
- Therefore, changes in cross-border financial data in IFCs could be used to assess offshore activity and potentially examine the impact of EOI.
- Previous studies have looked at different components of countries’ assets and liabilities:
  - (Johannesen & Zucman, 2014) EOIR reduces bank deposits, but bank deposits in IFCs overall had not declined.
    - Suggests that commencement of EOIR leads tax evaders to shift deposits to non-signatory jurisdictions, limiting the impact of EOIR.
    - However, standards are now more widely adopted – fewer places for money to hide.
Data on bank deposits

- Key dependent variable - cross-border bank deposits (from the Bank for International Settlements) held in an International Financial Centre by a non-bank counterparty (bank to bank deposits excluded).
  - Non-banks include households and corporates

- Why bank deposits?
  - Bank deposits one of the key variables covered by AEOI, also one of the most liquid
  - Data quality

- 29 countries disclose bilateral counterparty country data in a file the BIS makes available to the public (i.e. non-bank cross-border deposits):
  - Australia, Austria, Belgium, Brazil, Canada, Chile, Chinese Taipei, Denmark, Finland, France, Germany, Greece, Guernsey, Hong Kong SAR, Ireland, the Isle of Man, Japan, Jersey, Korea, Luxembourg, Macao SAR, Mexico, the Netherlands, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States

- 8 jurisdictions have provided bilateral data to the OECD on a confidential basis
  - Bahrain, Bermuda, China, Curacao, India, Malaysia, Panama and Turkey
Deposits in IFCs peaked at USD 1.6 trillion in Q1 of 2008.

Since then fallen substantially, by 551 billion or 34%.

Mainly in the immediate aftermath of the financial crisis – 22% over the period from Q2 2008 to the Q1 of 2009.

The decrease has continued in recent years (by a further 12% from the 2008 peak).

Reduction of deposits in IFCs being predominantly driven by household deposits (i.e. not by corporates) (results not shown)
Regression specification

- Approach is similar to that used by Johannesen & Zucman (2014) to regress EOI signature on cross-border bank deposits. The key hypothesis:

  An EOI agreement between a given IFC and a given non-IFC should be associated with reduction in bank liabilities held in that IFC by residents of the non-IFC.

- This hypothesis could be tested using the following regression equation

  \[ \log(\text{Deposits}_{ijq}) = \alpha + \beta EOI_{ijq} + \epsilon_{ijq} \]

- The main regression includes country-pair and quarter fixed effects, accounting for linear correlation at the country-pair level:

  \[ \log(\text{Deposits}_{ijq}) = \alpha + \beta EOI_{ijq} + \gamma_{ij} + \theta_{q} + \epsilon_{ijq} \]

- EOI$_{ijq}$: EOI agreement between countries $i$ and $j$, focusing on the signature of EOIR, announcement and implementation of AEOI, participation in MAC
Preliminary regression results – country-pair and quarter Fixed Effects (FEs)

Coefficients on EOI variables for regression of bank deposits in IFCs with respect to non-IFCs, across model types

- Quarter and country-pair FEs control for varying time trends such as financial crises and invariant country-pair factors (e.g. language)
- AEOI implementation decreases IFC bank deposits (20% - 25%)
- EOIR signature shows negative impact on IFC deposits (11% - 12%)
- Low statistical significance of AEOI announcement variable:
  - Multicollinearity issues possible
Exploring multicollinearity

Coefficients on quarter fixed effects for regression of bank liabilities in IFCs with respect to non-IFCs

- AEOI announcements bunched closely together in time
- Makes AEOI announcements collinear with time fixed effects
- Fixed effects on IFC bank deposits fall at the same time as key events in the expansion of AEOI
- Examine alternative specifications to account for this
Overview

1. Introduction
2. Exchange of Information OI Expansion
3. Data
4. Results
5. Conclusion and Future Work
Conclusion:

• Foreign-owned bank deposits in IFCs strongly decreased (-34%) after the 2008 Q1 peak
• Our analysis provides significant evidence of a positive impact of EOI, particularly AEOI, on this decline (20% - 25%)
• The reduction of deposits in IFCs has predominantly been driven by household deposits (i.e. not by corporates) (results not shown)

Future work:

• Continued examination of multicollinearity, household/corporate breakdown, country differences, bank data by ultimate investor, et al.
• Impact of EOI on other assets classes: FDI and portfolio data may be used as well
  – particularly in light of global FDI increase post-financial crisis (Lane & Milesi-Ferretti, 2018)
Thank you!

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References

9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
# Session 1. Estimating the Effects of Tax Administration on Compliance

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<tr>
<td>Robert McClelland</td>
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<td>Urban-Brookings Tax Policy Center</td>
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<td>Estimating the Specific Indirect Effect for Multiple Types of Correspondence Audits</td>
<td>Lucia Lykke</td>
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<td>Anne Herlache</td>
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<td>Assessing the Impact of Exchange of Information</td>
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<td>Discussant:</td>
<td>Michael Udell</td>
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<td>Michael Udell</td>
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<td>District Economics Group</td>
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9th Annual IRS/TPC Joint Research Conference on Tax Administration

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Next session begins at 11:00
9th Annual IRS/TPC Joint Research Conference on Tax Administration

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# Session 2. The Influence of External Factors on Compliance

**Moderator:**

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<th>Title</th>
<th>Speaker</th>
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<td>Recent Changes in the Paid Return Preparer Industry and EITC Compliance</td>
<td>Emily Y. Lin</td>
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<td>Taxpayer Responses to Third-party Income Reporting: Evidence from Spatial Variation across the U.S.</td>
<td>Bibek Adhikari</td>
<td>Illinois State University</td>
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<td>Effect of Recent Reductions in the Internal Revenue Service’s Appropriations on Revenues</td>
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**Discussant:**

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<tr>
<td>Alan Plumley</td>
<td>IRS:RAAS</td>
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9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Recent Changes in the Paid Return Preparer Industry and EITC Compliance

Emily Y. Lin

IRS-TPC Joint Research Conference on Tax Administration
June 20, 2019

Please do not cite. The findings and views in this paper are preliminary and do not necessarily reflect the positions of the Department of the Treasury.
Decades of research have shown a high level of noncompliance with Earned Income Tax Credit (EITC) eligibility rules.

- 25% improper payment rate for FY2018, estimated to be $18.4 billion.
- Misreporting of all individual income tax credits, EITC included, accounted for 9% of the gross tax gap in tax years 2008-2010 ($458 billion).
  - Underreporting of business income accounted for 27% of the gross tax gap.

Over 50 percent of EITC returns used a paid preparer in tax year 2016. Roles of preparers—

- Preparers assist taxpayers in understanding and complying with tax law;
- Incompetent or unethical preparers can add to tax noncompliance.

A series of changes in legislation, regulation, and tax administration that affected the profession took place between 2009 and 2012.

- Goal-- Strengthen preparer compliance and competence and thereby reduce tax return errors, often with a focus on addressing EITC improper payments.

Have these efforts achieved their stated goal of enhancing EITC compliance?
EITC amounts vary with income, filing status, and the number of Qualifying Children claimed. The maximum credit is $6,431 for low-income families with 3 or more children in tax year 2018.
Extended List of Eligibility Requirements

Eligibility depends on a number of criteria IRS cannot readily observe under self-certification of tax reporting, such as living arrangements, marital status and self-employment income. Among the eligibility rules,

- **Income tests**
  - Taxpayers must have earned income. The credit initially phases in with earned income, reaches the maximum, and then phases out as income increases
  - Earned income includes wage income and self-employment income
  - Adjusted Gross Income (AGI) must be below specific amounts
  - Investment income must be $3,500 or less (TY 2018)

- **Qualifying Child tests:**
  - Age: under age 19, under age 24 if student, or disabled
  - Relationship: son/daughter, stepchild, foster child, sibling, or a descendent of these
  - Residency: must live with taxpayer in the United States for more than half of the year

- **Filing status**
  - Married individuals must file jointly. Married couples filing separately are not eligible

Treasury (2018) has identified inability to authenticate eligibility by the IRS before tax refunds are paid as the main root cause for EITC improper payments.
Common Types of EITC Errors

- IRS (2014): Common types of EITC errors for tax years 2006-2008:

<table>
<thead>
<tr>
<th>Error Type</th>
<th>Percentage of Total EITC Over-Claim Dollars*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualifying Child Error (mostly failure of the residency test)</td>
<td>54%</td>
</tr>
<tr>
<td>All Income Misreporting</td>
<td>32%</td>
</tr>
<tr>
<td>Self-Employment Income</td>
<td>23%</td>
</tr>
<tr>
<td>Wage Income</td>
<td>6%</td>
</tr>
<tr>
<td>AGI or Investment Income</td>
<td>8%</td>
</tr>
<tr>
<td>Filing Status Error</td>
<td>17%</td>
</tr>
<tr>
<td>Other Errors</td>
<td>10%</td>
</tr>
</tbody>
</table>

*Percentages add to more than 100% due to multiple errors on a return.

- Leibel (2014): 75% of all children claimed in error failed to meet the residency test.
Paid Preparers and EITC Noncompliance

  • No difference in the over-claim dollar percentage between self-prepared and paid-preparer EITC returns, 28%-39%.
  • A wide range of over-claim dollar percentages across EITC returns prepared by different types of paid preparers. Two most common types of paid preparers used were—
    • National tax return preparation firms: 21% of EITC returns. 20%-30% error dollar rate.
    • Un-enrolled return preparers: 26% of EITC returns. 33%-40% error dollar rate.

• Studies on the role of paid preparers in affecting EITC compliance—
  • Book (2007) outlines scenarios in which EITC errors may be made on returns prepared un-credential preparers.
  • Jones (2017) finds evidence that EITC compliance is compromised when a preparer has a strong incentive to sell refund anticipation products to taxpayers.
Paid Preparer Industry Changes 2009-2012 (I)

- Congress enacted **electronic-filing mandate** of individual income tax returns prepared by paid preparers in 2009.
  - Paid preparers, except for those expecting to file 10 or fewer returns, were required to e-file.
  - IRS phased in the implementation in calendar years 2011 and 2012.

- IRS released *Return Preparer Review* in 2009; recommended an increased oversight of paid preparers and identified implementation plans to achieve the goal.
  - Beginning in January 2011, all paid preparers were required to register with the IRS and receive a **preparer tax identification number (PTIN)** to furnish on tax returns.

- Langetieg et al. (2013) find association between the above changes (e-filing, preparers holding a PTIN) and fewer errors on paid-preparer returns.

- Regulation in 2011 **required standards for all paid preparers**, including those without license or credential.
  - Minimum education and competency requirements (later ruled to be exceeding the IRS’s authority).
In 2011, Congress raised the EITC preparer due diligence penalty from $100 (unindexed) to $500 (indexed).

- Penalty assessed on paid preparers for each tax return with which the preparer fails to exercise due diligence in determining taxpayer eligibility for, and the amount of, the EITC.

- Under the authority, preparers are required by regulation to complete Form 8867, Paid Preparer’s Earned Income Credit Checklist (redesigned and renamed in 2016). Changes to Form 8867 and its administration.
  - Beginning in TY 2011, preparers were required to submit the form to the IRS for EITC claims.
  - IRS began to summarily impose the penalty for missing Form 8867 in TY 2012.
  - Major revisions for TY 2012 to address the less compliant EITC rules.

- IRS began a multi-year EITC Return Preparer Study in FY 2012.
  - IRS tested different outreach and enforcement strategies on paid preparers of EITC returns and adopted those identified as effective in its routine operation.
  - Efforts (calls, letters, audits) targeted to paid preparers who failed to meet the EITC due diligence requirements or who filed a large number of EITC returns with potential errors.
Methodology

- Data: 1% EITC sample from the population file of individual income tax returns, TYs 2004-2016.

- Four potential EITC error indicators:
  - **Claiming the head-of-household status**
    - A common EITC error-- misreporting of filing status by married individuals as head-of-household.
  - **Claiming a qualifying child to whom the taxpayer is not the parent**
    - Leibel et al. (2017) shows that children claimed with qualifying child errors are much less likely to be the son or daughter of the taxpayer than children meeting the eligibility tests.
  - **Breaking the IRS Dependent Database Scoring System (DDB) rules**
    - DDB applies a large number of eligibility-related rules to returns claiming child related tax benefits, and is one of the scoring system used for audit selection.
  - **Reporting earned income at the first EITC kink if self-employed**
    - Chetty et al. (2012) shows bunching at the first kink of the EITC schedule, an income point that maximize tax refunds, is related to income misreporting for the self-employed.

- Methodology: difference-in-difference
  - Paid-preparer v. self-prepared, before and after the 2009-2012 industry reform.
Trends in Error Predictors by Preparation Method (I)

Figure 1: Claiming Head of Household

Figure 2: Non-Parent Claim for EITC with QC
Trends in Error Predictors by Preparation Method (II)

Figure 3 DDB Rule Violation

Figure 4 Income at First EITC Kink, if Self-Employed
Trends in Relative Potential Error Rates

Figure 5 Relative Potential Error Rates: Paid-Preparer EITC Returns vs. Self-Prepared EITC Returns

Rate (%)

Income at First EITC Kink


DDB Rule Violation

Head-of-Household; DD= -11.6 ppt

Non-Parent Claim for EITC w QC; DD= -2.4 ppt

DDB Rule Violation; DD= -2.2 ppt

Income at First EITC Kink; DD= -5.0 ppt

Tax Year
Estimation Results and Error Reductions

- Difference-in-difference estimation; controls for age, gender, return complexity (schedules attached), state effects, and two indicators of individual compliance
  - Pre-reform DIF score top 5 percent or top 5-20 percent in the low-income sample.
  - Whether the taxpayer has a child age 18 or younger in the year.

- \[ Y_i = \alpha + \beta (Paid_i \times Post_i) + \gamma Paid_i + \delta Post_i + X_i \theta + \epsilon_i. \]

<table>
<thead>
<tr>
<th>Potential Error Indicator</th>
<th>OLS Coefficient</th>
<th>Implied Reduction in Error Rate (ppt) under Plausible Assumptions</th>
<th>Percent of EITC Returns with This Error, TYs 2006-2008 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head-of-Household Filing Status</td>
<td>-0.0739</td>
<td>-0.34</td>
<td>4.2 (Filing Status Errors)</td>
</tr>
<tr>
<td>Non-Parent Claim for EITC with QC</td>
<td>-0.0340</td>
<td>-0.95</td>
<td>12.7 (QC Errors)</td>
</tr>
<tr>
<td>DDB Rule Violation</td>
<td>-0.0153</td>
<td>-0.67</td>
<td>12.7 (QC Errors)</td>
</tr>
<tr>
<td>Income at the First EITC Kink, if Self-Employed</td>
<td>-0.0521</td>
<td>-0.68</td>
<td>13.1 (SE Income Misreporting)</td>
</tr>
</tbody>
</table>
Conclusion and Future Research

• Modest, positive effects of the preparer industry changes in 2009-2012 on EITC compliance.

• Use IRS’s random audit studies to examine the effects on actual, rather than predicted, errors.

• Study the exact channels through which the effects occurred.
  • Types of preparers: small- v. large-volume preparers, unenrolled preparers vs. other types.
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Taxpayer Responses to Third-party Income Reporting: Evidence from Spatial Variation across the U.S.

by

Bibek Adhikari (Illinois State University)
James Alm (Tulane University)
Timothy F. Harris (Illinois State University)

The views and opinions presented in this paper reflect those of the authors. They do not necessarily reflect the views or official position of the Internal Revenue Service.
Businesses Prefer Cash
Businesses Prefer Cash
• Tax compliance gap
  • Wages and salary = 99%
  • Business income = 37%
  • Similar results for other advanced countries (Kleven, 2016)

• What could be the cause of this tax compliance gap?
  • Third-party income reporting and withholding
  • Examples are W-2, 1099-INT, 1099-MISC, and 1099-K
Difficult to Subject Business Income to Third-party Income Reporting

- Form 1099-K to the rescue?
  - Passed in 2008, effective from 2011
  - Payment companies such as American Express
  - Required to report to the IRS
  - Receipts that businesses receive through their payment system

- What is covered by 1099-K?
  - Business income are third-party reported
    - Except for cash receipts
  - But, expenses are still not third-party reported
Does Form 1099-K Increase Tax Compliance?

- Research questions
  - Does 1099-K increase reported receipts?
  - How about reported expenses?
  - For what industries is the policy most effective?
  - Any difference between Schedule C vs S-Corp?

- Current Study focuses on
  - Small businesses
  - Business-to-Consumer industries
Average Receipts and Deductions around 1099-K Implementation
How to Evaluate the Effectiveness of Form 1099-K?

• Identification is challenging due to lack of a control group
  • Form 1099-K was not randomized
  • Firms receiving 1099-K are different from firms not receiving 1099-K
How to Evaluate the Effectiveness of Form 1099-K?

• Use spatial variation in the use of payment card
  • First, focus on firms receiving 1099-K
  • If a firm is located in high payment card use area
  • Then higher share of its revenue reported via 1099-K
  • Thus, more affected by 1099-K
Index of Payment Card Use by Zipcode

\[ \text{Index}_{ij} = \frac{\sum_i \text{Payment Card Receipts}_{ij}}{\sum_i \text{Total Receipts}_{ij}} \]
<table>
<thead>
<tr>
<th>Quartile</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>S.D.</th>
<th>Number of Zip codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Sample</td>
<td>0.32</td>
<td>0.32</td>
<td>0.09</td>
<td>0.51</td>
<td>0.07</td>
<td>867</td>
</tr>
<tr>
<td>1st Quartile</td>
<td>0.22</td>
<td>0.23</td>
<td>0.09</td>
<td>0.26</td>
<td>0.03</td>
<td>217</td>
</tr>
<tr>
<td>2nd Quartile</td>
<td>0.30</td>
<td>0.30</td>
<td>0.27</td>
<td>0.32</td>
<td>0.02</td>
<td>217</td>
</tr>
<tr>
<td>3rd Quartile</td>
<td>0.35</td>
<td>0.35</td>
<td>0.32</td>
<td>0.38</td>
<td>0.02</td>
<td>217</td>
</tr>
<tr>
<td>4th Quartile</td>
<td>0.42</td>
<td>0.41</td>
<td>0.38</td>
<td>0.51</td>
<td>0.03</td>
<td>216</td>
</tr>
</tbody>
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Empirical Specification: Continuous Difference-in-Differences

\[
\text{Log} (\text{Receipts}_{i,j,t}) = \delta_1 \text{Post}_t \times \text{Log} (\text{Index}_j) + \alpha_i + \gamma_t + \varepsilon_{i,j,t}
\]

Where,
\[\delta_1 = \text{Index elasticity of receipts}\]
\[\alpha_i = \text{Firm fixed effects}\]
\[\gamma_t = \text{Year fixed effects}\]
\[\varepsilon_{i,j,t} = \text{Error term}\]

Subscripts:
\[i = \text{Firm}\]
\[j = \text{Zip code}\]
\[t = \text{Year}\]
Index Elasticity of Receipts and Deductions by Business Type

<table>
<thead>
<tr>
<th></th>
<th>Log Receipts</th>
<th>Log Deductions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Schedule C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Index X Post 1099-K</td>
<td>0.079***</td>
<td>0.044***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>4,422,903</td>
<td>4,432,495</td>
</tr>
<tr>
<td><strong>S-Corporation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Index X Post 1099-K</td>
<td>0.085***</td>
<td>0.052***</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>1,815,510</td>
<td>1,815,508</td>
</tr>
<tr>
<td>Industry</td>
<td>Log Receipts</td>
<td>Log Deductions</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>0.063***</td>
<td>0.018*</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.011)</td>
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<tr>
<td>Transportation / Warehouse</td>
<td>0.073*</td>
<td>0.18***</td>
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<tr>
<td></td>
<td>(0.041)</td>
<td>(0.044)</td>
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<tr>
<td>Professional Services</td>
<td>0.049**</td>
<td>0.009</td>
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<tr>
<td></td>
<td>(0.023)</td>
<td>(0.021)</td>
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<tr>
<td>Entertainment/ Arts</td>
<td>0.132***</td>
<td>0.059**</td>
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<tr>
<td></td>
<td>(0.031)</td>
<td>(0.026)</td>
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<tr>
<td>Accommodations/ Food Services</td>
<td>0.149***</td>
<td>0.101***</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Other Services</td>
<td>0.03**</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.012)</td>
</tr>
</tbody>
</table>
Conclusions

• Suggest an increase in tax compliance
  • More affected firms report more revenue
  • They also report more expenses, partially offsetting increases in receipts

• Suggests some heterogeneity by industry
  • Largest effect on receipts
    • Accommodation and Food Services (0.149)
  • Largest effect on deductions
    • Transportation and Warehousing (0.18)
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Effects of Recent Reductions in the Internal Revenue Service’s Appropriations on Revenues

June 2019

Janet Holtzblatt (Tax Policy Center) and Jamie McGuire (Joint Committee on Taxation)

This paper was prepared for the 9th Annual IRS-TPC Joint Research Conference on Tax Administration.

This paper embodies work undertaken for the staff of the Joint Committee on Taxation, but as members of both parties and both houses of Congress comprise the Joint Committee on Taxation, this paper should not be construed to represent the position of any member of the Committee. The statements made and the views expressed are solely those of the authors and do not reflect the views of the Urban Institute or its Board.
Focus of Study

- How did the IRS respond to recent reductions in funding for enforcement?
- What was the impact on returns on investment?
- What was the effect on revenues?
In 2019, the IRS received appropriations totaling $11.3 billion—24 percent less than in 2010.
The biggest cutbacks were in enforcement. Funding fell by nearly $2 billion from 2010 levels.

In some years, some of the funds appropriated for enforcement were shifted to other IRS accounts. Those transfers are not shown here.

**FIGURE 2**

Where Have the Cuts Been Deepest? Fiscal Years 2010 and 2019

<table>
<thead>
<tr>
<th>IRS Appropriation Accounts</th>
<th>2010</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxpayer Services</td>
<td>2.8</td>
<td>2.5</td>
</tr>
<tr>
<td>Enforcement</td>
<td>6.7</td>
<td>4.9</td>
</tr>
<tr>
<td>Operations Support</td>
<td>4.9</td>
<td>3.7</td>
</tr>
<tr>
<td>Business Systems Modernization</td>
<td>0.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*Source: Appropriation acts and Internal Revenue Service, *Budget in Brief*, various years.*
Budget Cutbacks Accompanied By More Responsibilities

- Administration of new tax credits for health insurance coverage and the enforcement of health coverage mandates (Affordable Care Act in 2010)*

- Processing of reports of financial assets held abroad by U.S. citizens (Foreign Account Tax Compliance Act in 2010)

- Acceleration of matching of W-2s to returns and delay of payment of certain refundable tax credits (Protecting Americans from Tax Hikes Act in 2015)*

- Major changes to the tax code and forms (the 2017 tax act)*

* Some start-up funding provided.
Since 2010, the number of IRS full-time-equivalent (FTE) employees fell from about 95,000 to 74,000.

Two-thirds of the reductions occurred in examinations and collections.

The IRS lost nearly 8,000 revenue officers and agents—the employees responsible for the most difficult audits.
The IRS’s Aging Computer Systems

- Master files rely on programming language that is over 50 years old.

- From former IRS Commissioner John Koskinen:
  - The IRS’s technology is “analogous to driving a Model T automobile that has satellite radio and the latest GPS system.”

- But electronic filing grew from 50 percent of returns in 2010 to 70 percent in 2018.
The audit rate fell from 0.9 percent in 2010 to 0.5 percent in 2018. The chance of being audited fell for both low-income taxpayers and for big businesses. Audit rates for the largest corporations—$20 billion or more of assets—dropped by half—from 98 percent to 49 percent.

Source: Internal Revenue Service, Data Book, various years.
Enforcement Revenues

- Includes taxes, interest, plus penalties from:
  - Automated underreporting program
  - Examinations
  - Collections

- Includes revenues collected in fiscal year but from actions that may have begun in earlier years.

- Amounts received may reflect economic conditions.
  - 2010: $66 billion (2019 dollars)
  - 2018: $60 billion (2019 dollars)
Average Return on Investment (ROI)

- In our study, the average return on investment is the amount collected by the IRS relative to the costs of the enforcement activities.
  - Includes taxes, interest, and penalties
  - Includes compensation paid to IRS employees directly involved in enforcement activities
  - Includes costs from beginning of an enforcement action—possibly from prior year—through the collections process
  - Collections may extend over multiple years.
- Limited to tax returns audited in either 2010 or 2017
  - In our study, enforcement revenue is equal to the amounts—which may be received in multiple years—attributable to the examinations that occurred in either 2010 or 2017.
What Is Not Included in Our Measures of ROI?

- Costs of support staff and management
- Costs of buildings, computers, etc.
- Costs incurred by other agencies (e.g., Tax Division at Department of Justice)
- Savings from deterrence
Data

- Enforcement Revenue Income System (ERIS)
  - IRS data set
  - Follows each tax return from start of enforcement activity through collections.
  - Contains number of hours worked by IRS staff and their grade (level) on the government’s salary scale
  - Includes enforcement-related payments from individual
- Pay scales from Office of Personnel Management
- Costs of nonwage compensation based on studies by Congressional Budget Office
3.2 million returns—both newly-initiated and carried over from prior years—were audited in 2010.

Number of returns in audit fell to 1.8 million in 2017.

Most audits were conducted through correspondence—and that ratio did not change much between 2010 and 2017.

But a smaller share of field audits in 2017 were started that year compared to 2010.

<table>
<thead>
<tr>
<th>Type of Examination (Percent)</th>
<th>2010</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td>23</td>
<td>21</td>
</tr>
<tr>
<td>Office</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Correspondence</td>
<td>65</td>
<td>68</td>
</tr>
<tr>
<td><strong>Total (thousands)</strong></td>
<td>3,206</td>
<td>1,827</td>
</tr>
</tbody>
</table>

**Source:** Authors’ calculations from Enforcement Revenue Information System.
### TABLE 2
Number of Tax Returns in Examinations (After Exclusions) Conducted in 2010 or 2017

<table>
<thead>
<tr>
<th>Tax Returns</th>
<th>2010</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3,205,573</td>
<td>1,827,295</td>
</tr>
<tr>
<td>Exclude returns with Earned Income Tax Credit</td>
<td>2,302,088</td>
<td>1,184,662</td>
</tr>
<tr>
<td>and exclude if reported hours = 0</td>
<td>1,921,456</td>
<td>1,079,638</td>
</tr>
<tr>
<td>and exclude if in top half percentile of enforcement revenue</td>
<td>1,911,856</td>
<td>1,074,246</td>
</tr>
<tr>
<td>and limit to case where enforcement completed by March 31, 2012 (2019)</td>
<td>1,332,663</td>
<td>917,531</td>
</tr>
</tbody>
</table>

**Source:** Authors’ calculations from Enforcement Revenue Information System.

**Notes:** EITC returns are excluded because savings from pre-refund audits (which are generally associated with the EITC) are not counted as enforcement revenue in ERIS. The cut-offs for the top half percentile of enforcement revenue are:

- **2010:** Field: $790,000; Office: $43,000; Correspondence: $30,000
- **2017:** Field: $1,200,000; Office: $62,000; Correspondence: $40,000
The more complicated the examination, the more time spent on it and related activities.

The average hours per tax return increased by 2 hours between 2010 and 2017.

But the average rose by 12 hours for field examinations.

### TABLE 3

<table>
<thead>
<tr>
<th>Type of Examination</th>
<th>2010</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td>45</td>
<td>57</td>
</tr>
<tr>
<td>Office</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Correspondence</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td>15</td>
<td>19</td>
</tr>
</tbody>
</table>

**Source:** Authors' calculations from Enforcement Revenue Information System.

**Notes:** Sample restricted to returns (1) without earned income tax credit, (2) with positive reported hours for IRS enforcement and collections staff, (3) with enforcement revenue in the zero to 99.5 percent range, and (4) with enforcement activities completed by March 31, 2012 (March 31, 2019).
### TABLE 4
Average Costs of Examinations (After Exclusions) Conducted in 2010 And 2017 And Related Activities

<table>
<thead>
<tr>
<th>Type of Examination</th>
<th>Per Return 2010</th>
<th>Per Return 2017</th>
<th>Per Hour 2010</th>
<th>Per Hour 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td>2,920</td>
<td>4,170</td>
<td>65</td>
<td>73</td>
</tr>
<tr>
<td>Office</td>
<td>447</td>
<td>556</td>
<td>46</td>
<td>52</td>
</tr>
<tr>
<td>Correspondence</td>
<td>80</td>
<td>98</td>
<td>40</td>
<td>43</td>
</tr>
<tr>
<td>Overall</td>
<td>932</td>
<td>1,285</td>
<td>62</td>
<td>69</td>
</tr>
</tbody>
</table>


**Notes:** Sample restricted to returns (1) without earned income tax credit, (2) with positive reported hours for IRS enforcement and collections staff, (3) with enforcement revenue in the zero to 99.5 percent range, and (4) with enforcement activities completed by March 31, 2012 (March 31, 2019).
### TABLE 5
Average Enforcement Revenue From Examinations (After Exclusions) Conducted in 2010 and 2017

<table>
<thead>
<tr>
<th>Type of Examination</th>
<th>Per Return (dollars)</th>
<th>Per Hour (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
<td>2017</td>
</tr>
<tr>
<td>Field</td>
<td>12,053</td>
<td>14,496</td>
</tr>
<tr>
<td>Office</td>
<td>2,562</td>
<td>3,139</td>
</tr>
<tr>
<td>Correspondence</td>
<td>1,075</td>
<td>1,693</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>4,376</strong></td>
<td><strong>5,427</strong></td>
</tr>
</tbody>
</table>

**Source:** Authors's calculations from Enforcement Revenue Information System.

**Notes:** Sample restricted to returns (1) without earned income tax credit, (2) with positive reported hours for IRS enforcement and collections staff, (3) enforcement revenue in the zero to 99.5 percent range, and (4) with enforcement activities completed by March 31, 2012 (March 31, 2019).

The average enforcement revenue per return was 11 times higher for field examinations than for correspondence audits conducted in 2010 and 9 times higher in 2017.

However, the average enforcement revenue per hour was larger for correspondence audits than for the other types of examinations in 2010, and that gap grew larger in 2017.
The ROI was greatest for correspondence examinations—the least costly type with the least revenue per return.

Only the ROI for correspondence audits rose from 2010 to 2017—reflecting the growth in average enforcement revenue.

The ROI fell for field audits because of the increase in hours worked.

### TABLE 6
Average Returns on Investment for Examinations (After Exclusions) Conducted in 2010 and 2017

<table>
<thead>
<tr>
<th>Type of Examination</th>
<th>2010</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td>4.1</td>
<td>3.5</td>
</tr>
<tr>
<td>Office</td>
<td>5.7</td>
<td>5.7</td>
</tr>
<tr>
<td>Correspondence</td>
<td>13.4</td>
<td>17.3</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td>4.7</td>
<td>4.2</td>
</tr>
</tbody>
</table>

**Source:** Authors’ calculations from Enforcement Revenue Information System.

**Notes:** Sample restricted to returns (1) without earned income tax credit, (2) with positive reported hours for IRS enforcement and collections staff, (3) enforcement revenue in the zero to 99.5 percent range, and (4) with enforcement activities completed by March 31, 2012 (March 31, 2019).
We estimated the average ROI for audits conducted in 2010, including all revenue collected through March 2019.

Overall, the ROI was 8:1—again highest for correspondence audits, but close to the average ROIs for field and office audits.

### TABLE 7
Average Returns on Investment for Examinations Conducted in 2010

<table>
<thead>
<tr>
<th>Type of Examination</th>
<th>Average ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td>7.5</td>
</tr>
<tr>
<td>Office</td>
<td>7.3</td>
</tr>
<tr>
<td>Correspondence</td>
<td>18.5</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>8.0</strong></td>
</tr>
</tbody>
</table>

*Source:* Authors' calculations from Enforcement Revenue Information System.
What if inflation-adjusted funding had remained at the 2010 levels throughout decade?

- And if there had been no changes in tax law, IRS enforcement, and taxpayer behavior:
  - Then audits in 2019 would yield $15 billion in enforcement revenue over time.

- The same conditions as above, except the funds—in excess of the 2019 appropriations—were used for field examinations:
  - Then audits in 2019 would yield $14 billion in enforcement revenue over time.

- The estimates assume (1) additional funding would not be used for EITC returns; (2) the audits would not result in unusually large collections; and (3) the marginal return on additional investment would be equal to the average return on investment.
Conclusions

- Cutbacks in funding between 2010 and 2017 did not change the composition of audits by types.
  - But fewer field audits—as share of all field audits—initiated in 2017 than in 2010.
- An increase in hours worked reduced the ROI for field examinations, whereas an increase in average enforcement revenues raised the ROI for correspondence audits.
- On average, the ROI on 2010 audits was 8:1—but this calculation omits EITC audits (with low costs and low yields) and taxpayers with unusually large payments (with high costs and high yields).
- Focusing only on ROIs, however, for audit selection could lead to fewer field audits, which typically involve taxpayers with business income and corporations.
Next Steps

▪ Incorporate more types of costs into ROIs

▪ Explore characteristics of outliers and frequency

▪ Estimate ROIs for pre-refund audits

▪ Estimate revenue effects of cut-backs over the entire decade
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Session 2: The Influence of External Factors on Compliance

Alan Plumley
IRS Research, Applied Analytics, and Statistics

IRS-TPC Research Conference
June 20, 2019
What is the impact of an intervention?

That is, how much of the change is attributable to the intervention?
What is the impact of an intervention?

It may appear that the impact is the difference we observe over time.

Observed Difference = $O_2 - O_1$
What is the impact of an intervention?

True Impact = $O_2 - C_2$

But the true impact is the difference between what we observe after the intervention ($O_2$) and what we would have observed in the absence of the intervention ($C_2$).
What is the impact of an intervention?

True Impact = $O_2 - C_2$

$= (O_2 - O_1) - (C_2 - O_1)$

That's the same as the observed difference $(O_2 - O_1)$ minus the status quo difference over the same interval $(C_2 - O_1)$.

It's often called a difference in differences.
What is the impact of an intervention?

**True Impact** = \( O_2 - C_2 \)

= \((O_2 - O_1) - (C_2 - O_1)\)

**Simple in concept. What’s the challenge?**

We generally don’t observe what *would have* happened in the absence of the intervention \((C_2)\), so we have to *estimate* it.
What is the impact of an intervention?

True Impact = \( O_2 - C_2 \)
\[
= (O_2 - O_1) - (C_2 - O_1)
\]

Ideal would be to set up a randomized control trial in advance of the intervention.

Most analyses, though, try to create a control after the fact.
What is the impact of an intervention?

True Impact = $O_2 - C_2$

$= (O_2 - O_1) - (C_2 - O_1)$

Key characteristics of a control group:

1. Identical to the test group (except for the intervention)
2. Not affected by the intervention
<table>
<thead>
<tr>
<th>Author</th>
<th>Outcome of interest</th>
<th>Intervention</th>
<th>Control for what would have happened</th>
</tr>
</thead>
</table>
| Lin     | Indirect indicators of potential EITC noncompliance on paid-prepared returns         | Legislative, regulatory and tax administrative changes affecting the paid return preparer industry | Corresponding indicators on self-prepared returns  
(controlling for DIF score, presence of children, and non-claimants)                                |
| Adhikari| Reporting of business receipts & expenses by sole props & S-corps                    | 3rd-party reporting of payment amount to vendor and IRS on Form 1099-K           | Index of payment card use in ZIP codes in highest quartile vs. those in lowest quartile                 |
| Holtzblatt | Enforcement revenue in 2019                                                           | Cuts in the IRS budget between 2010 and 2019                                   | Assumes 2010 ROI would be unchanged                                                                  |
Emily Lin: “Recent Changes in the Paid Return Preparer Industry and EITC Compliance”
Concerns About the Control

- Two identical bare rooms, each filled with the same mix of moths and cockroaches.
- A light is turned on in one room; completely dark in the other.
- After an hour, the lit room has more moths and fewer cockroaches, while the dark room has fewer moths and more cockroaches.
Concerns About the Control

- Doesn’t eliminate the possibility that preparer reforms (intervention) \textit{caused} people to change preparation mode (room) rather than change compliance (cockroaches becoming moths).

- Could check frequency of changing preparation mode.
To what extent are the “compliance indicators” (dependent variables) actually indicative of noncompliance?

Percentiles of DIF score distributions make sense only within an Exam activity code (which has a unique DIF formula).

The OLS specification is suspect, given that the dependent variables and all but one of the independent variables are binary.
Emily Lin: “Recent Changes in the Paid Return Preparer Industry and EITC Compliance”

Binary dependent and independent variables:

All the observations occur at 4 points.
Emily Lin: “Recent Changes in the Paid Return Preparer Industry and EITC Compliance”

Ordinary Least Squares fit of a straight line through binary dependent and independent variables.
Emily Lin: “Recent Changes in the Paid Return Preparer Industry and EITC Compliance”

Ordinary Least Squares fit of a straight line through binary dependent and independent variables.

Residuals can’t be normally distributed.
Emily Lin: “Recent Changes in the Paid Return Preparer Industry and EITC Compliance”

Probit fit of a cumulative normal curve through binary dependent and independent variables
Emily Lin: “Recent Changes in the Paid Return Preparer Industry and EITC Compliance”

Yes

No

Compliance Indicator

Predictor

Probit fit of a cumulative normal curve through binary dependent and continuous independent variable
Adhikari: “Taxpayer Responses to Third-party Income Reporting”
Concerns About the Control

- The index of credit card use is based on the new Form 1099-K (the intervention). The authors **assume** that:
  - Credit card use is fixed over time within a 3-digit ZIP code.
  - The 1099-K didn’t affect credit card usage. What if (after intro of 1099-K) vendors gave consumers incentives to use cash or checks?
- Control for businesses that operate in multiple ZIP codes?
  - Those with $10M of receipts or expenses may not be local.
- Control is affected by the intervention, only “less” than the “test” group.
Notes / Questions

- Wouldn’t it be better to create the index from the population, rather than a sample?

- 3-digit ZIP code areas are smaller in the east and in urban areas, so the local assumption may be less true there. Control for population in ZIP code?

- Increase in reported expenses: businesses underclaim expenses if they underreport receipts (to avoid looking like an outlier)

- Tax gap compliance rates are percentages of dollars, not people
Holtzblatt: “Effect of Recent Reductions in the IRS’s Appropriations on Revenues”
The impact of a budget reduction is the revenue we observe after the budget cut minus the revenue we would have observed without the budget cut.
Concerns About the Control

ROI = Average Revenue/Cost
= \frac{R_1}{B_1}
(the slope of the dashed line)
Concerns About the Control

Assuming constant Revenue/Cost ratio appropriate only if enforcement cases are selected randomly.

Holtzblatt: “Effect of Recent Reductions in the IRS’s Appropriations on Revenues”
Concerns About the Control

Since enforcement cases are selected according to expected risk of noncompliance, the average Revenue/Cost changes as a function of Budget level.

Holtzblatt: “Effect of Recent Reductions in the IRS’s Appropriations on Revenues”
The graph illustrates the relationship between cumulative budget outlay and cumulative revenue. Since enforcement cases are selected according to expected risk of noncompliance, the average Revenue/Cost changes as a function of budget level. A reduction in budget should increase average ROI.
Concerns About the Control

The marginal change \((R_2 - R_1)\) is less than what would be expected if the average Revenue/Cost didn’t change \((R_2 - R_1)\).
This seems to be true for Correspondence audits, but not Field audits. (Not enough time for the 2017 cohort’s results?)
The authors estimate the forgone revenue as $= \text{ROI}_1 \times (B_2 - B_1)$

But that’s $(R_2 - R_1)$ rather than

$(R_2 - R_1) = \text{ROI}_2 \times B_2 - \text{ROI}_1 \times B_1$
Concerns About the Control

- IRS enforcement is a fruit salad: apples, oranges, bananas, etc. You can’t assume that the mix of fruit stays the same (even with a fixed budget).

- The mix has a huge impact on outcomes.

- Better to study each category separately.

- But even if you did that, the ROI should increase from a budget cut, so the marginal loss in revenue would be less than if ROI remained constant.
Restricting 2010 sample to those completed by March 2012 likely doesn’t exclude corporation carry-forwards/backs since 3/2012.

I would exclude interest & penalties (we shouldn’t rely on them to increase ROI)

How to isolate Collection costs related solely to Examinations?

AUR = Automated (not automatic) Underreporter program

ERIS = Enforcement Revenue Information (not income) System
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Session 2. The Influence of External Factors on Compliance

| Recent Changes in the Paid Return Preparer Industry and EITC Compliance | George Contos  
IRS, Communications & Liaison |
|---------------------------------------------------------------|---------------------------------------------------------------|
| Taxpayer Responses to Third-party Income Reporting: Evidence from Spatial Variation across the U.S. | Emily Y. Lin  
Treasury Office of Tax Analysis |
| Effect of Recent Reductions in the Internal Revenue Service’s Appropriations on Revenues | Bibek Adhikari  
Illinois State University |

Discussant:

| Alan Plumley  
IRS:RAAS |
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
9th Annual IRS/TPC Joint Research Conference on Tax Administration

Keynote address begins at 1:00
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Session 3. Improving the Digital Taxpayer Experience

| Moderator: | Alcora Walden  
IRS, Office of Online Services |
|---|---|
| Online Account User Testing | Heather Gay  
Mediabarn Inc. |
| Accessible Authentication for All: An Evaluation Framework for Assessing Usability and Accessibility of Authentication Methods | Ronna ten Brink  
MITRE Corporation |
| Customer Experience Research Leads to Better Design and Increased Adoption | Nikki Kerber  
Booz Allen Hamilton |
| Discussant: | Courtney Rasey  
IRS, Wage & Investment Division |
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Online Account User Testing
Improving the User Experience through iterative design and research
Agenda

- What Is Online Account?
- Overview of User Testing
  Methodology
  What We’ve Tested So Far
  Simple, Impactful Improvements
  What We’ve Learned – Key Themes
- The Future of Online Account
What Is Online Account?
Vision and Purpose

“For taxpayers who have to interact with the IRS (e.g., balance due, notice, refund), Account is a one-stop shop for personalized tax assistance that enables taxpayers to serve themselves.”

Business priorities established in 2014 and reaffirmed in 2018:

- Make Online Account easy to use so that it is spontaneously used by taxpayers and they can help themselves.
- Reduce the number of phone calls to the IRS and save taxpayers money.
- Increase public trust in the IRS through secure access to your own tax data.
- Improve voluntary compliance.
Key Features

- **Balance Due**: Check total balance owed to the IRS and see details by tax year.
- **See Payments**: See recent payments made to the IRS.
- **Make A Payment**: Make payments (hands off to other systems).
- **Tax Records**: View tax records.
Online Account – Current Design

Important Message from the IRS
If you’ve been affected by a recent disaster, learn about the most recent tax relief provisions to know your options.

Total amount owed as of February 26, 2019:
$230.00

Penalties and interest continue to accrue until tax is paid in full.
The information provided is based on our current data.
The numbers here may not reflect:
- Recently filed or processing returns
- Pending payments or adjustments
- Information on your business account
- Installment agreement fees

Payment Options
- PAY BY BANK ACCOUNT
- PAY BY CARD
Fees apply when paying by card.

Amount Owed by Year
Amounts include all penalties and interest.
Tax Year | You Owe
--- | ---
2017 | $230.00

Recent Payments (within 24 months)
Payments may take 1 to 3 weeks to be listed.

<table>
<thead>
<tr>
<th>Tax Year / Type</th>
<th>Amount / Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 Payment</td>
<td>$831.00</td>
</tr>
<tr>
<td>2017 Shared Responsibility Payment (Health Care)</td>
<td>$865.00</td>
</tr>
<tr>
<td>2017 Payment</td>
<td>$781.00</td>
</tr>
</tbody>
</table>

Tax Records
View, print or download your tax records using the button below.

GET TAX RECORDS ONLINE

+F Show all payments
Online Account Facts & Stats

- Over 5 million unique users tracked since Online Account launched in Nov 2016
- Clicks from Online Account to IRS Direct Pay (i.e., “Pay by Bank Account”) have resulted in transactional value of $4.3 billion from launch through May 31, 2019
  - In addition, almost 198K installment agreements have been established by Online Account users
Overview of User Testing
Methodology

Qualitative Research
One-on-one moderated interviews.

Design Prototype
Establish design hypotheses/problems to be tested.

Small Sample Size
Targeted recruiting of 8-12 participants per round of testing.

Iterative
Findings from frequent rounds of testing inform the questions and design hypotheses in future rounds.
What We’ve Tested So Far

- Online account page layout – modular view and transactional view
- Payment option flows – non-modal pages / wizards to include IRS Direct Pay, Pay1040.com, and a path to Payment Plans
- Future Balance Due Calculator
- Overview by Tax Year / Amount Owed by Year table
- Recent Payments table
- Tax Records / Get Transcript module
- Frequently Asked Questions link – supported by Taxpayer Advocate Service
- Expand widgets in table views
- Desktop and mobile layouts
- Text/language of buttons, links, and educational copy
<table>
<thead>
<tr>
<th>Initial Copy</th>
<th>Copy Revised after User Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>GET TRANSCRIPT ONLINE</td>
<td>GET TAX RECORDS ONLINE</td>
</tr>
<tr>
<td>- Minimize payments</td>
<td>- Show fewer payments</td>
</tr>
<tr>
<td>NEED MORE TIME TO PAY?</td>
<td>GO TO PAYMENT PLANS</td>
</tr>
</tbody>
</table>
Impact of User Testing

- Based on user testing, we uncovered that changing the wording on a button label (from “Need More Time to Pay?” to “Go to Payment Plans”) increased Online Account sessions continuing on to Installment Agreement by over 100% (from 10% to 22%) overnight – without cannibalizing click-throughs to Direct Pay or Pay by Card.
What We’ve Learned – Key Themes

- Taxpayers regard the IRS as a financial institution.
- There is an unmet and increasing taxpayer need for digital communication and solutions from the IRS.
- Taxpayers want to see more of a connection between balance due and payments made.
- Taxpayers want to see all payment options before deciding how to pay.
- When faced with owing a balance, taxpayers consider how much to pay, when to pay, and then form of payment.
- Taxpayers expect Account to be one integrated system.
Future of Online Account
Integration of New Features

- The ultimate goal for Online Account is to offer individualized/personalized information.
- To address taxpayers’ needs and expectations, Online Account needed to evolve from a single-page application to something more robust.
- The integration of new features – such as Installment Agreement, payment APIs, and receiving digital notices – necessitated that the structure of Online Account offer more flexibility.
New Navigation Tabs

Welcome, SUSAN BURCH

Account Status
Total Amount Owed as of December 3, 2018:
$1,632.18

Tax Records
View key information from your most recent tax return as originally filed and download tax records.

View Tax Records
Timeline

- Conception: Online Account was defined. (2014)
- Launch: Online Account was launched. (Nov 2016)
- Enhancement: New version of Online Account. (June 2019)
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Usability of Biometric Authentication Methods for Citizens with Disabilities

The MITRE Corporation
Ronna ten Brink
Becca Scollan
Katja Sednew
MITRE Is Solving Problems for a Safer World

- MITRE is a not-for-profit company chartered in 1958 to work solely in the public interest.
- MITRE works across the whole of government to tackle difficult problems that challenge the safety, stability, security and wellbeing of our nation through its operation of Federally Funded R&D Centers, as well as public-private partnerships.

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Background

Authentication and identity proofing are critical touchpoints for online government services

- Citizen-facing federal agencies (e.g., IRS, VA) increasingly move services online
- Touchpoints are “gatekeepers” to access
- Growing challenge of customer experience and serving users with disabilities

Future trends in authentication and ID proofing for federal government favor smartphone-based access, multi-factor authentication, and biometrics

- Widespread smartphone ownership, NIST recommendations, security needs
Related Work

- *Performance and perceived usability metrics*: time on task, success rates, error rates; System Usability Scale (SUS), modified SUS
- Comparisons of traditional “know” authenticators and biometrics; and of “know” and “have”
- Few authentication studies include participants with disabilities

**Observations from literature**

- Accessibility has not received adequate attention in biometric system design (Sasse & Krol, 2013)
- Recommended SUS as standard measure (Ruoti et al., 2015)
- Important to provide appropriate feedback for proper facial biometric alignment, to reduce errors and recognition time (Trewin et al., 2012)
- Found participants with visual disabilities disliked face biometric (Blanco-Gonzalo et al., 2018)
Vision: Remove Barriers to Government Services
Access

Goal: Contribute empirical usability results to federal agencies’ customer experience modernization efforts

▪ There is a notable gap of “generally accepted guidance on designing usable, accessible, and secure interfaces.” (W3C Web Security Context Working Group Chair Mary Ellen Zurko)

Goal: Contribute to the development of a standardized methodology to evaluate the usability and accessibility of authentication technologies intended for use with public government services

▪ Future: Interactive authentication system design decision-making tool
Comparative usability study on PIN and biometric authentications

- Methods chosen for current popularity and future usage potential

Hearing loss | Vision loss | No disabilities
---|---|---
Non-biometric: PIN | Biometrics: Finger | Eye Palm

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Partnership with HYPR

- HYPR offers a multi-factor, decentralized authentication solution designed to eliminate passwords and shared secrets as a means for authenticating users more securely with an easier user experience.

- HYPR provided a real, working system and hosting resources to support a prototype of several modes of biometric authentication on iOS and Android devices.

- The user’s device application allows six authentication schemes for “unlocking” a private key: PIN, palm, face, a combination of face and voice (iOS), fingerprint, and eye.

After enrolling one or more authenticators, a dashboard was enabled for participants, showing icons representing each authenticator enrolled.
Study Design

PIN is considered a baseline similar to passwords

New proposed positioning categorization for biometrics:

- Dynamic positioning

- Non-dynamic-positioning

Three predictions:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>PIN and biometric schemes will cause different performance</td>
</tr>
<tr>
<td>H2</td>
<td>Positioning biometrics (eye, palm) will cause different performance than non-positioning biometrics (fingerprint) will</td>
</tr>
<tr>
<td>H3</td>
<td>For the user group with visual impairments, non-positioning biometrics will lead to better performance than positioning biometrics will</td>
</tr>
</tbody>
</table>

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Participants and Metrics

Participants

- **Vision loss:** 9
- **Hearing loss:** 11
- **Control:** 9
- **Gender balance:** 13 female, 16 male
- **Age range (years):**
  - 25-34: 1
  - 35-44: 6
  - 45-54: 8
  - 55-64: 5
  - 65+: 9

Metrics

- **Perceived Usability:** self-reported UMUX-LITE item ratings
  1. This system’s capabilities meet my requirements.
  2. This system is easy to use.
- **Efficiency:** success trial response time
- **Effectiveness:** task completion rate
  - “Trial success” included *independent success* and *success with some guidance*
  - “Trial failure” included *success with heavy guidance* and *failure*
## Method

1. **Before session, participant completes survey on demographics, technology experience, and authentication behaviors**
2. **Participant installs application and registers authentication schemes on personal smartphone**
3. **Facilitator describes scenario of authenticating to a fictional gov service**
4. **Participant completes 2 trials per task (scheme). Task order is randomized.**
5. **After 1 or 2 trials, participant rates usability of that scheme**
6. **After all trials are completed, participants share their thoughts about the schemes with the facilitator in structured interviews**

**Scenario:**
- Use mobile device to log in to a gov service called MyUSA Account to download a digital copy of your latest tax returns

**Ethics & Privacy:**
- MITRE IRB-approved
- Privacy precautions taken
- Accessibility accommodations made
- Participants with disabilities used their normal assistive tech
Results: Perceived Usability

No statistically significant differences in ratings between the different populations, for either item

Meets My Requirements. Significant differences between:
- PIN and palm; fingerprint and eye; fingerprint and palm
- Vision loss group: fingerprint scored significantly higher than eye and palm

Easy to use. Significant differences between:
- PIN and fingerprint; PIN and palm; fingerprint and eye; fingerprint and palm; eye and palm
- Vision loss group: fingerprint scored significantly higher than eye and palm

Mean UMUX-LITE requirements item scores across all populations, with standard error shown.

Mean UMUX-LITE ease item scores across all populations, with standard error shown.
Results: Effectiveness

Population was found to have an effect. Control participants were 3.690 times more likely to be successful than those with vision loss.

No significant differences between completion rates due to mechanism, although:

- Every participant who registered PIN and fingerprint was able to successfully complete PIN and fingerprint tasks, regardless of participant group.
- No participant group had 100% task completion rates for eye and palm tasks.

Mean completion rates across participant groups.
Results: Efficiency

Population had no significant effect

Scheme had no significant effect
- However, lack of power ($\eta = 0.546$) may have limited the ability to find a significant effect.

Planned post-hoc tests were still performed on scheme comparisons
- Found fingerprint had significantly faster reaction times than all other schemes
- No significant differences for vision loss group

Mean response time in seconds from all success trials across participant groups, with standard error shown.
Perhaps there are key interaction differences between traditional and certain biometric authentication schemes – recall and spatial monitoring.

Suggests there might not be a clear usability divide between traditional authentication methods and biometric schemes.

- Alternately – there may be distinct usability differences between traditional methods and some biometrics, but grouping the biometrics examined here into a single usability category could be an overreach.

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Findings: Dynamic Positioning Interactions in Authentication

**Dynamic positioning difference**
- Requirement of continuously monitoring spatial information vs. simply locating and selecting a single, non-moving target with tactile breakpoints and bracing
- Should be researched further to confirm this split and explore its nature

**Population affected completion rate**
- With greater power, we might see effects occurring with fingerprint/eye and fingerprint/palm
- Suggests that dynamic positioning is an important aspect of biometric usability and accessibility for users with low or no vision

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Additional Observations

Completion rate did not vary statistically significantly due to scheme

- Surprising in light of seemingly drastic scheme differences
- Possibly because:
  - Not enough power to see a significant effect (small sample size)
  - Prior familiarity with the schemes may have affected completion rate results

Population significantly affected completion rate results. **We recommend completion rate as an additional consideration in assessing a technology’s accessibility.**
Future Research Directions and Current Limitations

**Recommendations**
- Automate performance data capture; collect enrollment performance data
- Address potential effects of scheme familiarity
- Larger sample size; more granular severity groups within disability groups

**Observations**
- Some metrics may be better suited to testing *across* disabilities and some to testing *between* disabilities
- Possibility of a minimum RT threshold for affecting perceived usability

**Future Research Directions**
- Focus on ability/interaction requirement relationships for more immediate value
- Further explore dynamic positioning aspect
- Expand into more types of disabilities, severity levels within disabilities, more biometrics
- Explore directionality of usability differences for evidence-based system design guidance
- Usability for participants with multiple disabilities
- How learnability may play a role in biometric accessibility

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Conclusion

We contribute empirical findings and expand the body of work on usability of biometric authentication schemes for users with disabilities.

We propose dynamic device positioning as a new accessibility consideration for biometric usability evaluations.

- Operationalized as *actionable recommendations* for citizen-facing federal authentication process design:
  - A dynamic positioning biometric should never be the sole authentication scheme.
  - Multi-factor authentication using biometrics should offer at least one non-dynamic positioning biometric. Fingerprint is a good option until other schemes are empirically shown to be more accessible.
Authors

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Becca Scollan is a Lead Human Factors Engineer at The MITRE Corporation. She earned a M.S. in Interaction Design and Information Architecture from the University of Baltimore and a B.F.A. from the Maryland Institute College of Art. She has extensive experience in UX research and design on IRS projects. Current interests include usable security, universal design, and increasing research robustness of UX industry heuristics.

Ronna N. ten Brink
Sr Human Factors Engineer

Ronna ten Brink is a Senior Human Factors Engineer at The MITRE Corporation. She earned a B.S. in Engineering Psychology and Computer Science from Tufts University. She researches the usability of authentication methods for people with disabilities; studies human-machine teaming with a focus on calibrated trust; and performs user experience design and research across a variety of government domains. Other interests include gestural and tactile HCI, ubiquitous computing, and the intersection of usability and privacy.
Presentation References

Background


Related work


Thank you
Appendix
### Study Design: Participants

#### Age range (years)

<table>
<thead>
<tr>
<th>Age range (years)</th>
<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>

#### Impairment Type and Level

<table>
<thead>
<tr>
<th>Impairment Type and Level</th>
<th>Visual</th>
<th>Hearing</th>
<th>All participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Moderate</td>
<td>Total</td>
</tr>
<tr>
<td>All participants</td>
<td>6</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>PIN</td>
<td>7</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Finger print</td>
<td>7</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Eye print</td>
<td>7</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Palm print</td>
<td>5</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Face</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Voice / Face</td>
<td>1</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

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## Results: Prior Experience with Biometrics

<table>
<thead>
<tr>
<th>Participant responses to questionnaire items about prior experience with authentication methods</th>
<th>Amount of “yes” responses to the following questionnaire items:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>... secure your personal devices to access a web service?</td>
</tr>
<tr>
<td><strong>Passwords</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>Pin or pattern</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>2-factor using code received by email</strong></td>
<td>23</td>
</tr>
<tr>
<td><strong>2-factor using security question</strong></td>
<td>21</td>
</tr>
<tr>
<td><strong>2-factor using code received by personal cellphone or smartphone</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>Two-factor using standalone device with digital key</strong></td>
<td>7</td>
</tr>
<tr>
<td><strong>Two-factor using a code received by landline phone</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>Two-factor using an online or software digital key (e.g., Google Authenticator, Duo)</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Biometric – fingerprint</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>Biometric – voice</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Biometric – face</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Biometric – iris</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>0</td>
</tr>
</tbody>
</table>

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9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
CUSTOMER EXPERIENCE RESEARCH LEADS TO BETTER DESIGN AND INCREASED ADOPTION

Presented by: Nikki Kerber
*Nikki Kerber, Kristen Papa, and Jake Sauser* (Booz Allen Hamilton)

IRS TPC Joint Research Conference | June 20th, 2019
“Most Americans may not think about the Federal Government every day — but when they need Government services, they expect them to work” - PMA
WHAT IS CUSTOMER EXPERIENCE?

• Forrester, an American market research company that provides advice on existing and potential impact of technology, defines Customer Experience, or CX, as how customers perceive their interactions with an organization.

• CX is not just about one great product or experience - it’s about continuously deploying seamless interactions across different processes and technology platforms to establish an orchestrated ecosystem across people, processes and technology that meet customers’ needs at the time they need it.

• Includes external consumers of a product or service AND front-line employees who interact and deliver the experience to those customers (e.g., call center customer service representatives and IT help desk agents).

Creating a memorable and satisfactory CX takes into account these considerations from the perspective of the customer:

- Are they useful (deliver value)?
- Are they usable (make it easy to find and engage with the value)?
- Are they enjoyable? (emotionally engaging so that people want to use them)
RESEARCH OBJECTIVE AND THE ESTABLISHMENT OF A CX FRAMEWORK

• In partnership with the IRS, our primary objective is to understand taxpayers’ perceptions of the agency and ultimately how that perception translates into engagement, and advocacy.

• Through a framework that focuses on people, process and technology, the IRS seeks to uncover taxpayer needs, wants, and opinions to better understand the challenges they may face now and in the future.

• The establishment of a CX framework at the IRS requires customers and stakeholders to be involved throughout the research, design, and deployment processes.

• As a result, our framework aims to understand how the organization’s functions and processes work to get an accurate picture of the back-end operations driving the experience.
MEASURING CUSTOMER EXPERIENCE

CX QUALITY

Effectiveness

The experience delivers value to customers.

Ease

It’s not difficult to get value from the experience.

Emotion

Customers feel good about their experience.

CX INDEX
SCORE

CUSTOMER LOYALTY

Retention

Likelihood of keeping existing business.

Enrichment

Likelihood of buying additional products and services.

Advocacy

Likelihood of recommending to others.

Image credit: Forrester - The US Customer Experience Index, 2018
MEASURING CUSTOMER EXPERIENCE IN THE FEDERAL GOVERNMENT

• Since 2015, government agencies’ average Customer Experience Index score for digital channels has remained flat while the average score for non-digital channels has risen by three points.
• Customers consider their experiences with federal digital channels to be ineffective, difficult, and emotionally negative.
• The IRS ranks near the bottom of government agencies in terms of public perception and customer satisfaction.
• In the 2017 American Customer Satisfaction Index (ASCI) Federal Government Report, the Department of Treasury received a score of 61, well below the government average of 69.7.
• Forrester’s U.S. Federal CX Index, 2018: Rankings of U.S. Federal Government Agencies report ranks the IRS as “very poor” with a rank of 12 out of 15.
• The private sector average score for Customer Experience (CX) is 69 whereas the federal average score is 59.
CUSTOMER EXPERIENCE IN TAX ADMINISTRATION

- The Federal Government is now required to consider customer experience and satisfaction when delivering services and must deliver customer experiences that the citizen is able to take advantage of regardless of location, task complexity or touchpoint.

- **President’s Management Agenda (PMA)**
  - The Office of Management and Budget (OMB) introduced a new aspect of its Circular A-11 in June 2018 that instructs government agencies to craft customer experience frameworks. The changes guide agencies on how to manage their customer experience efforts and requires that agencies report certain Key Performance Indicator (KPI’s) starting in the first quarter of fiscal year 2019.
  - CAP Goal 4, “Improving Customer Experience with Federal Services”, mandates that Treasury and related agencies comply with the following objectives:
    - Transform the customer experience by improving the usability and reliability of our Federal Government’s most critical digital services;
    - Create measurable improvements in customer satisfaction by using the principles and practices proven by leading private sector organizations;
    - Increase trust in the Federal Government by improving the experience citizens and businesses have with Federal services whether online, in-person, or via phone.

- **21st Century Integrated Digital Experience Act**
  - Passed in Congress in December 2018, this policy aims to increase efficiencies by promoting data-driven, secure, personalized and mobile-friendly websites. The law establishes minimum standards for federal websites and encourages agencies to digitize manual processes and accelerate the usage of electronic signatures.

- **Taxpayer First Act of 2019**
  - Passed in the House in April 2019, this policy is an amendment to the IR Code of 1986 to modernize and improve the IRS.
  - Provisions that the IRS develop a comprehensive customer service strategy within one year of the bill passing.
METHODOLOGY USED TO ESTABLISH CUSTOMER EXPERIENCE FRAMEWORK

• Immersion
  - Gather and analyze previously conducted research
  - Conduct a gap analysis, listing topics and questions for further research
  - Write a research plan and obtain approvals
  - Recruit taxpayers to engage in user research activities
  - Listen and learn directly from taxpayers

• Ideate
  - Synthesize feedback and insights
  - Identify potential areas of opportunity
  - Update/Establish user personas and journey maps
  - Conceptualize potential solutions

• Implementation
  - Design and test solutions to meet taxpayer needs
UNDERSTANDING TAXPAYER AUDIENCE SEGMENTS

- Before deploying the CX Framework into a known service or product, it was imperative to deeply understand the various audiences that the IRS served.
- Since the IRS serves several different audience segments, we came up with a coordinated prioritization strategy with IRS stakeholders to efficiently and effectively analyze customer needs and goals. As a result, individual taxpayers within the following categories were identified as a priority audience segment. Specifically:
  - Taxpayers who identify as having “straightforward” taxes
  - Taxpayers who identify as having “complex” tax situations
  - Taxpayers who owe back-taxes
  - Low-income taxpayers
  - Atypical taxpayers who file using non-standard processes
- To understand the needs, wants, goals, concerns and frustrations of individual taxpayers, user research activities such as one-one-one interviews, usability testing sessions, facilitated design workshops and deploying/analyzing survey data were utilized.
OPTIMIZING IRS.GOV AND ONLINE ACCOUNT TO PAY TAXES

• Through pre-study analysis, several potential challenges to the customer, or “pain points,” were uncovered with the payment process.

• Business Goal
  - Allow individual taxpayers to setup or revise installment agreements from within their existing online account so that they can manage multiple aspects of their interactions with the IRS from one user experience, while simultaneously decreasing telephone and paper requests.

• Research Focus
  - To identify and understand the needs, challenges, and opportunities related to integrating Online Payment Agreement (OPA) into Online Account (OLA).

• Hypothesis
  - Enabling individual taxpayers to easily make payments and/or set up a payment plan online instead of via paper or over the phone, which would help deflect the number of calls to the IRS call center and ultimately increase overall tax compliance.

• Study Objectives
  - Understand the points of greatest anxiety in the taxpayer journey when paying the IRS.
  - Understand the mindset of taxpayers who owe money to the IRS and gain insight into what may be hindering them from making a payment and/or setting up a payment plan online.
  - Obtain taxpayer feedback and behavioral data on select payment scenarios.
  - Validate if taxpayers who owe money to the IRS understand the concept of existing IRS nomenclature terms and phrases.
USER RESEARCH ARTIFACTS: PERSONAS AND JOURNEY MAPS

• **Personas**
  - A fictional character who represents the qualities of average users within an audience segment.
  - Are not “made up”, rather they are discovered as a by-product of the investigative user research process. In essence, personas are the voice of our customer when they are not in the room with us.
  - Intended to be living, breathing documents, and as such should be updated based on new research findings.

• **Journey Maps**
  - Tells the story of the customer’s experience from initial contact through the process of engagement and into a long-term relationship. It may focus on a particular part of the story or give an overview of the entire experience.
  - Identifies key interactions that the customer has with the organization. It discusses the user’s feelings, motivations and questions for each of these touchpoints.
  - Overall goal is to teach an organization about their customers and identify opportunities to improve the customer’s overall experience.
SUSAN
Exasperated Tax Over
Confident Self-Preparer: Owes over $1,000 After Filing
Individual Taxpayer

STORY/NARRATIVE
Susan is married and a mother of two high school aged children. She works full-time as an office manager, but also started freelance writing for various publications. This year, Susan received a notice informing her she owed taxes after filing which was more than she could afford. She’s not sure how to adjust her payment plan or check her balance. Overall, Susan and her husband thinks the IRS makes filing and paying taxes too complicated. They wish the process could be simpler for their busy family.

- Prepares and files taxes using TurboTax
- Did not make quarterly tax payments this year
- Works with an accountant to set up a monthly payment plan

“Last year when I filed, I thought I did my taxes right. I ended up getting audited and now I owe the IRS more than $3,000.”

GOALS
- I want to make sure that I do not owe money at the end of next year
- I want to pay back what I owe in a way that fits my financial situation
- I want to take advantage of college savings plan tax benefits

TASKS
- Find out how much I currently owe
- Easily set up a payment plan online, make recurring payments, and view my payment history and activities online
- Find out the right amount of income tax to be withheld from my paycheck

MOTIVATIONS/BEHAVIOIRS
- Has started saving money in preparation for next tax filing season
- Busy parent of two kids and relies on quick and simple processes where possible
- Juggling unexpected taxes owed against my regular budgeted expenses

CONCERNS
- Owing more money than able to afford
- Worried about the IRS going after them
- Receiving inconsistent information on a balance owed (notices, IRS call center, online, etc.)
- Getting audited again
- Feels that government agencies are demanding and unapproachable

Citations
1. 2017 National Taxpayer Experience Survey National Report
2. IRS.gov/Google Analytics, May 2019

Updated Last: 06/01/2019
"Glad that part is over, but what should I do about this balance I owe?"

"I was in shock! What do I do now?"

"Is the IRS going to come after me? The letter didn't explain why I owed. A brief description to understand why it would have been helpful."

"My first thought is to go online so I can do it on my own time; the second would be through friends and family because they would give me unbiased info."

**ACTIVITIES**  
*Possible activity a taxpayer may encounter; not all taxpayers will experience this step.*

- **File Return**
  - Taxpayer files taxes and submits return to the IRS

- **Identifies**
  - Taxpayer discovers that they owe the IRS money during the filing process

- **Gets Notice**
  - Taxpayer receives IRS letter in the mail stating they owe money

- **Seeks Info**
  - Taxpayer looks for payment information through a variety of resources
RESULTS

• Establishment of an “IRS Audience Yearbook”
  - Meant to serve as a tool to document the various audiences. As work continues in the future, it is likely that more segments will be identified, and audiences may be grouped together when building solutions to meet Customer Needs.

Taxpayers
• Simple Routine Filer
• Exasperated Ower
• First-Time Filer
• Multilingual Student
• Entrepreneur
• Low Income Filer
• Independent Farmer
• Gig Economy Worker
• Independent Consultant

Tax Professionals
• CPA/Enrolled Agent
• Attorney
• Reporting Agent
• Return Preparer

Informational
• Policy/Academic
• Lobby/Adv/Trade
• Media
• Tax Prep Software Manufacturer
• IRS IT Help Desk Rep

Businesses
• Small Business Rep
• Large Business Rep
• Global High Wealth

Tax-Exempt Organizations
• Small Non-profit Volunteer
• Non-profit Employee

Gov’t Entities
• State Agency
• Local Municipality
• US Fed Agency
• Foreign Gov’t
• Indian Tribal Nation
RESULTS (CONTINUED)

• Findings and recommendations are now being implemented to improve content on payments-related pages on IRS.gov.
  - Multiple interview participants used the word “overwhelming” to describe the Pay Your Taxes by Debit or Credit Card page, causing uncertainty on which option to select in the payment process.
  - To address the issue of content overload, OLS in partnership Online Engagement, Operations & Media (OEOM) is actively working on design enhancements to better display debit and credit card processor information on the page.

• Deeper understanding of mental models individual taxpayers have regarding payments.
  - Modify Online Account aspects that leverage these insights.
  - Conceptualize and ideate on new products and services that will serve the need of individual taxpayers and even tax professionals.

IRS.gov: Paying Your Taxes content page
CONCLUSION

“Those who lead the way in digital government CX are able to combine people, process, and technology to deliver better experiences that benefit customers and the organization” – Forrester

• Regardless of organization or industry vertical, customer experience research is a constantly evolving, never ending endeavor.
• Our team has only begun to scratch the surface of all the customer interactions, audience segments, touchpoints, and products that the IRS agency offers.
• Taken together, insights gathered now and in the future should be used across the entire agency to improve the customer experience for taxpayers and customer segments.
9TH ANNUAL IRS/TPC JOINT RESEARCH CONFERENCE ON TAX ADMINISTRATION

#LiveAtUrban
Session 3: Improving Digital Service
2019 IRS/TPC Joint Research Conference

Courtney L. Rasey
Discussant
June 20, 2019
Introduction

• All three papers highlight that improving digital service requires thoughtful consideration of taxpayers and the larger service delivery environment.

• Together, these papers showcase that the IRS incorporates Forrester’s “three E’s” of customer experience (ease, efficiency, and emotion) in all areas of digital service planning and development.
  • Cultivating a seamless customer experience based on an understanding of taxpayer’s motivations and emotions
  • Ensuring digital service is quick and efficient
  • Designing digital products that are easy to access and use

• Other common themes from these papers that demonstrate important principles for improving digital service include:
  • design with the taxpayer in mind,
  • ensure accessibility for taxpayers,
  • understand taxpayer motivation and experience through segmentation, and
  • view digital service within a broader customer experience framework.
IRS Online Account User Testing by MediaBarn
Research Focus: iterative user testing of IRS Online Account

How does this research improve digital service?

• Integrates user experience throughout the design process by testing a demo account with taxpayers using fictional account information.
  • Provides design feedback prior to launch
  • Ability to test ideas without making them visible to the public
  • Quick feedback throughout the design phase

• Bringing the taxpayer into the process as early as possible helps focus future efforts to refine user interfaces, wording, and service features.

What are the limitations of this research?

This study contains the limitations inherent to lab research using scenarios.

• Industry sample size is low, which prohibits segmentation.
• Testing with demos can make it difficult to separate confusion from unfamiliarity with the tax situation from confusion related to design.
IRS Online Account User Testing by MediaBarn

How does this research benefit the entire IRS Online Account design process?
MediaBarn collaborates with Wage & Investment Strategies & Solutions (WISS) through IRS Online Services and their mutual operational customers.
• WISS performs post-release IRS Online Account testing that compliments MediaBarn’s work.

Pre-Release Testing:
• MediaBarn completes user testing with demo accounts to inform the next release and test multiple design elements.
• MediaBarn recommends questions for inclusion in post-release testing.

Post-Release Testing:
• WISS tests Online Account with actual users to gather feedback about usability and potential features based on their own tax information.
• With its larger sample size, recruitment and segmentation can occur to answer questions about a particular segment based on service need.
• New designs are tested by MediaBarn prior to release.
Customer Experience Research Leads to Better Design and Increased Adoption by Booze Allen Hamilton

Research Focus: Using personas and journey maps to better understand taxpayers’ emotions about and experience with paying the IRS

How does this research improve digital service?

• Personas support investigations of taxpayer motivation and drivers for channel selection by humanizing taxpayer segments.
  • Personas group taxpayers by their attitudes and perceptions to gain a better understanding of their goals, motivation, and concerns.
  • Better understanding these personas assists in development of digital services that accomplish tasks while addressing individual concerns and helping taxpayers reach their overarching goals.
  • In addition, personas aid in development of communication campaigns that effectively motivate taxpayers towards digital service.

• Journey maps are an essential part of understanding what process taxpayers take to complete specific tasks.
  • Having very detailed maps ensures the IRS does not overlook potential barriers to service.
Customer Experience Research Leads to Better Design and Increased Adoption by Booze Allen Hamilton

What should the authors consider in continuing their research?

• Based on previous behavioral research performed by WISS, I think the authors should consider adding two additional components to the payment Journey Map:
  1) finding information about what payment options are available and how they work
  2) being able to access their chosen payment option

• Both of these components can become barriers to digital service use.

Booze Allen Hamilton’s Payment Journey Map

<table>
<thead>
<tr>
<th>DISCOVER</th>
<th>&gt; ASSESS</th>
<th>&gt; ESTABLISH</th>
<th>&gt; PAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxpayer discovers they owe money to the IRS</td>
<td>Taxpayer assesses how they plan to address payment back to the IRS</td>
<td>Taxpayer determines best payment option for their situation and proceeds down the journey of:</td>
<td>Taxpayer determines form of payment and completes payment.</td>
</tr>
</tbody>
</table>
How does this research improve digital service?

• IRS strives to make digital service options accessible for all taxpayers, including those with specific access barriers.
  • Research about authentication accessibility for taxpayers with disabilities is crucial to ensuring authentication does not bar them from using digital service options.

• MITRE covers Forrester’s “Three E’s” in their evaluation of authentication methods.

<table>
<thead>
<tr>
<th>Authentication Measure</th>
<th>Corresponding “E”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency the time elapsed from when the prototype app instructed the participant to attempt the authentication until indication of task success or failure</td>
<td>Ease</td>
</tr>
<tr>
<td>Effectiveness the number of successful task completions out of the number of attempted task completions</td>
<td>Effectiveness</td>
</tr>
<tr>
<td>Perceived Usability measured using an established method of assessing a user’s perceived usability of a system</td>
<td>Emotion</td>
</tr>
</tbody>
</table>
What other populations could be included in Smartphone authentication and mobile digital product research to increase digital service accessibility?

As Smartphone use in the United States increases, authentication methods that utilize their features and development of mobile products could increase digital service access.

**Rural Taxpayers**
Mobile technology use has risen rapidly among rural populations since 2011, despite computer ownership having only risen slightly since 2008. *(Pew Research Center. May 2019)*

**Low-Income Taxpayers**
Many lower-income Americans rely on Smartphones as their only means of internet accessing – completing all tasks on their phone. *(Pew Research Center. May 2019)*

**Hispanic & Limited English Proficient Taxpayers**
Mobile devices have increased internet access for Hispanics, including those who are Spanish-dominant. Only 21% of Spanish language dominant Hispanics have broadband internet at home, while 71% report accessing the internet on a mobile device. *(Pew Research Center. July 20, 2016)*
Conclusions

• Increasing digital service use requires understanding what drives taxpayer choice and how to make digital services accessible for all taxpayer groups.

• The research presented in this session highlights the importance of designing service ecosystems, website content, and digital products from the taxpayer point of view.
  • It’s important to remember that the taxpaying population includes several subgroups with their unique motivations, goals, needs, and barriers to accessing digital services.

• These authors have provided a research framework that mirrors the current IRS strategic view of customer service aimed at:
  • providing seamless customer experience across channels, and
  • ensuring customers quickly get the service they need, when they need it, and through the optimal service channel.
Discussant Information

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Social Scientist Technical Lead
Wage & Investment Strategies & Solutions (WISS) Research
Courtney.L.Rasey@irs.gov
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
## Session 3. Improving the Digital Taxpayer Experience

**Moderator:**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Account User Testing</td>
<td>Heather Gay</td>
</tr>
<tr>
<td>Accessible Authentication for All: An Evaluation Framework for Assessing Usability and Accessibility of Authentication Methods</td>
<td>Ronna ten Brink</td>
</tr>
<tr>
<td>Customer Experience Research Leads to Better Design and Increased Adoption</td>
<td>Nikki Kerber</td>
</tr>
</tbody>
</table>

**Discussant:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Courtneay Rasey</td>
</tr>
</tbody>
</table>

**Moderator:**

Alcara Walden
IRS, Office of Online Services
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
9th Annual IRS/TPC Joint Research Conference on Tax Administration

Next session begins at 3:10
9th Annual IRS/TPC Joint Research Conference on Tax Administration

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9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Session 4. Understanding the Drivers of Taxpayer Behavior

Moderator: Melissa Vigil
IRS, RAAS

Underpayment of Estimated Tax: Understanding the Penalized Taxpayer Population
Janet Li
IRS, RAAS

The Effect of Audit Burden on Subsequent Tax Evasion
Ethan LaMothe
University of South Carolina

Using a Graph Database to Analyze the IRS Databank
Rahul Tikekar
IRS, RAAS

Discussant: Brian Erard
Brian Erard & Associates
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
Underpayment of Estimated Tax

Understanding the penalized taxpayer population

Janet Li, Tomas Wind, Alicia M. Miller, Brett Collins, Victoria L. Bryant, Alex Turk, Stacy Orlett

Research, Applied Analytics & Statistics
Knowledge Development and Application

June 20, 2019
Estimated tax penalty
What is it and why do we care?
U.S. federal income taxes are a pay-as-you-go system

• Most taxpayers have to prepay their tax throughout the year through withholding from their employer or through estimated tax payments.
  
  • **Withholding** is *mandated* for W-2 wage income, *opt-out* for pensions and IRAs, and *opt-in* for taxable Social Security benefits and unemployment insurance.
  
  • **Estimated tax payments** must be paid quarterly (typically April 15, June 15, September 15, January 15) on income that is not subject to withholding or if withholding is insufficient.
  
  • The **estimated tax penalty** is assessed on a taxpayer for each quarter that the prepayments are less than 22.5% of the current year’s tax or less than 25% of last year’s tax (less than 27.5% of last year’s tax for higher-income taxpayers). It is set at a rate of 4% of outstanding tax, compounding daily.
  
  • Prepayments are important both for Treasury’s fiscal planning and for supporting taxpayers with their overall tax compliance.
The estimated tax penalty is the second most common IRS penalty, and the vast majority are individual, not business, penalties.

Penalty counts, FY 2017 – FY 2018

<table>
<thead>
<tr>
<th>Penalty</th>
<th>FY 2017</th>
<th>FY 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total penalties</td>
<td>45.60 mil</td>
<td>45.73 mil</td>
</tr>
<tr>
<td>Failure to file (Delinquency)</td>
<td>10.7%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Failure to pay</td>
<td>46.8%</td>
<td>46.8%</td>
</tr>
<tr>
<td><strong>Estimated tax penalty</strong></td>
<td><strong>23.7%</strong></td>
<td><strong>24.1%</strong></td>
</tr>
<tr>
<td>Failure to deposit</td>
<td>3.4%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Accuracy related</td>
<td>1.2%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Other</td>
<td>14.2%</td>
<td>13.7%</td>
</tr>
</tbody>
</table>

Source: IRS Office of Servicewide Penalties
The percentage of taxpayers getting the estimated tax penalty has remained relatively consistent.

Estimated tax penalty over the last five years (TY 2013 – TY 2017)

<table>
<thead>
<tr>
<th>Year</th>
<th>Returns with estimated tax penalty (millions)</th>
<th>Percent of 1040 returns with estimated tax penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>9.74 m</td>
<td>6.64%</td>
</tr>
<tr>
<td>2014</td>
<td>10.06 m</td>
<td>6.80%</td>
</tr>
<tr>
<td>2015</td>
<td>10.09 m</td>
<td>6.74%</td>
</tr>
<tr>
<td>2016</td>
<td>9.89 m</td>
<td>6.60%</td>
</tr>
<tr>
<td>2017</td>
<td>9.73 m</td>
<td>6.51%</td>
</tr>
</tbody>
</table>

Source: Compliance Data Warehouse, IRTF_F1040, IMF_TRANS_HISTORY
A third of taxpayers with the estimated tax penalty enter the Balance Due Notice Process, 21% become Tax Delinquent Accounts, and 13% enter installment agreements.

Downstream compliance issues for taxpayers with estimated tax penalty (TY 2017)

<table>
<thead>
<tr>
<th>Penalized taxpayers</th>
<th>All filers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count (thousands)</td>
</tr>
<tr>
<td>Total</td>
<td>9,788</td>
</tr>
<tr>
<td>Full pay prior to notice</td>
<td>6,442</td>
</tr>
<tr>
<td>Enter bal due notice process</td>
<td>3,346</td>
</tr>
<tr>
<td>Resolved out of notice</td>
<td>1,326</td>
</tr>
<tr>
<td>Tax Delinquent Account</td>
<td>2,021</td>
</tr>
<tr>
<td>Assigned to Automated Collection System</td>
<td>640</td>
</tr>
<tr>
<td>Assigned to Queue</td>
<td>78</td>
</tr>
<tr>
<td>Assigned to Field</td>
<td>18</td>
</tr>
<tr>
<td>Installment Agreement</td>
<td>1,285</td>
</tr>
<tr>
<td>Other</td>
<td>255</td>
</tr>
</tbody>
</table>

Source: Compliance Data Warehouse, ARDI_IMF_MODULE, IMF_STATUS_HISTORY, IRTF_F1040
Taxpayers with an estimated tax penalty file extensions more than unpenalized taxpayers.

Late filing rates for those and without the estimated tax penalty, TY17

Source: Compliance Data Warehouse, IRTF_F1040
Just over 1 percent of taxpayers misreport their taxable income on their return. The estimated tax penalty is associated with higher underreporting.

Misreporting of taxable income for those who misreported, TY17

Source: Compliance Data Warehouse, IRTF_F1040
What factors are associated with the estimated tax penalty?

What affects taxpayers’ prepayment behavior?
Looking at all taxpayers, most have income subject to withholding and have lower levels of non-withholdable income.

Heat map of overall withholdable vs. non-withholdable income levels by filing status (TY 2017)

Source: Compliance Data Warehouse, IRTF_F1040
The estimated tax penalty is associated with increasing levels of non-withholdable income.

Heat map of penalty rates by withholdable and non-withholdable income levels, by filing status (TY 2017)

Source: Compliance Data Warehouse, IRTF_F1040, IMF_TRANS_HISTORY
Taxpayers with no withholding have **larger penalties** than taxpayers who withhold.

Size of estimated tax penalty for taxpayers by withholding behavior (TY 2017)

Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040
While overall small, estimated tax penalties are **largest** for those whose primary income is not subject to withholding (Schedule E, Schedule D, Schedule C) and **smallest** for those whose primary income is withholdable (pension, Social Security, unemployment compensation, wages).

### Size of estimated tax penalty for taxpayers by primary income type (TY 2017)

<table>
<thead>
<tr>
<th>Primary Income Type</th>
<th>Less than $25</th>
<th>$25 to $49</th>
<th>$50 to $99</th>
<th>$100 to $249</th>
<th>Over $250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage</td>
<td>30%</td>
<td>24%</td>
<td>21%</td>
<td>17%</td>
<td>9%</td>
</tr>
<tr>
<td>Pension</td>
<td>17%</td>
<td>23%</td>
<td>22%</td>
<td>23%</td>
<td>16%</td>
</tr>
<tr>
<td>IRA</td>
<td>15%</td>
<td>34%</td>
<td>13%</td>
<td>16%</td>
<td>33%</td>
</tr>
<tr>
<td>Dividends</td>
<td>23%</td>
<td>17%</td>
<td>16%</td>
<td>20%</td>
<td>24%</td>
</tr>
<tr>
<td>Other</td>
<td>33%</td>
<td>33%</td>
<td>24%</td>
<td>22%</td>
<td>14%</td>
</tr>
<tr>
<td>Alimony</td>
<td>21%</td>
<td>23%</td>
<td>20%</td>
<td>17%</td>
<td>4%</td>
</tr>
<tr>
<td>Farm</td>
<td>28%</td>
<td>22%</td>
<td>24%</td>
<td>21%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040
Taxpayers with estimated tax penalties have on average *more* types of income, particularly more types of non-withholdable income.

### Average number of types of income (TY 2017)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Average # types of income</th>
<th>Average # types of withholdable income</th>
<th>Average # types of non-withholdable income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxpayers with estimated tax penalty</td>
<td>9.7</td>
<td>3.36</td>
<td>1.45</td>
<td>1.91</td>
</tr>
<tr>
<td>All taxpayers, TY17</td>
<td>149.6</td>
<td>2.05</td>
<td>1.22</td>
<td>0.83</td>
</tr>
</tbody>
</table>

*Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040*
Each additional income type adds more **complexity** to an individual’s tax obligation. Penalties increase at a higher rate with additional non-withholdable income vs. withholdable income types.

**Estimated tax penalty by number of income types (TY 2017)**

*Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040*
What happens after a taxpayer incurs an estimated tax penalty?
Around half of taxpayers (53 percent) incurring the estimated tax penalty in one year reincur it the following year, and most have a balance due.

### Behavior after incurring the estimated tax penalty in TY16: return type

<table>
<thead>
<tr>
<th>Estimated tax penalty in TY17 (in thousands)</th>
<th>No estimated tax penalty in TY17 (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Balance due in TY16</strong></td>
<td></td>
</tr>
<tr>
<td>4,413</td>
<td>3,698</td>
</tr>
<tr>
<td>Same or higher bal due in TY17</td>
<td>50.5%</td>
</tr>
<tr>
<td>Lower bal due</td>
<td>43.1%</td>
</tr>
<tr>
<td>Even return</td>
<td>0.2%</td>
</tr>
<tr>
<td>Refund</td>
<td>6.1%</td>
</tr>
<tr>
<td><strong>Even return in TY16</strong></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Bal due in TY17</td>
<td>61.9%</td>
</tr>
<tr>
<td>Even return</td>
<td>12.9%</td>
</tr>
<tr>
<td>Refund</td>
<td>25.2%</td>
</tr>
<tr>
<td><strong>Refund in TY16</strong></td>
<td></td>
</tr>
<tr>
<td>417</td>
<td>640</td>
</tr>
<tr>
<td>Bal due in TY17</td>
<td>47.9%</td>
</tr>
<tr>
<td>Even return</td>
<td>0.7%</td>
</tr>
<tr>
<td>Lower refund</td>
<td>30.5%</td>
</tr>
<tr>
<td>Same or larger refund</td>
<td>21.0%</td>
</tr>
</tbody>
</table>

Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040
Taxpayers re-incurring the estimated tax penalty tend to have higher adjusted gross income compared to the previous year and have more **income variability** compared to taxpayers who are not re-penalized.

### Behavior after incurring the estimated tax penalty in TY16: Income variability

<table>
<thead>
<tr>
<th>Estimated tax penalty in TY17</th>
<th>No estimated tax penalty in TY17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Count</strong> (thousands)</td>
<td><strong>Count</strong> (thousands)</td>
</tr>
<tr>
<td>Average TY17 AGI over TY16 AGI</td>
<td>Average TY17 AGI over TY16 AGI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Estimated tax penalty in TY17</th>
<th>No estimated tax penalty in TY17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, TY16</td>
<td>4,846</td>
<td>4,349</td>
</tr>
<tr>
<td>Higher adjusted gross income</td>
<td>59.5%</td>
<td>45.0%</td>
</tr>
<tr>
<td></td>
<td>210%</td>
<td>150%</td>
</tr>
<tr>
<td>Same adjusted gross income</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Lower adjusted gross income</td>
<td>40.3%</td>
<td>54.8%</td>
</tr>
<tr>
<td></td>
<td>61%</td>
<td>79%</td>
</tr>
</tbody>
</table>

Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040
Of those who were withholding and got the estimated tax penalty, most of those who came into compliance increased their withholding.

### Behavior in the year after incurring the estimated tax penalty: Withholding

<table>
<thead>
<tr>
<th></th>
<th>Estimated tax penalty in TY17 (in thousands)</th>
<th>No estimated tax penalty in TY17 (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not withhold in TY17</td>
<td>167</td>
<td>548</td>
</tr>
<tr>
<td>Withheld in TY17</td>
<td>3,218</td>
<td>3,373</td>
</tr>
<tr>
<td>Withheld more</td>
<td>1,818</td>
<td>2,245</td>
</tr>
<tr>
<td>56%</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>Withheld the same</td>
<td>64</td>
<td>40</td>
</tr>
<tr>
<td>2%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Withheld less</td>
<td>1,336</td>
<td>1,088</td>
</tr>
<tr>
<td>42%</td>
<td>32%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040
One indicator of a taxpayer's obligation to make estimated tax payments is having at least $1,000 of tax liability from income from non-withholdable sources.

Using this criterion, the majority of those incurring the penalty (who make at least $10K in non-withholdable income) continue to pay zero estimated tax the following year. About a quarter increase their estimated tax payments.

Behavior after incurring the estimated tax penalty in TY17: Amount of estimated tax payments

<table>
<thead>
<tr>
<th>Estimated payments in TY17 as compared to TY16</th>
<th>Estimated tax penalty in TY17</th>
<th>No estimated tax penalty in TY17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero estimated payments</td>
<td>65%</td>
<td>53%</td>
</tr>
<tr>
<td>Higher amount</td>
<td>20%</td>
<td>29%</td>
</tr>
<tr>
<td>Same amount</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Lesser amount</td>
<td>14%</td>
<td>18%</td>
</tr>
</tbody>
</table>

Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040
Many taxpayers who do not re-incur the penalty may be complying by increasing their withholding or by having estimated tax liability that is dropping below the threshold needed to make estimated tax payments.

Behavior after incurring the estimated tax penalty in TY16: Number of estimated tax payments

---

Number of estimated tax payments in TY17

- None: 7%
- 1: 9%
- 2: 7%
- 3: 1%
- 4: 1%
- More than 4: 70%

Penalized in TY16 and in TY17: Penalized in TY16, unpenalized in TY17

- Penalized in TY16 and in TY17: 1%
- Penalized in TY16, unpenalized in TY17: 60%

Source: Compliance Data Warehouse, IMF_TRANS_HISTORY, IRTF_F1040
Summary of descriptive findings

- Three-quarters of taxpayers with the estimated tax penalty have withholding and could adjust their prepayments by increasing their withholding. This would work for the most common taxpayers, who make the majority of their income from wage or retirement sources with withholding and make side nonwithholdable income from self-employment sources.

- Most taxpayers who make nonwithholdable income make low levels of income from these sources, which might preclude them from being required to make estimated tax payments.

- Estimated tax penalties are small in size, particularly for taxpayers who are withholding. Penalty incurrence and size increase for taxpayers with larger amounts of nonwithholdable income and more complexity (i.e., more sources of income and more persons on the return).

- A penalty alone only serves to change the behavior of some taxpayers, but many with estimated tax obligations continue to not make estimated tax payments.

- Return data alone cannot explain the biggest barriers to making estimated tax payments for those who are required to make them. Options include: knowing to make them, remembering to make them, calculating them, and submitting them.
Ongoing experimental research

To better understand the compliance behavior of taxpayers with estimated tax obligations
Experimental research

1. Outreach Study
   - A randomized controlled experiment sending quarterly estimated payment reminder letters to taxpayers with a previous estimated tax penalty who have not come into compliance
   - Behaviorally informed treatments center around the timing and language of the letters, including testing the salience of a penalty vs. a balance due

2. Survey
   - A web survey sent to taxpayers who are making estimated tax payments or who have sufficient non-withholdable income and should be making estimated tax payments
   - Asks information about taxpayer burden (time, money) for making estimated tax payments, as well as barriers to compliance
Outreach Study: Treatments

1. Baseline
   - Sample of 60,000 taxpayers who were assessed an estimated tax penalty in TY 2017 and made fewer than four estimated payments in TY18, segmented by making any payments

2. Monthly option
   - Treatments include three waves of reminder letters around the last three quarterly estimated tax deadlines

3. Avoid a penalty
   - TBA

4. Avoid a balance due
   - TBA
Estimated Tax Burden Survey

Sections:

• Types of household income
• Awareness of timing of tax payments for different income types
• Frequency of estimated tax payments
• Process of making estimated tax payments
• Time and money spent to make estimated tax payments
• Penalties
• Recordkeeping
• Tax planning and attitudes to taxes
• Self-employment
• Customer service feedback
Appendices available upon request
9th Annual IRS/TPC Joint Research Conference on Tax Administration

#LiveAtUrban
The Effect of Audit Burden on Subsequent Tax Evasion

Amy M. Hageman, PhD
Ethan LaMothe
Mary E. Marshall, PhD

Kansas State University
University of South Carolina
Louisiana Tech University
Background

▶ Traditional models account for audits by incorporating the expected value of the costs of being caught against possible gains.

▶ Anecdotally, people seem to hate the idea of being audited even if they are completely compliant – but why?
Purpose

- **Audit Burden**: the monetary and non-monetary expenditures associated with a tax audit which are not dependent on an individual’s chosen level of compliance.

- **Primary RQ**: How does audit burden influence subsequent compliance behavior?
  - Differences between compliers and evaders?
Summary of Findings

- The effect of audit burden depends on the behavior of the individual under audit on the audited tax return. High burden:
  - **Increases compliance** for those who **evaded** on their audited return
  - **Decreases compliance** for those who **complied** on their audited return

- An apology can help mitigate the negative effects of audit burden for compliers.
Research on Experiencing Audits

- Audits influence subsequent compliance, but not always in a consistent manner.
  - Sometimes audits **increase** compliance.
    - Experience makes the costs more salient.
  - Sometimes audits **decrease** compliance.
    - Misperception of chance
    - Loss repair
  - Sometimes **it depends** on situational factors.
    - Evaders vs compliers
Audit Burden

- Audit burden represents a real expenditure of time, resources, stress, etc. and may be viewed similarly to evasion penalties.

- Mental accounting suggests the way an expenditure is perceived depends on whether there is an associated benefit.
  - Framed as a loss if no benefit is received.
  - Framed as a cost if a benefit is received.
Hypotheses 1 and 2

- **Evaders:**
  - Burden is an additional cost of noncompliance
  - Reinforces the effects of other penalties
  - H1: ↑Burden → ↑Compliance for evaders

- **Compliers**
  - Burden is an undeserved loss
  - Perceived loss triggers loss repair
  - H2: ↑Burden → ↓Compliance for compliers
Experiment 1 – Overview

- 2x2 multi round experiment
  - Compliance on audited return (measured)
  - Audit burden (manipulated – stratified)

- 172 participants recruited from Mturk
  - US resident/citizen, >24 years old, 3 years or more of tax return filing experience

- DV: change in income reported
Experiment 1 – Audit Burden

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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## Experiment 1 – Results

### Panel B. ANOVA Table

<table>
<thead>
<tr>
<th>Source</th>
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<th>F-statistic</th>
<th>p-value</th>
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</table>
Experiment 1 – Results

Change in Income Reported

No Audit Burden  High Audit Burden

Compliers  Evaders
Experiment 1 – Results

$p = 0.004$

$2,307$
Experiment 1 – Results

Change in Income Reported

-3000 -2000 -1000 0 1000 2000

No Audit Burden  High Audit Burden

Compliers  Evaders

-$1,342  p = 0.040
Results

Change in Income Reported

-3000  -2000  -1000  0  1000  2000

No Audit Burden          High Audit Burden

- $178
p = 0.749

Compliers    Evaders
Hypothesis 3

- Given the negative effect of high burden audits on compliers, can an intervention reduce the effect of the perceived loss?
  - **Acknowledgment of burden** – service oriented procedure to increase compliance.
  - **H3**: Individuals who did NOT evade on an audited tax return, but were subjected to a burdensome audit, are less likely to decrease the amount of income they subsequently report (i.e., evade less) when the taxing authority apologizes for the undue audit.
Experiment 2 – Overview

- Structurally identical to experiment 1

- Half of the compliers view an apology:
  - “Thank you for properly reporting all of your income. We sincerely apologize for any inconvenience due to your audit. Unfortunately, audits are necessary to ensure other taxpayers don’t cheat. Again, thank you for your truthfulness.”
Experiment 2 – Results (Replication)

Panel B. ANOVA Table

<table>
<thead>
<tr>
<th>Source</th>
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<th>Mean Square</th>
<th>F-statistic</th>
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</table>
Experiment 2 – Results (Replication)

- Change in Income Reported

- No Audit Burden
- High Audit Burden

- Compliers
- Evaders
Experiment 2 – Results (Primary)

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
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<th>F-statistic</th>
<th>p-value</th>
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</table>
Experiment 2 – Results (Primary)

Change in Income Reported

No Audit Burden  High Audit Burden

- No Apology  - Apology
Experiment 2 – Results (Primary)

Change in Income Reported

<table>
<thead>
<tr>
<th>No Audit Burden</th>
<th>High Audit Burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Apology</td>
<td>Apology</td>
</tr>
</tbody>
</table>

- $983
  - $p = 0.068
Experiment 2 – Results (Primary)

Change in Income Reported

No Audit Burden | High Audit Burden
--- | ---
No Apology | Apology

$1,043$

$p = 0.107$
Conclusion

- Contribution
  - Literature on effects of being audited
  - Informative to tax authorities
  - Provides insights into cost-loss framing in contexts involving compulsory (as compared to voluntary) expenditures of resources
Thank You!
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#LiveAtUrban
Using a Graph Database to Analyze the IRS Databank

Ririko Horvath and Rahul Tikekar
Research, Applied Analytics and Statistics (RAAS)
Internal Revenue Service
Background: IRS Databank

- Subset of the Compliance Data Warehouse (CDW)
- Large dataset starting from 1996
  - Currently administered by Raj Chetty and John Friedman
- Tracks over 200 attributes relating to a taxpayer
  - SSN, Spouse(s), Dependent(s), Wages, etc.
- Provides a detailed picture of the American taxpayer; longitudinal in nature:
  - Taxpayer linked to dependents; dependents linked to their dependents, etc.
  - Unique opportunity to analyze taxpayer behavior
Motivation

• Conceptually the databank is arranged in a longitudinal manner
• Implementation: databank is stored as a relational database
  • Data is stored in tables (Sybase, Oracle, MySQL, etc.)
  • Need SQL to extract data
• Using a relational database for longitudinal data is neither efficient nor intuitive
  • Must use recursive SQL to “connect” taxpayers to their dependents
  • Like trying to find the manager of each employee
• Relational databases are good for transactional data
  • Retail stores
Graphs

• No, not these
Graphs and Graph Databases

• Table is the basic unit of a Relational Database

• Graph is the basic unit of a Graph Database (nodes and links)

• More natural to visualize, model, and query

• From tax administration perspective, rather than just a snapshot of a taxpayer’s situation for a given year, the graph database can show changes in a taxpayer’s situations over a span of many years

From neo4j.com
Why Graph Database, and When?

- Highlight links and relationships; stores properties for nodes and links
  - Person: name, age, income, etc.
  - Follows: from
- Very useful for highly connected data (deep vs bushy)
- Very efficient when following links
  - Join operation in relational databases is very expensive and time consuming
- Graph-based analytics (shortest path, connectedness, centrality, recommender systems, etc.) are becoming popular
- Generally not useful when data is changing frequently
  - Transactional databases
Databank as a Graph Database

• A simplified model
DEMO
**Scenario 1: Taxpayer claims grandchild as dependent**

1996 - Mr. Day is married and living in LA. He claims his daughter as dependent. Mr. Day’s income is in fourth quantile.

2008 – Mr. Day’s daughter becomes independent and moves to Texas. She has a baby. Her income is in first quantile.

2014 - Mr. Day claims his grandchild as a dependent.

2014 - Mr. Day’s daughter no longer capable of providing for her child, she moves back to LA to live with her parents.
Scenario 2: A dependent claimed by two taxpayers

1996 – Mr. and Mrs. Fox living in NY with one child. His income was in fifth percentile.

2008 – Due to the recession, Mr. Fox is forced to accept a lower paying job. His wife divorces him and becomes a primary taxpayer living in NY.

2008 – Both Mr. Fox and ex Mrs. Fox claim their child on the tax return.

2014 – Mr. Fox remarries to a younger wife.

2014 – Ex Mrs. Fox remains single and continues to claim her child as a dependent.
Scenario 3: Taxpayer claiming parent as dependent

1996 – Mr. May Sr. living alone independently in Illinois

1996 – Mr. May Jr married with two children was living in in Illinois

2008 – Mr. May Sr age 67, loses his job with no saving

2008 – Mr. May Jr claims his father as dependent

2014 – Mr. May Sr passes away

2014 – Mr. May Jr drops his father as a dependent
Scenario 4: Spouse claimed by two taxpayers
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Discussant Comments: Understanding the Drivers of Taxpayer Behavior

Brian Erard
Key elements in empirical research

- Selection and compilation of data
- Exploratory data analysis
- Hypothesis generation and testing
Ririko and Rahul: graph databases

- Flat data file example: TCMP
  - All data fields recorded for all individual income taxpayers
    - Blank or missing value code for irrelevant or missing information

- Advantages
  - Conceptually easy to understand
  - Requires relatively little skill/training to use
  - Easy to run tabulations and empirical analysis

- Disadvantages
  - Inefficient use of space
  - Most suitable for stand-alone applications
Relational databases

**Example:** NRP
- A collection of separate tables for different forms/schedules and for various exam results
- Tables linked using a key (case id number)

**Advantages**
- Relatively easy and fast to do ad hoc queries of various kinds
- More efficient data storage
  - Scalable

**Disadvantages**
- Requires a bit more skill/knowledge to use
Graph databases

- **Advantages**
  - Organized in a more natural way for understanding relationships
  - Only need to touch/load information that is directly related to one’s query
    - Simplifies analysis of relationships that would require many “joins” to achieve using a relational database
  - Can perform real-time updates while supporting queries

- **Disadvantages**
  - Users already familiar with SQL need training to learn new database programming language
  - Requires investment to transform relational database into graph database
  - There are some applications/queries that are better suited for a relational database
Examples where graph database is/is not more convenient

- **No clear advantage**
  - Comparing future reporting behavior of individual taxpayers who were and were not audited in a given tax year.
  - Identifying individual income taxpayers who received an understatement penalty in one year and related information on whether they also received an understatement penalty in subsequent years.

- **Advantage**
  - Investigating whether an audit of a taxpayer has spillover effects on other individuals in the same “network” or on other types of tax reports by the same taxpayer.
  - Identifying shell corporations that have similar or identical addresses or contact numbers, share one or more directors, and have been created or administered from the same set of IP addresses.
Reaction

- Graph databases are certainly better suited for some types of analysis that a tax administration may want to undertake
  - IRS and some other tax administrations have experience using graph databases for certain specific initiatives
- At the same time, developing a graph database version of the IRS Databank and training users requires an investment of resources and time
- It would be helpful to identify some likely use cases to help evaluate whether such an investment makes sense
Janet’s presentation on underpayment

- Withholding is hard to get right
  - Deductions that depend on factors such as family size, medical expense, family income, home ownership
  - Graduated rate structure
  - Refundable credits and other offsets
- Tax reform created new complications
Asymmetric treatment

- No interest from government when over-withheld
- But may owe penalty if under-withheld
- Rationally, one should avoid being over-withheld
  - However, many taxpayers seem to like getting a refund – they seem to frame this as a gain rather than a loss
Challenges for non-withheld

- Self-employed and other non-withheld taxpayers
  - Required to make quarterly estimated tax payments
    - Curiously, the “quarters” are in April, June, Sept., and Jan.
  - It can be difficult to predict earnings for coming year
  - Income flows tend to vary from one quarter to next
  - Some solace from being able to prepay 100%/110% of last year’s tax liability over coming year

- Special rules for farmers and fisherman
  - Should explore if this is good or bad policy
Reasons for receiving penalty

- Unintentional mistake
  - Poor understanding of requirements
  - Poor record-keeping, lack of attention
- Unexpected financial shortfall
- Estimated tax penalty may not be very salient to higher income taxpayers
- May be a consequence of decision not to file
- Rational borrowing behavior
  - “IRS as loan shark”: 6% seems like a great loan rate for many taxpayers
Possible consequences of being under-withheld

- May postpone filing (with or without an extension)
- May be more inclined to understate tax liability when one does file
- May have difficulty paying full balance at filing time
- Since first estimated tax payment for current tax year is due on same date that balance is due for prior tax year (April 15), this may perpetuate cycle of under-withholding
Ongoing and future research directions

- Collection notice redesigns have shown some promise, so reminder letters pilot seems sensible
- Other research questions
  - Can the withholding system better facilitate compliance among households with both withheld and non-withheld income sources?
  - Are quarterly payments the best frequency?
  - Is the current penalty rate optimal?
Ethan’s presentation on audits

- Focus is on specific deterrence
  - Impact of a tax audit on future reporting behavior
- Proposes that the impact of an audit is different for compliant and noncompliant taxpayers
- Hypothesizes that the size of the audit impact increases with the level of audit burden
- Explores whether a simple apology to compliant taxpayers can neutralize the counter-deterrent effect of an audit
Existing evidence on audit impact by compliance status

- Cheaters seem to become more compliant following an audit, while compliers tend to become cheaters (Gemmell and Ratto, 2012; Beer et al., 2019)
Rational actor explanation of specific-deterrent effect of an audit

• An audit is a learning experience that may lead to:
  • Change in perceived probability \((p)\) or penalty rate \((\theta)\)
  • Resolution of uncertainty about:
    • True tax liability
    • Tax agency’s capacity to uncover and punish evasion

• When audits go back several years, increased cheating following an audit might be a rational response
Theoretical insights from psychology and behavioral economics

- Changes in perceived risk of audit and penalty
  - Greater salience of audit costs (availability-heuristic effect)
  - Gambler’s fallacy
- Loss-repair (motivation to recoup financial loss)
- Change in tax morale
  - Audit of a compliant taxpayer may “crowd-out” tax morale
  - Fair and respectful behavior during audit may enhance tax morale
Experiment focuses on impact of audit burden on future compliance

- Compares behavior of those receiving high-burden audit to those receiving no-burden audit
- Relative to a low-burden audit, a high burden audit is found to:
  - Drive cheaters to become more compliant
  - Drive compliers to become less compliant
- An apology to audited compliers
  - Mitigates cheating effect a little for high-burden audits
    - Underreport by 1,212 in next period instead of 1,608
  - Exacerbates cheating effect substantially for no-burden audits
    - Underreport by 2,245 in next period instead of 625
Observations

- Study shows audit burden may be related to audit impact
- Puzzling that apology seems to have “backfired” for compliant taxpayers with a no-burden audit; also, it only slightly improved compliance in the case of high-burden audits
- It would be useful to isolate the absolute impact of an audit on reporting behavior, not just differential impact of no-burden and high-burden audits
- It would have been helpful to extend the experiment for a few more rounds to see if specific deterrent effects taper off over time
- Some questions about external validity
Session 4. Understanding the Drivers of Taxpayer Behavior

Moderator: Melissa Vigil
IRS, RAAS

Underpayment of Estimated Tax: Understanding the Penalized Taxpayer Population
Janet Li
IRS, RAAS

The Effect of Audit Burden on Subsequent Tax Evasion
Ethan LaMothe
University of South Carolina

Using a Graph Database to Analyze the IRS Databank
Rahul Tikekar
IRS, RAAS

Discussant: Brian Erard
Brian Erard & Associates
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Wrap-Up

Eric Toder
Codirector, Urban-Brookings Tax Policy Center
9th Annual IRS/TPC Joint Research Conference on Tax Administration

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