New Research on Tax Administration: An IRS-TPC Conference

Papers Given at the
2012 IRS-Tax Policy Center Research Conference

Held at the Urban Institute
Washington, DC
June 21, 2012

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Foreword

This edition of the *IRS Research Bulletin* (Publication 1500) features selected papers from the IRS-Tax Policy Center (TPC) Research Conference "New Research on Tax Administration," held at the Urban Institute in Washington, DC, on June 21, 2012. Conference presenters and attendees included researchers from all areas of the IRS, officials from other government agencies, and academic and private sector experts on tax policy, tax administration, and tax compliance. This year's conference was a joint effort with the nonpartisan Tax Policy Center. More people could participate because the TPC broadcast video of the proceedings live over the Internet and the videos were archived on their Web site. Online viewers participated in the discussions by submitting questions via e-mail as the sessions proceeded.

The conference began with welcoming remarks by Eric Toder, Co-Director of the Tax Policy Center and by Rosemary Marcuss, the IRS Director of Research, Analysis, and Statistics. The remainder of the conference included sessions on understanding the taxpayer experience, measuring the tax gap, understanding individual tax compliance behavior, and the tax implications of business complexity. The lunchtime keynote address was by former IRS Commissioner Fred Goldberg. He noted the importance of research on tax administration issues and the role this should play in the tax policy debates.

We trust that this volume will enable IRS executives, managers, employees, stakeholders, and tax administrators elsewhere to stay abreast of the latest trends and research findings affecting Federal tax administration. We also hope that the research featured here will stimulate improved tax administration and additional helpful research.

Acknowledgments

The IRS Research Conference was the result of substantial effort and preparation over a number of months by many people. The conference program was assembled by a committee representing research organizations throughout the IRS. Members of the program committee included: Alan Plumley, John Guyton, Taukir Hussain, Ahmad Qadri, Rahul Tikekar, Cheryl Wagner, and Leann Weyl (National Headquarters Office of Research); Kevin Hankton (Office of Program Evaluation and Risk Analysis); Barry Johnson (Statistics of Income); Clay Swanson (Small Business and Self-Employed); Shannah Lineberger (Tax Exempt and Government Entities); Tiffanie Reker and Howard Rasey (Wage and Investment); Fran Cappelletti (Taxpayer Advocate); Davy Leighton (Criminal Investigation); Charles Boynton (Large and Midsize Business); and Elaine Maag (Tax Policy Center). In addition, Blake Greene from the Tax Policy Center oversaw numerous details to ensure that the conference ran smoothly.

This volume was prepared by Paul Bastuscheck, Lisa Smith, and Camille Swick (layout and graphics) and Beth Kilss and Georgette Walsh (editors), all of the Statistics of Income Division. The authors of the papers are responsible for their content, and views expressed in these papers do not necessarily represent the views of the Department of the Treasury or the Internal Revenue Service.

We appreciate the contributions of everyone who helped make this conference a success.

Janice M. Hedemann
Director, National Headquarters Office of Research
Chair, 2012 IRS-TPC Research Conference

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Taxpayer Compliance Costs for Corporations and Partnerships: A New Look

George Contos, John Guyton, and Patrick Langetieg, IRS Office of Research,
and Allen H. Lerman and Susan Nelson, Department of the Treasury, Office of Tax Analysis[1]

The estimates of income tax compliance costs of corporations and partnerships are intended to reflect the out-of-pocket costs and the time—often expressed as the monetized value of time—incurred in order to comply with their Federal income tax obligation, up to and including the filing of their income tax returns. This paper presents the preliminary results of new research by the Internal Revenue Service (IRS) and the Treasury Department's Office of Tax Analysis that updates and improves the estimates of total Tax Year 2009 compliance costs for corporations and partnerships. In addition, the new estimates reflect a more comprehensive measure of compliance costs.

There are three main objectives of IRS compliance cost research. The first is to gain insights into what determines compliance costs and how changes in the macro-economy, the tax laws, and tax administration interact to affect those costs. The second is to improve our knowledge about the costs of information that is needed to support tax administration and how those costs may affect taxpayer behavior. The third objective is to provide statutorily required information: information for Congress through the Office of Management and Budget's Information Collection Budget and information for taxpayers (provided in tax return instructions) about their average estimated compliance costs.

This paper first summarizes the old methodology used to estimate taxpayers' compliance costs, then describes the new estimation methods and presents the new compliance cost estimates (both the results of survey data weighted to population totals and results based on econometric models constructed from the survey data). Finally, the paper compares the new and previous estimates.

Existing IRS Estimation Method for Corporations and Partnerships

For many years, IRS estimated the compliance costs of corporations and partnerships—indeed for all businesses—using a methodology developed for the IRS by Arthur D. Little, Inc. (ADL) based on average time burden estimated from a survey of corporations and partnerships conducted in 1984.[2] For each type of taxpayer, the ADL methodology provides a set of burden equations, one for each of several major taxpayer paperwork activities. Each equation, resulting from regression analysis of the 1984 taxpayer surveys, depends on the basic characteristics of the forms and instructions, form and form line usage by taxpayers, and characteristics of the taxpayer populations using the forms. These equations are applied to each tax form or tax schedule used by taxpayers to produce an average time for each use of that form or schedule. That time is assumed to be the same for each use of the form or schedule regardless of how many lines the taxpayer actually uses. The ADL taxpayer models predict average compliance costs by type of activity (e.g. recordkeeping, learning about the law, etc.) and by preparation method (paid professional vs. self-prepared). At the time of the survey, there was only very limited electronic return preparation, and there was no electronic filing of tax returns. An estimate of the total time for a specific form is produced by multiplying the average time for that form by the number of taxpayers filing the form.

The ADL methodology has a number of limitations. First, it is outdated, being based on taxpayer behavior and business structures of nearly 30 years ago. A lot has changed in the tax preparation environment since the 1984 business taxpayer survey. Business taxpayers have increasingly outsourced many of their pre-filing and filing activities. In Tax Year 2009, approximately 89 percent of all business returns were prepared by a paid professional. Second, the ADL methodology ignores technology. Its estimates are independent of the preparation and submission methods. Today, both paid professionals and taxpayers use software for the majority of

the pre-filing and filing activities. More than 90 percent of all business returns in Tax Year 2009 were prepared using tax preparation software. Third, the ADL methodology provides estimates only of time expended, combining taxpayer and preparer time in lieu of a separate estimate of out-of-pocket costs including the cost of hiring outside professionals. Finally, its estimates of average time expended provide little information on the differences of time incurred across filling populations whose size and other characteristics may vary greatly. It does not differentiate time expended based on the underlying recordkeeping, accounting, etc., that is required to develop the information to be entered on the tax form. Generally, this means that the averages overstate the time required for smaller businesses and understate the time required for larger businesses.

New Business Taxpayer Compliance Cost Modeling Approach

For the past 14 years the IRS and the Treasury Department have been developing new methodologies to estimate compliance costs to replace the ADL methodology. The new methodologies rely on surveys that measure time and out-of-pocket costs that taxpayers spend on pre-filing and filing activities. The methodologies establish econometric relationships between taxpayer and tax return characteristics and compliance costs. The results control for the substitution of time and money by monetizing time and reporting total compliance costs in dollars. The new methodologies are based on the activities performed by the taxpayer rather than the actual forms and schedules used. In a world of electronic tax preparation, time and out-of-pocket costs are governed by the information required rather than the form on which it is ultimately reported. Even where the same tax form lines must be used, the new method differentiates the cost based on the characteristics and size of the business. The micro-simulation models developed from the combination of survey results and linked tax returns can be used for forecasting and simulation of changes in the underlying tax law, IRS administrative procedures, and taxpayer behavior.

Since 2006, IRS has deployed the Small Business Burden Model (SBBM) to estimate compliance costs for corporations and partnerships with end-of-year assets of less than $10 million. It is driven by compliance cost estimates based on a survey of Tax Year 2004 small business taxpayers.[3] The SBBM complements the IRS Individual Taxpayer Burden Model (ITBM) in use since 2003, which now uses Tax Year 2010 survey data. The ITBM and SBBM models cover only the pre-filing and filing activities (such as tax-related recordkeeping and planning) that would not have occurred without a Federal tax system and also exclude psychological costs and deadweight losses from economic behavior changes.[4] Incremental compliance costs from state and local income taxes are also excluded from these estimates.

Tax Year 2009 Business Compliance Cost Survey

In 2010, the IRS commissioned a second business taxpayer compliance cost survey. This survey covered corporations and partnerships of all sizes that filed income tax returns for Calendar or Fiscal Year 2009. The 2009 survey collected information on both the time and out-of-pocket costs that corporations and partnerships spent on pre-filing and filing activities in response to their Federal tax obligations. As with the 2004 survey, the intention was to exclude baseline business activities such as recordkeeping and financial planning that would have been performed even without a tax system, as well as the incremental costs associated with other taxes beyond those incurred for the Federal income tax.

The survey's target population was all corporations and partnerships that filed Federal income tax returns by the end of December 2011 for Tax Year 2009.[5] The statistically valid survey sample of over 22,000 business entities was divided into twenty-four strata based on data from the Tax Year 2004 Small Business Burden Survey.[6] The strata were based on four factors: organizational type; size (assets or receipts); industrial sector of the business; and use of a paid professional. A Neyman allocation method was used to maximize the survey's precision given the fixed sample size.[7]

In an effort to minimize the effects of memory decay, the sampling was conducted and the survey was administered in five waves over the course of approximately 21 months, from July 2010 to April 2012. The multiple waves allowed for surveys to be mailed as close as feasible to the filing of the return.[8] The long fielding period was needed to accommodate fiscal year tax periods and tax return filing extensions beyond the normal filing dates. Approximately 11 percent of all C corporations had non-calendar year filing periods (fiscal years),

and many corporations and partnerships, including some of the largest, request six-month filing extensions. Because of the non-Calendar Fiscal Years and filing extensions, Tax Year 2009 returns could be filed as late as December 2011.[9]

The survey instrument was subjected to two rounds of extensive pretesting to ensure that the requested information accurately captured the costs, both in time and in dollars, associated with Federal tax obligations. Since respondents of the final survey could complete it on paper, on the web, or by telephone, all three versions of the survey went through successive rounds of testing, by both the contracted survey administrator and the IRS.

After the IRS drew the sample for each wave, the survey administrator reviewed and standardized the business name and address information for various anomalies (e.g. obvious misspellings, missing zip code, etc). The vendor then located the telephone numbers associated with the business' name and address. Under the assumption that directing the survey to the most knowledgeable respondent is more challenging for medium and large businesses, a pre-screening effort was implemented in order to identify the specific individual to whom the survey should be addressed.

The data collection protocol included four successive contacts. The first mailing included an IRS endorsement letter, a letter from the vendor, and a survey questionnaire booklet. The respondents had the option of taking the survey on the web, completing the survey in the booklet and returning it by mail, or contacting the survey vendor to arrange for the survey to be conducted by telephone. The second mailing was a reminder/thank-you postcard. The third contact was a follow-up telephone call to nonrespondents. The fourth contact was a final reminder postcard to nonrespondents. All contacts included instructions on how to take the survey on the web. The overall response rate for the survey was 31.5 percent.[10]

The response rate was higher for medium and large businesses than for small businesses. Specifically, the response rate for small businesses (those with end-of-year assets less than $10 million) was 31.1 percent; for medium businesses (those with end-of-year assets between $10 million and $500 million) 35.6 percent; and for large businesses 34.1 percent. Approximately 57 percent of all responses were completed on the web. Fewer than 45 taxpayers (0.2 percent) completed the survey on the phone, with the remaining surveys (43 percent) being completed in the paper survey questionnaire and returned by mail. The final survey dataset was delivered to the IRS in May, 2012.

Due to widely varying response rates across the strata, there is a potential for nonresponse bias. The IRS controlled for nonresponse bias by adjusting the sample weights.[11] The sample weights were adjusted to meet control totals for the following variables: total assets; processing year; existence of deductions or inventory; sector code; stratum; and large firm indicator. The control totals by entity type and asset size are shown in Table 1. The survey responses were then associated with the taxpayers' corresponding income tax returns[12] for Tax Year 2009 and adjusted for outliers.[13]

TABLE 1. Number of Corporations and Partnerships, Tax Year 2009

By Size of Assets

Total Assets ($ in millions)	Number of Entities (in thousands)			
	C corporations	S corporations	Partnerships	Total
$0 to $0.10	1,081.8	2,763.7	1,587.1	5,432.6
$0.10 to $1	592.9	1,196.9	1,039.5	2,829.3
$1 to $10	158.4	280.3	580.2	1,018.8
$10 to $500	31.7	39.0	106.9	177.6
$500 or more	3.8	0.0	2.2	6.0
All Asset Sizes	**1,868.6**	**4,279.8**	**3,315.9**	**9,464.3**

NOTE: Includes all active corporations and partnerships filing returns with accounting periods ending between July 2009 and June 2010.

In order to combine the time and out-of-pocket costs from the survey into a single estimate of compliance costs in dollars, the time estimates must be monetized. The monetization method may have a large impact on the final results. Whereas previous studies have typically used a constant dollars-per-hour rate for monetizing

time for all taxpayers, we use a variable hourly rate based on the size of assets and sales (turnover or total receipts). The variable rate methodology reflects the different opportunity costs of the time spent by firm owners and employees on federal income tax related activities according to the size of the business. This is consistent with evidence that larger firms tend to pay higher wages and with a more realistic approach than assigning the same opportunity cost to businesses of all sizes.[14]

While variable monetization is clearly preferable to a constant rate, there are many possible variable monetization methods. To avoid zero or unreasonably small opportunity costs, we limited the variable rate at the low end (for firms with zero assets and total receipts) to $8.00 per hour, which is the minimum wage plus the employer's share of associated payroll taxes. At the upper end (for firms with assets over $5 million or total receipts over $2.5 million), the variable rate is capped at $90 per hour, which is the 90th percentile of the pay rate for accountants.[15] The upper end cap ensures that the monetization rate does not exceed the fees charged by professionals for these activities. The rates between the two limits are set according to a simple negative parabolic function. The function produces monetization rates that rise faster at lower levels of assets and receipts until they reach the maximum monetization rate of $90 per hour. The function's parameters were selected so as to produce reasonable monetization rates across all levels of assets and receipts.

We believe this monetization method is clearly preferable to using a constant monetization rate, and it yields reasonable results. Nevertheless, since more than 60 percent of the total monetized compliance costs result from monetizing time, the monetization assumptions have an important impact on the size of the estimates of total monetized compliance costs. Since there are a virtually unlimited number of monetization approaches and parameters, we recognize that sensitivity analysis and further exploration of different approaches are important areas for future research.

Table 2 shows the average monetization rates for corporations and partnerships by asset size that result from our assumptions and methodology. The average rates vary considerably by organizational form and asset size, from $14.27 per hour for partnerships with total assets under $100,000 to $90 per hour for businesses with total assets of $10 million or more. As intended, the variable rate methodology reflects different opportunity costs faced by the business population. The overall average monetization rate is $28.73 per hour.

TABLE 2. Average Monetization Rates Using a Variable Monetization Rate, Tax Year 2009

By Size of Assets

Total Assets ($ in millions)	Average Monetization Rates (in $ per hour)			
	C corporations	S corporations	Partnerships	All
$0 to $0.10	$16.71	$16.28	$14.27	$15.78
$0.10 to $1	$33.50	$34.50	$26.38	$31.38
$1 to $10	$71.78	$72.45	$67.77	$69.65
$10 to $500	$90.00	$90.00	$90.00	$90.00
$500 or more	$90.00	$90.00	$90.00	$90.00
All Asset Sizes	**$29.79**	**$25.94**	**$31.77**	**$28.73**

Applying these variable monetization rates to the Tax Year 2009 survey results, weighted to the population of tax returns shown in Table 1, produces estimated total compliance costs of $110 billion for corporations and partnerships filing Tax Year 2009 Forms 1120, 1120-S, and 1065.[16] Table 3 shows both the average and the aggregate monetized compliance costs for corporations and partnerships, classified by asset size, as developed directly from the survey.[17] Average compliance costs vary greatly by organizational form and, especially, by asset size. Compliance costs increase with size, but the percentage increase is less than the percentage increase in size. These results differ considerably from the cost estimates based on the previous ADL little method because the new method reflects the activities and costs of businesses—which differ substantially by the size and complexity of the business—rather than just the tax return form or schedule that the business filed at the close of the year.

TABLE 3. Income Tax Compliance Costs from New Survey, by Size of Assets, Using a Variable Monetization Rate, Tax Year 2009

By Size of Assets

Total Assets ($ in millions)	C corporations	S corporations	Partnerships	All
Panel A: Average Compliance Costs (in $)				
$0 to $0.10	$4,600	$4,400	$4,300	$4,400
$0.10 to $1	$13,700	$14,000	$10,700	$12,700
$1 to $10	$37,600	$31,000	$29,300	$31,100
$10 to $500	$98,400	$82,100	$85,900	$87,300
$500 or more	$611,600	NA	$225,000	$471,000
All Asset Sizes	**$13,100**	**$9,600**	**$13,400**	**$11,600**
Panel B: Total Compliance Costs (in $ billions)				
$0 to $0.10	$5.0	$12.2	$6.8	$23.9
$0.10 to $1	$8.1	$16.8	$11.1	$36.0
$1 to $10	$6.0	$8.7	$17.0	$31.7
$10 to $500	$3.1	$3.2	$9.2	$15.5
$500 or more	$2.4	$0.0	$0.5	$2.8
All Asset Sizes	**$24.5**	**$40.9**	**$44.6**	**$110.0**

NOTE: Includes all active corporations and partnerships filing returns with accounting periods ending between July 2009 and June 2010.

Business Taxpayer Burden Modeling Approach

The survey results provide only a static estimate of business compliance costs in 2009. To answer questions about compliance costs in future years or under alternative tax structures or other changes that may affect compliance costs requires a method for producing dynamic estimates. To accomplish that, the survey data need to be used as inputs to a model of compliance costs that allows the simulation of various legal, administrative, technological, economic, and behavioral changes.

The modeling approach adopted for the Business Taxpayer Burden Model (BTBM) reflects the objectives and approach developed several years ago for the Small Business Burden Model (SBBM). The primary objective of the SBBM is to be able to estimate and understand corporation and partnership compliance costs. To do so, IRS developed an econometric model using both the survey data and tax return data. The model needed to be easily adaptable to changes in the tax system and to changes in the structure and level of economic activity. Finally, the SBBM needed to be able to be adapted to, and integrated with, the compliance burden models for other taxpayer populations, such as large and medium-size businesses and tax exempt entities. The econometric model developed for the BTBM is an extension of the SBBM and of prior compliance burden modeling of large and mid-size businesses by Slemrod and Venkatesh (2002).

Economic Model

In modeling the compliance burden for businesses, an underlying assumption is that business entities select the combination of capital and labor that allows them to respond fully to the requirements of the U.S. federal tax system with the minimum amount of compliance costs.[18] While this assumption may not hold true for all firms all the time, we believe that for-profit entities generally adopt a compliance process that minimizes costs. For example, small and young entities with limited resources tend to handle more pre-filing and filing activities in-house. The owners often maintain the financial books and other business records, and substantially perform tax preparation activities such as reviewing the tax rules, preparing tax records, completing, and submitting all tax forms. As firms grow, they have more and a wider variety of business transactions, and the business owners face higher opportunity costs on the time spent dealing with payroll, recordkeeping, and other paperwork. Consequently, they are more likely to invest in recordkeeping software, hire recordkeeping

staff, employ paid professionals for business activities, such as payroll, or use a combination of methods. The improved infrastructure leads to relatively less time expended on the tax-related activities, though substituting out-of-pocket costs for time. In addition, compliance costs tend to be mitigated as a firm's management becomes more familiar with the federal tax system and its requirements; otherwise it hires paid tax preparers.

The SBBM was used to test the hypothesis that business compliance costs increase at a decreasing rate with the size of the business. Contos et al. (2009) presented evidence that this is indeed the case.[19] The BTBM described below will also be used to further measure these effects in a model covering corporations and partnerships of all sizes.

The Business Taxpayer Burden Model

As discussed above, we use a model based on Slemrod and Venkatesh (2002) and Contos *et al.* (2009). The dependent variable is the logarithm of total monetized compliance costs. Independent variables include the logarithms of total assets, total receipts, the logarithms of the sum of dollars reported for line items requiring either very little or conversely significant tax-specific recordkeeping,[20] and dummy variables for organizational form, industry, and use of a paid tax return preparer. Controlling for both assets and total receipts provides a better fit across a range of types and sizes of businesses. Dummy variables were used for cases where either assets or receipts were not reported.

Table 4 shows the results of the robust ordinary least squares (OLS) regression of the complete business econometric model. The estimated coefficient for logarithm of total assets is (as expected) positive, 0.188, and significant at the 1 percent level. The same is true for the No Assets coefficient, 1.649. The estimated coefficient for logarithm of total receipts is also positive, 0.139, and significant at the 1 percent level. The same is true for the No Receipts coefficient, 1.564. The coefficient for high complexity, 0.100, is positive and statistically significant at the 1 percent level. The fact that the coefficient is positive suggests that increases in the volume of high complexity activity will increase total burden, controlling for other drivers of burden. The coefficient for low complexity, while insignificant, is lower than the coefficient for high complexity, with a coefficient of 0.005. The coefficients for the remaining variables are generally in line with our expectations.

TABLE 4. Business Survey Regression Results

Variable	Burden Coefficients	
	Estimate	T-statistic
Intercept	**4.057**	6.91
Ln (Total Assets)	**0.188**	17.22
No Assets Indicator	**1.649**	12.24
Ln (Total Receipts)	**0.139**	8.17
No Receipts Indicator	**1.564**	7.16
Low Complexity	0.005	0.64
High Complexity	**0.100**	5.94
No Complexity	**0.787**	3.06
Partnership Indicator	0.067	0.96
S Corporation Indicator	-0.013	-0.21
Self-Prepared Indicator	**-0.276**	-3.30
Positive Tax Liability	0.080	0.89
Industry Controls	YES	—

NOTE: Coefficients in bold are statistically significant at the one percent level.

Compliance Burden

Before reporting compliance cost results from the BTBM, this section presents burden estimates using the older ADL methodology. The tables based on ADL methodology provide a basis for showing how the new methodology changes the estimates of compliance costs.

Estimates for both models are produced by applying the model coefficients to the Statistics of Income (SOI) corporation and partnership files. There are technical and practical reasons for basing the model on the SOI samples, rather than the entire database of tax returns filed, which consist of all returns of active corporations and partnerships organized for profit that were required to file one of the 1120 or 1065 forms for Tax Year 2009. The SOI sample excludes duplicate returns from the same entity that are in the database of tax returns filed and excludes returns of inactive entities. As such, the number of filers included in the SOI files is lower than the number of filers included in the IRS Business Master File that was used for the sample selection of the survey.[21] Thus, basing a model on the IRS Business Master File would overstate compliance costs (due to double-counting burden associated with duplicate tax returns) whereas basing the model on the SOI database understates compliance costs because it excludes the costs of inactive entities. Fortunately, the number of returns differs by only a few percent between the two datasets, and it seems reasonable to assume that inactive entities are smaller than average. Thus, the difference in costs based on the two datasets is probably five percent or less. Future research will attempt to prepare a database that includes all non-duplicate entities.

The number corporations and partnerships included in the SOI database for Tax Year 2009 is shown in Table 5.

TABLE 5. Number of Corporations and Partnerships, Tax Year 2009
By Size of Assets

Total Assets ($ in millions)	Number of Entities (in thousands)			
	C corporations	S corporations	Partnerships	Total
$0 to $0.10	923.3	2,648.4	1,468.5	5,040.2
$0.10 to $1	550.9	1,115.9	926.8	2,593.6
$1 to $10	178.5	293.8	645.0	1,117.4
$10 to $500	37.7	36.0	124.0	197.7
$500 or more	4.5	0.5	4.4	9.3
All Asset Sizes	**1,694.9**	**4,094.6**	**3,168.7**	**8,958.2**

NOTE: C corporations are entities filing Form 1120; S corporations are entities filing Form 1120S; and partnerships are entities filing Form 1065.
SOURCE: IRS Statistics of Income

Table 6 shows the results of applying the variable monetization rates described above to the SOI database using the ADL method of estimating burden. This results in an overall average compliance cost of $6,500 per entity and an aggregate compliance cost of $58.3 billion.

TABLE 6. Income Tax Compliance Costs from ADL Methodology, Using a Variable Monetization Rate, Tax Year 2009
By Size of Assets

Total Assets ($ in millions)	C corporations	S corporations	Partnerships	All	Share of Total
Panel A: Average Compliance Costs (in $)					
$0 to $0.10	$3,400	$3,100	$2,500	$3,000	
$0.10 to $1	$7,800	$7,200	$5,400	$6,700	
$1 to $10	$18,700	$16,200	$15,700	$16,300	
$10 to $500	$38,000	$31,200	$36,500	$35,800	
$500 or more	$44,800	$35,900	$37,200	$40,800	
All Asset Sizes	**$7,300**	**$5,400**	**$7,400**	**$6,500**	
Panel B: Total Compliance Costs (in $ billions)					
$0 to $0.10	$3.2	$8.3	$3.7	$15.2	26.1%
$0.10 to $1	$4.3	$8.0	$5.0	$17.3	29.7%
$1 to $10	$3.3	$4.8	$10.1	$18.2	31.2%
$10 to $500	$1.4	$1.2	$4.5	$7.1	12.2%
$500 or more	$0.2	$0.0	$0.3	$0.4	0.7%
All Asset Sizes	**$12.4**	**$22.3**	**$23.6**	**$58.3**	**100.0%**

NOTE: C corporations are entities filing Form 1120; S corporations are entities filing Form 1120S; and partnerships are entities filing Form 1065.

Table 7 shows the results of applying the ADL method to the same database but using a constant monetization rate of $28.73, which is the weighted average for all entities of the variable monetization methodology.[22] Using constant monetization yields an estimated average compliance cost of $5,800 and an estimated aggregate compliance cost of $51.8 billion.

TABLE 7. Income Tax Compliance Costs from ADL Methodology, Using a Constant Monetization Rate of $28.73, Tax Year 2009

by Size of Assets

Total Assets ($ in millions)	C corporations	S corporations	Partnerships	All
Panel A: Average Compliance Costs (in $)				
$0 to $0.10	$7,200	$6,800	$7,700	$7,100
$0.10 to $1	$11,400	$10,600	$11,100	$109,005
$1 to $10	$18,200	$16,300	$16,600	$16,800
$10 to $500	$43,700	$35,000	$36,900	$37,800
$500 or more	$175,100	$112,300	$132,500	$152,000
All Asset Sizes	**$11,000**	**$8,800**	**$11,800**	**$10,300**
Panel B: Total Compliance Costs ($ in billions)				
$0 to $0.10	$6.6	$18.1	$11.3	$36.1
$0.10 to $1	$6.3	$11.8	$10.3	$28.4
$1 to $10	$3.3	$4.8	$10.7	$18.8
$10 to $500	$1.6	$1.3	$4.6	$7.5
$500 or more	$0.8	$0.1	$0.6	$1.4
All Asset Sizes	**$18.6**	**$36.0**	**$37.5**	**$92.2**

NOTE: C corporations are entities filing Form 1120; S corporations are entities filing Form 1120S; and partnerships are entities filing Form 1065.

Comparing Tables 6 and 7 shows that switching to a fixed monetization rate lowers the estimate of total compliance costs under the ADL methodology by $6.5 billion, or 11 percent. The variable rate produces both a wider range and a steeper increase in average burden by size of business. With a constant monetization rate, average burden by organizational form and total assets ranges from $5,300 to $13,000 (a 2.5-to-1 ratio) whereas with a variable rate average burden ranges from $3,000 to $40,800 (greater than a 13-to-1 ratio). The use of a variable monetization rate changes the distribution of compliance costs among businesses of different sizes. Firms with total assets greater than $10 million bear a much larger share of total burden than estimated under the ADL method with constant rate monetization, 12.9 versus 4.8 percent of all compliance costs.

Next, we show compliance cost estimates from the BTBM. As discussed earlier, the BTBM uses current statistical techniques to develop an econometric model using the survey data and tax return data. Robust OLS regression results for the 2009 survey collections using the more realistic variable monetization method are presented in Table 8 by size of assets and in Table 9 by size of receipts. Results using the fixed monetization rate of $28.73 (which is the weighted average of the variable monetization rates) by size of assets are shown in Table 10.

Overall, regardless of which monetization method is chosen, using the same Tax Year 2009 population, the compliance cost estimates under the new model are much larger—nearly 80 percent larger—than under the ADL methodology. Using the variable monetization rate methodology, the compliance cost estimate from the new model is $104.1 billion. Using the constant rate monetization, the estimated compliance costs are $92.2 billion. It is important to stress that these differences result not from changes in behavior but simply from different methodologies applied to newer data about the time and out-of-pocket expenses incurred by taxpayers to comply with their federal income tax obligations.

Tables 8 and 10 show that switching to a variable monetization rate has a very similar, effect to that seen with the ADL methodology. Using a constant monetization rate lowers estimated compliance costs by $11.9

billion (11.4 percent) below the estimate based on the more realistic variable monetization rates. More importantly, the distribution of that burden by size of business shifts dramatically. The average burden by organizational form and total assets with constant monetization rates ranges from $7,100 to $152,000 (a 21-to-1 ratio). When the monetization rate is variable, the average burden ranges from $4,600 to $468,000 (a 102-to-1 ratio). Thus, a variable monetization rate increases the share of total burden borne by businesses with total assets greater than $10 million from 10 percent of total compliance costs to 19 percent.

TABLE 8. Income Tax Compliance Costs from BTBM, Using a Variable Monetization Rate, Tax Year 2009

By Size of Assets

Total Assets ($ in millions)	C corporations	S corporations	Partnerships	All
Panel A: Average Compliance Costs (in $)				
$0 to $0.10	$4,800	$4,400	$4,600	$4,600
$0.10 to $1	$14,000	$12,000	$11,300	$12,200
$1 to $10	$34,400	$27,800	$23,700	$26,500
$10 to $500	$112,400	$76,300	$68,600	$78,300
$500 or more	$630,000	$331,800	$316,800	$468,000
All Asset Sizes	**$14,900**	**$8,900**	**$13,400**	**$11,600**
Panel B: Total Compliance Costs ($ in billions)				
$0 to $0.10	$4.5	$11.9	$6.8	$23.1
$0.10 to $1	$7.7	$13.3	$10.5	$31.5
$1 to $10	$6.1	$8.2	$15.3	$29.6
$10 to $500	$4.2	$2.7	$8.5	$15.5
$500 or more	$2.8	$0.1	$1.4	$4.3
All Asset Sizes	**$25.3**	**$36.3**	**$42.5**	**$104.1**

NOTE: C corporations are entities filing Form 1120; S corporations are entities filing Form 1120S; and partnerships are entities filing Form 1065.

TABLE 9. Income Tax Compliance Costs from BTBM, Using a Variable Monetization Rate, Tax Year 2009

By Size of Receipts

Total Receipts ($ in millions)	C corporations	S corporations	Partnerships	All
Panel A: Average Compliance Costs (in $)				
$0 to $0.10	$4,700	$3,900	$6,700	$5,300
$0.10 to $1	$13,000	$9,800	$18,100	$12,500
$1 to $10	$35,700	$27,600	$43,500	$34,000
$10 to $500	$157,800	$89,800	$134,600	$128,200
$500 or more	$1,100,000	$504,000	$645,800	$925,400
All Receipt Sizes	**$15,000**	**$8,900**	**$13,400**	**$11,600**
Panel B: Total Compliance Costs ($ in billions)				
$0 to $0.10	$3.7	$7.9	$14.2	$25.9
$0.10 to $1	$8.8	$16.6	$14.9	$40.3
$1 to $10	$6.9	$9.6	$8.7	$25.1
$10 to $500	$4.2	$2.2	$4.3	$10.7
$500 or more	$1.7	$0.0	$0.4	$2.1
All Receipt Sizes	**$25.3**	**$36.3**	**$42.5**	**$104.1**

NOTE: C corporations are entities filing Form 1120; S corporations are entities filing Form 1120S; and partnerships are entities filing Form 1065.

TABLE 10. Income Tax Compliance Costs from BTBM, Using a Constant Monetization Rate of $28.73, Tax Year 2009

By Size of Assets

Total Assets ($ in millions)	C corporations	S corporations	Partnerships	All
Panel A: Average Compliance Costs (in $)				
$0 to $0.10	$7,200	$6,800	$7,700	$7,100
$0.10 to $1	$11,400	$10,600	$11,100	$109,005
$1 to $10	$18,200	$16,300	$16,600	$16,800
$10 to $500	$43,700	$35,000	$36,900	$37,800
$500 or more	$175,100	$112,300	$132,500	$152,000
All Asset Sizes	**$11,000**	**$8,800**	**$11,800**	**$10,300**
Panel B: Total Compliance Costs ($ in billions)				
$0 to $0.10	$6.6	$18.1	$11.3	$36.1
$0.10 to $1	$6.3	$11.8	$10.3	$28.4
$1 to $10	$3.3	$4.8	$10.7	$18.8
$10 to $500	$1.6	$1.3	$4.6	$7.5
$500 or more	$0.8	$0.1	$0.6	$1.4
All Asset Sizes	**$18.6**	**$36.0**	**$37.5**	**$92.2**

NOTE: C corporations are entities filing Form 1120; S corporations are entities filing Form 1120S; and partnerships are entities filing Form 1065.

Table 11 shows the comparison of compliance cost estimates under the ADL and the BTBM methodologies for Tax Year 2009 using the variable and the constant monetization rate. The BTBM produces average and total compliance costs nearly 80 percent higher than the ADL methodology.

As discussed in section 2 of this paper, the ADL methodology has a number of limitations that lead to the underestimation of compliance costs for corporations and partnerships of all sizes, particularly for large business. For example, the average monetized burden for C corporations with total assets of less than $100,000 is $3,400 from ADL versus $4,800 for the BTBM—a difference of 41.2 percent. When the ADL compliance time estimates for C corporations with assets greater than $500 million are monetized, the average compliance cost from ADL is $44,800 versus $630,000 for the BTBM—a more than one thousand percent difference.

These differences are not surprising since the ADL methodology is based on average burden for each tax form. It does not account for the apparently very large differences in the time and cost of developing, preparing, and maintaining the records and systems of records necessary to prepare the actual tax form entries. Obviously, the time and costs are correlated with the size and complexity of businesses. The ADL method also reflects the economic activity and business structures of nearly 30 years ago. For example, in 1984 there were approximately 700,000 S corporations, with total receipts, in 2009 dollars, of $385 billion. In 2009, after changes in the tax law that made the S corporation form more popular, the number of S corporations had climbed to more than 4 million, with total receipts of over $5.4 trillion**.** As a result, the average S corporation in Tax Year 2009 is quite different from the average S corporation of 1984. The average size of C corporations has also increased in real terms, although by a much smaller percentage. The number of C corporation tax returns has decreased since 1984, from 2.5 million to 1.7 million, but total receipts have increased, from $13.6 trillion (in 2009 dollars) to $16.8 trillion. Hence, the "average" firm for which ADL produces compliance costs is very different from the "average" firm in the BTBM.

The BTBM estimates for corporations and partnerships with less than $10 million in assets are comparable to the Tax Year 2004 (SBBM) estimates, after controlling for return growth, inflation, and technical changes. For comparison, we adjusted the Tax Year 2004 data to reflect the same filing population, monetization methodology, and econometric specification. We then applied the resulting coefficients to the 2009 SOI data with inflation adjustments, yielding a Tax Year 2009 estimate of $93B for corporations and partnerships with less

than $10M in assets. The comparable figure estimated using the Tax Year 2009 survey data is $86B. This suggests that total compliance costs, for corporations and partnerships with less than $10 million in assets, have remained stable over the 5-year period from 2004 to 2009. For large and medium businesses, the most recent prior estimate of $24 billion is based on a 2001 survey conducted by Slemrod and Venkatesh (2002).[23] The estimate tabulated from our Tax Year 2009 survey data for similar-sized businesses is just under $20 billion.

TABLE 11. Comparison of Compliance Cost Estimates Under the ADL and BTBM Methodologies, Tax Year 2009

Total Assets ($ in millions)	ADL	BTBM	Percentage Differance
Panel A: Average Compliance Costs (in $)			
Variable Rate Monetization (range $8.00/hr to $90.00/hr)	$6,500	$11,600	78.5%
Constant Rate Monetization ($28.73 per hour)	$5,800	$10,300	77.6%
Panel B: Total Compliance Costs ($ in Billions)			
Variable Rate Monetization (range $8.00/hr to $90.00/hr)	$58.3	$104.1	78.6%
Constant Rate Monetization ($28.73 per hour)	$51.8	$92.2	78.0%

Conclusions and Outlook

In comparison with the ADL-based estimates, the new estimates—based on recent survey data and using a variable monetization rate that increases with business size—more intuitively reflect the distribution of compliance burden across the corporation and partnership populations by size. Even though there appear to be economies of scale for costs incurred in complying with tax laws, the magnitude of compliance costs definitely increases with the size of assets and receipts. Thus, with the BTBM larger businesses incur a much larger share of compliance costs than estimated under the ADL methodology. Conversely, smaller businesses incur a smaller share of compliance costs than estimated under previous methodologies. Estimates based on the Tax Year 2009 survey results show evidence of significant fixed costs and costs increasing with firm size but at a decreasing rate.

We have used a monetization method under which compliance costs per hour increase with size but with the maxima and minima capped. We believe that this general structure yields significantly improved compliance cost estimates. However, other versions of this monetization approach could produce a range of total compliance cost estimates. Generally, these differences should not be problematic for simulating and forecasting changes in compliance costs due to policy changes, if the same monetization method is used for different simulations. The difference in total compliance costs, however, may be problematic when the goal is to produce a hard estimate of total tax compliance costs. Thus, monetization remains an interesting and useful area for future exploration. At minimum, sensitivity analyses of various methods need to be performed. However, given that a larger and ever-growing share of compliance costs is in the form of outlays rather than in time, the monetization methods will become less significant. To that end, to the extent possible, future surveys should attempt to elicit costs in outlays rather than owner and employee hours. That would reduce the uncertainties from attempting to monetize the time expended on tax compliance.

The simulation model provides some further capabilities in providing "what-if" type analyses and forecasts that reflect changes in tax law and other aspects of the tax system. Taken together, the BTBM and the Tax Year 2009 burden survey on which it is based provide an up-to-date and robust substitute for the ADL method for estimating corporation and partnership income tax compliance costs.

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Appendix
Definitions of the Variables in the Business Taxpayer Burden Model

Logarithm of Total Assets

= ln (end of year total assets plus 1)

No Assets Indicator

= 1, if total assets were equal to zero

= 0, otherwise

Logarithm of Total Receipts

= ln (sum of absolute value of total receipts plus 1).

No Receipts Indicator

= 1, if total assets were equal to zero

= 0, otherwise

Low Complexity

= ln (sum of amounts of all low complexity items reported) [see Table A]

High Complexity

= ln (sum of amounts of all high complexity items reported) [see Table A]

No Receipts Indicator

= 1, if no low or high complexity items are available

= 0, otherwise.

Partnership Indicator

= 1, if entity filed Form 1065

= 0, otherwise.

S Corporation Indicator

= 1, if entity filed Form 1120S

= 0, otherwise.

Self-Prepared Indicator

= 1, if entity had end-of-year total assets less than $5 million, and total receipts less than $2.5 million, and the return was not signed by a paid preparer

= 0, otherwise.

Positive Tax Liability Indicator

= 1, if entity's tax return showed tax liability for current tax year

= 0, otherwise.

Table A: Elements of the Complexity Categories in the Business Taxpayer Burden Model

(Forms and Schedules for Taxable Year 2009)

LOW Complexity Items

Form or Schedule	Line	Short Description
1120	1b	Less Returns and Allowances
1120	12	Compensation of Officers
1120	13	Salaries and Wages (less employment credits)
1120	14	Repairs and Maintenance
1120	15	Bad Debt
1120	16	Rents Deductions
1120	17	Taxes and Licenses
1120	18	Interest Deduction
1120	22	Advertising
1120	29b	Special Deductions
1120	32d	Estimated Tax Payments
1120	32e	Tax Deposited with F7004
1120	32f(1)	Regulated Investment Credit F2439
1120	33	Estimated Tax Penalty
1120 Schedule A	1	Inventory at Beginning of Year
1120 Schedule A	7	Inventory at End of Year
1120 Schedule J	2	Gross Income Tax
1120S	7	Compensation of Officers
1120S	8	Salaries and Wages (less employment credits)
1120S	9	Repairs and Maintenance
1120S	10	Bad Debt
1120S	11	Rents Deductions
1120S	12	Taxes and Licenses
1120S	13	Interest Deduction
1120S	16	Advertising
1120S	23a	TY2009 Estimated Tax Payments and 2008 Overpayment Credited to TY2009
1120S	23b	Tax Deposited with F7004
1120S	24	Estimated Tax Penalty
1120S	27	Credit Applied to TY2010 Estimated Tax
1120S Schedule A	1	Inventory at Beginning of Year
1120S Schedule A	7	Inventory at End of Year
F1065	1b	Less Returns and Allowances
F1065	'9	Salaries and Wages (less employment credits)
F1065	10	Guaranteed Payments to Partners
F1065	11	Repairs and Maintenance
F1065	12	Bad Debt
F1065	13	Rents Deductions
F1065	14	Taxes and Licenses
F1065	15	Interest Deduction
F1065 Schedule A	1	Inventory at Beginning of Year
F1065 Schedule A	2	Purchases
F1065 Schedule A	7	Inventory at End of Year

HIGH Complexity Items

Form or Schedule	Line	Short Description
1120	8	Capital Gains
1120	9	F4797 Net Gain or Loss
1120	10	Other Income
1120	19	Charitable Contributions
1120	20	Depreciation from F4562 not Claimed on Sch A or elsewhere
1120	21	Depletion
1120	23	Pension, Profit-sharing, etc., Plans
1120	24	Employee Benefit Programs
1120	25	Domestic Production Activities Deduction
1120	26	Other Deductions
1120	29a	NOL
1120	32f(2)	Total Gas Tax Credit
1120	32g	Refundable Credits from F3800, Line 19c, and F8827, line 8c
1120 Schedule J	1(1)	Control Group Additional Tax 1
1120 Schedule J	1(2)	Control Group Additional Tax 2
1120 Schedule J	3	AMT
1120 Schedule J	5a	Foreign Tax Credit
1120 Schedule J	5b	Qualified Electric Vehicle Credit
1120 Schedule J	5c	General Business Credit
1120 Schedule J	5d	Credit for Prior Year Minimum Tax
1120 Schedule J	5e	Renew Energy Bond Credit
1120 Schedule J	8	Personal Holding Company Tax
1120 Schedule J	9	Other Taxes F4255
1120 Schedule J	9	Other Taxes F8611
1120S	4	F4797 Net Gain or Loss
1120S	5	Other Income
1120S	14	Depreciation not Claimed on Schedule A or elsewhere
1120S	15	Depletion
1120S	17	Pension, Profit-sharing, etc., Plans
1120S	18	Employee Benefit Programs
1120S	19	Other Deductions
F1065	5	Net Farm Profit or Loss
F1065	6	F4797 Net Gain or Loss
F1065	7	Other Income
F1065	16c	Net Depreciation
F1065	17	Depletion
F1065	18	Retirement Plans, etc.
F1065	19	Employee Benefit Programs
F1065	20	Other Deductions
F1065 Schedule A	6	Total Cost of Sales
1120S Schedule K	2	Net Rental Real Estate Income F8825
1120S Schedule K	9a	Net Long-term Capital Gain
1120S Schedule K	10	Net Section 1231 Gain F4797

Endnotes

[1] The views expressed in this paper are those of the authors and do not represent the official views of the Internal Revenue Service or the Department of the Treasury. The authors would like to thank Tom Brandt, Jose Colon de la Matta, Ardeshir Eftekharzadeh, Janice Hedemann, Kerry Levin, Karen Masken, Don McPartland, Jennifer O'Brien, Ahmad Qadri, Lisa Rupert, Michael Sebastiani, Brenda Schafer, Ken Szeflinski, and Melissa Vigil for their roles in bringing the 2009 business taxpayer compliance cost survey to fruition, Jeff Berglund, Stephen Rhody, and Michael Stavrianos for assistance in analyzing the 2004 small business compliance cost survey data for comparison, and Elaine Maag and Alan Plumley for comments.

[2] See Arthur D. Little *et al.* (1988).

[3] See DeLuca *et al.* (2007), Contos *et al.* (2009a), and Contos *et al.* (2009b).

[4] Compliance costs incurred after the filing of the tax return due to the filing of an amended return or IRS enforcement processes are also outside the scope of estimates from both the ADL and these models. See Guyton *et al.* (2003), and Connors *et al.* (2007).

[5] Specifically, the following primary Forms were included in the sample: 1120, 1120S, 1120C, 1120H, 1120ND, 1120POL, 1120SF, 1120L, 1120REIT, 1120RIC, 1120PC, 1120F, 1065, 1065B, and 1066.

[6] However, the samples for Forms 1120L, 1120REIT, 1120RIC, 1120PC, 1120F, and 1066 were selected using a simple random sampling method due to the lack of the data needed for stratified samples.

[7] See Singh (2003), p.753.

[8] Surveys were generally mailed between six weeks and four months after the date the tax return was filed.

[9] A more detailed discussion on the patterns of corporation filings is reported in IRS Statistics of Income (2009), Section 3, Description of the Sample and Limitations of the Data.

[10] This response rate measure is conservative in that it makes no adjustment for businesses that have ceased operating or are otherwise unreachable by the survey administrator.

[11] Nonresponse bias adjustment followed the approach described in Brick *et al.* (2009).

[12] For the remainder of this paper, we will focus on corporation and partnership taxpayers filing Forms 1120, 1120S, or 1065. Corporation and partnership taxpayers filing on the less common Forms 1120C, 1120H, 1120ND, 1120POL, 1120SF, 1120L, 1120REIT, 1120RIC, 1120PC, 1120F, 1065B, and 1066 are excluded from discussion in the remainder of the paper, except as explicitly noted.

[13] Outlier adjustments were made using multiple imputation techniques for rounding bias correction based on Drechsler and Kiesl (2012) and for robust regression.

[14] For example, Haltiwanger et al. (2012), figures 7 and 8.

[15] May 2009 Occupational Employment Statistics (OES) Survey Estimates: BLS, Department of Labor. These rates reflect the inclusion of fringe benefits.

[16] These estimated costs would be a few percentage points higher except for the exclusion of the compliance costs for taxpayers filing one of the less common corporate or partnership income tax forms: 1120C, 1120H, 1120ND, 1120POL, 1120SF, 1120L, 1120REIT, 1120RIC, 1120PC, 1120F, 1065B, and 1066.

[17] The results in Table 3 reflect imputations for missing response in the surveys. Otherwise, they reflect the survey responses weighted to the actual population of Tax Year 2009 Forms 1120, 1120-S, and 1065 corporation and partnership income tax returns filed. Overall, the majority of the groups shown are well represented except for S corporations and Partnerships with assets of $500 million or more. Particularly, as shown on Table 1, there are fewer than 500 S corporations with assets of $500 million or more. We did not have any completed surveys from that group.

[18] Labor in this scenario is the time spent on pre-filing and filing activities by firm owners and employees but also by paid professionals.

[19] Similar findings were reported for large U.S. corporations by Slemrod and Blumenthal (1996). Eichfelder and Schorn (2009) found similar results for different groups of small business taxpayers in northern Europe.

[20] This variable is used to reflect differences in the recordkeeping intensity of different information reporting activities. See the Appendix for a list of the tax return line items counted as either high or low complexity for the creation of these variables.

[21] While both the SOI files and the Business Compliance Cost Survey start as nationally representative samples, of all corporations and partnership returns, drawn from the IRS Business Master File, the target population of the SOI files differs slightly from that of the BCCS. For a more detailed discussion of the reasons returns are excluded from the SOI Corporation file, see IRS Statistics of Income (2009), Section 3, Description of the Sample and Limitations of the Data.

[22] Earlier compliance cost research has used constant monetization rates often based on assumptions by Moody et al. (2005). For Tax Year 2009, the monetization rate based on this methodology would be $47. It is the blended mean of Accountants and Lawyers hourly rates from the May 2009 Occupational Employment Statistics (OES) Survey Estimates: BLS, Department of Labor. If the previously mentioned $47 per hour constant monetization rate were used, each of the amounts shown in Table 7 would be larger by 63.6 percent ($47.0 / $28.73) resulting in estimated aggregate costs of $84.8 billion.

[23] The IRS Small Business Burden study described in Contos *et al.* (2009a) covered corporations and partnerships with less than $10 million in assets, while the Slemrod and Venkatesh study essentially covered corporations with at least $5 million in assets and partnerships having more than a certain number of partners. There is both coverage overlap and a coverage gap across the two studies.

2012 Taxpayer Experience of Individuals Living Abroad: Service Awareness, Use, Preferences, and Filing Behaviors

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The U.S. Department of State estimates that approximately 6.32 million American civilians (excluding overseas military) live abroad in over 160 countries, each with 13 countries acting as the temporary or primary residence to 100,000 or more of these individuals.[2] With the continuing trend of globalization, tax planning has become increasingly more focused on minimizing the worldwide effective tax rate. Additionally, globalization has expanded the taxpayer base to which the Internal Revenue Service (IRS) is responsible for providing service and monitoring for compliance. To address these challenges, the IRS is committed to proactively enforcing international tax law by expanding IRS approaches, tools, and workforce skills on international issues, ensuring adherence to professional standards by tax practitioners, increasing cooperation and outreach efforts with foreign governments, and using a data-driven approach to target new and emerging issues with differentiated enforcement and service treatments. In this context, international/U.S. territory noncompliance, as well as service to individuals living abroad, continue to remain significant areas of concern and focus for the IRS.[3]

Wage and Investment Research & Analysis (WIRA) has devoted significant resources to research the needs of individual taxpayers living abroad in support of the IRS initiative to study the effect of service delivery on compliance. Over a period of nearly four years, WIRA has engaged in a systematic and multi-source program of research to identify and define this taxpayer segment's tax preparation and filing habits, service channel preferences, potential barriers to service, and opportunities for service improvement. Specifically, in an effort to develop a current and accurate baseline of international taxpayer needs, preferences, and behaviors, WIRA implemented a multi-tiered international research program with each project grounding as well as informing the next project.[4] Highlights of this systematic and multi-source program of international taxpayer research include:

- Focus groups with tax practitioners who serve international taxpayers
- Demographic and tax filing profiles of international taxpayers over various tax years[5]
- Multiple interviews with tax attachés working with taxpayers overseas
- Interviews with multinational companies based in the U.S. employing U.S. citizens overseas
- *2009 IRS Survey of International Taxpayers*
- Collaboration with gatekeepers of U.S. Department of State Passport Data and Certificate of Loss Nationality Data
- Effect of IRS Printing and Postage Budget Reduction (PPBR) on direct mailings to embassies and taxpayers living abroad
- *2011 IRS Survey of Individuals Living Abroad*

The result of this research is a picture of a taxpayer segment that is underserved, relatively young in age, has a high awareness and use of IRS.gov, expresses a desire for self-service channels, and may experience a higher rate of post-filing problems than the general taxpayer population.

The current report will begin by first providing a summary of international taxpayers' service needs, a description of services currently available to these taxpayers, and key service issues this population faces. The report will then discuss the background of and responses to the *2011 IRS Survey of Individuals Abroad*.

Summary of International Taxpayers' Service Needs

Survey data and interviews with tax attachés working overseas revealed that the most frequently asked questions by international taxpayers deal with the Individual Taxpayer Identification Number (ITIN) application process and requests for forms and publications. Other common topics on which international taxpayers seek assistance, in no particular order, include:

- Tax law questions
- Filing obligations
- Nonfiler questions
- Accounts and notices
- Form 8938, *Statement of Specified Foreign Financial Assets*
- FBAR, *Report of Foreign Bank and Financial Accounts*
- Foreign earned income exclusion
- Tax treaties
- Tax preparation

Availability of IRS Service to International Taxpayers

Telephone Services

International taxpayers in Puerto Rico, Guam, the Bahamas, and U.S. Virgin Islands have access to the IRS Toll-Free Telephone line (1-800-829-1040). The IRS also operates an International Telephone Line (1-267-941-1000), which taxpayers outside the U.S. can use; however, this service channel is not free, and taxpayers incur the associated telephone costs. For Fiscal Year (FY) 2011, 334,742 phone calls were answered at the International Telephone Line,[6] with a 38 percent abandonment rate.[7] For the same period, 19,186,679 calls were answered at the IRS Toll-Free Telephone Line, with a significantly higher abandonment rate at 49 percent. Further, the average handle time (AHT) at the International Telephone Line for FY 2011 was 9.4 minutes, whereas the AHT at the Toll-Free Telephone Line was 6.8 minutes during the same period.[8]

In addition to the IRS Toll-Free and International Telephone Lines, taxpayers living abroad have the option of calling one of four international IRS posts located in U.S. embassies or consulates in London, Paris, Frankfurt, and Beijing. The posts track the volume of calls answered by month; for the first half of FY 2012 (October 2011 through March 2012), the London post had answered 1,730 phone calls.[9]

Face-to-Face Assistance

In Guaynabo, Puerto Rico, the IRS operates a Taxpayer Assistance Center (TAC), which provides taxpayers with face-to-face assistance.[10] Examples of services provided include account inquiries (help with letters, notices, and levies on wages or bank accounts), adjustments (changes to tax account information or payments), tax return preparation, payments and/or payment arrangements, and tax law assistance. For the 2012 filing season, the IRS provided taxpayer assistance at the Ponce, Puerto Rico, post of duty (POD) one Wednesday a month in February, March, and April 2012.[11] The Ponce POD is located approximately 115 kilometers from the Guaynabo TAC, or slightly over 70 miles. An IRS employee from the Guaynabo TAC drove to the Ponce POD to provide walk-in assistance to taxpayers on a first-come, first-served basis,[12] and services provided were similar to those provided at the Guaynabo TAC. Because the building at which the Ponce POD is located will no longer be occupied by the IRS next year, taxpayers in Puerto Rico will not have the option of visiting this POD for assistance during the 2013 filing season.[13]

Outside of Puerto Rico, in-person service is available at the four international IRS posts in London, Paris, Frankfurt, and Beijing. Notably, no more than ten IRS employees from the Large Business and International (LB&I) business operating division (BOD) are stationed at any of the four posts. In addition to responding to phone calls, IRS staff at these posts provide in-person service and respond to correspondence from taxpayers of all ages and income ranges, including civilian filers, nonresident aliens, expatriates, and Nonfilers. Staff at these posts also conduct town hall meetings and outreach events to individual taxpayers in their respective countries, as well as in neighboring countries within their jurisdiction. The events cover topics of interest to international taxpayers, such as filing obligations, ITIN applications, foreign earned income exclusion, foreign bank and financial accounts (FBAR), and avoiding double-taxation. Attendance at the events is in most cases filled to capacity.[14]

Online Services

International taxpayers have access to U.S. embassy Web sites, which include relevant tax information and hyperlinks to IRS.gov. On IRS.gov, the *International Taxpayer* page provides a wealth of information for international taxpayers. Specifically, the "Frequently Asked Questions" (FAQ) link directs web users to the top eight frequently asked questions and question subcategories for resident/nonresident aliens and U.S. Citizens living abroad.[15] Figure 1 provides a screenshot of the IRS.gov *International Taxpayer* Web page.

Additionally, on IRS.gov, the Interactive Tax Assistance (ITA) tool provides accurate, consistent answers on tax law questions based on customers' responses to a series of questions. However, international tax topics have not yet been launched on the ITA portal. The absence of an effective, self-service online tool requires international customers to use more expensive service channels, such as the International Telephone Line and the Electronic Tax Law Assistance (ETLA) tool on IRS.gov.

ETLA, a tool that allows taxpayers to submit tax law questions by e-mail to the IRS, is available to all taxpayers; however, this channel is being used overwhelmingly by resident/nonresident aliens and U.S. citizens living outside of the United States. As seen in Table 1, some 37 percent of all ETLA inquiries in FY 2011 were related to international tax topics. International inquiries on ETLA have grown 147 percent over the past five years, despite ETLA being the most expensive service channel for the IRS[16] and taxpayers' inability to ask account-specific questions through this channel.

TABLE 1. International Inquiries via Electronic Tax Law Assistance (ETLA)

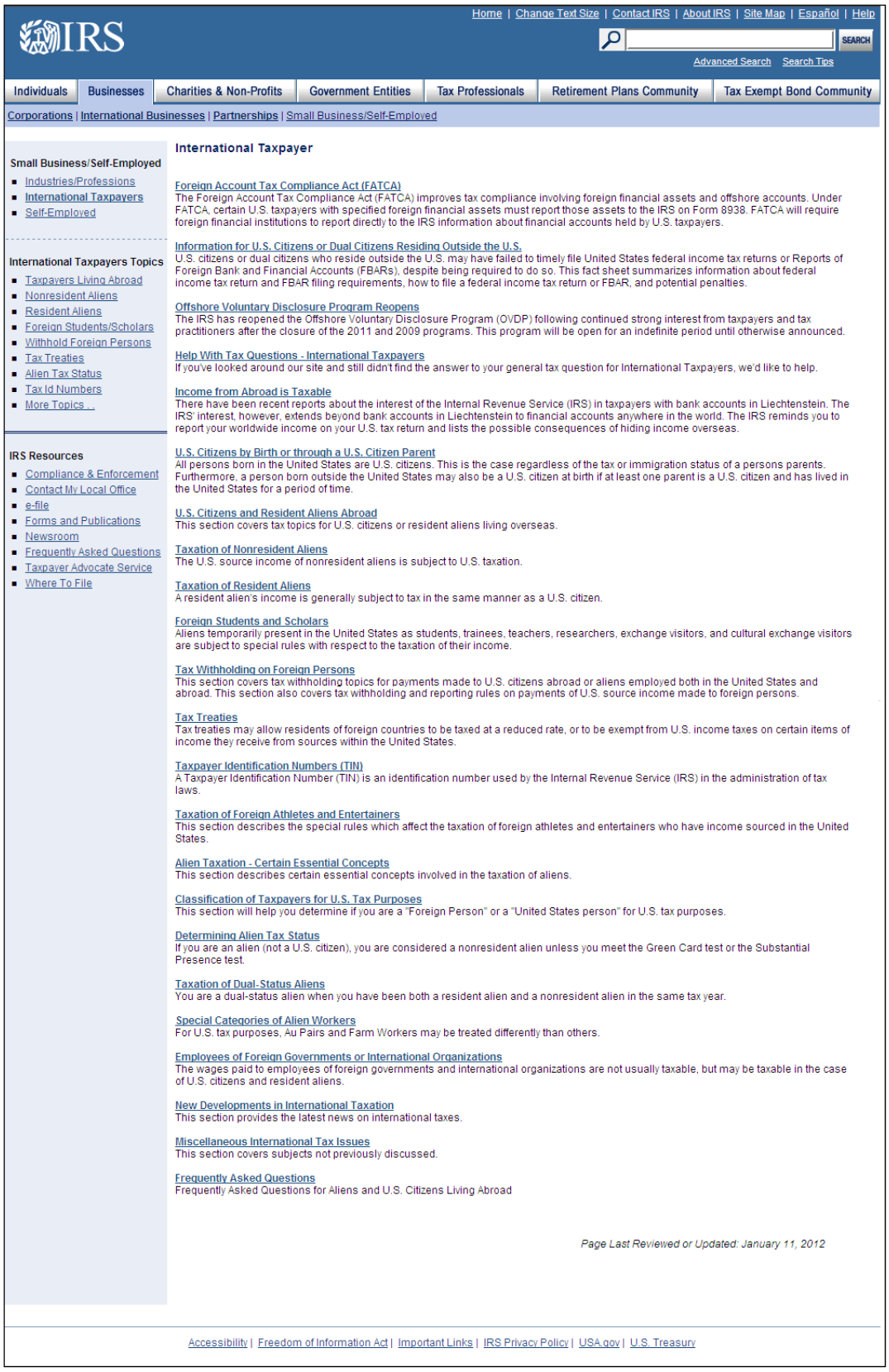
Fiscal Year	International Inquiries			All ETLA Inquiries	
	Total Inquiries Received	Percent of all Inquiries	Average Response Time (days)	Total Inquiries Received	Average Response Time (days)
2007	3,375	22%	2.6	15,357	3.4
2008	3,483	21%	3.2	16,383	2.8
2009	7,092	37%	6.9	19,139	4.6
2010	7,920	36%	7.3	21,738	5.5
2011	8,333	37%	4.3	22,743	7.2

Source: ETLA Access to Historical Reports, accessed March 22, 2012.

NOTE: Deletes were excluded from Total Inquiries Received and from the calculation of Average Response Time.

Two of the four international IRS posts, Paris and Beijing, also offer e-mail services to international taxpayers; individuals with a routine tax question may send an e-mail to irs.paris@irs.gov or irs.beijing@irs.gov. Although IRS posts in London and Frankfurt initially offered e-mail as a service channel when it became available, the two posts have since discontinued offering the service.[17]

FIGURE 1. International Taxpayer Page on IRS.gov



Key Service Issues Facing International Taxpayers

Based on international taxpayers' responses to the *2009 IRS Survey of International Taxpayers,* the primary reasons these taxpayers[18] were unable to obtain information they sought from the IRS fell into three major categories:

- Burden—Difficulty finding information.
  - —"The Web site is very difficult to use. You almost need to be a tax specialist to find anything. I spent more than an hour looking for the information I needed and finally gave up in frustration."
- Availability of response—Difficulty reaching the IRS and/or receiving a response.
  - —"No one has ever responded by e-mail or letter."
- Clarity—Difficulty understanding information.
  - —"The information and forms are very confusing."

IRS language on forms, publications, notices, and IRS.gov as a whole has historically been difficult for native English speakers within the U.S. to understand. Survey responses and interviews with tax attachés at the international IRS offices revealed that IRS verbiage is especially difficult to understand for taxpayers living abroad whose primary language is not English. Further, tax attachés often receive complaints from taxpayers living abroad who have received notices from the IRS that penalties began accruing on their accounts before the taxpayers had even received the notices, due to the extensive length of time taken to ship mail outside of the U.S.[19]

Tax attachés at the international posts also reported that W&I's decision to discontinue mailing tax forms and instructions to individuals worldwide created an unprecedented number of walk-ins, calls, and e-mails requesting forms, instructions, and publications at the posts. Faced with tight budgetary constraints and continued growth in electronic filing, the IRS eliminated the mailing of selective forms and publications in FY 2010 under the Printing and Postage Budget Reduction (PPBR) plan. Specific to international taxpayers, direct shipments of Package 7[20] were discontinued in 2011 to international taxpayers and to embassies in foreign countries.[21] Table 2 documents the number of international shipments of selected items that had been included in Package 7.

TABLE 2. International Shipments for Selected Items Contained in Package 7

Product	Quantity Shipped Internationally		
	TY 2008	TY 2009	TY 2010
Form 1040	16,906	7,954	7,362
Form 1040, Schedule A	N/A	1,867	1,786
Form 1040, Schedule B	N/A	1,942	2,176
Form 1040, Schedule C	3,269	1,213	1,442
Form 1040, Schedule D	5,263	1,941	2,061
Form 1040, Schedule E	4,525	1,431	1,841
Form 1040, Schedule M	N/A	781	1,502
Form 1040, Schedule SE	1,439	812	719
Form 1040-V	1,299	1,026	941
Form 1116	5,938	2,462	2,171
Form 2441	1,281	634	439
Form 2555	6,867	3,342	3,051
Form 2555-EZ	7,890	2,944	3,062
Form 6251	1,761	665	546
G TDF 90-22.1	1,369	2,314	2,401
Publication 54	6,634	3,647	3,341

Source: E-mail contact with Program Manager. Customer Assistance, Relationships, & Education (CARE), Media & Publications (M&P). September 20, 2011.

The institution of PPBR was especially difficult on elderly taxpayers with dial-up or no access to the Internet; those with slow connection speeds were unable to download large forms and publications from the Internet.[22] Additionally, international taxpayers remained uninformed regarding new laws and reporting requirements for taxpayers with foreign financial assets. New to the 2012 filing season, the IRS mandated that international taxpayers with foreign assets equal to or over $100,000 file Form 8938, *Statement of Specified Foreign Financial Assets,* in addition to FBAR, *Foreign Bank and Financial Accounts Form TD F 90-22.1.*[23] Due to PPBR, however, many international taxpayers who relied on the IRS to mail them necessary forms and publications were unaware of these requirements.[24]

One exception to the excessive number of requests for forms and publications at the posts was in Beijing. Due to the general unreliability of postal systems in Asia, many international taxpayers located there had been downloading IRS forms and publications online even prior to the institution of PPBR.[25]

2011 IRS Survey of Individuals Living Abroad

Building on the success and heightened awareness of the first phase of international taxpayer research, WIRA kicked off a second phase of research to further develop and refine the IRS's understanding of international taxpayer service needs, issues, and preferences. The focal point of this second phase of research was the *2011 IRS Survey of Individuals Living Abroad,* which focused on the experiences, expectations, and perceptions of individuals living abroad with the current IRS international telephone line. The survey also delved into questions regarding a proposed toll-free IRS international telephone line as well as alternative service delivery channels such as e-mail with the IRS, online, interactive (i.e., probe and response) tools, and IRS.gov content.

Survey Methodology

The IRS contracted with ICF Macro to conduct the *2011 Survey of Individuals Living Abroad*. WIRA and ICF Macro used a hybrid mail/web methodology (i.e., mixed mode study) to survey individuals living abroad. ICF Macro contacted respondents by mail to participate in the survey either by completing a paper copy of the survey or by accessing an online, Web-based version of the survey. The survey administration period started on May 10, 2011 with completed surveys accepted by mail or via the web survey through July 29, 2011.

Mail Survey Administration

The following four-wave survey methodology and timeline was used:

1. ***May 10, 2011*** Pre-notification letter (printed on IRS letterhead) alerted participants to the upcoming survey, and also notified them that they could immediately complete the survey online by using the web address and unique password provided.
2. ***May 24, 2011*** Initial survey instrument mailed along with a cover letter and international postage-paid return envelope to all individuals sampled. Letter again alerted recipients of the online survey and included the web address and unique password
3. ***June 10, 2011*** Brief reminder letter mailed, thanking those who already participated in the survey and urging others to complete the survey online using the included web address and unique password or via a replacement paper copy of the survey, which would be mailed in a couple of weeks
4. ***June 24, 2011*** Second copy of survey instrument along with a cover letter and international postage-paid return envelope mailed to non-respondents only. Web address and unique password included in the mailing for online survey access

Web Survey Administration

Respondents who did not want to complete the pencil-and-paper version were given the option of completing the survey online by typing in the Web address and unique password to the survey. These were provided in each of the four survey mailings. The password feature:

- Permitted participants to begin the survey, suspend it, and re-enter where they left off, with their data saved up to that point;
- Protected participants' data against power or network interruption;
- Provided safeguards for the survey process by preventing a respondent from completing multiple surveys;
- Ensured that only targeted participants could complete the survey; and
- Linked to an individual so that if a respondent completed both a web and mail survey, only the first one completed/received was used.

Respondent Sampling, Response Rate, and Survey Mode

The sampling plan for the *2011 IRS Survey of Individuals Living Abroad* consisted of three distinct populations[26] including International Filers, Nonfilers, and Expatriates.[27] The sample of 4,700 International Filers was stratified into three groups including Civilians, Military personnel stationed abroad, and Nonresident Aliens. The sample of 300 Nonfilers was segmented into two groups including Nonfilers with a perceived filing obligation and Nonfilers with no perceived filing obligation. Nonfilers with no perceived filing obligation were assumed to be those who did not have a filing requirement but filed a TY 2008 return to receive the economic stimulus payment. Nonfilers with a perceived filing obligation were identified through their information on the IRS nonfiler database and matched to passport data from the U.S. Department of State. Lastly, the sample of 1,000 Expatriates was identified through the LB&I Expatriate Database, which is comprised of data from the IRS[28] as well as the Bureau of Consular Affairs.[29] At the request of LB&I, Expatriates were stratified by net worth, either above or below $2 million as reported on IRS Form 8854, Initial and Annual Expatriation Statement.[30] Of the entire sample, 84 percent were Filers, 12 percent were Expatriates, and 5 percent were Nonfilers.

In all, the *2011 IRS Survey of Individuals Living Abroad* received 1,753 unique responses from individuals in 81 countries constituting a 32 percent response rate (up from a 24 percent response rate on the prior international survey). The top ten countries represented in the responses were Canada, the United Kingdom, Germany, China, Japan, France, Switzerland, Israel, Australia, and Italy. The Philippines, Mexico, and Spain were also in the top 20 countries based on number of respondents. Approximately 62 percent of respondents completed the survey via the Web, while 38 percent of respondents completed the paper survey via mail. Table 3 outlines survey instruments sent, surveys completed, and the response rate for each of the survey populations and sub-groups.

TABLE 3. Response Rates and Survey Mode by Survey Population

	Surveys Sent	Undeliverable Surveys	Completed by Mail	Completed by Web	Total Completed Surveys	Response Rate[1]
Filers	**4,700**	**424**	**546**	**925**	**1,471**	**34%**
Civilian	2,316	64	331	576	907	40%
Military	1,500	344	92	180	272	24%
Nonresident Aliens	884	16	123	169	292	34%
Nonfilers	**300**	**29**	**51**	**28**	**79**	**29%**
With a Filing Obligation	100	18	2	11	13	16%
With No Filing Obligation	200	11	49	17	66	35%
Expatriates[2]	**1,000**	**42**	**73**	**130**	**203**	**21%**
Net Worth Above $2M	93	0	8	11	19	21%
Net Worth Below $2M[3]	907	42	65	119	184	21%
Total	**6,000**	**495**	**670**	**1,083**	**1,753**	**32%**

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

[1] Response Rate does not include surveys that were undeliverable.

[2] The Expatriate sample was limited to individuals with an expatriation date of January 1, 2009 through February 10, 2011.

[3] Four cases in the Expatriate sample did not include Net Worth information.

Due to the high number of Filers in the sample, combining the data for all respondents would heavily skew the results toward Filers' responses. For that reason, and also because these three groups were compiled from different sources, their results are primarily reported separately. Additionally, whenever fewer than 50 individuals answered a question, their data are shown as ratios (e.g., "6/10") or numbers (e.g., "6") instead of percentages to indicate that these results should be viewed as qualitative or directional in nature. This is often the case with Nonfilers, as there are fewer of these respondents in the data. It is also important to note that the demographics of individuals who responded to this survey generally did not differ greatly from those of the entire sample.

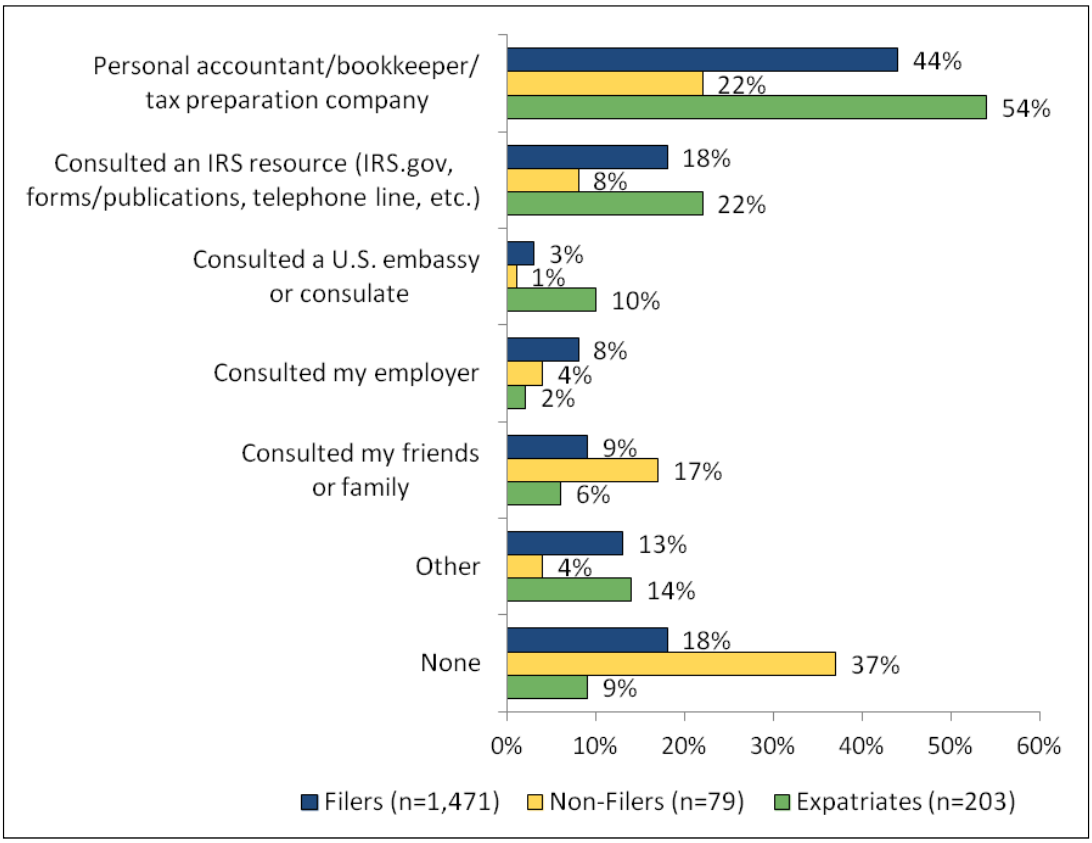
Tax Preparation and Filing Among International Taxpayers

Determination of Filing Requirement

When asked if they had a Federal U.S. tax filing requirement in the most recent tax year, 81 percent of Filers indicated that they had a TY 2010 filing requirement, while 11 percent were unsure. Expatriates were closely split, with 52 percent stating that they had a filing requirement and 47 percent stating they did not. Interestingly, while the majority of Nonfilers (67 percent) stated that they did not have a filing requirement, 21 percent stated they did and 12 percent were unsure.

Filers and Expatriates were most likely to report consulting a personal accountant/bookkeeper/tax preparation company to determine whether they had a filing requirement (44 percent and 54 percent, respectively). In contrast, Nonfilers were most likely to report not consulting anyone to determine whether they had a filing requirement (37 percent). See Figure 2 for a detailed breakdown of the resources respondents used to determine their filing requirement.

FIGURE 2. Resources Used To Determine Filing Requirements



Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

Preparation of Most Recent U.S. Federal Tax Return

In reporting the preparer of their most recent U.S. Federal tax return, 46 percent of Filers reported that they or their spouse prepared their return, and 39 percent of these respondents reported using tax software.[31] Forty-three percent reported using a paid personal accountant/bookkeeper/tax preparation company to prepare their return, with 58 percent of these Filers reporting that their preparer was located within the U.S.

In comparison, 31 percent of Expatriates reported that they or their spouse prepared their most recent U.S. Federal tax return, and only 25 percent of these Expatriates used tax software. Sixty-four percent of Expatriates reported that a paid personal accountant/bookkeeper/tax preparation company prepared their most recent return, and of these Expatriates, 55 percent reported that their preparer was located within the U.S.

Filing of Most Recent U.S. Federal Tax Return

Regarding filing activities, Filers spent on average 11.7 hours and $413 on activities and expenses related to their most recent U.S. Federal tax return (see Table 4).[32] Nearly two-thirds of Filers (64 percent) reported filing their return by regular or express mail, and over a quarter (26 percent) reported filing electronically. In comparison, 71 percent of all U.S. TY 2010 tax returns were filed electronically.[33]

TABLE 4. International Filers' Time and Money Spent Related to Most Recent U.S. Federal Tax Return

	Amount of Time/Money	Percent of Respondents
Time Spent on Most Recent Return (n = 1,276)	2 hours or less	30%
	3 to 4 hours	19%
	5 to 10 hours	30%
	11 to 25 hours	14%
	More than 25 hours	8%
	Average:	**11.7 hours**
Money Spent on Most Recent Return (n = 1,237)	$0	13%
	$1 to $50	34%
	$51 to $200	18%
	$201 to $500	17%
	More than $500	17%
	Average:	**$413**

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

International Taxpayers' Reported Use of Resources for Obtaining U.S. Federal Tax Information

Regarding their U.S. Federal tax returns while living outside of the United States, survey respondents were asked to indicate which sources they had used to obtain information for four tax issues:

- Tax Treaties
- Resolving Notice/Letter from the IRS
- Making a Payment
- Obtaining an ITIN

Ten to 20 percent of Filers reported they had used a personal account/bookkeeper/tax preparation company to receive information on the four issues listed above. A lower percent range of Filers (9 to 13 percent) reported using IRS.gov as a resource to obtain information on the four issues.

Of Expatriates, a higher percent range than Filers (11 to 35 percent) reported receiving information from a personal accountant/bookkeeper/tax preparation company. Expatriates were also more likely than Filers to obtain tax treaty information from an IRS resource. See Table 5 for a full breakdown of resources that Filers and Expatriates used while living abroad by tax issue.

TABLE 5. U.S. Federal Tax Information Sources Used While Living Abroad by Tax Issue

Tax Information Souce	Filers (n = 1,471)				Expatriates (n = 203)			
	Tax Treaties	Resolving Notice/Letter from the IRS	Making a Payment	Obtaining an ITIN	Tax Treaties	Resolving Notice/Letter from the IRS	Making a Payment	Obtaining an ITIN
IRS.gov	12%	11%	13%	9%	22%	7%	10%	2%
IRS Telephone Line	1%	7%	2%	2%	3%	7%	2%	1%
IRS publications	8%	5%	8%	3%	15%	8%	7%	1%
Personal accountant/bookkeeper/ tax preparation company	15%	12%	20%	10%	35%	23%	28%	11%
U.S. embassy or consulate	2%	1%	1%	1%	4%	4%	1%	1%
Employer/Union/Trade Organization	2%	1%	1%	1%	0%	1%	1%	1%
Family/Friend	4%	3%	2%	2%	4%	2%	1%	0%
American Citizens Abroad (ACA)	1%	<1%	<1%	<1%	0%	1%	2%	0%
Association of Americans Residing Overseas (AARO)	<1%	<1%	<1%	<1%	0%	0%	1%	0%
Federation of American Women's Clubs Overseas (FAWCO)	0%	<1%	<1%	<1%	1%	0%	1%	0%
Other	2%	2%	2%	1%	3%	3%	2%	2%
Not applicable/Did not receive information on the issue	49%	50%	42%	54%	30%	37%	33%	51%

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

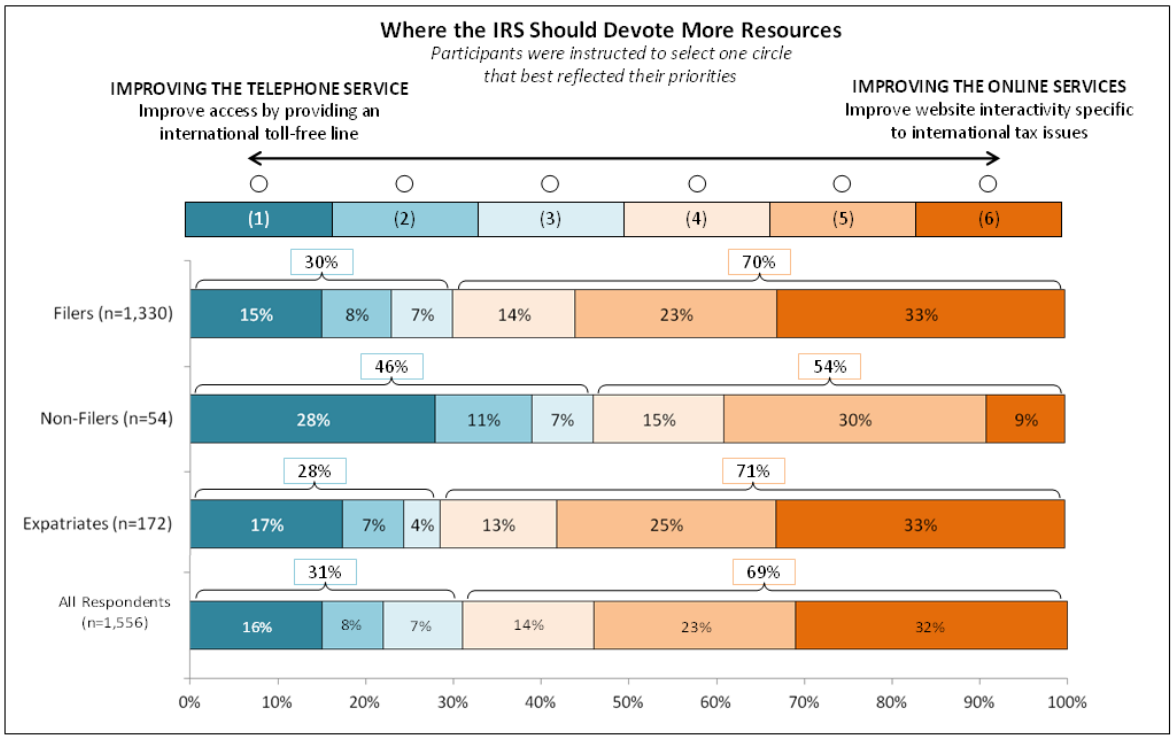
International Taxpayers' Reported Preferences for IRS Services

In reporting their preferences for using the IRS Telephone Line and IRS.gov, the majority of Filers and Expatriates (66 and 62 percent, respectively) indicated a preference for obtaining the information they need on IRS.gov rather than calling the IRS. Additionally, over three-quarters (76 percent) of both Filers and Expatriates reported that if they had a tax question, they would look for information on IRS.gov before calling the IRS.

With respect to preferences for potential services the IRS may offer, Filers and Expatriates (61 and 60 percent, respectively) were likely to report a willingness to use an IRS-provided international toll-free telephone line for tax-related inquiries. A slightly lower percentage of Filers and Expatriates (55 and 53 percent, respectively) reported a preference for using an interactive tool on IRS.gov that would ask a series of tax-related questions and provide information based on taxpayers' answers. However, only 19 percent of Filers reported they would be more confident with the information they receive from the IRS Telephone Line than information they view on the IRS.gov Web site. Additionally, Military Filers were less likely to report a preference for an IRS-provided international toll-free line (53 percent) and were more likely to report a preference for an interactive web tool on IRS.gov (60 percent).

When asked where the IRS should devote more resources to improve the support it provides to U.S. taxpayers living abroad, 70 percent of Filers and 71 percent of Expatriates leaned more heavily toward supporting improving online services rather than improving the telephone service (see Figure 3). Of Filers, more Military respondents leaned towards improving online services (79 percent) than did Civilian respondents (67 percent) and Nonresident Alien respondents (69 percent).

FIGURE 3. Where the IRS Should Devote More Resources



Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

International Taxpayers' Reported Awareness, Use, and Satisfaction with IRS Services

Survey respondents were asked to indicate their awareness, use, and satisfaction with the following IRS resources:

- IRS International Telephone Line (1-267-941-1000)
- IRS website (IRS.gov)
- International section of IRS.gov
- E-mail to the IRS through IRS.gov
- IRS Brochure Publication 4732: *Federal Tax Information for U.S. Taxpayers Living Abroad*
- Other

Filers were most likely to be aware of (78 percent), to have used (39 percent), and to be satisfied with (66 percent) the IRS Web site (see Table 6). Filers' awareness of the IRS International Telephone Line, the International section of IRS.gov, e-mail to the IRS via IRS.gov, and Publication 4732 ranged from 29 percent to 39 percent. Further, apart from the Web site as a whole, the resources Filers reported using most often were the International section of IRS.gov (12 percent) and Publication 4732 (11 percent). Only 5 percent reported using the IRS Telephone Line, and two percent e-mailed the IRS via IRS.gov. Although the majority of Filers reported being satisfied with the resources they used, dissatisfaction was highest among Filers who used the IRS Telephone Line (24 percent).

TABLE 6. Filers' Reported Awareness, Use, and Satisfaction with IRS Resources

IRS Resource	Aware of Resource (n = 1,471)	Used Resource (n = 1,471)	Satisfaction with Resource *among those who used resource* [1]	Mean
IRS Telephone Line	39%	5%	(n = 75) 53% / 53% / 24%	3.48
IRS website	78%	39%	(n = 572) 66% / 26% / 8%	3.81
International section of IRS.gov	32%	12%	(n = 167) 53% / 37% / 10%	3.60
E-mail to the IRS via IRS.gov	33%	2%	(n = 34) 17 Satisfied, 8 Neutral, 9 Dissatisfied	*
IRS Brochure Publication 4732	29%	11%	(n = 156) 60% / 28% / 12%	3.70
Other	4%	4%	(n = 59) 64% / 24% / 12%	3.75

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

Mean is derived from a five point scale with "1" representing very dissatisfied and "5" representing very satisfied.

[1] *Satisfied* *Neutral* *Dissatisfied*

* *Means not shown for bases under 50.*

Of Expatriates, approximately three-quarters (74 percent) reported being aware of the IRS Web site. Similar to Filers, reported use for Expatriates was highest for the IRS Web site (43 percent), although 50 percent of Expatriates reported being satisfied with the Web site, compared to 66 percent of Filers. For other resources, Expatriates' awareness ranged from 29 percent (e-mail to the IRS via IRS.gov) to 37 percent (IRS Telephone Line), and use ranged from three percent (e-mail to the IRS via IRS.gov) to 18 percent (Publication 4732).

Nonfilers had significantly lower awareness of IRS resources when compared to Filers and Expatriates (see Table 7). While 78 percent of Filers and 74 percent of Expatriates were aware of the IRS Web site, only 35 percent of Nonfilers reported being aware of this resource. Also, only 28 percent of Nonfilers were aware of the IRS Telephone Line, whereas 39 percent and 37 percent of Filers and Expatriates, respectively, were aware of this resource. Eight or fewer Nonfilers reported using the listed IRS resources to prepare their most recent U.S. tax return.

TABLE 7. Segmentation of Respondents' Awareness of IRS Resoures

IRS Resource	Percent of Filers Aware (n = 1,471)	Percent of Expatriates Aware (n = 203)	Percent of Nonfilers Aware (n = 79)
IRS Telephone Line	39%	37%	28%
IRS Web site	78%	74%	35%
International section of IRS.gov	32%	37%	17%
E-mail to the IRS via IRS.gov	33%	29%	13%
IRS Brochure Publication 4732	29%	32%	19%
Other	4%	3%	3%

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

Contact with the IRS by Telephone

When asked where they first found the telephone number for the IRS, all respondents[34] who reported calling the IRS Telephone Line about their most recent tax return were most likely to state that they found the number

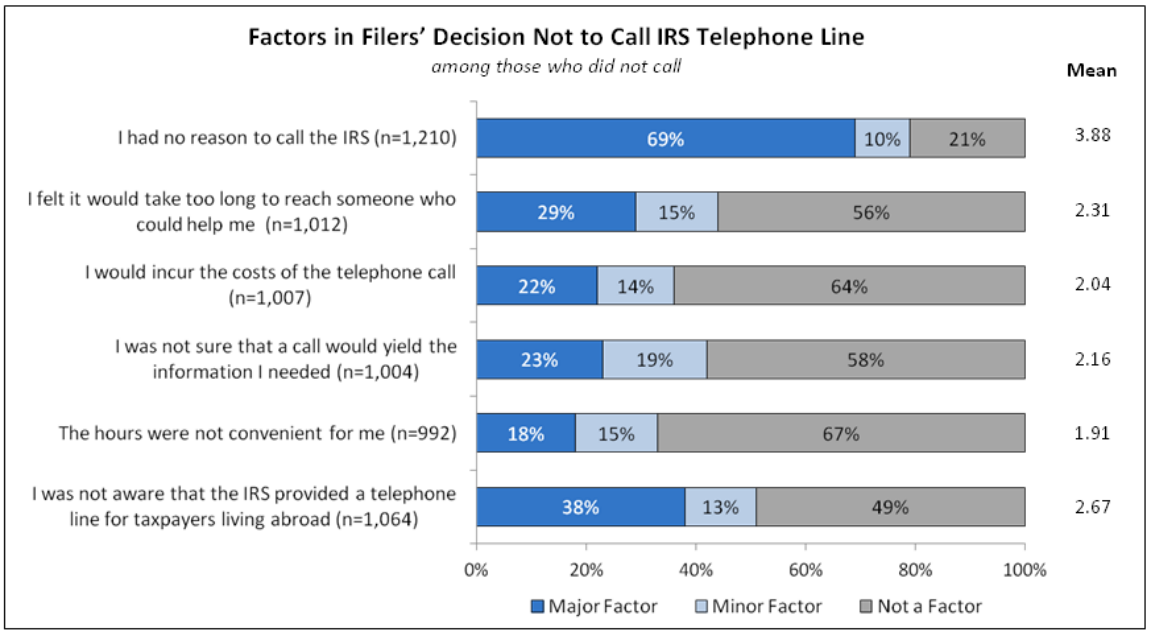
on IRS.gov (42 percent) followed by a notice or letter from the IRS (33 percent). Further, 67 percent of respondents who called the IRS Telephone Line about their most recent tax return reported visiting IRS.gov prior to calling the IRS. These respondents are comprised of the 41 percent who stated they visited IRS.gov but could not find the information they needed, and the 26 percent who stated they found the information on IRS.gov but wanted to confirm or clarify the information with someone by phone. Lastly, 28 percent of survey respondents who called the IRS Telephone Line stated they did not visit IRS.gov prior to calling.

The majority of Filers who called the IRS Telephone Line (87 percent) spoke to an IRS representative. Twelve Filers who called the IRS Telephone Line (13 percent) were unable to reach a representative, and 6 of these 12 reported their reason for not speaking to an IRS representative was that the hold time was too long. Three of the 12 Filers stated that the automated information was sufficient, and another 3 reported that their reason for not speaking to an IRS representative was because they called outside of the stated business hours.[35]

Regarding method of payment for their call to the IRS Telephone Line, 60 percent of Filers who called the IRS (67 out of 112) stated that they personally paid for the international phone call, and 69 percent of these Filers (46 out of 67) felt the usefulness of the information they received was worth the monetary cost of the call. Sixteen percent of Filers who called the IRS Telephone Line stated that they used a free Internet-based phone service (e.g., Skype, Live Messenger), and 13 percent stated that they used a landline or mobile phone that did not incur charges. Lastly, 4 percent of Filers who called the IRS Telephone Line stated that the cost of their phone call was paid by their employer or another person.

Among Filers who did not call the IRS Telephone Line, 69 percent stated that lack of a reason to call was a major factor in their decision to not call the IRS Telephone Line. Over two-thirds (67 percent) stated that the hours of operation were not a factor in their decision to not call (i.e., they were unconcerned with the hours of operation), and 64 percent stated that the cost of the telephone call was also not a factor in their decision to not call (see Figure 4).

FIGURE 4. Factors in Filers' Decision Not To Call IRS Telephone Line



Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.
Mean is derived from a five point scale with "1" representing not a factor at all and "5" representing major factor.

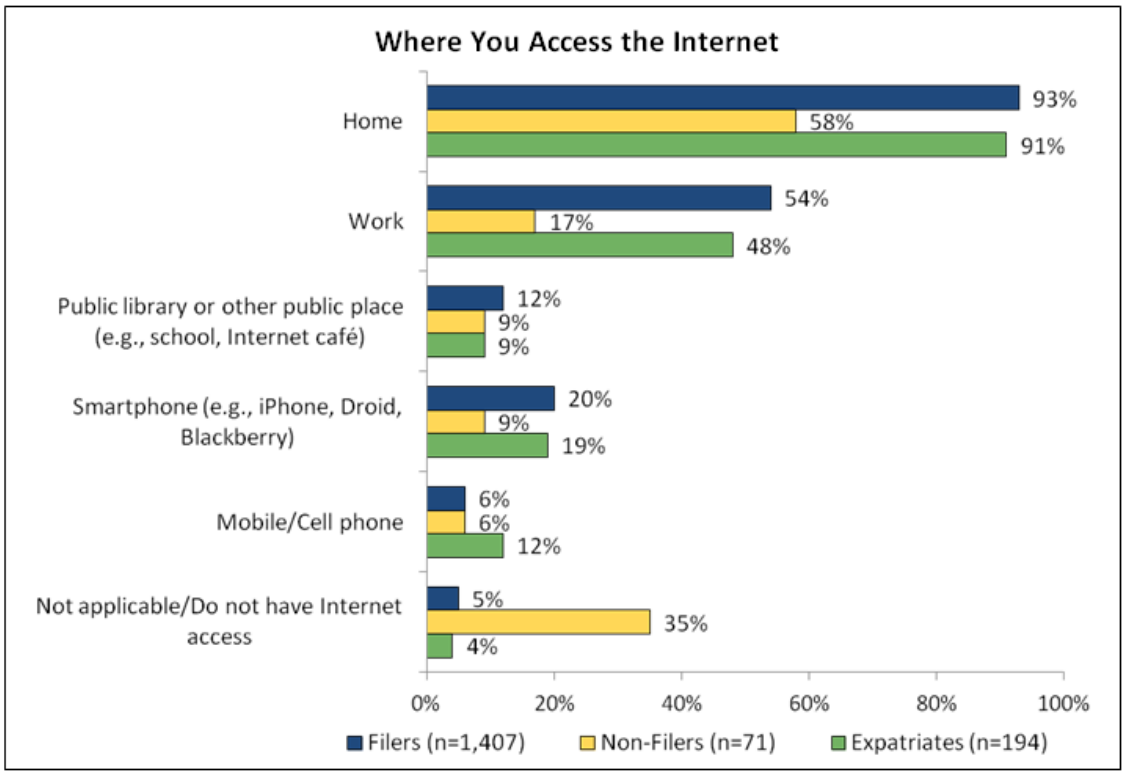
Notably, Expatriates who did not call the IRS Telephone Line were more likely (38 percent) than Filers (23 percent) to list one of their major factors as not being sure that a call to the IRS would yield the information they needed. Expatriates were also more likely (43 percent) than Filers (29 percent) to list one of their major factors in not calling as feeling that it would take too long to reach someone who could help them.

Use of IRS.gov

With respect to international taxpayers' use of online services, survey respondents were asked to rate their agreement with a series of questions related to their use of online resources, including their use of IRS.gov for their most recent tax return and their experiences with contacting the IRS by e-mail.

With respect to their Internet use, the vast majority of Filers and Expatriates (93 percent and 91 percent, respectively) reported accessing the Internet from home. Further, 54 percent and 48 percent of Filers and Expatriates, respectively, reported also accessing the Internet from work. In contrast, only 58 percent of Nonfilers reported accessing the Internet from home, and 17 percent reported accessing the Internet from work. Over a third of Nonfilers (35 percent) answered as "Not applicable/Do not have Internet access." For a full breakdown of where respondents access the Internet, refer to Figure 5.

FIGURE 5. Where Respondents Access the Internet



Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

Among those who used IRS.gov regarding their most recent tax return, Filers were more likely than Expatriates to agree with the four statements in Table 8. Very few Nonfilers provided responses to statements describing their use of IRS.gov.

TABLE 8: Agreement with Statements about IRS.gov[1]

Statement	Filers (n = 367-567)[2]	Expatriates (n = 69-82)	Nonfilers (n = 9-10)
Going to IRS.gov was a more convenient option for me than calling the IRS	84%	69%	5/9
It was easy to find the specific tax-related information I needed on IRS.gov (e.g., capital gains/losses, tax exemptions)	59%	42%	5/10
It was easy to understand the information about international tax topics on IRS.gov	41%	27%	4/9
The Frequently Asked Questions (FAQs) in the International Taxpayers section of IRS.gov provided the information I needed	33%	17%	3/9

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

[1] *Among those who used IRS.gov regarding their most recent tax return*

[2] *The bases (n) are shown as ranges because the number of respondents who answered by item varies.*

Expatriates who used IRS.gov regarding their most recent tax return were more likely to disagree with the positively-oriented statements regarding IRS.gov than Filers. While 28 percent of Filers disagreed that it was easy to understand the information about international tax topics on IRS.gov, 49 percent of Expatriates disagreed with the same statement. Additionally, 33 percent of Filers disagreed that the FAQs on the International Taxpayer page of IRS.gov provided the information they needed, whereas 55 percent of Expatriates disagreed with this statement.

Among Filers, between 81 and 85 percent of the three sub-groups (Civilian, Military, and Nonresident Aliens) agreed that going to IRS.gov was a more convenient option for them than calling the IRS. However, Military Filers were significantly more likely to agree with the remaining three statements about the ease and effectiveness of finding information on the Web site than Civilian and Nonresident Alien Filers, as shown in Table 9.

TABLE 9: Filers' Agreement with Statements about IRS.gov[1]

Statement	Civilians (n = 249-370)[2]	Military (n = 58-110)	Nonresident Aliens (n = 60-87)
Going to IRS.gov was a more convenient option for me than alling the IRS	85%	84%	81%
It was easy to find the specific tax-related information I needed on IRS.gov (e.g., capital gains/losses, tax exemptions)	56%	72%	58%
It was easy to understand the information about international tax topics on IRS.gov	35%	62%	49%
The Frequently Asked Questions (FAQs) in the International Taxpayers section of IRS.gov provided the information I needed	29%	48%	35%

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

[1] *Among those who used IRS.gov regarding their most recent tax return*

[2] *The bases (n) are shown as ranges because the number of respondents who answered by item varies.*

Contact with the IRS by E-mail

Of the few Filers who had e-mailed the IRS,[36] 60 percent agreed that the e-mail address for contacting the IRS was easy to find online. Additionally, 54 percent agreed that corresponding through e-mail was a more convenient option than calling the IRS.

Barriers to Using IRS Resources

The last question of the survey was open-ended and asked respondents to describe the barriers they had experienced when using IRS resources while living outside of the U.S. Most often, respondents discussed the complexity of and confusion over international tax law; dissatisfaction with not receiving international tax filing materials; excessive use of jargon or unclear language in IRS letters, publications, and forms; and difficulty finding needed information on IRS.gov. Additionally, respondents conveyed several problems with return preparation and filing and with calling the IRS Telephone Line.

With respect to the complexity of international tax law, respondents often discussed the situation of taxpayers who reside in a foreign country covered by a tax treaty with the U.S. that has a higher average income tax rate than in the U.S. Accordingly, these individuals' tax liability to the U.S. is generally small or zero. Two respondents stated the following:

- "I spend more money each year preparing taxes than I owe the government in liability."
- "One often has to spend an inordinate amount of time reading instructions and filling out forms just in order to show that one doesn't actually owe any U.S. taxes."

Additionally, consistent with the tax attachés' comments regarding dissatisfaction over not receiving international tax filing materials, one elderly respondent provided the following comment:

- "Something must be done to ensure that taxpayers without computers promptly get their paper forms and instructions and that telephone numbers of IRS reps at consulates and embassies are correct. I am 89 and have no intention of purchasing a computer. People in my category are also taxpayers and should be considered."

One respondent offered the following insight on the use of unclear language in IRS letters, publications, and forms:

- "I think your question on where to spend more effort misses the point. I do not need a toll-free phone number or an interactive web site. I need more understandable material."

Regarding return preparation and filing, respondents often discussed their inability to e-file, their problems with using tax software that does not accept foreign addresses[37] and/or does not include necessary forms, and their need to use expensive tax preparers because filing is too difficult.

Further, regarding barriers when calling the IRS, respondents commented on the long wait times, inconvenient hours of operation, high cost of calling the International Telephone Line, and the telephone line staff not being knowledgeable about international tax issues or giving inconsistent answers.

Not to be overlooked, many respondents also provided positive comments about using IRS resources. As two respondents stated:

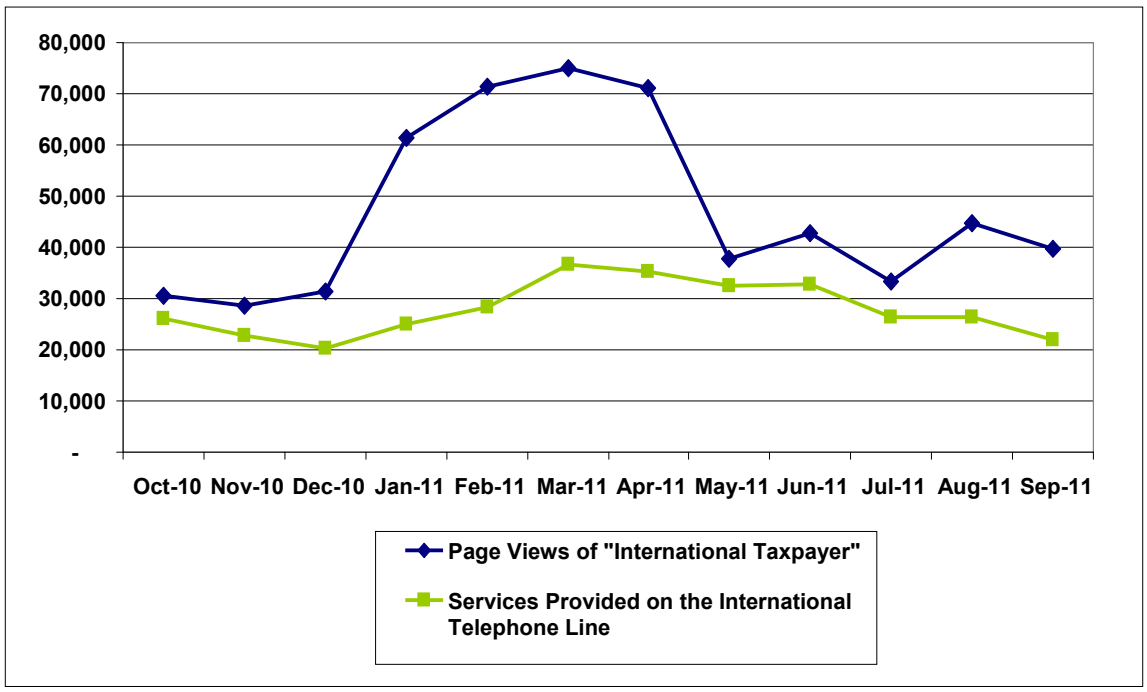
- "My personal experience with the IRS while living overseas has been encouraging. I have only called a couple of times in my years overseas, but the representatives I have spoken with have been cordial and helpful, guiding me to the information I needed."
- "Overall, I am pleased with the service of the IRS where my requirements and needs are concerned."

International Taxpayers' Actual Use of IRS Services

Analysis of FY 2011 IRS operations data supports international taxpayers' higher reported preferences and use of online services over phone services. As shown in Figure 6, there were consistently greater numbers of page

views of the International Taxpayer page on IRS.gov when compared to the number of services provided at the International Telephone Line. Additionally, the significant increase in number of page views during the filing season was not mirrored in the trend of services provided.

FIGURE 6. Fiscal Year 2011 Comparison of International Taxpayer Page Views and Services Provided at the International Telephone Line



Sources:
"IRS.gov Site Usage Reports (Monthly)," Online Services SharePoint, accessed January 5, 2012.
Aspect Application Activity, Joint Operations Center (JOC) ETD Quick Links, accessed January 5, 2012.

Although few survey respondents reported contacting the IRS by e-mail, the Electronic Tax Law Assistant (ETLA) tool is nevertheless being used overwhelmingly by resident/nonresident aliens and U.S. citizens living outside the United States, as stated earlier. Of all ETLA inquiries in FY 2011, 37 percent were related to international tax topics. Further, international inquires via ETLA have grown 147 percent from FY 2007 to FY 2011 (see Table 1).

International Taxpayers' Reported Awareness, Use, and Satisfaction with Other U.S. Federal Resources

In addition to the IRS resources previously mentioned, survey respondents were asked to indicate their awareness, use, and satisfaction with other U.S. federal resources, including:

- Onsite IRS assistance at the U.S. embassy or consulate in Frankfurt, London, Paris, or Beijing
- Telephone assistance from IRS staff at the U.S. embassy or consulate
- U.S. embassy Web site for tax information
- E-mail to the IRS through the U.S. embassy or consulate

Filers were most aware of the U.S. embassy Web site for tax information (21 percent) and least aware of e-mail to the IRS through the U.S. embassy or consulate (9 percent). Fewer than five percent of Filers reported using the federal resources listed above (see Table 10).

TABLE 10. Filers' Awareness, Use, and Satisfaction with Other Federal Resources

Federal Resource	Aware of Resource (n = 1,471)	Used Resource (n = 1,471)	Satisfaction with Resource *among those who used resource* [1]	Mean
Onsite IRS assistance at U.S. embassy or consulate	16%	1%	(n = 17) 11 Satisfied, 2 Neutral, 4 Dissatisfied	*
Telephone assistance from IRS staff at U.S embassy or consulate	18%	2%	(n = 29) 17 Satisfied, 9 Neutral, 3 Dissatisfied	*
U.S. embassy Web site	21%	4%	(n = 57) 54% / 30% / 16%	3.44
E-mail to the IRS via U.S. embassy or consulate	9%	<1%	(n = 6) 2 Satisfied, 2 Neutral, 2 Dissatisfied	*

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

Mean is derived from a five point scale with "1" representing very dissatisfied and "5" representing very satisfied.

[1] *Satisfied* *Neutral* *Dissatisfied*

** Means not shown for bases under 50.*

Expatriates were more likely than Filers to be aware of every federal resource for tax information listed in Table 10: onsite IRS assistance at the U.S. embassy or consulate (23 percent), telephone assistance from IRS staff at the U.S. embassy or consulate (23 percent), U.S. embassy Web site (30 percent), and e-mail to the IRS via the U.S. embassy or consulate (18 percent). However, no more than seven percent of Expatriates reported using any of the aforementioned Federal resources.[38]

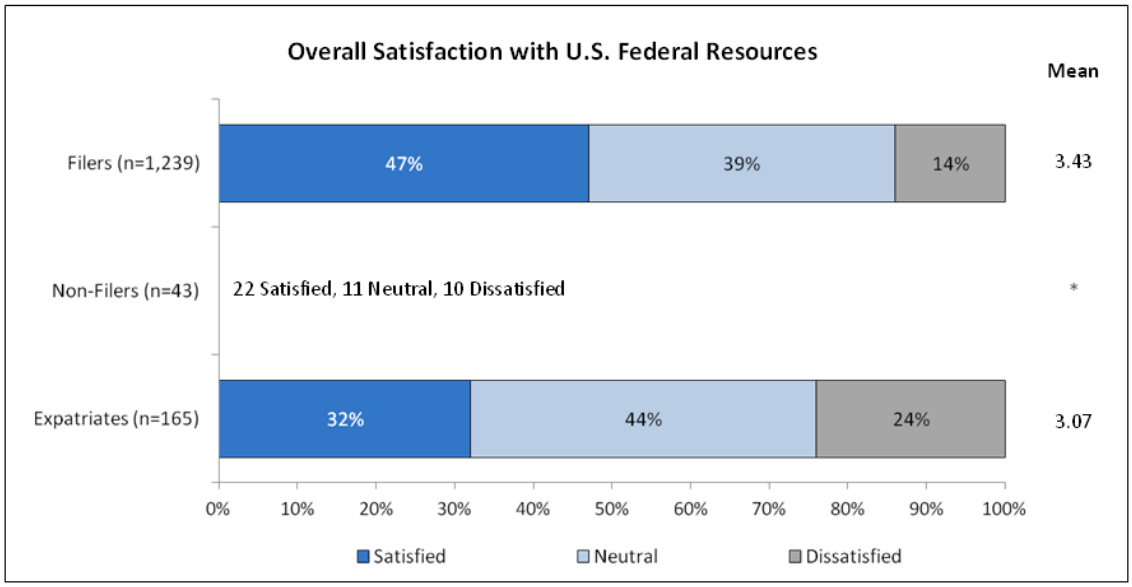
Of Nonfilers, awareness of the other Federal resources was highest for telephone assistance from IRS staff at the U.S. embassy or consulate (19 percent) and lowest for e-mail to the IRS via the U.S. embassy or consulate (six percent). Six or fewer Nonfilers reported using the additional Federal resources listed in Table 10.[39]

International Taxpayers' Reported Overall Satisfaction with All U.S. Federal Resources

In addition to indicating their satisfaction with individual tax resources, survey respondents were asked to indicate their overall satisfaction with all U.S. Federal tax resources, including IRS and non-IRS resources, which were available to them when they completed their most recent tax return. Less than half of Filers (47 percent) reported being satisfied with U.S. Federal resources available to them, and 14 percent reported being dissatisfied. Expatriates were less satisfied with the resources overall, with 32 percent stating they were satisfied and 24 percent stating they were dissatisfied (see Figure 7).

Of Filers, Military respondents were more likely (62 percent) than Civilian or Nonresident Alien respondents (41 and 47 percent, respectively) to be satisfied with U.S. Federal resources. Civilian Filers were most likely to be dissatisfied with U.S. Federal resources (18 percent), when compared to Military Filers (6 percent) and Nonresident Alien Filers (12 percent).

Figure 7. Overall Satisfaction with U.S. Federal Resources[1]



Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.
Mean is derived from a five point scale with "1" representing very dissatisfied and "5" representing very satisfied.
[1] U.S. Federal Resources refers to IRS resources as well as non-IRS federal resources, such as those from a U.S. embassy or consulate.

Segmentation of Filers Based on Latent Class Analysis

Latent class analysis (LCA) is a probability-based model used to estimate membership in an underlying and unknown ("latent") population segment based on observed characteristics. Five unique segments of Filers were identified through conducting LCA based on the following observed characteristics:

- Use of tax software to prepare most recent U.S. Federal tax return
- Self-prepared most recent U.S. Federal tax return
- Electronically filed most recent U.S. Federal tax return
- Not sure how filed/'someone else filed most recent U.S. Federal tax return
- Had no reason to call the IRS Telephone Line
- IRS Telephone Line and IRS.gov affinity factors
- IRS Telephone Line and IRS.gov usage factors
- Awareness of IRS, non-IRS Federal, and non-Federal tax resources

Based on the above behavioral and attitudinal measures of telephone and electronic support, the five segments of Filers detailed in Table 11 were derived.

TABLE 11. Segmentation of Filers Based on Latent Class Analysis

Segment	Percent of All Filers	Defining Characteristics	Who They Are
Do-It-Yourself (DIY) Tech	9% (n = 130)	Self-prepares taxes; uses tax software, files electronically, prefers web	Median age 40 (youngest segment); 71% have lived outside the U.S. for five years or less; highest Internet access (99% at home, 82% at work), including access via smartphone (29%); high full-time employment (91%)
Do-It-Yourself (DIY) Paper	30% (n = 439)	Self-prepares taxes, files by paper, prefers web, considers phone a barrier, moderate to high awareness of federal resources	Median age 52; 57% have lived outside the U.S. for more than five years, 53% have advanced degrees; median spent on tax preparation $10 (lowest)
Hires Out, Involved	27% (n = 394)	Does not prepare own taxes, moderate to high awareness of all tax resources (IRS, non-IRS federal, and non-federal)	Median age 48; 50% have lived outside the U.S. for more than five years; median spent on tax preparation $300; 13% used Volunteer Income Tax Assistance (VITA) and 75% used a paid preparer in or outside of the U.S.
Hires Out, Uninvolved	16% (n = 231)	Does not prepare own taxes, does not have reason to contact the IRS, generally less aware of IRS services, but is aware of personal accountant/bookkeeper	Median age 54; median spent on tax preparation $400 (highest); 22% have never lived in the U.S.; 86% used a paid preparer in or outside of the U.S.
Phone First	19% (n = 277)	Prefers improvement of phone service, web not convenient, low awareness of IRS website and IRS Telephone Line	Median age 64 (oldest segment); 21% have never lived in the U.S. and 53% have lived outside the U.S. for 10 years or more; 17% do not have Internet access; high retirement

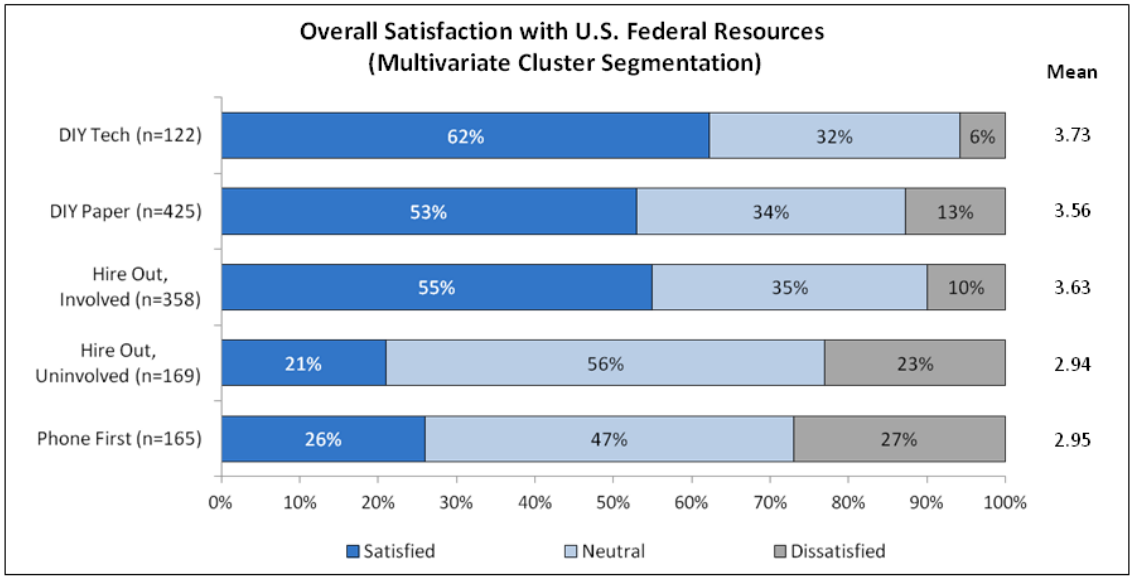
Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.

Notably, Military Filers were most likely to be DIY Tech (38 percent), whereas Civilian and Nonresident Alien Filers were least likely to be DIY Tech (three and less than one percent, respectively). Additionally, 13 percent of the Hires Out, Involved group reported using Volunteer Income Tax Assistance (VITA) to prepare their most recent U.S. tax return, indicating that these respondents were part of the Military Filer sample. Civilian Filers were most likely to be DIY Paper (36 percent), and Nonresident Aliens were most likely to be Phone First (28 percent).

Of the DIY Paper group, 16 percent reported that problems with tax software or an inability to e-file was a barrier for them, potentially leading some of these taxpayers to file paper returns when they would prefer to e-file. Also, the DIY Paper group was much less likely (26 percent) than the DIY Tech group (68 percent) to state that they did not encounter any barriers while using IRS resources. Interestingly, the DIY Paper group was as likely as the DIY Tech group (72 percent) to complete the web version of the *2011 IRS Survey of Individuals Abroad* and slightly more likely than the Hires Out groups to complete the survey online.[40] Again, this suggests that DIY Paper respondents may prefer to e-file but may be prevented from doing so due to barriers with accessing online services, or due to their view of tax filing as an inherently different activity compared to, for example, responding to a Web survey or researching tax topics online.

With respect to overall satisfaction with U.S. Federal resources available to the five segments of Filers when they completed their most recent tax return, the DIY Tech segment reported the highest satisfaction (62 percent), whereas the Phone First segment reported the highest dissatisfaction (27 percent). Refer to Figure 8.

FIGURE 8. Segmentation of Filers' Overall Satisfaction with U.S. Federal Resources Based on Latent Class Analysis[1]



Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.
Mean is derived from a five point scale with "1" representing very dissatisfied and "5" representing very satisfied.
[1] *U.S. Federal Resources refers to IRS resources as well as non-IRS federal resources, such as those from a U.S. embassy or consulate.*

International Taxpayers' Reported Awareness, Use, and Satisfaction with Non-Federal Resources

Lastly, survey respondents were asked to indicate their awareness, use, and satisfaction with the following non-Federal resources on tax information:

- Tax preparation company
- Personal accountant/bookkeeper
- Tax preparation software

Filers reported higher awareness and use of non-Federal resources compared with Federal resources, with the exception of the IRS Web site (see Table 12). Additionally, Filers who used non-Federal tax resources were significantly more likely to be satisfied with the resource, when compared with Filers who rated their satisfaction with Federal tax resources.

TABLE 12. Filers' Awareness, Use, and Satisfaction with Non-Federal Resources

Non-Federal Resource	Aware of Resource (n = 1,471)	Used Resource (n = 1,471)	Satisfaction with Resource among those who used resource [1]	Mean
Tax preparation company	62%	23%	(n = 340) 80% / 12% / 8%	4.16
Personal accountant/ bookkeeper	62%	27%	(n = 389) 84% / 10% / 6%	4.28
Tax preparation software	57%	19%	(n = 282) 76% / 15% / 9%	4.03

Source: 2011 Survey of Individuals Living Abroad: Top Line Report. ICF Macro, September 16, 2011.
Mean is derived from a five point scale with "1" representing very dissatisfied and "5" representing very satisfied.
[1] *Satisfied* *Neutral* *Dissatisfied*

Expatriates' awareness of non-Federal tax resources was similar to that of Filers: 66 percent were aware of a tax preparation company, 64 percent were aware of a personal accountant/bookkeeper, and 55 percent were aware of tax preparation software. Additionally, Expatriates were more likely to have used a tax preparation company (32 percent) and a personal accountant/bookkeeper (30 percent) than Filers, while they were less likely to have used tax preparation software (12 percent) than Filers. Regarding their satisfaction, Expatriates were less likely to be satisfied with the tax preparation company (77 percent) and with the personal accountant/bookkeeper (75 percent) than Filers.[42]

Nonfilers were much less aware of the three non-Federal tax resources than Filers and Expatriates; 29 percent were aware of a tax preparation company, 27 percent were aware of a personal accountant/bookkeeper, and 19 percent were aware of tax preparation software. Only ten or fewer Nonfilers reported using any of the three non-Federal resources.[43]

Key Highlights From WIRA's Portfolio of International Research

For nearly 4 years, WIRA has engaged in a systematic and multi-source program of research to capture and define the service needs of international taxpayers through a portfolio of research designed to identify the demographic profile as well as the tax preparation and filing habits of international taxpayers, service channel preferences, potential barriers to service, and opportunities for service improvement. WIRA's portfolio of international taxpayer research reveals a taxpayer segment that is underserved, expresses a desire for self-service channels, and may experience higher post-filing problems than the general taxpayer population.

Specifically, for TY 2010, international returns were less likely to be filed electronically when compared to non-international returns (30 percent compared to 81 percent). With 7 percent of Puerto Rican returns as well as 7 percent of international (excluding Puerto Rico) returns having at least one math error, compared to only 4 percent of non-international returns, filing method may be a contributing factor to these high error rates. Additionally, 91 percent of total international returns with at least one math error were committed by paper filers.

For TY 2010, approximately 44 percent of all international filers were between the ages of 25 and 44. International taxpayers were more concentrated in the 25 to 44 age categories and there were fewer total international taxpayers age 65 and over (12 percent) compared to non-international taxpayers (15 percent). These findings indicate that retirees are not a large segment of international filers. These findings also have potential relevance regarding the ability, preference, and/or willingness of international filers to use certain service delivery channels, such as the web or telephone.

Highlights of WIRA's International Interview and Survey Research indicate that international taxpayers may best be served through investment and improvements in IRS.gov and online services. For example, U.S. based multinational companies employing U.S. citizens working abroad expressed a need for the IRS to accept faxed signatures as opposed to only accepting original signatures for tax returns to help lower the costs and time associated with international mail. Respondents to the *2009 IRS Survey of International Taxpayers* reported an Internet access rate of 91 percent with 95 percent of these individuals accessing the Internet at home. IRS.gov was consistently ranked among the top resources respondents used in the past and would be willing to use again in future for questions about filing requirements/taxable income, tax treaties, resolving notice/letter from IRS, making a payment, and/or obtaining an individual taxpayer identification number (ITIN).

Survey analysis from the *2011 IRS Survey of Individuals Living Abroad* reveals striking differences in the awareness of the IRS Web site among international taxpayers. Specifically, 78 percent of Filers and 74 percent of Expatriates reported an awareness of IRS.gov compared to an only 35 percent awareness of IRS.gov among Nonfilers. Additionally, 39 percent of Filers used the IRS Web site, which is more than three times the number who used any other IRS resource listed. Among those Filers who visited IRS.gov regarding their most recent tax return, the majority (84 percent) indicated that it was a more convenient option for them than calling the IRS telephone line. Lastly, nearly 70 percent of survey respondents reported a preference for improving online services (i.e., improve Web site interactivity specific to international tax issues) over improving the telephone service (i.e., improve access by providing an international toll-free line).

Conclusions

Over the past three decades, several unique trends in the international tax arena have posed service and enforcement challenges for the IRS including significant increases in cross-border transactions, transfer pricing and foreign tax credit filings, and the growth in not only U.S. citizens and small businesses abroad but also non-citizens working in the U.S. In response to these trends, the IRS has strengthened its focus on international tax administration with the main focus of improving voluntary compliance with international tax provisions and reducing the tax gap attributable to international transactions.

While international taxpayers as a whole may best be served through investment and improvements to IRS.gov and/or online services, the challenge of providing service to facilitate compliance cannot be overlooked. Although the vast majority of Filers and Expatriates reported that they have Internet access at home (93 percent and 91 percent, respectively), only 58 percent of Nonfilers reported having Internet access at home. Additionally, 35 percent of Nonfilers reported not having Internet access. Nonfilers were also less likely to agree that they would look for information on IRS.gov before calling the IRS (55 percent) or that they would prefer to get the information on IRS.gov (52 percent) compared to Filers and Expatriates.[43]

Lastly, in comparing international taxpayers' reported preferences to their reported use of service, there is consistency with each in terms of international taxpayers' confidence in the information received from the phone versus the website, their opinions of visiting IRS.gov prior to calling the IRS, and also in their opinions on the IRS Telephone Line's hours of operation. As for reported use versus actual use of service, a comparison of Services Provided via the International Telephone Line to Page Views of the International Taxpayer page on IRS.gov as well as ETLA data reveals that international taxpayers' actual use of Web service over phone service support their reported preferences and reported use. In summary, there is a consistent alignment in what international taxpayers say they want, say they use, and actually use.

Endnotes

[1] The authors would like to thank the WIRA directors and management (Frederick T. McElligott, Mark E. Pursley, Elizabeth L. Blair, Karen D. Truss, Javier A. Framiñan, Gwen M. Garren, and Kathleen P. Holland) and researchers (Julie Thompson-Evans, Maria Celina Iglesia, Robert P. Thomas, and Jennifer D. Turner) who contributed to this study. We would also like to acknowledge the support of Pacific Consulting Group and ICF Macro.

[2] U.S. Department of State, http://state.gov/.

[3] "Servicewide Approach to International Tax Administration—Strategic Initiatives and FY 2009 Priorities," Large and Mid-Size Business (LMSB), April 10, 2009.

[4] For the *2009 IRS Survey of International Taxpayers*, the focus groups and interviews were used in the development and refinement of the survey instrument while the demographic and tax filing profile was used to define the sample. For the *2011 IRS Survey of Individuals Living Abroad*, lessons learned and survey responses from the 2009 Survey were used to develop the survey instrument with the sampling plan being informed by WIRA research into alternative data sources including the IRS nonfiler database, U.S. Department of State Passport data, and Certificate of Loss of Nationality data.

[5] Source: Tax return data from Individual Returns Transaction File (IRTF) and Individual Master File (IMF) Tables housed on the Compliance Data Warehouse (CDW). The demographic and filing profiles of international taxpayers were analyzed for tax years 2006, 2008, and 2010.

[6] The number of phone calls answered includes Services Provided at 1-267-941-1000 and at 1-215-516-2000. The latter number (ext. 2000) was the former International Telephone Line, and this number was discontinued in October 2010.

[7] Abandoned calls are those that are put into queue; however, the taxpayer hangs up before speaking with an IRS assistor.

[8] Source: Aspect Application Activity, Joint Operations Center (JOC) ETD Quick Links, accessed May 10, 2012.

[9] During the same period, the London post provided services to 1,939 walk-in taxpayers and responded to 1,349 letters/faxes. Source: Monthly Activity Report, London Post, March 2012, prepared by Lynn Marsland, London Deputy Tax Attaché, Team 1, Assistant Deputy Commissioner International, LB&I. April 10, 2012.

[10] The TAC in Guaynabo, Puerto has walk-in assistance service hours on Monday through Friday from 8:30 AM to 4:30 PM.

[11] Taxpayer assistance at the Ponce, Puerto Rico POD was provided only on Wednesdays February 29, March 14, and April 4, 2012 from 8:30 AM to 3:30 PM.

[12] Source: Telephone interview with Ricardo M. Perez, Individual Taxpayer Advisor Specialist. Customer Assistance, Relationships, & Education (CARE) Field Assistance (FA) Area 3. May 14, 2012.

[13] Source: Telephone interview with Ricardo M. Perez, Individual Taxpayer Advisor Specialist, Customer Assistance, Relationships, & Education (CARE) Field Assistance (FA) Area 3. May 14, 2012.

[14] Source: Interviews with Tax Attachés in International IRS Posts, W&I Research & Analysis (WIRA) Group 4, April 2012. Project #4-12-09-A-040.

[15] The frequently asked question subcategories for resident/nonresident aliens and U.S. Citizens living abroad include Canadian & U.S. Tax Issues, Exchange Rate, Foreign Income & Foreign Income Exclusion, Nonresident Alien—General, Nonresident Alien—Tax Withholding, Nonresident Alien—Students, U.S. Citizens Overseas, and Other.

[16] W&I Finance estimates the unit cost of e-mail to be approximately $116.66 (May 10, 2012).

[17] Source: Interviews with Tax Attachés in International IRS Posts, W&I Research & Analysis (WIRA) Group 4, April 2012. Project #4-12-09-A-040.

[18] Excluding survey respondents who had no need to obtain information because they used a paid practitioner.

[19] Source: Interviews with Tax Attachés in International IRS Posts, W&I Research & Analysis (WIRA) Group 4, April 2012. Project #4-12-09-A-040.

[20] Package 7 contained Forms 1040, 1040-V, 1116, 2106, 2555, 2555EZ, 3903, 6251, TD F 90-22, Schedules A, B, C, D, E, L, M, and SE, and Publication 54.

[21] Direct mailings of Package 7 to embassies in U.S. territories w*ere* not discontinued.

[22] Source: Interviews with Tax Attachés in International IRS Posts, W&I Research & Analysis (WIRA) Group 4, April 2012. Project #4-12-09-A-040.

[23] The Foreign Account Tax Compliance Act (FATCA) was enacted in 2010 as part of the Hiring Incentives to Restore Employment (HIRE) Act. FATCA was an important development in U.S. efforts to combat tax evasion by U.S. taxpayers with investments in offshore accounts, and the Act required the new Form 8938 to be filed by taxpayers who met certain criteria regarding foreign assets beginning in January 2012.

[24] Source: Interviews with Tax Attachés in International IRS Posts, W&I Research & Analysis (WIRA) Group 4, April 2012. Project #4-12-09-A-040.

[25] Source: Interviews with Tax Attachés in International IRS Posts, W&I Research & Analysis (WIRA) Group 4, April 2012. Project #4-12-09-A-040.

[26] Capitalized instances of Filers (Civilian, Military, and Nonresident Alien), Nonfilers, and Expatriates refer to groups of survey respondents. Where not capitalized, the terms refer to overall populations of filers, nonfilers, and expatriates.

[27] Although Americans living abroad are commonly known as expatriates, an "expatriate" for the purposes of the survey is defined as "a U.S. citizen who relinquished citizenship or a long-term resident who ceased to be a lawful permanent resident."

[28] U.S. Department of the Treasury, Internal Revenue Service, Form 8854, *Initial and Annual Expatriation Statement*.

[29] U.S. Department of State, Bureau of Consular Affairs, DS-4083, *Certificate of Loss of Nationality of the United States*.

[30] Individuals who expatriated on or after June 16, 2008 and had a net worth of $2 million or more at the date of expatriation are classified as "covered expatriates" under Internal Revenue Code (IRC) sections 877 and 877A and are subject to a one time mark-to-market tax on their net unrealized gain on property as of the day before the expatriation date (i.e., treated as if they sold (deemed sale) all of their property for fair market value on the day prior to the expatriation date).

[31] Of all TY 2009 taxpayers, 42 percent reported self-preparing their tax returns, with 69 percent of these taxpayers using tax software. Source: 2010 W&I Taxpayer Experience Survey National Report—Tax Year 2009, Filing Season 2010. W&I Research & Analysis Group 1.

[32] The Web version of the survey required setting upper limits on the time and dollar amounts entered for these questions. The limits were 500 hours and $5,000, respectively. However, some open-ended comments and communications to the survey helpdesk indicated that some respondents to the web survey spent in excess of $5,000. Therefore, the true dollar average is actually greater than $413.

[33] Source: IRS Compliance Data Warehouse (CDW), for data through cycle 8 of processing year (PY) 2011.

[34] Includes Filers, Expatriates, and Nonfilers.

[35] Question 7D of the survey asked respondents to rate their agreement with the statement "The IRS Telephone Line's hours of operation (6:00 am to 11:00 pm (ET) M-F) are convenient for me." Of Filers who responded to this question, 50 percent agreed with the statement.

[36] Among Filers who contacted the IRS by e-mail, between 45 and 60 respondents rated their agreement with statements about e-mailing the IRS.

[37] WIRA acknowledges that many leading tax preparation software companies currently support foreign addresses; however, from the *2011 IRS Survey of Individuals Living Abroad*, it appears the perception that tax preparation software does not support foreign addresses still exists among some international taxpayers.

[38] Of Expatriates, 203 responded to the questions regarding awareness and use of IRS resources.

[39] Of Nonfilers, 79 responded to the questions regarding awareness and use of IRS resources.

[40] Sixty-eight percent and 63 percent of Hires Out, Involved and Hires Out, Uninvolved, respectively, completed the survey online.

[41] Of Expatriates, 203 responded to the questions regarding awareness and use of IRS resources.

[42] Of Nonfilers, 79 responded to the questions regarding awareness and use of IRS resources.

[43] Approximately 76 percent of both Filers and Expatriates agreed that if they had a tax question they would consult IRS.gov before calling the IRS. Additionally, 66 percent of Filers and 62 percent of Expatriates indicated they preferred to get information on IRS.gov rather than calling the IRS.

Behavioral Experiments of Alternative Reporting Regimes: Transparency vs. Burden

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Among the puzzles the Internal Revenue Service (IRS) faces in enforcing the U.S. income tax is how to stretch its limited resources so as to maximize taxpayer compliance. Random enforcement would be optimal only under a set of restrictive assumptions: (a) all taxpayers exhibit the same degree of noncompliance, paying the same share of their true tax liabilities, (b) the IRS is able to detect all noncompliance during an audit, and (c) audit costs are also proportional to true tax liabilities. But, in the first place, it is unlikely that all taxpayers are equally noncompliant. Instead, they differ in many ways that can affect compliance behavior: their occupations, the sources of their incomes and the various consumption choices they make, to name a few. These differences grant some taxpayers opportunities that others do not have to understate their liability—or more opportunities to do so than other taxpayers. Moreover, even if it were possible to eliminate these opportunities, people might still be endowed with individual differences in their underlying propensities to comply with tax laws.

At least partly in response to these differences, the IRS currently expends some resources to identify which taxpayers are to receive enforcement efforts. Alternatively, if taxpayers could be induced to reveal or signal their compliance propensities, a portion of those resources could be redirected elsewhere. How might we design a revelation strategy? One possibility that we study here is to offer people a choice of taxpaying regimes, coupled with adjustments in their taxpaying burden. Beyond self-revelation, this scheme also enables us to explore whether compliance changes. The idea is that a compliant taxpayer with a low propensity to cheat might prefer a regime that eliminated any cheating opportunities while also offering a reduced compliance burden. On the other hand, a noncompliant taxpayer with a higher propensity to cheat might prefer a regime that did offer opportunities to cheat, willingly accepting a higher compliance burden.

Opportunities to cheat are reduced when a taxpayer's income or deductions are transparent to the tax administrator, for example because they are required to be reported to the administrator by the source. In some cases, tax administrators allow taxpayers to trade transparency—and with it the chance to underreport income or overstate deductions—for reduced compliance burden. For example, the IRS maintains voluntary compliance agreements for industries where tipping of service-providers is customary. Under these programs, employers and employees may benefit from reduced compliance burdens and/or reduced threat of IRS examinations.[1] In exchange, they accept restrictions on their ability to underreport taxable tip income. As another example, under the Compliance Assurance Program, certain corporate taxpayers work with the IRS to identify and resolve potential compliance issues prior to filing a return. In return for being transparent and disclosing all materials to the IRS, the taxpayer receives certainty regarding their tax liability and potentially reduces their own resources dedicated to the examination process.

This paper presents the results of a laboratory experiment designed to explore three main questions: (1) whether offering a regime choice can serve as a sorting mechanism, separating (relatively) compliant from noncompliant taxpayers; (2) how much taxpayers are willing to pay for a reduction in burden, conditioned on their income; and (3) whether the compliance behavior of taxpayers who are able to choose a reporting regime changes in ways that improve the overall level of compliance.

We constructed three experimental treatments. In each treatment, subjects earned income by completing tasks on a computer terminal, and a tax was levied on income. In the first treatment, subjects reported their earnings to the experiment authority, and the reports were randomly audited, with penalties for underreporting. In this simplified experimental setting, differences in reporting compliance reflect only differing

propensities to cheat, as everyone has the same occupation, the same income source, and there are no tax-sensitive consumption opportunities. The results of this treatment allow us to identify the subjects' propensities to underreport earnings and how that propensity varies with earnings and the tax, audit, and penalty rates. Among noncompliant subjects, we also learn how the amount of understatement varies with earnings and the experiment parameters.

The second treatment introduced a reporting burden in the form of an earnings worksheet—requiring the subject to perform a calculation—plus an on-screen form in which to enter earnings and several other pieces of information. Subjects could choose to pay a fee to be relieved of the reporting burden. If the subject paid the fee, the computer automatically and instantaneously recorded their earnings. Varying the fee, we trace out the schedule of subjects' willingness to pay for (demand) burden reduction. We also construct individual willing-to-pay indices for each subject.

Treatment 3 presented subjects with a choice of two tax reporting regimes: a transparent, variable burden regime and a non-transparent, high burden regime. The results of this treatment allow us to identify how well the propensity to cheat, as identified in Treatment 1, and willingness to pay for burden reduction, as identified in Treatment 2, explain regime choice. As we also vary the reporting burden, we study how the quality of separation and the overall level of compliance vary with burden.

In the following sections, we review the salient literature, describe the experiment, describe subject recruitment and characteristics, present results, and offer some conclusions.

Literature Review

Theoretical analysis of tax compliance behavior began in the deterrence models of Allingham and Sandmo (1972) and Yitzhaki (1974), following the earlier work of Becker (1968). For the United States, where audit and penalty rates are comparatively low, these models predict substantially more tax evasion than have usually been observed. In a more recent paper, Mark Phillips (2011) argues that replacing constant deterrence parameters with the IRS's targeted and endogenously determined audit and detection probabilities, compliance behavior does respond in the direction deterrence theory would predict. That is, for example, the 2007 net misreporting percentage for income subject to complete information reporting (wages and salaries) was only 1.2 percent while that for income not subject to any information reporting was 53.9 percent. To augment the deterrence theory, researchers have sought to model alternative explanations for compliance behavior. Some work focuses on the influences of social norms (Posner, 2000) or of how the government treats taxpayers (Feld & Frey, 2002). Other research enlarges the compliance paradigm beyond deterrence to include the provision of information and services (Andreoni et al., 1998, Slemrod et al., 2001, Alm, Jones, Cherry, and McKee, 2011).

While we know that individual taxpayers differ in important ways and that a tax authority often uses audit selection criteria to target and exploit such differences, comparatively few contributions to this literature address these differences. Alm, Cronshaw and McKee (1993) show experimentally that audit selection using endogenous rules results in enhanced compliance. Taxpayer differences may also be identified via self-selection mechanisms. For example, among business taxpayers, Chu (1990) proposes a separation into alternative plea-bargaining regimes on the basis of firm profit levels, while Cowell (1990) suggests that when multinational firms transfer income between sub-units, they are in effect self-selecting between alternative national tax regimes. For individuals, Falkinger and Walther (1991) allow taxpayers to choose between two tax regimes, with the tax authority subsequently using the separation to target its audits. Theirs is an Allingham/Sandmo/Yitzhaki model in which there are two types of taxpayers: "big fish" who evade a lot and "small fish" who evade only a little. To identify or separate the types, taxpayers are offered a choice between a BONUS and a NO BONUS regime. In the BONUS regime, likely attractive to "small fish," there is a lower tax rate (the bonus) and a higher penalty for evasion. In the NO BONUS regime, designed to attract "big fish," there is no lower tax rate but the penalty rate for evasion is lower. The tax authority sets the bonus tax rate reduction and the penalty rate increase so that "small fish" are better off in the BONUS regime and "big fish" in the NO BONUS regime. They show that when the tax authority subsequently raises the audit probability for those choosing NO BONUS, taxpayers who remain in the regime evade less, paying more tax. On the other hand, those "big fish" who migrate to the BONUS regime also evade less and pay more tax. While it is possible that some "small fish"

will evade more (and pay less tax), the tax authority could eliminate this by setting the BONUS penalty rate sufficiently high. The end result here is that the small fish experience a welfare gain (lower tax rate), the big fish are induced to reduce their evasion, and the government receives higher tax yields.

Raskolnikov (2009) supposes two types of taxpayers, gamers and non-gamers. The gamers are either aggressive tax evaders whose behavior is clearly not justifiable, or aggressive tax avoiders, whose behavior can be justified by ambiguities in tax law. Non-gamers are taxpayers motivated other than by expected tax penalties, for example, by habit, a sense of duty, a desire to avoid guilt or shame, or a wish to behave as others do. Like Falkinger and Walther, he proposes that the IRS ask all taxpayers to choose between two tax regimes, here a compliance regime (CR) and a deterrence regime (DR). The CR features a lower penalty rate, an increased probability of conviction, and a few special benefits. Raskolnikov achieves this higher conviction probability by removing some existing legal protections in resolving taxpayer disputes with the IRS and introducing more stringent rules for tax preparers. Taxpayer benefits in CR would include respectful, friendly treatment and some pre-filing assistance for questionable positions. The DR is characterized by a higher penalty rate, no change in the conviction probability, and no special benefits. While Raskolnikov acknowledges that some gamers will prefer CR to DR, rendering the separation incomplete, he argues that some separation is better than no separation and that experimentation could reveal the policy settings most productive of the desired separation. Note that, as in Falkinger and Walther, Raskolnikov does not use the audit rate as a part of the separation mechanism. In discussing whether to use the audit rate to discriminate between gamers and non-gamer, he first argues that amongst gamers, audits constitute the best deterrent. On account of this assertion, the audit rate should be set higher in DR. Doing so will prevent expensive, wasteful audits of CR taxpayers, and prevent crowding out their voluntary compliance. On the other hand, Raskolnikov argues that the CR is likely to include some gamers along with non-gamers (i.e., the separation will be incomplete). Raising the audit rate in CR will enable identifying gamers and support a more complete separation, pushing the gamers to choose DR instead. Given these two opposing arguments, Raskolnikov asserts that a uniform audit rate could be a credible government policy under his system.

Since taxpayers engage in compliance decisions on a regular basis (e.g., annually), one wonders whether the Falkinger-Walther and Raskolnikov separations would survive repeated choices over time.[2] If the authority exploits the separation to target enforcement (e.g., audits), then it would set a higher audit rate in Falkinger-Walther's NO BONUS and Raskolnikov's deterrence regimes. When making a regime choice in the following year, taxpayers would likely incorporate their prior audit experience. In the second year, a big fish who had been audited in NO BONUS would knowingly face a higher audit rate as well as a lower penalty rate, so that her expected penalty could be smaller or larger than if she moved to the BONUS regime. This might also apply to a big fish who had not been audited, if audit rate information becomes public. However, so long as the authority sets the penalty and audit rate differentials to maintain the separation (high enough penalty rate in BONUS and low enough audit rate differential), the Falkinger-Walther separation could persist (small fish who are aware of the audit rate differential would have an additional reason for choosing the BONUS regime). For the Raskolnikov proposal, auditing gamers in the deterrence regime visits a double whammy on these taxpayers in the second year: a higher likelihood of being audited and a bigger penalty. Thus, it is harder to imagine that the separation could persist, as these gamers would then have an incentive to move to the compliance regime (lower audit rate and lower penalties). Suppose instead that, under the (incomplete) Raskolnikov separation, the authority targets audits on CR taxpayers. In the following year, a CR gamer who was audited but faced a lower penalty rate might rationally decide to stay put. In this case, time reinforces an incomplete separation. However, it is also true that resources are wasted on compliant CR taxpayers.[3]

In a series of dictator game experiments, Lazear, Malmendier and Weber (2012) demonstrate that people who self-select into a sharing regime behave differently from those who participate without an express opportunity to opt out. Initially using a between-subjects design, the authors find that the number of subjects who share a portion of their endowment in a standard dictator game regime (with no opportunity to self-select either into or out of the game) is more than twice as high as the number who share when self-selection is allowed. Then, employing a within-subjects design, they show that some subjects (33–41 percent in their experiments) who share when not allowed to opt out of a dictator game will, given a self-selection opportunity, prefer to opt out and not to share. Applied to the tax compliance situation we study here, these results suggest that

the compliance behavior of taxpayers who sort themselves into particular compliance regimes may be quite different from that of an unsorted population of taxpayers.

The Experiment

We conducted 16 one-hour experiment sessions in April 2012 at a computer lab on the University of Minnesota's Minneapolis campus.[4] The lab's 44 networked computer workstations are installed in high-sided carrels that partially isolate subjects from one another. At the beginning of each session, subjects selected carrels, and heard an overview of the experiment and data confidentiality procedures read aloud. Experiment instructions appeared on the computer screens, and subjects had paper copies of the same instructions at their workstations. Subjects also were given paper and pencils to perform calculations.

The experiment proceeded in three treatment stages, with multiple rounds in each stage. All subjects progressed through the stages in the same order. Each stage began with a screen providing the instructions for that treatment, including the number of rounds to be completed. That screen was followed by a three-question, multiple-choice quiz on the instructions. A subject who answered a quiz question incorrectly was informed of the correct answer. The quiz scores in each round were retained as input into the subject's payout. In each treatment, the quiz was followed by at least one practice round.

Within each treatment, subjects faced the possible experiment states—combinations of experiment parameters—in random order. The parameter values for each state are listed in Table 1. At the beginning of each round, the computer screen showed the value of the parameters for that round. Subjects then earned income by completing tasks on the computer terminal within a fixed period of time.[5] The earning task was the same for each round. A list of 30 English words appeared in random order in a box on the computer screen. Subjects completed tasks by correctly sorting words into one of three alphabetical bins: A-H, I-P, and Q-Z. Their earnings for a round equaled the wage rate ($1.20) times the number of correctly sorted words. In all but the third treatment practice rounds, the earning time was 30 seconds. At the conclusion of the earning time, the number of completed tasks appeared on the screen. When each of the three treatments ended, the computer program randomly selected one round (excluding practice rounds) to use to determine the payout for that treatment. Each round in a treatment had the same chance of being selected to be a "payout round." The randomly selected round was not revealed to subjects. At the end of the experiment session, subjects received cash payouts equal to 50 percent of the credited amounts from the three randomly chosen payout rounds plus $0.50 for each correctly answered quiz question, rounded up to the nearest dollar. The average payout was $34.

In each treatment, subjects were charged a tax equal to a tax rate times their income. In the first treatment, subjects reported their earnings to the experiment authority, which randomly audited a fraction of the participants to verify their reported income. Subjects who were audited and found to have reported less income than they earned were charged the correct tax amount: the tax rate times the amount they actually earned. In addition, they were charged a penalty equal to the penalty rate times the tax due on underreported income (penalty rate x tax rate x amount of underreported income). There was no penalty if a report was audited and the subject accurately or overstated income. However, overstated income was corrected (so overstating income did not result in an increased payout for a round), and the tax was recalculated using the correct amount of earned income. If a report was *not* audited and the subject either understated or overstated income, there was no penalty and the tax was based on reported income.

Prior to the earning period in each round of the first treatment, subjects were informed of the tax rate, audit probability, and penalty rate. They reported the earnings by typing a dollar amount into a box. Prior to clicking "submit," the screen showed the subject's tax, penalty, and net-of-tax-and-penalty earnings if audited, and the tax and net-of-tax earnings if not audited for the tentative reported amount of earnings. Subjects could, therefore, experiment with different amounts of reported earnings prior to finalizing their submission.

Subjects proceeded through 12 rounds of the first treatment. Each subject faced tax rates of .15 and .30; audit rates of zero, .10, and .50; and penalty rates of 1.0 and 2.0 in random order.

TABLE 1. Summary of Experiment States

State	Treatment	Tax rate	Probability of audit	Penalty rate	Burden reduction fee	Form type
1	1	0.15	0.00	1.00		
2	1	0.15	0.10	1.00		
3	1	0.15	0.50	1.00		
4	1	0.15	0.00	2.00		
5	1	0.15	0.10	2.00		
6	1	0.15	0.50	2.00		
7	1	0.30	0.00	1.00		
8	1	0.30	0.10	1.00		
9	1	0.30	0.50	1.00		
10	1	0.30	0.00	2.00		
11	1	0.30	0.10	2.00		
12	1	0.30	0.50	2.00		
13	2	0.15			$0.25	Long
14	2	0.15			$0.50	Long
15	2	0.15			$1.00	Long
16	2	0.15			$2.00	Long
17	2	0.15			$4.00	Long
18	3	0.15	0.00	2.00		None
19	3	0.15	0.10	2.00		None
20	3	0.15	0.50	2.00		None
21	3	0.15	0.00	2.00		Short
22	3	0.15	0.10	2.00		Short
23	3	0.15	0.50	2.00		Short
24	3	0.15	0.00	2.00		Long
25	3	0.15	0.10	2.00		Long
26	3	0.15	0.50	2.00		Long

In the second treatment, reporting of earnings required more time and effort. Prior to reporting their earnings, subjects had to calculate their total earnings and enter three data items into an on-screen form. Two of those items (number of tasks completed and seconds per task) appeared on the screen. The third, their workstation number, was posted on their carrel. Therefore, burden occurred in several ways: a calculation, locating information, and entering data.

At the beginning of each round, subjects had the option of paying a fee to be relieved of the reporting burden. If they paid the fee, they didn't have to enter any data or complete any calculations, and their earnings were automatically reported to the authority. Subjects who paid the burden reduction fee were able to move on to the third stage more quickly, ultimately completing the entire experiment in less time.

In this treatment, inaccurate earning reports were not accepted. Instead, subjects who did not pay the burden reduction fee repeated the earnings report until they entered the correct amount. Therefore, there was no opportunity to cheat in the second treatment, reports were not audited, and there were no misreporting penalties.

There were five rounds in this treatment, each with a tax rate of .15. Each subject faced burden reduction fees of $0.25, $0.50, $1.00, and $2.00, and $4.00 in random order.

In the third treatment, subjects chose between two reporting regimes. In the automatic-reporting (transparent, variable burden) regime, actual earnings were automatically reported to the experiment authority, removing any opportunity to underreport. The reporting burden was either none, a short form (requiring the subject to enter only the workstation number), or a long form with the same requirements as in treatment two. The self–reporting (non-transparent, high burden) regime always imposed the highest level of burden. However, subjects *chose* the amount of earnings they reported to the authority, giving them the opportunity to underreport. Reports were randomly audited, and penalties were applied as in the first treatment.

To ensure that subjects understood the differences among the burden levels, the third treatment included three practice rounds (with shortened earning periods to save time), each presenting the self-reporting regime with a different form type.

Prior to making the regime choice at the beginning of each round, subjects were informed of the tax rate, the form type in the automatic-reporting regime, and the audit and penalty rates in the self-reporting regime. There were nine rounds in this treatment, each with a tax rate of .15 and a penalty rate in the self-reporting regime of 2.0. Each subject faced self-reporting regime audit rates of zero, .10, and .50; and automatic-reporting regime form types of none, short, and long in random order.

After completing all rounds in all three treatments, subjects responded to a survey requesting demographic data, their perceptions of the experiment, and their responses to questions that identify their basic personality types. They also answered a single question about their views on tax compliance that is patterned on a question appearing in the World Values Survey (2011): Is cheating on your taxes, if you have a chance, always justifiable, never justifiable, or something in between?[6]

Subject Recruitment and Characteristics

Subject Recruiting

During March and April 2012, we recruited subjects from among students and staff at the University of Minnesota and from the general public in the Minneapolis area. We recruited via flyers on campus, visits to undergraduate classes, ads on Craig's List™ and in the campus newspaper *The Minnesota Daily*, and emails to University students and staff.

As subjects received their payouts and exited the computer lab, we asked them how they learned about the experiment. The most common way of learning about the experiment was via word of mouth (33 percent of subjects) with that share varying from a low of zero percent of subjects in the third and fourth sessions to a high of 59 percent of the participants in session 15. Fairly equal shares of all subjects (24 and 21 percent, respectively) learned about the experiment from a flyer posted on campus or Craig's List ™. Twelve percent of subjects responded to an email to University students and staff, and 7 percent were recruited during a visit to their class.

Subject Characteristics and Perceptions

The result of our recruitment strategy was a subject pool that is more diverse than is typical for on-campus experiments. Subjects' demographic characteristics are summarized in Table 2. Slightly more than half (52 percent) of our subjects were female, 38 percent were non-White, 24 percent were age 30 or older, and 28 percent were not students. Of the student subjects, 68 percent had majors outside of economics or related fields. Students were roughly evenly distributed among years in school, from freshman to graduate.

To see how subjects' behavior in the experiment might correlate with their work circumstances, and to compare our subject pool to the general population, we asked about employment, occupation, and status as a business owner or partner. Their responses are also summarized in Table 2. Nearly 64 percent of our subjects reported being employed, which is a larger share than that for the U.S. over-age-16 population (58.4 percent in April 2012).[7] About 32 percent of the employed subjects chose "other" for their occupation. Of the remaining employed subjects, 20 percent each chose management and professional, service, or sales and office. In

comparison, a larger share of the general employed U.S. population is in management and professional occupations (38 percent in 2011), and smaller shares are in service (18 percent) and sales and office occupations (24 percent). Among both our subjects and the general U.S. population, less than 10 percent are employed in occupations related to natural resources/construction/maintenance or production/transportation/material moving.[8]

TABLE 2. Subject Characteristics with Mean Index Value

Subject characteristics	Number of observations	Percent of total	Propensity to cheat		Willingness to pay for burden reduction
			Index 1	Index 2	
Female	173	52.4	.46	.28	.15
Male	157	47.6	.48	.32	.18
Age: under 20	61	18.5	.61	.39	.14
Twenties	191	57.9	.47	.32	.14
Thirties	33	10.0	.45	.28	.17
Forties	14	4.2	.30	.15	.24
Fifties	21	6.4	.21	.09	.27
Sixties	10	3.0	.32	.11	.40
Race/ethnicity: White	205	62.1	.46	.30	.17
Asian/Pacific Islander	76	23.0	.56	.35	.13
Black/African American	25	7.6	.40	.19	.16
Hispanic/Latino	9	2.7	.28	.18	.16
American Indian	3	1.0	.58	.25	.60
Other	12	3.6	.37	.23	.08
Student	239	72.4	.50	.32	.15
Not a student	91	27.6	.38	.23	.20
Year in school[1]: Freshman	51	21.3	.60	.37	.15
Sophomore	48	20.1	.51	.32	.16
Junior	42	17.6	.51	.34	.13
Senior	51	21.3	.43	.27	.19
Graduate student	47	19.7	.46	.32	.11
Major[1]: Not economics or related	151	63.2	.50	.31	.16
Economics or related	77	32.2	.48	.34	.13
Undeclared major	11	4.6	.68	.38	.11
Employed	211	63.9	.44	.28	.16
Unemployed	119	36.1	.52	.33	.16
Occupation[2]: Management/professional	43	20.4	.39	.23	.15
Service	43	20.4	.47	.32	.13
Sales and office	42	19.9	.47	.28	.21
Natural resources/construction/maintenances	10	4.7	.54	.34	.42
Production/transportation/material moving	6	2.8	.42	.28	.09
Other	67	31.8	.42	.29	.14
Business owner or partner	34	10.3	.47	.30	.16
Not a business owner or partner	296	89.7	.43	.26	.18

[1] Year in school and major are for students only.
[2] Ocupation is for employed subjects only.

The experiment subjects' perceptions of the experiment are summarized in Table 3. A majority of subjects reported that they agree or strongly agree that they understood the experiment instructions (81 percent) and that their anonymity would be preserved (84 percent). Both questions had fewer than six percent of "disagree" and "strongly disagree" responses.

To compare our subjects' behavior in the experiment to their self-reported views of tax compliance, we asked them to choose from a 10-point Likert scale whether cheating on their taxes, if given the chance, is always justifiable (1), never justifiable (10), or somewhere in between. Nearly 29 percent of subjects chose never justifiable, and about 5 percent chose always. (In response to a similar question in the 2006 World Values Survey, 60 percent of the 1,249 U.S. respondents chose never justifiable, and 1 percent chose always.)[9]

TABLE 3. Perception Statement Responses

(Statements in Italics)

Response	Number of observations	Percent of total
I understood the instructions for this experiment.		
Strongly Agree (5)	134	40.6
Agree (4)	133	40.3
Neutral (3)	44	13.3
Disagree (2)	6	1.8
Strongly Disagree (1)	13	3.9
The procedures used in this study will preserve my anonymity.		
Strongly Agree (5)	188	57.0
Agree (4)	89	27.0
Neutral (3)	39	11.8
Disagree (2)	3	1.0
Strongly Disagree (1)	11	3.3
Is cheating on your taxes, if you have the chance, always justifiable, never justifiable, or something in between?		
Never justifiable (10)	95	28.8
(9)	43	13.0
(8)	42	12.7
(7)	30	9.1
(6)	16	4.9
(5)	43	13.0
(4)	25	7.6
(3)	14	4.2
(2)	7	2.1
Always justifiable (1)	15	4.6

Results

Determinants of Underreporting

The first treatment included 12 rounds in which subjects earned income and reported their earnings to the experiment authority. Reports were randomly audited, and subjects who were audited and found to have underreported income were charged the correct amount of tax and penalized. The experiment design exhibited within-subject variation in the tax, audit and penalty rates and between-subject variation in demographic characteristics, propensity to cheat and, in the second and third treatments, willingness to pay for burden reduction. The design allows us to estimate subjects' propensity to underreport income and to pay for burden reduction, and to identify the determinants of the amount of underreported income. Table 4 shows the share of subjects who were noncompliant and the mean amount of underreported income for the noncompliant subjects by experiment state.

TABLE 4. Compliance, Burden Reduction, and Regime Choice by Experiment State

State	Percent of subjects noncompliant[1]	Mean underreported amount[2]	Percent of subjects choosing burden reduction	Percent of subjects choosing self-reporting
1	62.7	$18.42		
2	53.3	$13.91		
3	27.0	$8.60		
4	63.3	$18.15		
5	48.5	$12.98		
6	23.6	$7.24		
7	63.9	$18.75		
8	54.2	$13.71		
9	27.3	$7.45		
10	65.8	$18.04		
11	48.8	$12.32		
12	23.6	$6.75		
13			42.1	
14			32.1	
15			25.2	
16			16.4	
17			10.3	
18	78.3	$24.44		72.7
19	70.2	$18.28		57.9
20	32.8	$4.79		35.2
21	80.7	$24.16		72.4
22	69.0	$18.07		59.7
23	27.3	$7.35		36.7
24	82.9	$23.90		70.9
25	67.0	$18.13		60.6
26	28.0	$8.10		35.8

[1] For states 18-26, the percent noncompliant is among subjects who chose the self-reporting regime.

[2] The mean underreported amount is for noncompliant subjects only.

Table 5 shows the results of two Tobit[10] regressions with the amount of underreported income as the dependent variable. Results in the first column are from a fixed effects model (using individual subject dummy variables as controls), and results in the second column are from a model using subjects' responses to our demographic questionnaire as controls. In both models, the tax rate had a positive but insignificant impact on the level of underreporting while both the audit rate and the penalty rate had significantly negative impacts. Because income was determined by subjects' performance in the earning task, it varied both across subjects and across rounds for any individual subject. In both models, underreporting varied positively with income, with another $1 of earned income being associated with additional underreporting of $0.20 or $0.37, holding all else equal (for fixed-effects and demographic controls, respectively).

In the second model, several of the demographic control variables were significantly correlated with the amount of underreported income. Males underreported more than females. Relative to Whites, Blacks and Other Races underreported less. Relative to subjects under age 20, all other age groups underreported less.

TABLE 5. Coefficients from Tobit Regression of Treatment 1 Results

Dependent Variable: The amount of underreported income

Control variables	Fixed effects	With demographic controls
Tax rate	2.525	1.710
	(3.853)	(5.248)
Audit rate	-54.418	-54.055
	(1.657)***	(2.189)***
Penalty rate	-2.129	-2.067
	(0.577)***	(0.787)**
Income	0.652	1.234
	(0.120)***	(0.107)***
Female		-3.531
		(0.834)***
Age 60+		-12.208
		(3.410)***
Age 50s		-16.589
		(3.001)***
Age 40s		-12.200
		(3.105)***
Age 30s		-5.487
		(2.451)***
Age 20s		-6.994
		(2.035)***
Black		-5.245
		(1.637)***
Asian		0.996
		(1.156)
Other races		-6.927
		(1.687)***
Sophomore		3.939
		(2.062)
Junior		6.161
		(2.495)
Senior		-0.435
		(2.451)
Graduate student.		3.794
		(2.471)
Major Economics or related		-1.291
		(1.071)
Major undeclared		5.058
		(2.254)**
Non-student		2.208
		(2.511)

Footnotes at end of table.

TABLE 5. Coefficients from Tobit Regression of Treatment 1 Results—Continued

Dependent Variable: The amount of underreported income

Control variables	Fixed effects	With demographic controls
Business owner		1.907
		(1.440)
Management/professional		0.166
		(1.336)
Natural res./constr./maint.		-1.777
		1.658
Other occupation		5.004
		(2.510)**
Production/transport.		-2.353
		(1.471)
Sales&office		-0.998
		(3.344)
Service		0.014
		(1.596)
Round	0.378	0.117
	(0.097)***	(0.125)
WTP index		-2.154
		(1.548)
Cheating not justifiable[1]		-1.317
		(0.161)***
Constant	-78.753	-0.706
	(179.412)	(3.479)
Number of observations	3,950	3,950

* $p<0.1$; ** $p<0.05$; *** $p<0.01$ (standard errors in parentheses)

[1] "Cheating not justifiable" is the subject's response to the question "Is cheating on your taxes, if you have the chance, always justifiable, never justifiable, or something in between?" where 1=never justifiable and 0=always justifiable.

Note: The marginal impact on observed underreporting is the Tobit regression estimate x the probability of underreporting a fraction of the income. In Treatment 1 the average probability was .302.

Subjects' response to the question, "Is cheating on your taxes, if you have the chance, always justifiable, never justifiable, or something in between?" was significantly correlated with underreporting. A higher numerical response—meaning a *lower* tendency to justify cheating—was associated with lower levels of underreported income.

Repeating these Tobit regressions and substituting the proportion of income underreported in place of the level of underreporting, the results remain qualitatively the same (see Table 5a). Since these regressions also included income as an explanatory variable, it is possible to explore its impact on underreporting quadratically. Notice that in both models the income coefficient is both positive and significant, suggesting that the marginal impact on compliance of earning another $1 increases as a subject earns more.

Measures of Propensity to Cheat

Observations of subject behavior over the 12 rounds of the first treatment provide several ways to measure propensity to underreport income. In this paper, we derive two simple propensity-to-cheat indices.[11] The first index (PTC1) is the share of rounds (out of 12) a subject reports income that is strictly less than their actual earnings. The index score varies from zero to one, with a subject who never underreports getting a score of zero, and a subject who underreports at every opportunity a score of 1.0. The mean value of PTC1 over all

subjects was .47, with 23 percent of subjects receiving scores of zero, and 10 percent of subjects receiving scores of 1.0.

TABLE 5a. Coefficients from Tobit Regression of Treatment 1 Results

Dependent Variable: the proportion of underreported income

Control variables	Fixed effects	With demographic controls
Tax Rate	0.125	0.076
	(0.167)	(0.230)
Audit Rate	-2.344	-2.350
	(0.072)***	(0.096)***
Penalty rate	-0.089	-0.087
	(0.025)***	(0.0345)**
Income	0.011	0.038
	(0.005)**	(0.005)***
Female		-0.153
		(0.037)***
Age 60+		-0.584
		(0.149)***
Age 50s		-0.767
		(0.131)***
Age 40s		-0.567
		(0.135)***
Age 30s		-0.245
		(0.107)**
Age 20s		-0.319
		(0.089)***
Black		-0.241
		(0.072)***
Asian		0.043
		(0.051)
Other races		-0.319
		(0.074)***
Sophomore		0.171
		(0.090)*
Junior		0.284
		(0.109)***
Senior		-0.020
		(0.107)
Grad.		0.168
		(0.108)
Major Economics or related		-0.064
		(0.047)
Major undeclared		0.233
		(0.099)**

Footnotes at end of table.

TABLE 5a. Coefficients from Tobit Regression of Treatment 1 Results—Continued

Dependent Variable: the proportion of underreported income

Control variables	Fixed effects	With demographic controls
Non-student		0.100 (0.110)
Business owner		0.077 (0.063)
Management/professional		0.015 (0.059)
Natural resources/construction/ maintenance		-0.075 (0.073)
Other occupation		0.241 (0.110)**
Production/transportation		-0.112 (0.065)*
Sales&office		-0.060 (0.146)
Service		0.004 (0.070)
Round	0.017 (0.004)***	0.005 (0.005)
WTP index		-0.095 (0.0676)
Cheating not justifiable[1]		-0.058 (0.007)***
Constant	-3.137 (12.666)	0.3783 (0.152)**
Number of observations	3,950	3,950

* p<0.1; ** p<0.05; *** p<0.01 (standard errors in parentheses)

[1] "Cheating not justifiable" is the subject's response to the question "Is cheating on your taxes, if you have the chance, always justifiable, never justifiable, or something in between?" where 1=never justifiable and 0=always justifiable.

Note: The marginal impact on observed underreporting is the Tobit regression estimate x the probability of underreporting a fraction of the income. In Treatment 1 the average probability was .302.

The second index (PTC2) is the share of total income over all 12 rounds that a subject failed to report: [(total actual income—total reported income)/total actual income]. A subject who never underreported received a PTC2 score of zero, and a subject who maximized underreporting by never reporting any income would earn a 1.0. Over all subjects, the mean value of PTC2 was .30. As with PTC1, 23 percent of subjects received scores of zero, but no subjects received PTC2 scores of 1.0. The maximum value of PTC2 was .84. Table 2 (presented earlier) contains separate mean index scores for the subjects, by demographic group.

Table 6 shows the correlation coefficient between the propensity-to-cheat indices and an index constructed from subjects' responses to the justifiability of cheating question, where a value of one corresponds to always justifiable and value of zero corresponds to never justifiable. Correlations range from .22 to .26 depending on the type of correlation coefficient used. Although these are positive and significantly different from zero, these correlations are quite small and suggest that most of the variation in within-experiment propensity to cheat is coming from sources other than subjects' reported feelings about tax cheating.

TABLE 6. Correlations Between Justifiability of Cheating and Propensity To Cheat Indices

All subjects						
	Pearson[1]			Spearman[2]		
	Cheating justifiable	PTC1	PTC2	Cheating justifiable	PTC1	PTC2
Cheating justifiable	1.00			1.00		
PTC1	0.24	1.00		0.26	1.00	
PTC2	0.22	0.78	1.00	0.25	0.79	1.00
Excluding subjects who always complied						
	Pearson			Spearman		
	Cheating justifiable	PTC1	PTC2	Cheating justifiable	PTC1	PTC2
Cheating justifiable	1.00			1.00		
PTC1	0.15	1.00		0.13	1.00	
PTC2	0.13	0.58	1.00	0.12	0.55	1.00

[1]The Pearson product-moment correlation detects a linear relationship between two variables.
[2]The Spearman correlation coefficient detects a monotonic relationship between two variables.

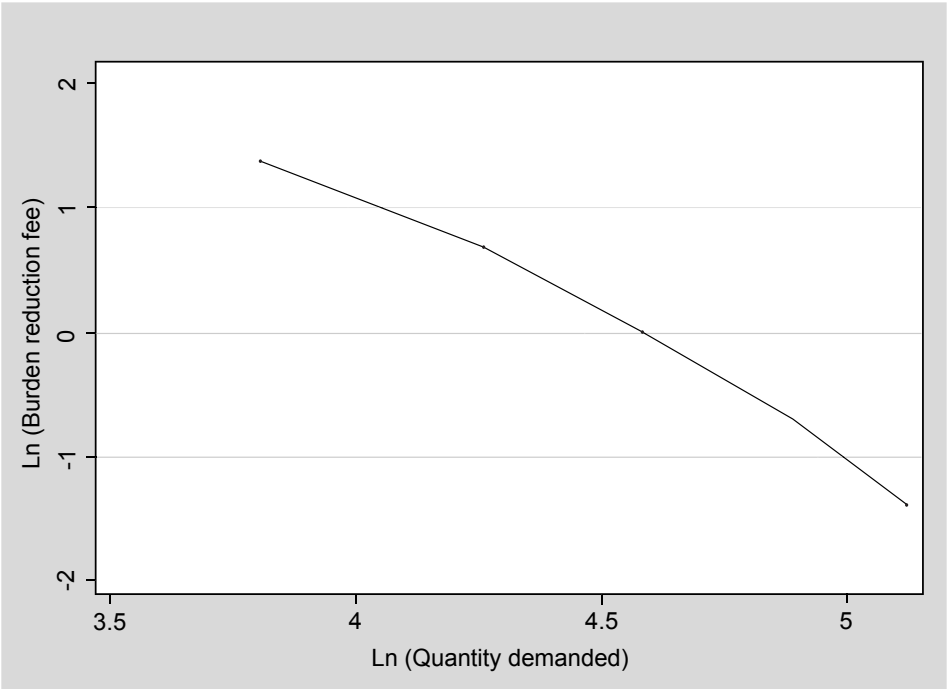
Measures of Willingness To Pay for Burden Reduction

The five rounds of the second treatment were designed to measure the subjects' willingness to pay a fee in order to reduce the burden of reporting their earnings to the experiment authority. That burden had several time and task components. First, subjects had to complete an on-screen Earnings Calculation Worksheet, entering several pieces of information: their laboratory carrel number (posted on the carrel wall), the average time spent completing a task and the number of tasks completed (available in a simultaneously displayed on-screen box), and their calculation of total earnings ($1.20 times the number of completed tasks). Subjects had to continue working on this until all of their entries were correct. Second, an Earnings Reporting Form appeared on the screen. Here, subjects had to enter their total earnings again. If a subject made an incorrect entry, she was asked to try again. Upon a correct total earnings entry, the computer screen displayed "Report Accepted" along with net-of-tax earnings for the round. Alternatively, subjects who paid the burden reduction fee were relieved of completing both of these forms, as the computer screen displayed "Report Accepted" and their earnings, net of tax and the fee, as the round concluded. A different burden reduction fee ($4, $2, $1, $0.50, $0.25), in random order, applied to each round. Table 4 (presented earlier) shows the share of subjects who chose to purchase the burden reduction fee by experiment state.

A subject who chose to pay the burden reduction fee in all five rounds would reduce their earnings in this stage by $7.75, while a subject who did not would have no such earnings reduction. As an index of willingness to pay for burden reduction, we calculated how much each subject paid, as a proportion of $7.75. Index scores therefore run from 0 (no fees paid) to 1.0 (all 5 fees paid). Over all subjects, the mean index score was .16, with 48 percent of subjects scoring zero and 6 percent of subjects scoring 1.0. Table 2 (presented earlier) contains separate mean index scores for the subjects, by demographic group.

As subjects face different fees, their decisions regarding whether to purchase burden reduction trace out a willingness to pay or demand for burden reduction schedule. Our results demonstrate that demand is downward-sloping; more subjects purchased burden reduction when the fee was low than when it was high. Moreover, we find that demand is more price-sensitive (elastic) at higher fees (Figure 1 graphs the schedule with a double logarithmic scale).

FIGURE 1. Willingness To Pay (Demand) for Burden Reduction



Determinants of Regime Choice

In each round of the third experimental treatment, subjects face the same tax rate and penalty rates (0.15 and 2, respectively), but differing audit rates (0, 0.10, and 0.50) and self-reporting forms (no form, short form, long form). Given these round parameters, subjects choose between two reporting regimes: one in which they self-report their earnings and another in which earnings are automatically reported by the computer. They then engage in the same income-producing activity. Subjects choosing the self-reporting regime use the indicated form to report their earnings, and face a possible audit and penalty. Those choosing the automatic regime do not report their earnings and face no audit or penalty. Table 4 shows the share of subjects choosing the self-reporting regime by experiment state.

Table 7 contains the results of a series of probit regressions in which the dependent variable is "1" if the subject chose the self-reporting regime and "0" if she chose automatic reporting. These regressions explore the impact of the audit rate, the form type, subjects' willingness to pay for burden reduction (from Treatment 2), subjects' propensity to cheat (from Treatment 1), and subject demographic characteristics on their regime choice. We display here the calculated marginal effects of the independent variables, with their standard errors in parentheses.

Column 1 measures propensity to cheat as the proportion of Treatment 1 rounds in which a subject's reported income was strictly smaller than actual income (PTC1). Column 3 uses instead PTC2, the proportion of the subject's Treatment 1 income that she underreported. Columns 2 (PTC1) and 4 (PTC2) add the demographic characteristics. The marginal effects we discuss below are all subject to holding everything else constant.

Regarding the audit rate, in all four regressions, subjects were significantly less likely to choose the self-reporting regime as the audit rate increased, confirming our expectations. The magnitudes of the marginal effect are about the same: a 0.1 (10 percentage point) increase in the audit rate is associated with a .06 (6 percentage point) decline in the probability of choosing self-reporting.

TABLE 7. Marginal Effects from Probit Regression for Choice of Self-Reporting Regime in Treatment 3

	(1)	(2)	(3)	(4)
AuditRate	-0.646	-0.648	-0.645	-0.645
	(0.032)***	(0.032)***	(0.032)***	(0.031)***
SimpleForm	0.010	0.010	0.011	0.011
	(0.020)	(0.020)	(0.020)	(0.020)
LongForm	0.002	0.002	0.002	0.003
	(0.020)	(0.020)	(0.020)	(0.020)
Income	0.015	0.012	0.014	0.012
	(0.002)***	(0.002)***	(0.002)***	(0.002)***
WTP	-0.264	-0.257	-0.273	-0.268
	(0.031)***	(0.030)***	(0.031)***	(0.031)***
PTC1	0.235		0.221	
	(0.023)***		(0.024)***	
PTC2		0.402		0.392
		(0.032)***		(0.034)***
Number of observations	2,970	2,970	2,970	2,970

* $p<0.1$; ** $p<0.05$; *** $p<0.01$ (standard errors in parentheses)

Note: Column 1 includes PTC1 as a regressor and no demographics; Column 2 includes PTC2 and no demographics; Column 3 includes PTC1 and all demographic controls; Column 4 includes PTC2 and all demographic controls

Subjects with higher propensities to cheat were significantly more likely to choose the self-reporting regime, as expected. For the PTC1 index, a 0.1 (10-percentage-point) increase in the proportion of Treatment 1 rounds in which a subject underreported was associated with a 0.02 (2-percentage-point) increase in the probability of choosing self-reporting. The effect, also significant, was about twice as large for PTC2: a 0.1 (10 -percentage-point) increase in the proportion of Treatment 1 income underreported was associated with a 0.04 (4-percentage-point) increase in the probability of self-reporting.

The impact of subjects' willingness to pay for burden reduction was also as expected: those with higher willingness to pay for burden reduction index values were significantly less likely to choose self-reporting. A 0.1 (10-percentage-point) increase in the index is here associated with about a .026 (2.6-percentage-point) decrease in self-reporting.

Subjects who earned more income were significantly more likely to choose self-reporting: a $1 increase in income was associated with a .01 (1-percentage-point) increase in the probability of self-reporting.

Regarding the effect of the type of self-reporting form (none, short, or long), subjects who faced a short form were more likely to choose self-reporting than those who faced a long form (both relative to those facing no form), but neither effect was statistically significant.

In columns 3 and 4, we note that the inclusion of demographic variables has little impact on the coefficients discussed above. Several of these do appear to be statistically significant correlates of self-reporting. Males were more likely than females to choose self-reporting. Relative to Whites, Blacks (column 4 only) and Other Races were more likely to self-report while Asians were less likely to do so (column 3 only). Only one of the age categories had a significant impact: subjects 60 years of age and older were less likely to self- report, relative to those 20-30 (column 3 only). Year in school, not having declared a major and not being a student had no significant impacts on regime choice. Subjects who were majors in Economics or a related field were significantly less likely to choose the self-reporting regime (column 4 only), while those who owned businesses were significantly more likely to self-report than non-business owners. Regarding the occupational dummies, Management & Professional, Sales & Office, Service and Other all had significantly negative coefficients. This suggests that subjects in these occupations were less likely to select the self-reporting regime, relative to those who were not employed.[12]

Determinants of Underreporting in the Self-Reporting Regime

Table 8 contains the results of a series of linear regressions that explore the behavior of those subjects who chose the self-reporting regime in Treatment 3. In all four regressions, the dependent variable is a subject's amount of underreported income. The first two columns do not include demographic characteristics, while the last two columns do (demographic variables suppressed here). Columns 1 and 3 use the PTC1 measure of cheating propensity; columns 2 and 4 use the PTC2 alternative measure.

Both propensity-to-cheat indices are significantly associated with greater underreporting. A 0.1 increase in PTC1 (proportion of Treatment 1 rounds with underreporting) is related to $1.24 more Treatment 3 underreporting. The same increase in PTC2 (proportion of stage 1 income underreported) has a much larger impact ($2.40). Both of these results persist in the regressions that include demographic characteristics. Together with the findings of the prior section, these results suggest that subjects who have a greater propensity to cheat are more likely to choose a self-reporting regime and, thereafter, to underreport more of their income.

TABLE 8. Coefficients from a Linear Regression in Treatment 3

Dependent Variable: Amount Underreported, conditional on choosing the self-report regime

	(1)	(2)	(3)	(4)
Audit rate = 0.1	-7.628	-7.501	-7.472	-7.399
	(0.537)***	(0.484)***	(0.526)***	(0.478)***
Audit rate = 0.5	-16.911	-15.933	-16.317	-15.544
	(0.628)***	(0.567)***	(0.618)***	(0.562)***
Income	0.785	0.601	0.634	0.525
	(0.050)***	(0.046)***	(0.057)***	(0.052)***
WTP	5.993	6.087	5.440	5.712
	(1.121)***	(1.009)***	(1.146)***	(1.041)***
PTC1	12.391		12.125	
	(0.738)***		(0.766)***	
PTC2		23.954		23.362
		(0.883)***		(0.917)***
Constant	-8.942	-6.145	-4.518	-2.432
	(1.415)***	(1.257)***	(2.166)**	(1.963)
R2	0.46	0.56	0.49	0.58
Number of observations	1,656	1,656	1,656	1,656

* p<0.1; ** p<0.05; *** p<0.01 (standard errors in parentheses)

Note: Column 1 includes PTC1 as a regressor and no demographics; Column 2 includes PTC2 and no demographics; Column 3 includes PTC1 and all demographic controls; Column 4 includes PTC2 and all demographic controls

The willingness to pay for burden reduction index also has a positive and significant coefficient. A 0.1 increase in the index (from Treatment 2 behavior) is associated with approximately another $0.60 of underreporting in Treatment 3, both with and without the demographic variables. As we note in the previous section, subjects with a higher willingness to pay for burden reduction were less likely to choose the self-reporting regime. However, the results here imply that, among the subjects who *chose* self-reporting, a higher willingness to pay for burden reduction—or a greater distaste for burden—leads to larger amounts of underreporting. This can be interpreted as meaning that those willing to pay more for burden reduction *that we see choosing self-reporting* are even more willing to trade burden for the additional take-home pay that results from cheating. Further work would be required to determine if this result persists in a model that controls for selection bias (regime choice) and/or fixed effects.

In these regressions we entered the audit rate as a categorical variable (rates of 0.1 and 0.5), omitting the zero audit rate category. As we would expect, subjects underreported less when the audit rate rose to either 0.10 or 0.50. The 10-percent audit rate was associated with between $7.40 and $7.63 less underreporting, relative to a zero audit rate; that comparison range was $15.54–$16.91 for a 50-percent audit rate.

A self-reporting subject's actual income in a Treatment 3 round also appeared to affect the magnitude of her underreporting. A $1 increase in income is associated with between $0.53 and $0.79 in additional underreporting, holding all else equal.

Several of the demographic variables have statistically significant effects. Being male has a negative impact on underreporting (column 4) as do being Black, or being Asian (column 3) or having an "other" race (column 3), measured relative to being White. The two oldest age categories are associated with less underreporting (column 3), relative to subjects in their 20's. Regarding student status, sophomores underreported less, relative to freshmen (column 4), while Economics majors underreported more, relative to students declaring other majors. In the previous section, subjects who own their own businesses were more likely to choose the self-reporting regime. However, here those business owners who did self report had significantly lower underreporting than non-business owners. Subjects who work in Natural Resources, Construction and Maintenance or Services or "Other" are associated with significantly higher overreporting, relative to subjects who are not employed.[13]

Table 9 contains the results of Tobit[14] regressions to explain amounts of underreported income, conditional on subjects choosing the self-reporting regime. The first two columns do not include demographic characteristics, while the last two columns do (demographic variables suppressed here). Columns 1 and 3 use the PTC1 measure of cheating propensity; columns 2 and 4 use the PTC2 alternative measure. The results are similar to those reported above for the linear regressions. Both propensity-to-cheat indices are significantly associated with greater underreporting. A 0.1 increase in PTC1 (proportion of Treatment 1 rounds with underreporting) is related to $1.43 more Treatment 3 underreporting. The same increase in PTC2 (proportion of stage 1 income underreported) has a much larger impact ($2.17). The willingness to pay for burden reduction index also has a positive and significant coefficient. A 0.1 increase in the index (from Treatment 2 behavior) is associated with approximately another $0.54 of underreporting without and $0.45 with demographic control variables in Treatment 3.

In these regressions we entered the audit rate as a categorical variable (rates of 0.1 and 0.5), omitting the zero audit rate category. As we would expect, subjects underreported less when the audit rate rose to either 0.10 or 0.50. The 10-percent audit rate was associated with between $5.66 and $6.08 less underreporting, relative to a zero audit rate; that comparison range was $12.71–$14.84 for a 50-percent audit rate.

A self-reporting subject's actual income in a Treatment 3 round also appeared to affect the magnitude of her underreporting. A $1 increase in income is associated with between $0.17 and $0.45 in additional underreporting, holding all else equal.

Finally, we note positive, significant coefficients for the Round variable, with underreporting increasing between $0.23 and $0.30 with each Treatment 3 round.

Table 9a repeats the two-limit Tobit analysis, substituting the proportion of income underreported for the level of underreporting, as the dependent variable. Qualitatively, the results are the same. As in Table 5a, the significantly positive coefficient on income (models 1, 2 and 3) suggests that its marginal impact increases as a subject earns more.

Using Regime Choice To Separate Compliant and Noncompliant Subjects

Above we established that subjects with higher propensities to cheat were significantly more likely to choose the self-reporting regime and having made that choice, underreported significantly more income. Here, we classify subjects according to their Treatment 1 behavior and observe how different classes of subjects behave when faced with a regime choice. We create two classes: subjects who fully reported their income in every round of Treatment 1 (PTC1 = 0) and subjects who at least once underreported their Treatment 1 income (PTC1 > 0).

TABLE 9. Coefficients from Tobit Regression in Treatment 3

Dependent Variable: Amount underreported, conditional on choosing the self-report regime

	(1)	(2)	(3)	(4)
Audit rate = 0.1	-19.692	-18.514	-19.285	-18.327
	(1.609)***	(3.770)***	(1.557)***	(1.372)***
Audit rate = 0.5	-48.031	-42.053	-45.989	-41.140
	(2.341)***	(1.950)***	(2.257)***	(1.920)***
Income	1.457	0.866	0.883	0.559
	(0.150)***	(0.131)***	(0.172)***	(0.152)***
WTP	17.401	16.665	14.561	14.796
	(3.302)***	(2.837)***	(3.280)***	(2.864)***
PTC1	46.282		44.457	
	(2.673)***		(2.661)***	
PTC2		70.292		67.809
		(3.193)***		(3.196)***
Round	0.871	0.738	0.964	0.803
	(0.273)***	(0.235)***	(0.264)***	(0.230)***
Constant	-42.067	-26.142	-27.221	-18.139
	(4.567)***	(1.870)***	(5.779)***	(5.001)***
Scale	23.311	19.804	22.177	19.094
Log Likelihood	-3016	-2880	-2955	-2834
Number of observations	1,655	1,655	1,655	1,655

* $p<0.1$; ** $p<0.05$; *** $p<0.01$ (standard errors in parentheses)

Notes: Column 1 includes PTC1 as a regressor and no demographics; Column 2 includes PTC2 and no demographics; Column 3 includes PTC1 and all demographic controls; Column 4 includes PTC2 and all demographic controls. The marginal impact on observed underreporting is the Tobit regression estimate x the probability of underreporting a fraction of the income. In Treatment 3 the average probability was .309.

With 330 subjects and 9 rounds in Treatment 3, there were 2,970 total opportunities for subjects to make a regime choice. Subjects chose self-reporting 55.8 percent of the time, and those who made that choice underreported 65.4 percent of the time, underreporting an average of $20.24. The share of subjects choosing self-reporting decreased with the self-reporting regime audit rate, from 72 percent when the audit rate was zero to 35.9 percent with a .50 audit rate. And within the self-reporting regime, both the share of subjects underreporting and the average amount underreported decreased with the audit rate.

Over all audit rates, subjects who sometimes underreported in Treatment 1 chose self-reporting 61.2 percent of the time, and those who made that choice underreported 76 percent of the time, with a mean amount of underreporting of $20.45. Over all audit rates, 37.4 percent of subjects who always complied in Treatment 1 chose self-reporting, but few of those (7.4 percent) chose to underreport. The average amount underreported by this group was $8.81.

Subjects who *always* underreported in Treatment 1 (PTC1 = 1) chose the self-reporting regime only 54.9 percent of the time. However, having made that choice, they underreported 92.3 percent of the time. Nevertheless, 45.1 percent of subjects who consistently underreported in Treatment 1 self-selected into a regime that automatically increased their compliance rate to 100 percent.

The number of subjects who chose self-reporting and subsequently underreported income divided by the total number of subjects provides an overall noncompliance rate for Treatment 3 rounds. As shown in Table 10, for rounds in which the audit rate was zero, 10 percent, and 50 percent, the Treatment 3 noncompliance rates were 59 percent, 41 percent, and 10 percent, respectively. The comparable noncompliance rates for Treatment

TABLE 9a. Coefficients from Tobit Regression in Treatment 3

Dependent variable: Proportion of Income underreported, conditional on choosing the self-report regime

	(1)	(2)	(3)	(4)
Audit rate = 0.1	-0.714	-0.666	-0.696	-0.656
	(0.058)***	(0.050)***	(0.056)***	(0.049)***
Audit rate = 0.5	-1.729	-1.499	-1.646	-1.459
	(0.085)***	(0.069)***	(0.081)***	(0.068)***
Income	0.037	0.016	0.015	0.004
	(0.005)***	(0.005)***	(0.006)**	(0.005)
WTP	0.620	0.585	0.505	0.509
	(0.119)***	(0.100)***	(0.117)***	(0.101)***
PTC1	1.684		1.602	
	(0.097)***		(0.096)***	
PTC2		2.557		2.449
		(0.114)***		(0.113)***
Round	0.032	0.027	0.035	0.029
	(0.010)***	(0.008)***	(0.009)***	(0.008)***
Constant	-1.099	-0.540	-0.514	-0.224
	(0.164)***	(0.133)***	(0.207)**	(0.176)
Scale	0.844	0.705	0.798	0.676
Log Likelihood	-1318	-1173	-1253	-1124
Number of observations	1,655	1,655	1,655	1,655

* $p<0.1$; ** $p<0.05$; *** $p<0.01$ (standard errors in parentheses)

Notes: Column 1 includes PTC1 as a regressor and no demographics; Column 2 includes PTC2 and no demographics; Column 3 includes PTC1 and all demographic controls; Column 4 includes PTC2 and all demographic controls. The marginal impact on observed underreporting is the Tobit regression estimate x the probability of underreporting a fraction of the income. In Treatment 3 the average probability was .309.

TABLE 10. Percent of All Subjects Noncompliant and Shares of Unreported Income by Regime and Audit Rate

Audit Rate	Single Regime	Dual Regime
	Percent Noncompliant	
0	63%	59%
10%	49%	41%
50%	24%	10%
	Share of Income Unreported	
0	55%	55%
10%	31%	28%
50%	7%	3%

1 were 63 percent, 49 percent, and 24 percent, respectively. The results are similar for the shares of income unreported. At each audit rate, therefore, both the percentage of noncompliant subjects and the share of income unreported were lower in the dual-regime case than under the single regime.

Conclusion

This paper presents the results of a laboratory experiment designed to explore taxpayers' willingness to trade non-transparency—or the opportunity to underreport income—for a reduction in reporting burden. We measured subjects' propensity for noncompliance by observing their reporting behavior in 12 experimental states

that exhibited varying tax, audit, and penalty rates. We also measured subjects' willingness to pay for burden reduction by introducing a reporting burden and offering subjects the option of paying a fee to avoid it. We then observed whether these measures could explain subjects' choice of regime and, for subjects choosing a self-reporting regime, their compliance behavior.

We found that subjects were significantly less likely to choose the self-reporting regime as the audit rate increased. Subjects with higher propensities to cheat and who earned more income were significantly more likely to choose the self-reporting regime. Those with higher willingness to pay for burden reduction were significantly less likely to choose self-reporting.

Conditional on having chosen the self-reporting regime, we found that both propensity to cheat and willingness to pay for burden reduction were significantly associated with greater underreporting.

We classified subjects according to their behavior in a basic tax compliance environment. We found that a majority of subjects who were classified as sometimes noncompliant self-selected into the automatic-reporting regime, eliminating any opportunity for them to underreport. We also found that more than a third of subjects who were classified as fully compliant opted into the self-reporting regime, but once there, rarely chose to underreport. Comparing the share of subjects who were noncompliant under the single regime and the dual-regime system, we found that the noncompliance rate was lower when subjects were offered a choice of regimes.

Acknowledgments

This research was conducted under contract with the Internal Revenue Service, IRS/TIRNO-11-P-00718. The authors thank the IRS for supporting the research, Matthew Bombyk for graduate research assistance, Ryan Anderson for computer programming, and Alan Plumley, Elaine Maag, and Alex Möhlmann for helpful comments.

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Endnotes

[1] Examples of such programs include the Tip Rate Determination Agreement (TRDA), Tip Reporting Alternative Commitment (TRAC), and the recently discontinued Attributed Tip Income Program (ATIP).

[2] In this analysis, we assume that taxpayers continue to file required returns.

[3] Unless, as Raskolnikov suggests, the authority overrules their choice, assigning CR gamers identified by audit into DR and removing regime choice from a subgroup of taxpayers. As Zelenak (2009) points out, this is inconsistent with rationalizing a two-regime proposal on the basis of taxpayer choice.

[4] A description of the Social and Behavioral Sciences Lab (SBSL) is available at http://sbsl.umn.edu/.

[5] Boylan and Sprinkle (2001) demonstrate that experimental subjects are likely to respond differently to an increased tax rate when they are simply endowed with income, relative to when they earn it. In order to capture more closely their real-world situations, we elected to required subjects to earn income.

[6] World Values Survey (2011), Question V201, p. 14.

[7] U.S. Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey, Series id LNS12300000,(Seas) Employment-Population Ratio, available at http://data.bls.gov/timeseries/LNS12300000.

[8] U.S. Bureau of Labor Statistics, Household Data Annual Averages, Table 10: Employed Persons by occupation, available at http://www.bls.gov/cps/cpsaat10.pdf.

[9] The Likert scale for the World Values Survey question is the reverse of the scale for our question. Reversing the scale to compare responses, our subjects' mean response was 3.8, which is larger than the mean response for U.S. World Values Survey respondents (2.1). See http://www.wvsevsdb.com/wvs/WVSAnalizeQuestion.jsp.

[10] We ran two-limit Tobit regressions, controlling for subjects who did not underreport any income as well as subjects who underreported all of their income.

[11] Although we label these indices "propensity-to-cheat," some observed underreporting could be due to unintentional error.

[12] Coefficients on all of the demographic control variables are available from the authors.

[13] Coefficients on all of the demographic control variables are available from the authors.

[14] These are two-limit Tobit regressions, controlling both for subjects who had zero underreported income and for subjects who underreported all of their income.

2

Measuring the Tax Gap

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Estimates of the Tax Year 2006 Individual Income Tax Underreporting Gap

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IRS recently estimated the Tax Year (TY) 2006 gross tax gap (the difference between the total tax imposed by law and the amount of tax paid timely) to be $450 billion. Individual income taxes were underreported by $235 billion, representing 19 percent of the amount of individual income taxes that should have been reported on returns that were filed on time.[1] Self-employment taxes were underreported by $57 billion, 59 percent of the amount that should have been reported on individual income tax returns that were filed on time. The individual income tax and self-employment tax underreporting gaps combined accounted for 65 percent of the total gross tax gap in TY 2006. The tax gap estimates show that as information reporting increases, underreporting of that income tends to decrease. Only 8 percent of income subject to substantial information reporting (but not withholding) was underreported, while 56 percent of income subject to little or no information reporting was underreported.[2]

Prior to the release of the TY 2006 tax gap estimates in January 2012, the last tax gap estimates were for TY 2001, which were released in February 2006. The TY 2006 individual underreporting gap reflects new data and significant advancements in methodology over the TY 2001 estimates. The ideal data for estimating reporting compliance would both represent the population of tax returns and be complete in the detection of underreported tax. The individual underreporting gap estimate was not an actual tallying of observed misreported taxes across all individual accounts. Instead, misreported individual income taxes for the population were estimated by auditing a stratified random sample of individual income tax returns. Since the taxpayers were randomly selected, the sample was representative of the population of individual income tax returns. However, misreported income detected during the course of a given audit most likely did not account for all of the income that should have been reported on the return.

In order to account for all underreporting, the amount of income that was not detected during the audit was estimated using an econometric technique called detection controlled estimation (DCE). The DCE technique was applied for both TYs 2001 and 2006 tax gap estimates. However, for TY 2006 the DCE methodology was expanded to produce estimates of undetected income for individual line items—unlike for TY 2001 where estimates were made for aggregated line items. The TY 2006 estimate also reflects an improvement in the calculation of the tax liability based on the "true" income as expanded by the DCE estimates of undetected income. For TY 2006, IRS used a tax calculator to estimate the marginal increase in tax related to the unreported income on each tax return—an improvement over the prior use of aggregate average marginal tax curves. The remainder of this paper describes in greater detail the data and methodology used to estimate the TY 2006 individual income tax underreporting gap.

National Research Program

The IRS National Research Program (NRP) designs and administers reporting compliance studies for the IRS.[3] The first NRP study of individual reporting compliance consisted of a stratified random sample of about 45,000 TY 2001 individual income tax returns filed during calendar year 2002.[4] That study served as the basis for the TY 2001 individual underreporting gap estimates. NRP used a process called classification to determine the type of audit for each return selected and the mandatory issues to be examined.[5] In the classification process, examiners compared information return documents (W-2s, 1099s, etc.) with the actual tax return in order to identify discrepancies and also identify items that appeared large, unusual, or questionable. Some line items on the return, typically those that could not be verified through information returns, were always classified as mandatory to audit. In the case of simple returns where information could be easily reconciled with

the information returns, taxpayers were not audited and actually not even contacted. Returns that had only a small number of simple issues identified in classification were routed to correspondence exams where the exam could be handled through telephone calls, faxes, and traditional mail. More complicated returns were assigned to one of two types of audits that involved face-to-face interaction with an examiner: either an office audit handled by a Tax Compliance Officer (TCO) or a field audit handled by a Revenue Agent (RA) who may actually visit the taxpayer's place of business.

The purpose of the classification process was to limit the burden on taxpayers by selecting an appropriate audit technique and set of issues. The number of mandatory issues on an NRP audit still typically exceeded the number of issues that would have been examined had the return been selected through one of the typical IRS compliance risk-based return selection processes. In that sense they were more complete audits, which was beneficial from a research perspective. Examiners also had the discretion to expand the audit to include non-classified issues, typically whenever additional information was uncovered during the course of the audit that caused the examiner to question that issue.

Although research from the study provided long-term benefits,[6] the random selection of 45,000 tax returns for a single tax year was a disruption to the normal exam workload. Instead of randomly selecting a large number of returns for a compliance study every few years, IRS decided to begin selecting a smaller number of returns on an annual basis. The smaller number of returns would provide more timely information and could be combined over several years to provide compliance estimates at a similar level of reliability as a single-year larger study. The smaller annual studies were designed to randomly select about 13,000 returns each year, beginning with TY 2006. Returns would go through a similar classification process as the TY 2001 study; there would just be fewer returns for a given tax year. Since the TY 2006 underreporting gap was estimated before enough of the annual studies were complete, both the TY 2001 and TY 2006 NRP studies were used to estimate the TY 2006 individual underreporting gap, as described below.

Detection Controlled Estimation (DCE)

Not all underreported income is detected by every audit, even ones of the scope and quality of NRP audits. This was confirmed by the 1976 IRS Taxpayer Compliance Measurement Program (TCMP) individual reporting compliance study, which was the last IRS reporting compliance study to audit taxpayers without the auditors having the use of third-party information return documents. IRS later compared the information return documents to the audit findings and found that for every $1.00 of detected unreported income that was reported on information documents, an additional $2.28 went undetected.[7] As a result of that study, IRS began multiplying the portion of income detected without the use of information documents by a multiplier, typically 3.28, in order to estimate the individual underreporting gap.

In the late 1980s, Jonathan Feinstein developed an econometric technique for estimating undetected income that he termed detection controlled estimation.[8] The intuition behind the methodology was that examiners have varying abilities for detecting income that can be observed through patterns in the data collected from taxpayer audits. Feinstein explained that the observed audit adjustment actually reflects the product of the true (unobserved) unreported income and the propensity of the examiner to detect unreported income. Feinstein's application of the methodology to TCMP data resulted in comparable estimates for the amount of undetected income as the IRS was assuming based on the 1976 TCMP study.

The original DCE methodology focused on estimating overall noncompliance for a given return, while IRS was also interested in the sources of noncompliance. The IRS Office of Research contracted with Dr. Brian Erard (B. Erard and Associates) and Professor Feinstein (Yale School of Management) to extend and refine Professor Feinstein's original DCE methodology.[9] The first extension of the DCE methodology for the IRS estimated noncompliance separately for two groups of returns and two types of income items using the face-to-face audit results from the TY 2001 NRP study as part of the TY 2001 underreporting gap estimation process. Returns without reported Schedule C or Schedule F income and with reported total positive income (TPI) less than $100,000 were estimated separately from all other returns. Similarly, income lines subject to less information reporting were estimated separately from all other income lines.

This extension provided IRS with four new multipliers that were used to estimate the TY 2001 individual underreporting gap. While an improvement over the old TCMP multiplier method, that approach was still primarily an aggregate approach to DCE estimation. Only the aggregate undetected income for income lines expected to have similar compliance characteristics and detection rates was estimated. In order to estimate the tax gap for specific income items, the TY 2001 DCE estimates required the assumption that average detection rates for income items grouped together for estimation were equal. Additionally, the use of a multiplier meant that undetected income was allocated only to returns where some unreported income was initially detected by the auditor. This approach also precluded the use of a micro tax calculator to estimate the tax value of the underreporting, so tax was estimated using average marginal tax rates for the TY 2001 tax gap estimates.

These assumptions meant that some line items received more undetected income than they should have while other income items received less, and that some returns were allocated more undetected income than they should have been while other returns were allocated less. For example, net capital gains or losses were grouped with income items covered by significant amounts of information reporting (wages and salaries, interest income, dividend income, social security income, etc.). Given the complex nature of capital gains transactions and the fact that the basis was not reported on information documents, unreported capital gains may actually have been more difficult to detect than other income items in its TY 2001 DCE estimation group.

Estimation at the Income Item Level

For estimating the TY 2006 individual underreporting gap, a second extension of the DCE methodology provided separate estimates of undetected income for income lines on the Form 1040. This extension allowed for greater variability in the average detection rates across line items.[10] DCE estimation requires explicit modeling of a detection equation whose arguments include the type of examiner (TCO or RA), the experience of the examiner, and binary variables that take the value of 0 or 1 to indicate which examiner conducted the exam. In order to differentiate the detection capabilities of different examiners, the examiners included in the detection equation must have audited a sufficient number of returns with the income item being modeled. Typically, this requirement would be 15 or more returns. Since the TY 2006 NRP study was less than a third of the size of the TY 2001 study, there were not enough observations to estimate the DCE equations. It may take three or more annual NRP studies before IRS has enough observations to estimate the DCE equations on the more recent data. Therefore, the TY 2001 NRP data was used to estimate the equation parameters for the second DCE extension. An imputation methodology, discussed later, was developed to allocate the DCE estimates derived from TY 2001 NRP data to the new TY 2006 NRP returns.

In addition to the detection equation, the second extension of the DCE methodology included a two-part specification for modeling the noncompliance of a line item. The first noncompliance equation modeled the likelihood of noncompliance while the second equation modeled the magnitude of noncompliance conditional on the presence of noncompliance. Since some income items with significant information reporting were not routinely classified, the extension also included an additional modeling of the likelihood of the item being classified based on its return characteristics and actual mismatches with information documents for these items.

The data requirements for DCE meant that some income items still needed to be grouped together for purposes of estimating the detection equation, even when using data from the larger TY 2001 NRP study. Table 1 shows the specific groupings of income items used for estimation. Income items that were routinely classified (typically because of the general lack of complete information reporting) were modeled separately from items subject to significant information reporting (wages, interest income, etc.). Schedules C and F income were primarily estimated independently of each other and of other routinely classified income items. Other routinely classified income items (capital gains, rental and royalty income, partnership and S corporation income, etc.) were estimated jointly with a common detection equation. Similarly, items subject to significant information reporting were also estimated jointly with a common detection equation.

TABLE 1. Grouping of Income Items for Joint Estimation

Items Subject to Significant Information Reporting	Items Routinely Classified	
Estimated Jointly	**Estimated Jointly**	**Estimated Separately**
Wages and Salaries	Short-term Capital Gains	Schedule C
Interest	Long-term Capital Gains	Schedule F
Dividends	Rents and Royalties	
State and Local Tax Refunds	Partnership, S Corporation, Estate, Other Income	
Pensions and IRAs	Form 4797 Net Gains	
Gross Social Security	Other Income	
Unemployment		

The joint estimation of some line items with a common detection equation meant that the expanded methodology assumed that a given examiner had similar detection capabilities across all of the income items within the group. Unlike the first extension of DCE, noncompliance of each income item was modeled using separate equations and parameters even though detection was modeled using a common equation. In other words, the equations and parameters that modeled the likelihood and magnitude of noncompliance were not constrained to be identical across line items within a group while the detection equation and parameters were constrained. The second extension explicitly provided separate estimates of undetected income for each income item, a marked improvement over the first extension. Additionally, because different examiners may have examined different income items, the overall average detection rates for a given line item could still vary within the group. Although separate detection equations would be preferred to the use of a common detection equation, there were simply not enough audits in the sample to support that level of detail.

The use of multipliers to expand from detected underreported income to total underreported income in the original TY 2001 DCE implementation meant that income could be allocated only to returns where unreported income was detected by the examiner. The second extension of the DCE methodology provided return level predictions of undetected income based on the probability and magnitude of undetected income conditional on whether or not unreported income was initially detected by the examiner. One significant implication of this enhancement was a more realistic distribution of undetected income. The more realistic distribution of undetected income enabled IRS to use a tax calculator, discussed later, to estimate the tax associated with all unreported income on each return in the sample separately.

Two-Stage Imputation of Undetected Income from TY 2001 to TY 2006

The smaller size of the TY 2006 NRP sample prevented IRS from using that data to estimate the DCE equation parameters. The primary purpose of the DCE estimation is to estimate how much underreported income was not detected on the NRP audits. Under the assumption that the average propensity of examiners to detect underreported income remained stable between the TY 2001 and TY 2006 NRP studies, the detected underreported income from the TY 2006 NRP data could still provide much of the information needed for estimating the TY 2006 individual underreporting gap. The imputation of undetected income from TY 2001 NRP data to TY2006 NRP data took place over two stages. The first stage generated 10 simulated TY 2001 NRP data sets with return level predictions of undetected income. During the second stage, those 10 simulated TY 2001 data sets were used to generate 10 simulated TY 2006 NRP data sets with return level predictions of undetected income.

Stage 1: TY 2001 DCE Simulations

The DCE formula underlying the return level predictions predicts a positive probability of undetected income for most returns (though this is typically very small for returns where no unreported income was detected). Simply multiplying the predicted probability of undetected income by the predicted magnitude of undetected

income would have resulted in nearly every return receiving some positive amount of undetected income for each income item—probably an unreasonable outcome. A small probability of undetected income for an income item actually means that undetected income would be present on a relatively small number of returns for that item. Since one goal was to have a more realistic allocation of undetected income, a simulation approach was developed in order to apply the DCE prediction formulas. The simulation process essentially randomly allocates undetected income for a given income item based on the probability of undetected income for that item on each return.

The specific steps of the TY 2001 simulation are described below. For each return:

Step 1: Calculate the predicted probability of the presence of undetected income conditional on whether unreported income was detected by the examiner.

Step 2: Calculate the predicted magnitude of total unreported income conditional the presence of undetected income.

Step 3: Draw a random number between 0 and 1.

Step 4: If the random number is less than or equal to the predicted probability from Step 1, allocate the predicted total (detected + undetected) amount of unreported income from Step 2. Otherwise, allocate only the detected amount of unreported income (if any).

Step 5: Calculate the weighted sum of predicted total unreported income from Step 4 across all returns to estimate unreported income for the population.

Steps 3 to 5 were repeated 10 times for each income item to create 10 sets of TY 2001 data with simulated undetected income.

Stage 2: TY 2006 DCE Imputations

In the past, IRS has relied upon "implicit" multipliers defined as the total estimated underreported income divided by detected underreported income. Implicit multipliers cannot accommodate the allocation of undetected income to returns on which no income was detected. Since the new DCE methodology explicitly provides estimates for these returns, IRS desired a new approach to applying the estimates of the average propensity to detect underreported income across NRP studies. The 10 simulations created during Stage 1 meant that undetected income could now be allocated directly to each TY 2006 NRP return (by income item), conditional on certain assumptions. First, detection of unreported income for a given line item was assumed to be different for returns that reported that line item versus returns where the taxpayer did not report any income for that line item. Second, if income was reported for the line item, detection was assumed to vary with the amount of the line item that was reported. Third, if income was not reported for the line item, detection was assumed to vary with the amount of adjusted gross income (AGI) that was reported.

Undetected income was imputed separately for each income item. Each TY 2001 NRP simulated data set was divided into returns that reported the income item and returns that did not report the income item. For returns that reported the income item, weighted deciles of the reported amount were calculated. For returns that did not report the income item, weighted deciles of AGI were calculated. If there was not sufficient data to calculate deciles, an alternative percentile was calculated.[11] For each income item, the calculation of deciles provided up to 20 groups of returns, or bins, (10 income item deciles and 10 AGI deciles). The TY 2006 NRP data were similarly apportioned according to income item and AGI deciles.

Using the first TY 2001 simulated data set, for each bin:

Step 1: Calculate weighted probability of the presence of undetected income, defined as the weighted number of returns with undetected income divided by the total weighted number of returns.

Step 2: Calculate the weighted mean amount of undetected income conditional on the presence of undetected income, defined as the weighted sum of undetected income divided by the weighted number of returns with undetected income.

For each TY 2006 return:

Step 3: Draw a random number between 0 and 1.

Step 4: If the random number is less than or equal to the weighted probability from Step 1, allocate the mean amount of undetected income from Step 2. Otherwise, do not allocate undetected income.

Step 5: Multiply the mean amount of undetected income by the ratio of the weighted detected underreported amount from TY 2006 to the weighted mean detected underreported amount from TY 2001.

Steps 1 to 5 were repeated for each income item for each of the 10 TY 2001 simulated data sets to create 10 TY 2006 simulated data sets with return level predictions of undetected income.

Additional Income Adjustments

Tip Income

For some line items, DCE is unlikely to fully account for all undetected income. Since tip income is relatively concentrated in a few industries and occupations, tip income represents a relatively small amount of overall wages, salaries, and tips. However, since a significant portion of tip income is paid in cash by customers, tip income is subject to less information reporting than most wages and salaries. The lack of complete information reporting and the cash nature of tips suggest that tip income had a lower compliance rate than other wages and salaries and was harder to detect during an audit. Given the concentration of tip income and the nature of the NRP samples, the design of the TY 2001 and TY 2006 NRP studies did not support estimates of unreported tip income. Furthermore, tip income earners who filed a Form 1040-EZ and who reported all of the income reported to them on their W-2 would be less likely to be subject to a face-to-face NRP audit compared to other cash intensive sources of income, like Schedule C income. Therefore, a separate estimate of unreported tip income based on prior IRS studies of tip income compliance supplemented the DCE estimate of undetected wages and salaries.

S Corporations, Partnerships, Estates and Trusts

With flowthrough income, there are two potential sources of misreporting: misreporting by the individual shareholder/partner and misreporting by the S corporation/partnership on the K-1 sent to both the shareholder/partner and IRS. On most NRP audits, examiners reconciled the income reported on the K-1 with the income reported by the individual taxpayer on Schedule E. Examiners looked at other individual level issues such as various limitations on the deduction of losses related to basis or passive-activity rules. It was very uncommon for examiners to examine the related closely held S corporation and partnership entities. Therefore, very little entity level misreporting was detected on the TY 2001 and TY 2006 NRP audits.

IRS previously conducted a separate reporting compliance study of S corporations spanning Tax Years 2003 and 2004. Preliminary results of the TYs 2003/2004 NRP S corporation study were reported at the 2009 IRS Research Conference and suggested the net misreporting percentage (NMP) of income by S corporations was 15 percent.[12] However, the percentage of flowthrough income misreported by individuals based on the TY 2001 and TY 2006 NRP individual studies, after attempting to account for undetected income using DCE, was below the estimated percentage of misreported income by S corporations from the TY 2003/2004 NRP S corporation study. Since this seemed unlikely, the final tax gap estimate adds a small amount of underreported income such that the overall percentage of misreported income for the S corporations, partnerships, estates and trusts rises to 15 percent, the level observed in the TY 2003/2004 NRP study of S corporations.

Tax Calculator

The imputation of return-level predictions of undetected income from the TY 2001 simulations to the TY 2006 NRP data provided estimates of total underreported income, but not underreported tax. To estimate

underreported taxes resulting from the underreported income, a tax calculator was applied to individual observations (i.e. tax returns) from the ten simulated TY 2006 data sets. The use of a tax calculator was an improvement over prior methodologies of estimating average marginal tax rates, particularly since the tax calculator could account for different statutory tax rates between long-term capital gains and dividends versus other sources of income.[13] This process provided ten underreporting gap estimates for each line item which were then averaged to produce the final underreporting gap estimate. The final line item underreporting gap estimates were summed to estimate the overall individual income tax underreporting gap. The specific process for estimating the underreporting gap for each income item using the tax calculator is described below. Essentially, the additional income for each income item was added (or subtracted) to the reported amount of income and tentative tax calculated. Then that additional income was dropped and the process repeated for the next income item.

Using the first simulated TY 2006 NRP data set from Stage 2 of the imputation:

Income and Deductions

Step 1: Calculate tentative tax based on reported income and deductions.

Step 2: Add net misreported wages, salaries, and tips and recalculate tentative tax.

Step 3: Subtract tentative tax calculated in Step 1 from tentative tax calculated in Step 2. This was the estimate of the underreporting gap for wages, salaries, and tips from the first simulated data set.

Step 4: Remove the unreported wages, salaries, and tips added during Step 2.

Step 5: Repeat Steps 2 to 4 for the remaining income items and deductions separately.

Credits[14]

Step 1: Calculate total credits based on reported income and deductions.

Step 2: Add all net misreported income and deductions to all line items and calculate total credits.

Step 3: Subtract total credits calculated in Step 2 from total credits calculated in Step 1. This was the estimate of the underreporting gap for total credits from the first simulated data set.

The separate steps for income and deductions and credits were repeated for each of the 10 simulated TY 2006 data sets and then the results were averaged. Had net misreported income been added to all line items simultaneously, the resulting calculation of tentative tax would have been larger than the estimate obtained by summing the marginal increases to tentative tax. Increased total income would have increased marginal tax rates due to the progressivity of income taxes, increasing the estimate of the total underreporting gap. However, the DCE estimation and imputation methodology included other assumptions, such as the imputation of the mean undetected income by decile. Those assumptions also have potential impacts on the distribution of income and therefore marginal tax rates. Taken as a whole, it's not clear that the complete DCE estimation, imputation and tax calculation methodology resulted in an estimate that could be interpreted as a lower bound.

Self-Employment Taxes

Self-employment taxes are required to be reported by individuals with self-employment income on individual income tax returns. The underreporting of self-employment income (primarily income reported on Schedules C and F) results in underreported self-employment taxes. Therefore, the TY 2001 and TY 2006 NRP studies and the tax calculator were used to estimate the self-employment tax underreporting gap. Self-employment taxes were calculated before and after including unreported self-employment income for each of the ten simulated TY 2006 data sets. Each spouse on a joint return has a separate earned income threshold above which the combined wages and self-employment income are subject to Medicare taxes but not Social Security taxes. Since the undetected income is allocated to the return as a whole and not to individual spouses on the return, self-employment tax was calculated under two different assumptions concerning the threshold. Under the first assumption, the unreported self-employment income was allocated to a single spouse. Under the second

assumption, the unreported self-employment income was allocated evenly to both spouses. The final self-employment tax underreporting gap estimate was the average of the estimates resulting from the two different assumptions. For TY2001 the average of the two estimates ($35.3 billion and $42.7 billion) resulted in the same estimate under the new DCE methodology as the estimate under the original DCE methodology. For TY2006, the average of the two estimates ($52.4 billion and $61.1 billion) was $57 billion.

TY 2006 Estimates

Table 2 shows the estimated tax gaps by individual income tax component for TY 2006 and TY 2001. Business income reported on Schedules C, E, and F accounted for just over half of the total individual income underreporting gap in both TY 2001 and TY 2006. Overall, the estimated NMP for TY 2006 was 19 percent, not significantly different from the estimated NMP in TY 2001, shown in Table 3. The underreporting gap associated with credits increased from $17 billion in TY 2001 to $28 billion in TY 2006. The increase in the underreporting gap for credits, shown in Table 3, was consistent with the growth in refundable credits between TY 2001 and TY2006. Notably, the reported amount of the earned income credit grew 30 percent while reported amount of the additional child tax credit tripled.

TABLE 2. Individual Income Tax and Self-Employment Tax Underreporting Gaps, Tax Years 2001 and 2006

(In billions of dollars)

Tax Gap Component	TY 2006	TY 2001
Individual Income Tax	**235**	**197**
Nonbusiness Income	68	56
Business Income	122	109
Adjustments, Deductions, Exemptions	17	15
Credits	28	17
Self-Employment Tax	**57**	**39**

TABLE 3. Individual Income Tax Underreporting Gap Estimates by Visibility Category, Tax Years 2001 and 2006

Tax Return Line Items Grouped by Visibility Category	Underreporting Gap (In billions of dollars)		Net Misreporting Percentage*	
	TY 2006	TY 2001	TY 2006	TY 2001
Total Individual Income Tax	**235**	**197**	**19**	**18**
Substantial Information Reporting and Withholding[1]	11	11	1	1
Substantial Information Reporting[2]	12	9	8	5
Some Information Reporting[3]	64	51	11	9
Little or No Information Reporting[4]	120	110	56	54
Tax Credits	28	17	37	26

* Net misreporting percentage is the net misreported amount divided by the sum of the absolute values of the amounts that should have been reported.

[1] Wages and salaries

[2] Pensions & annuities, unemployment compensation, dividend income, interest income, Social Security Benefits

[3] Deductions, exemptions, partnership/S corporation income, capital gains, alimony income

[4] Nonfarm proprietor income, other income, rents and royalties, farm income, Form 4797 income, adjustments

NOTE: Components might not sum to totals because of rounding.

Table 3 also shows that the main finding from TY 2001 has not changed. As the level of information reporting increases, the percentage of income that is misreported (as reflected by the NMP) decreases. When there was little or no information reporting, 56 percent of income was underreported in TY 2006. That contrasts with income subject to substantial information reporting, where only 8 percent of income was underreported. In the case of wages and salaries, where there was both substantial information reporting and withholding, only 1 percent of income was underreported.

Conclusion

The TY 2006 individual income tax underreporting gap estimate represents a significant methodological advance compared to prior tax gap estimates. Specifically, the latest estimate incorporates line item level estimates of undetected underreported income (instead of aggregate multipliers) and a tax calculator to more accurately compute marginal tax rates (in place of average marginal tax rates used in previous years). The latest estimate also makes extensive use of newly available TY 2006 NRP data. Future work will focus on modifying the DCE technique to use pooled NRP sample data for 3 or more years and to apply the modified DCE methodology to produce updated estimates of undetected underreported income.

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Endnotes

[1] Estimates of the amount of underreported income and the percentage of underreported income reflect underreported income net of overreported income. Individual income taxes reported (and underreported) on returns filed after the applicable filing deadline, including any valid extensions, are part of the individual income tax nonfiling gap.

[2] Income subject to substantial information reporting (but not withholding) includes dividend income, interest income, pensions and annuities, social security benefits, unemployment insurance, and state income tax refunds. Income subject to little or no information reporting includes nonfarm sole proprietor income reported on Schedule C, farm income reported on Schedule F, rental and royalty income reported on Schedule E, Form 4797 income, and income reported on the "other income" Form 1040 line.

[3] NRP conducts more than just individual reporting compliance studies. It should be assumed for the remainder of this paper that references to an NRP study refers to an individual reporting compliance study unless explicitly stated otherwise.

[4] The TY 2001 individual reporting compliance study consisted of returns with tax periods ending between July 2001 and June 2002, the overwhelming majority of which ended on December 31, 2001, and were filed in early 2002.

[5] Examples of issues include line items on the return, filing status, number of dependents, whether an activity is engaged in for profit or as a hobby.

[6] Research from the TY 2001 NRP study improved the targeting of audits towards taxpayers most likely to have compliance issues. It also inspired legislation that increased information reporting requirements, such as the reporting of basis for stocks and the reporting of merchant card and third-party payments.

[7] See Internal Revenue Service (1983) and Internal Revenue Service (1988) for a discussion of the 1976 Information Return Program document matching study and the derivation of the multipliers applied to TCMP audit results.

[8] See Feinstein (1990, 1991).

[9] See B. Erard & Associates (2005, 2006, 2007, and 2011) and Erard and Feinstein (2012).

[10] Detection rate here is defined as the amount of unreported income detected as a percentage of the total unreported income. The smaller the detection rate, the larger the amount of total underreporting is relative to detected underreporting.

[11] The only income item for which there was insufficient data to use deciles was alimony income. In this case, a single p-tile was used for returns with reported alimony income and a separate p-tile for returns with no reported alimony income.

[12] See http://www.irs.gov/pub/irs-soi/09resconawardscorp.pdf. Net Misreporting Percentage (NMP) for income is defined as the sum of the net misreported amount of income divided by the sum of the absolute values of the amounts of income that should have been reported.

[13] Average marginal tax curves were used for the TY 2001 individual underreporting gap estimates released in June 2006. Because the prior DCE methodology included capital gains and dividends with other line items and relied on multipliers, the average marginal tax curves were an appropriate approach. However, they likely overstated the marginal tax rate on capital gains.

[14] In addition to misreported eligibility criteria, the misreporting of income and tax often results in the misreporting of credits. Therefore the total misreporting of credits was calculated with undetected income included in the calculation of total income.

Advances in Nonfiling Measures

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The Internal Revenue Code places three basic obligations on individual income taxpayers: to file tax returns when required; to report accurately on those returns their income and tax; and to pay their tax on time. The Internal Revenue Service (IRS) therefore categorizes taxpayer noncompliance into three mutually exclusive and exhaustive types of behavior: nonfiling, underreporting, and underpayment. Underreporting accounts for the largest portion of the tax gap (the amount of tax imposed by law, but not paid on time) and receives most of the attention. Underpayment is generally observable, so the extent of underpayment can be tabulated and tracked from IRS systems. This paper focuses on two measures of individual nonfiling: the nonfiling gap (the amount of tax not paid on time by those who do not file on time) and the Voluntary Filing Rate (the number of required returns that are filed on time, expressed as a percentage of the total number of returns that are required to be filed, whether filed or not). In particular, we describe in this paper a number of methodological improvements we have made for estimating these two measures.

The Nonfiling Gap

The nonfiling gap focuses on those who are required to file tax returns, but do not file those returns on time. The nonfiling gap is defined as the difference between the total tax liability of these nonfilers and the amount of that tax that has been paid on time (such as through withholding and estimated tax payments). Thus, the nonfiling gap includes the amount of tax *not* paid on time by those who file late, but it excludes amounts of tax that *are* paid on time—both by late filers and by those who never file.[2]

The previous estimate of the individual income tax nonfiling gap (for Tax Year 2001) was based on aggregate tabulations derived from the Exact Match study conducted by the Census Bureau. This study "matched" records from the Current Population Survey with data that Census regularly receives from the IRS to identify potential nonfilers, whose tax liability could be estimated from the Census survey. This approach had several shortcomings, however. First, the IRS data did not clearly distinguish between timely and late returns, so Census treated all returns as timely. Second, the Census data do not include key tax-related information (e.g., eligibility for important tax benefits), and tend to understate some income types, so the calculation of tax liability is subject to much uncertainty. Finally, IRS tabulations of the tax paid on time by late filers and those who never filed were also subject to much uncertainty.[3]

Given our concerns about the Exact Match method for estimating the nonfiling gap, we decided to apply an alternative method pioneered by Treasury's Office of Tax Analysis and the congressional Joint Committee on Taxation. That method is based almost exclusively on IRS administrative data as opposed to Census data. The basic approach is as follows:

1. Select a large random sample of valid Social Security Numbers (SSNs) (e.g., excluding those of deceased persons).
2. Compare those SSNs with filed tax returns for a given tax year, putting them into three categories:
   a. Those that appeared on **timely** filed tax returns (as the primary taxpayer, the secondary taxpayer [i.e., spouse], or as a dependent);
   b. Those that appeared on **late** tax returns (as the primary taxpayer, the secondary taxpayer [i.e., spouse], or as a dependent); and
   c. Those that did not appear on any tax return at all (which we refer to as the "**no-return**" group).
3. Compile data for the no-return group of SSNs (primarily age, income, and income tax withholding) from Social Security records and third-party information returns.

4. Assemble the no-return group members into synthetic families, guided by the overall profile of the population from Census data, and taking into account the contribution to that profile by timely and late filers. For each synthetic family, identify one or more synthetic returns based on apparent filing statuses (e.g., married-joint, single, head of household) of the household members and assign income and exemptions to these returns based on the data collected in step 3.
5. Impute tax deductions, other income (such as capital gains), and likely tax credits to the synthetic returns, then compute their tax liability.
6. Subtract the amount of withholding from the estimated tax liability on each synthetic return to derive the hypothetical balance due (contribution to the nonfiling gap), then sum these amounts across all of the synthetic returns to derive the portion of the nonfiling gap attributable to the no-return group.

We applied this approach to Tax Year 2005 data, which resulted in a nonfiling gap estimate of $12.9 billion among the no-return population, as summarized in Table 1. That study was the subject of a paper presented at the 2011 IRS-Tax Policy Center Research Conference.[4]

TABLE 1. Estimates Related to Individuals Who Did Not Appear on Tax Returns for TY2005

	Total	Those Required to File	
		Before Credits	After Credits
Number of individuals	38.63 million	11.82 million	11.82 million
Number of synthetic tax returns	22.79 million	5.18 million	5.18 million
Income subject to tax	$233.7 billion	$196.7 billion	$196.7 billion
Tax liability	$20.2 billion	$21.1 billion	$20.2 billion
Tax balance due (not paid on time)	$12.9 billion	$13.8 billion	$12.9 billion

However, that represented just a portion of the overall nonfiling gap. The other major piece was the contribution from late filers. We found that the late returns identified above (in step 2. b.) reported an aggregate $8.7 billion balance due. However, this understates the true balance due on these returns, because the returns did not fully account for income that was independently reported on third-party information documents. Therefore, we accounted for additional income on those late returns using the logic summarized in Table 2 for each line item on the return.

TABLE 2. Logic for Using Information Return Data To Adjust Items Reported on Late Returns

	Form	Line	Item	Adjustment Logic
A	1040	7	Wages	Let GIC = Max[(D-E+G), (J+I+H+F), 0] • If A>0 and (B+C)>0 and GIC>0 and -150<(B+C+L-GIC)<150, then: ◦ Wages = (B+C) and ◦ Schedule C net income = Max[K-(B+C), 0] • Else, if A>0 and (B+C)>0 and GIC=0 and -150<(A-(B+C))<150, then: ◦ Wages = Max[A-L, (B+C), 0] and ◦ Schedule C net income = L • Else: ◦ Wages = Max[A, (B+C), 0] and ◦ Schedule C net income = Max[K, (L-GIC)+K]
B	W-2	1	Wages	
C	W-2	8	Allocated tips	
D	Schedule C	1	Gross receipts	
E	Schedule C	2	Returns & allowances	
F	Schedule C	4	Cost of goods sold	
G	Schedule C	6	Other income	
H	Schedule C	28	Total expenses	
I	Schedule C	30	Business use of home	
J	Schedule C	31	Net profit (loss)	
K	1040	12	Schedule C net income	
L	1099MISC	7	Nonempl compensation	

TABLE 2. Logic for Using Information Return Data To Adjust Items Reported on Late Returns—Continued

	Form	Line	Item	Adjustment Logic
M	1040	8a	Taxable interest	Interest income = Max[M, (N+O+P+Q+R)]
N	1099-INT	1	Interest income	
O	1099-INT	3	Interest on savings bonds	
P	K-1 (1041)	1	Interest income	
Q	K-1 (1120S)	4	Interest income	
R	K-1 (1065)	5	Interest income	
S	1040	9a	Ordinary dividends	Ordinary taxable dividends = Max[S, (T+U+V+W)]
T	1099-DIV	1a	Ordinary dividends	
U	K-1 (1041)	2a	Ordinary dividends	
V	K-1 (1120S)	5a	Ordinary dividends	
W	K-1 (1065)	6a	Ordinary dividends	
X	1040	9b	Qualified dividends	Qualified dividends = Min[X, Y] (The qualified dividends amounts from the Forms K-1 are not in our data.)
Y	1099-DIV	1b	Qualified dividends	
Z	1040	10	State tax refunds	State tax refund = Max[Z, Min[AA, AB]]
AA	1099-G	2	State tax refunds	
AB	Schedule A	5	Prior year deduction for S&L income taxes	
AC	1040	13	Capital gain (loss)	IRPCG = (AD+AE+AF+AG+AH+AI+AJ) Capital gain = Max[AC, IRPCG]
AD	1099-DIV	2a	Cap. gain distribution	
AE	K-1 (1041)	3	Net ST cap. gain (loss)	
AF	K-1 (1041)	4a	Net LT cap. gain (loss)	
AG	K-1 (1120S)	7	Net ST cap. gain (loss)	
AH	K-1 (1120S)	8a	Net LT cap. gain (loss)	
AI	K-1 (1065)	8	Net ST cap. gain (loss)	
AJ	K-1 (1065)	9a	Net LT cap. gain (loss)	
AK	1040	15a	IRA distributions	IRA and pension income combined to account for misclassification. If AK=0, then AK=AL If AM=0, then AM=AN IRA + Pension income = Max[(AL+AN), (AO-AK+AL), (AP-AM+AN)] AP=0 (to avoid double-counting pension income)
AL	1040	15b	Taxable IRA distrib'n	
AM	1040	16a	Pensions & annuities	
AN	1040	16b	Taxable pension, annuity	
AO	5498	3	Roth conversion amt	
AP	1099-R	2a	Taxable pension	
AQ	1040	18	Farm income or loss	Farm income = Max[AQ, (Max[AR,0] + Max[AS,0])]
AR	1099-G	7	Agricultural subsidy	
AS	1099-MISC	10	Crop insurance proceeds	
AT	1040	19	Unemployment comp.	Unemployment compensation = Max[AT, AU]
AU	1099-G	1	Unemployment comp.	
AV	1040	20a	Social security benefits	Social security benefits = Max[AV, AW]
AW	1099-SSA	3	SS benefits	
AX	1040	21	Other income	Line21Calc=AY+AZ+BA If (AX<0 and Line21Calc=0) or (Schedule C net income ≠ 0) or (Farm income ≠ 0) then: Other income = AX; Else: Other income = Max[AX, Line21Calc]
AY	W-2G	1	Gross winnings	
AZ	1099-C	2	Amt of debt cancelled	
BA	1099-G	5	ATAA payment	

TABLE 2. Logic for Using Information Return Data To Adjust Items Reported on Late Returns—Continued

	Form	Line	Item	Adjustment Logic
BB	1040	17	Schedule E net income	GrossE = (BC+BD+Max[(BE+BF), BG]+BH+BJ+Max[BI, 0]) If BB > GrossE, Then GrossE = BB Note: any negative amount from any of the following components is set to zero: Line17Calc = BK+BL+BM+BN+BO+BP+BQ+BR+BS+BT+BU+BV+BW+BX+BY Schedule E net profit (loss) = Max[BB, BB + (Line17Calc – GrossE)]
BC	Schedule E	23c	Total rents received	
BD	Schedule E	23d	Total royalties received	
BE	Schedule E	29a (g)	Passive income from partnership or S corp	
BF	Schedule E	29a (j)	Nonpassive income from partnership or S corp	
BG	Schedule E	30	Passive + nonpassive inc. from partn or S corp	
BH	Schedule E	35	Estate & trust income	
BI	Schedule E	40	Farm rental net income	
BJ	Schedule E	41	REMIC net income	
BK	K-1 (1065)	1	Ordinary business inc.	
BL	K-1 (1065)	2	Net rental real estate inc.	
BM	K-1 (1065)	3	Other net rental income	
BN	K-1 (1065)	4	Guaranteed payments	
BO	K-1 (1065)	7	Royalties	
BP	K-1 (1041)	5	Other portfolio income	
BQ	K-1 (1041)	6	Ordinary business inc.	
BR	K-1 (1041)	7	Net rental real estate inc.	
BS	K-1 (1041)	8	Other rental income	
BT	K-1 (1120S)	1	Ordinary business inc.	
BU	K-1 (1120S)	2	Net rental real estate inc.	
BV	K-1 (1120S)	3	Other rental income	
BW	K-1 (1120S)	6	Royalties	
BX	1099-MISC	1	Rents	
BY	1099-MISC	2	Royalties	
BZ	1040	64	Tax withheld	Total withholding = CB+CC+CD+CE+CF+CG+CH+CI+CJ+CK+CL+CM+CN Total prepayments = Total withholding + CA
CA	1040	65	Estimated tax payments	
CB	W-2	2	Income tax withheld	
CC	W-2G	2	Income tax withheld	
CD	K-1 (1120S)	13(Q)	Backup withholding	
CE	1099-B	4	Income tax withheld	
CF	1099-SSA	6	Income tax withheld	
CG	1099-RRB	10	Income tax withheld	
CH	1099-G	4	Income tax withheld	
CI	1099-DIV	4	Income tax withheld	
CJ	1099-INT	4	Income tax withheld	
CK	1099-MISC	4	Income tax withheld	
CL	1099-OID	4	Income tax withheld	
CM	1099-PATR	4	Income tax withheld	
CN	1099-R	4	Income tax withheld	

After accounting for additional income using the logic presented in Table 2, we recalculated tax and the balance due for each return.[5] As indicated in Table 3, the sum of those balances due rose to $12.7 billion after

estimated credits. Combining our estimate ($12.7 billion) for late filers with our earlier estimate ($12.9 billion) for those who did not file at all, our overall estimate of the nonfiling gap for 2005 is $25.6 billion. This compares with an estimate of $25 billion for TY2001, which was derived using the Exact Match methodology.

TABLE 3. Estimates Related to Late Filers for Tax Year 2005

	All Late Returns		Those Required To File	
	Dollars (billions)	Returns (millions)	Dollars (billions)	Returns (millions)
Reported income subject to tax	$410.6	8.07	$401.7	5.99
Adjusted income subject to tax	$432.3	8.07	$423.4	6.15
Reported balance due	$8.8	2.27	$8.8	2.27
Adjusted balance due	$12.7	2.73	$12.7	2.73

The last step was to project the Tax Year 2005 estimate forward 1 year, to be consistent with the overall tax gap update for Tax Year 2006. The average *dollars* did not change appreciably from 2005 to 2006—due either to inflation or to tax law changes. However, our separate work to estimate the Voluntary Filing Rate (described below) indicated that the *number* of nonfilers declined from 11.3 million to 9.6 million during this interval, so the nonfiling gap undoubtedly declined as well. Although we could not determine a precise reduction in the nonfiling gap corresponding to that decline in the number of nonfilers, it was clear that the decline was due primarily to the infusion of low-income people who had an incentive to file in order to claim the one-time Telephone Excise Tax refund in 2006. This suggests that the reduction in the nonfiling gap was significantly smaller than the reduction in the number of nonfilers. Therefore, we reduced the overall nonfiling gap estimate from $25.6 billion in 2005 to $25.0 billion for 2006.

The Voluntary Filing Rate (VFR)

The IRS has estimated the VFR since the mid-1990s to examine factors that influence individual income tax filing compliance. In fact, when the IRS began developing a concerted nonfiler strategy, the VFR was selected as one of the strategic measures to be tracked. It is defined for a given tax year as:

$$\text{VFR} = \frac{\text{Number of Required Returns Filed on Time}}{\text{Total Number of Returns Required To Be Filed}}$$

The numerator is tabulated from IRS data, and the denominator is estimated from Census data (the Annual Social and Economic Supplement, ASEC, of the Current Population Survey, CPS). Both the numerator and the denominator were first estimated in a fairly approximate manner since the CPS lacks some of the information needed to confirm various tax-related concepts. Initially, both the numerator and denominator were estimated from samples each year. However, when the IRS began storing data on the whole population in a form that is accessible to researchers, we began estimating the numerator from population data. This required developing new systems to categorize each return as timely or late and as required to be filed or not required. After demonstrating that the new population data were able to replicate the results from the trusted samples used until then, we began using the population data each year. That allowed us to examine in more detail what type(s) of taxpayers were driving fluctuations in the numerator.

In general, the estimated trend in the VFR was fairly stable at just over 90 percent. The percentage increased significantly in 2007 and 2008, however, which we ascribed to the effects of the economic downturn and the economic stimulus.[6] When we estimated the VFR for 2009, however, we observed a dramatic decline, which we could not fully explain initially. So, we began analyzing what was causing the decline.

We soon realized that the estimated trend in the VFR was potentially misleading owing to the various measurement issues surrounding the numerator and denominator of the statistic. So, we set out to ensure that the numerator and denominator more precisely represented the same population of taxpayers (U.S. residents over the age of 15), and that they reflected the same definitions (as much as the data would allow) for the

requirement to file. In the process, we discovered that none of the existing instructions that the IRS provides to taxpayers fully defined the requirement to file; at issue was how losses were to be handled in the definition of gross income. Technically, the gross income concept disregards all losses; that is, losses do not offset positive income for the purpose of establishing a filing requirement. Therefore, we took steps to ensure that the instructions given to taxpayers reflect this nuance.

Our next significant finding was that the Census data used to construct the denominator of the VFR significantly understates certain types of income (such as pensions, Social Security income, and sole proprietor income). This understatement in the denominator of the measure contributes to an overstatement of the VFR. Figures 1-3 illustrate the differences in the amounts of these types of income reported on the ASEC survey versus what is reported on the third-party information returns sent to the IRS (in the case of pension and Social Security income), or what is reported on filed income tax returns (in the case of self-employment income). To address these discrepancies, we have developed an econometric methodology for imputing the missing income to the ASEC records. We employ age, gender, region, and citizenship, as well as indicators and amounts of wages, interest, and unemployment compensation to predict the amount of pension and Social Security income that should have been reported on the CPS.[7] For predicting self-employment income, we also employ filing status and the number of dependents, but we do not control for citizenship.[8] Imputing these types of income caused the number of estimated required returns to increase by over 7 million each year, as illustrated in Figure 4. Table 4 shows that the imputations to pension and Social Security income added roughly the same number of required returns as the imputations to self-employment income.

In addition, there are several types of income that are subject to little or no reporting in the ASEC survey. These include capital gains and losses, other gains and losses, State and local tax refunds, royalties, and miscellaneous other incomes reported on Form 1040 Schedule E. To account for returns that would be seen to have a filing requirement had these types of income been reflected in the CPS data, we determined from IRS data the number of required returns among both timely and late filers first with and then without these types of income, then added the difference (i.e., the number of filed returns that were required due to the presence of these types of income) to the denominator. This approach does not address possible undercounting of required returns (due to the absence of these income sources) among those who never file, but we anticipate that any such undercounting is likely to be small.

After applying all of the adjustments to the numerator and denominator of our measure, we have re-estimated the VFR for each of the last 11 years (see Figure 5 and Table 5). Our updated results reveal that the decline in 2009 was not as pronounced as our preliminary measure had suggested and that the peak was in TY2007, not in TY2008. Our revised estimates further indicate that the decline in 2009 appears to represent a gradual return to historical filing behavior. Specifically, the temporary increase in the VFR was largely caused by the fact that many taxpayers who had traditionally filed late or not at all had a great incentive to file on time to be eligible for the Economic Stimulus Payment in 2007 (and to some extent the Telephone Excise Tax Refund in 2006). When that benefit lapsed, many of these taxpayers reverted to their old behavior. We suspect that this was especially true of those whose income put them above the filing threshold but below IRS enforcement thresholds.

FIGURE 1. Social Security Income Reported on Form 1099 SSA-RRB vs. CPS, TY2010

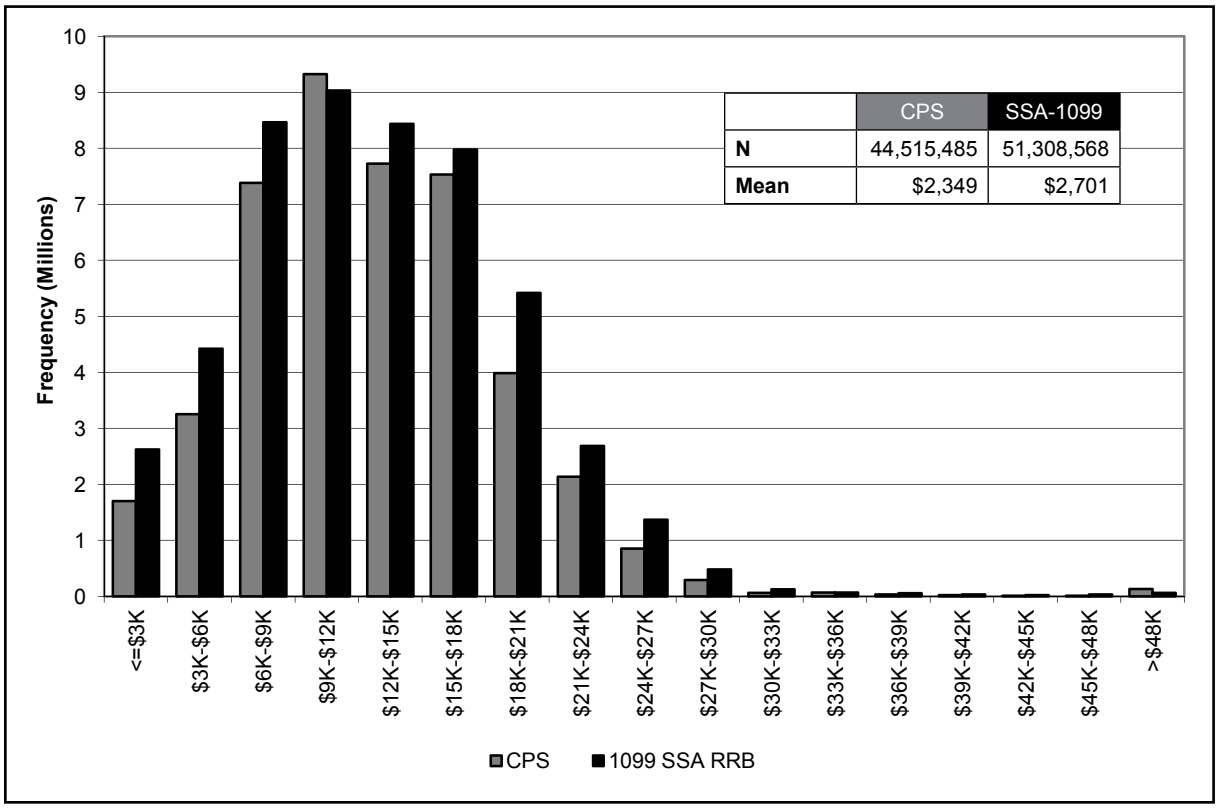


FIGURE 2. Pension Income Reported on Form 1099-R vs. CPS, TY2010

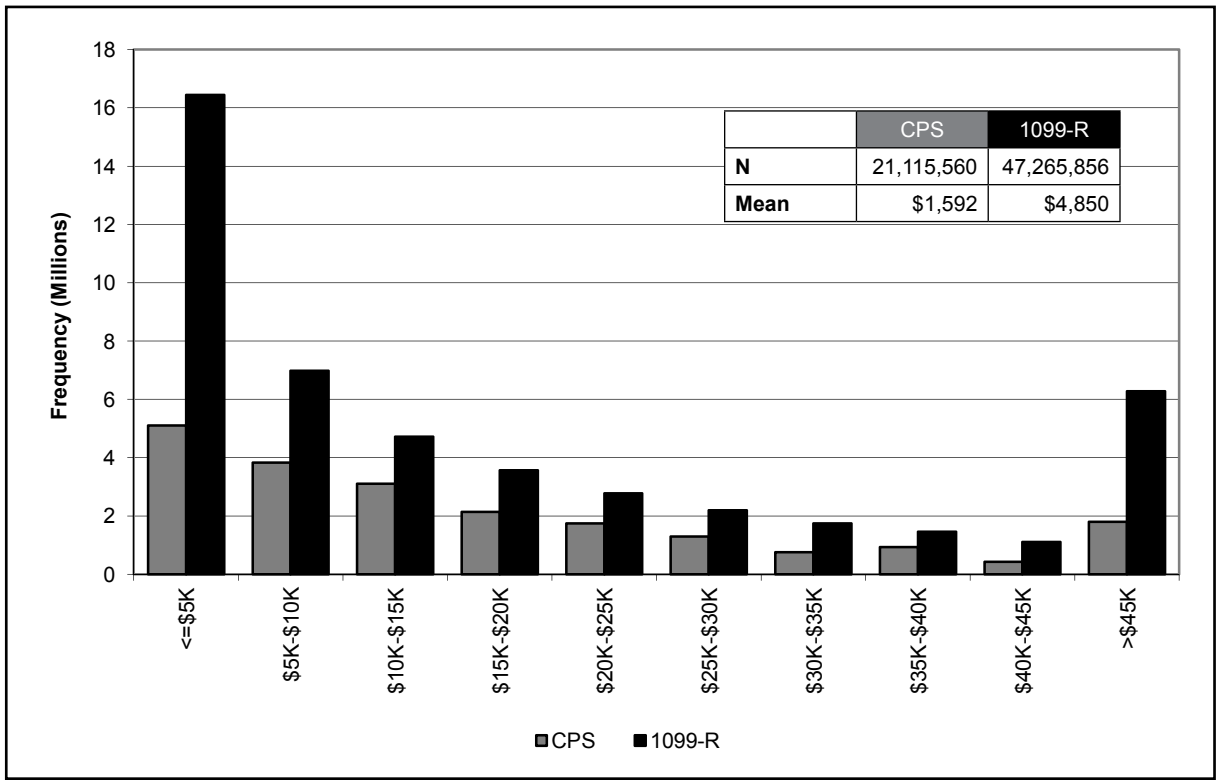
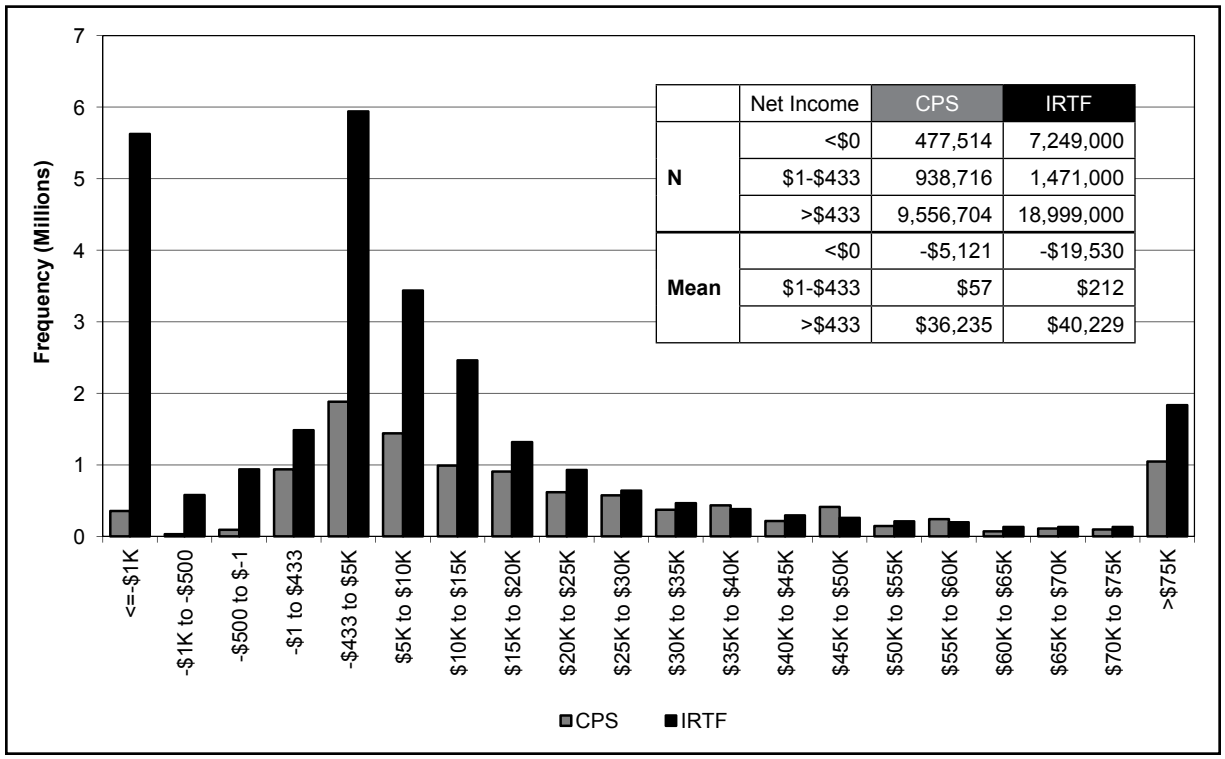


FIGURE 3. Self-Employment Income: IRTF vs. CPS, TY 2010



	Net Income	CPS	IRTF
N	<$0	477,514	7,249,000
	$1-$433	938,716	1,471,000
	>$433	9,556,704	18,999,000
Mean	<$0	-$5,121	-$19,530
	$1-$433	$57	$212
	>$433	$36,235	$40,229

FIGURE 4. CPS Estimates of Required Returns in Population

With and Without Imputed Income, Tax Years 2007–2009

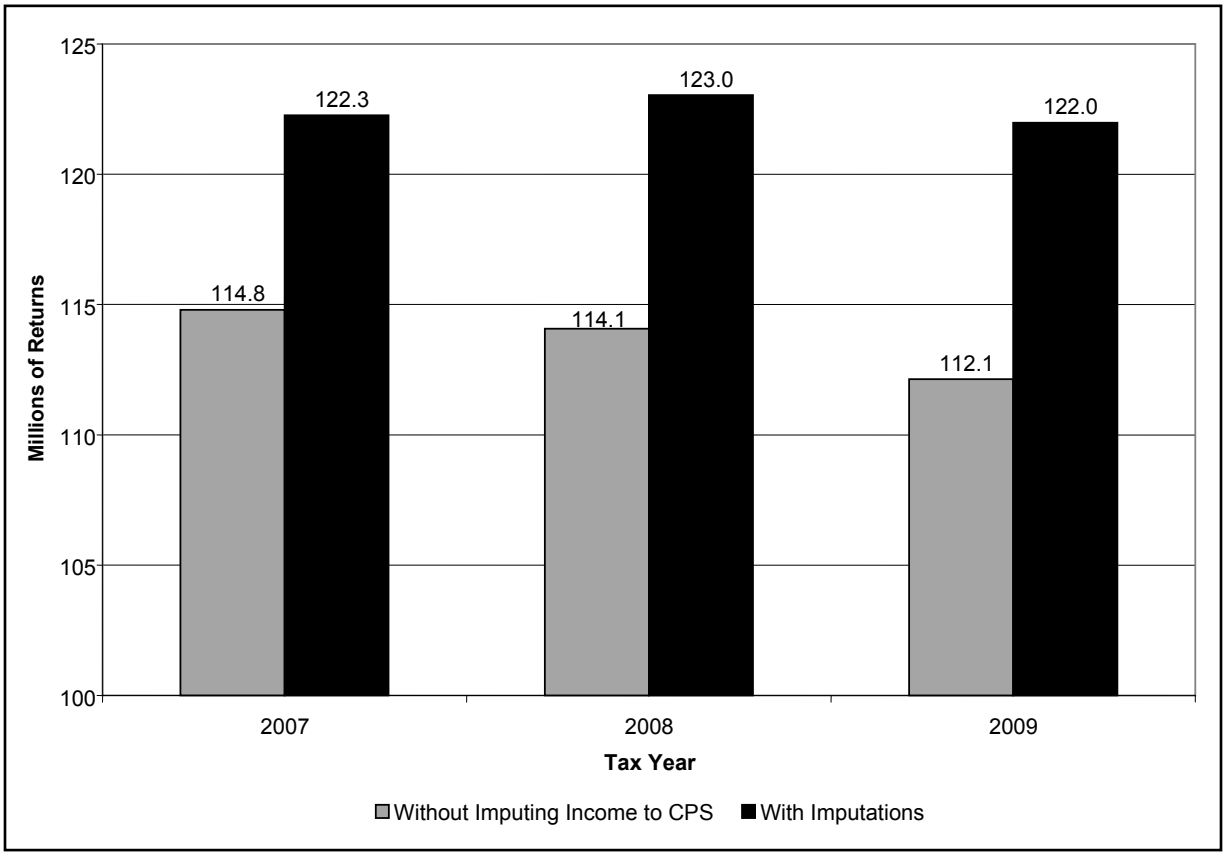


TABLE 4. CPS Estimates of Required Returns in Population

Impacts of imputing pension/Social Security income vs. self-employment income, Tax Years 2007–2009

Estimated Number of Required Returns (millions)	2007	2008	2009
Without imputing any income to CPS	114.8	114.1	112.1
Increment from imputing only Social Security and pension income	4.4	4.2	5.1
Increment from imputing only self-employment income	3.6	4.7	5.2
Number double-counted in the two increments	-0.5	0.0	-0.5
Total after all imputations	122.3	123.0	122.0

FIGURE 5. Individual Income Tax Voluntary Filing Rate

VFR = Number of Required Returns Filed on Time / Total Number of Returns Required To Be Filed

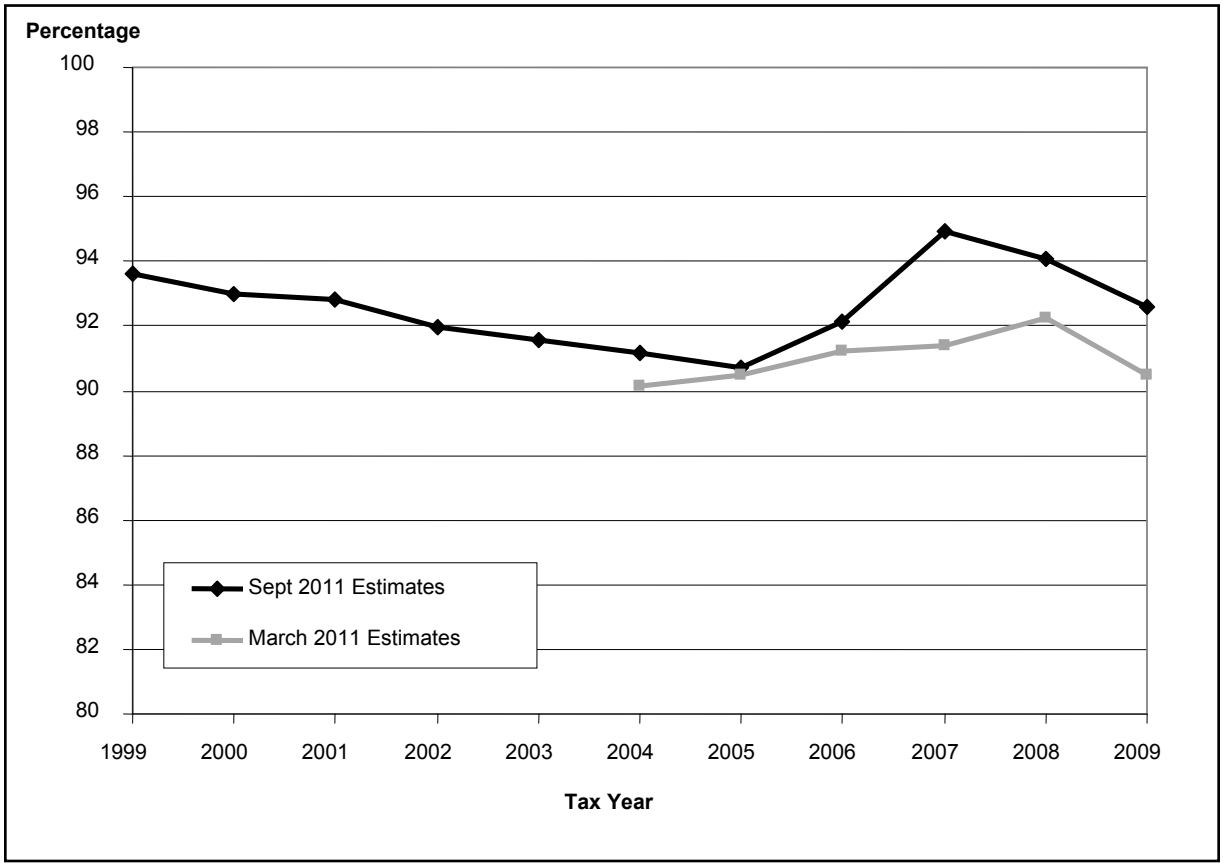


TABLE 5. Updated Voluntary Filing Rate and Related Estimates, Tax Years 1999–2009

Tax Year	Required Returns (Millions)					VFR
	Denominator (Total Required)	Numerator (Timely Filed)	Change in Denominator	Change in Numerator	Number of Nonfilers	
1999	112.6	105.4			7.2	93.6
2000	115.4	107.4	2.8	2.0	8.1	93.0
2001	116.1	107.8	0.7	0.4	8.3	92.8
2002	116.3	106.9	0.2	-0.9	9.4	91.9
2003	116.5	106.7	0.2	-0.2	9.8	91.6
2004	118.7	108.2	2.2	1.5	10.5	91.2
2005	121.4	110.1	2.7	1.9	11.3	90.7
2006	122.6	112.9	1.2	2.8	9.6	92.1
2007	123.3	117.0	0.7	4.1	6.3	94.9
2008	123.5	116.1	0.2	-0.9	7.3	94.1
2009	122.3	113.2	-1.2	-2.9	9.0	92.6

Influenced by the Telephone Excise Tax Refund

Influenced by the Economic Stimulus Payment

Benefits of the VFR Analysis

Our efforts to enhance the VFR measure have produced several important benefits. Perhaps one of the most significant of these has been to document the extent to which the CPS ASEC data understate certain types of income, and to develop a reasonable approach to imputing these income sources to the CPS each year. Our efforts have also resulted in a more accurate definition of the criteria underlying the filing requirement, which we now apply as closely as possible to both the numerator and denominator of the VFR measure. Our improved understanding of these criteria has even prompted a revised description of the gross income concept in the filing requirement section of the Form 1040 instruction booklet. Under our revised methodology, we now apply a consistent definition of what it means for a required return to be timely filed for VFR purposes; we now include in the numerator only those required returns that are filed by December 31 of the primary filing year.[9] Ultimately, these improvements enhance the quality of the measure, and allow us to develop a deeper understanding of the drivers of fluctuations in the VFR over time.

Future Work

Work is under way to evaluate if other types of income are significantly understated in the Census samples, and to use the VFR to analyze the factors that influence filing compliance. We also plan to explore ways to estimate the denominator of the VFR solely from administrative data (i.e., without Census data). This would present both advantages and disadvantages. A key advantage would be having greater ability to explore the role of the numerator and denominator together in affecting fluctuations in the VFR, rather than just the numerator.

Endnotes

[1] The views expressed in this paper are those of the authors, and do not necessarily reflect the positions of the Internal Revenue Service.

[2] This means that some nonfilers who were required to file did not contribute to the tax gap—either because they had no tax liability, or because they fully paid their tax liability on time. Thus, for tax gap purposes, the key issue is the amount of tax not paid on time—not the technical requirement to file a return. Note, however, that overpayments by some nonfilers do not offset underpayments by others (just as refunds paid to filers at the time of filing do not offset the underreporting gap). Also, returns filed before an officially extended due date are considered timely.

[3] Although it is possible to identify in the IRS Master File the timely payments made by late filers and nonfilers, the Master File does not indicate how much of those payments was in excess of true tax liability—particularly for those who never filed a return. Thus, the Master File tabulations are bound to overstate the timely payments of true tax liability, resulting in an underestimate of the nonfiling gap.

[4] Josh Lawrence, Michael Udell, and Tiffany Young, "The Income Tax Position of Persons Not Filing Returns for Tax Year 2005," *The IRS Research Bulletin*, Publication 1500 (Rev. 4-2012), pp. 143–155.

[5] We assumed that the total of all withholding for a given taxpayer that was documented by third parties on information returns was more accurate than the amount reported by the taxpayer on his or her Form 1040.

[6] The general observation is that as incomes fall, fewer people are required to file. If those who are no longer required to file were disproportionately less likely to have filed when they were required (as might be the case if their income was just over the filing threshold), then those who are still required to file would be disproportionately more likely to file, thus increasing the VFR—not because of a change in behavior, but because of a change in who is required to file. Furthermore, many additional returns were filed for Tax Year 2007 because in order to receive the one-time Economic Stimulus Payment, people had to file a tax return for 2007. This undoubtedly increased the number of required returns filed on time, and thus the VFR.

[7] To be consistent with our Form 1099-R income measure, we impute IRA income along with pension income.

[8] To be consistent with the CPS measure of self-employment income, we impute partnership income along with nonfarm sole proprietorship income.

[9] This excludes returns that are considered timely (e.g., due to combat extensions), but are filed much later than most. Setting December 31 as the cut-off date allows for a consistent measure to be produced each year.

Applied Tax Gap Analysis in the United Kingdom:

Its use in tax administration, and future research

Mick Thackray, HM Revenue and Customs

The published Vision of Her Majesty's Revenue and Customs (HMRC), The United Kingdom tax authority, is this:

> ***We will close the tax gap****, our customers will feel that the tax system is simple for them and even-handed, and we will be seen as a highly professional and efficient organisation.*

And HMRC's first Strategic Objective is this:

> *Maximise revenue to close the tax gap.*
>
> *Our objective is to provide the money for public services by maximising revenue to close the tax gap and improving the extent to which individuals and businesses receive the credits and payments to which they are entitled.*

These two statements show how the concept of the tax gap—the total amount of tax lost through non-compliance—is at the core of HMRC's strategic planning. Consequently, tax gap analysis, its application and its continuing development, is a priority for HMRC's Knowledge, Analysis and Intelligence (KAI) directorate.

HMRC and its indirect tax predecessor, Her Majesty's Customs and Excise (HMCE) have been estimating their tax gaps for about 15 years. These estimates are published annually, as a total tax gap since 2009.[1] The publications are now **Official Statistics**, published under a Code of Practice[2] introduced by the UK's Statistics and Registration Service Act. They help UK taxpayers and other external stakeholders to understand and challenge HMRC's operational performance at a strategic level, and are an important part of HMRC's contribution to the UK's transparency agenda.

The fact that HMRC's tax gap estimates are Official Statistics, produced by members of the UK Government Statistical Service, provides assurance of their independence from political and management interference. They are used extensively in the current public debate on fiscal deficits and austerity measures.

KAI's tax gap estimates have uses within HMRC that go beyond just that of being information. They are also used as strategic planning and risk management tools. Similarly, they are used in the UK Treasury's Fiscal Risk Register as well as in the Chancellor of the Exchequer's annual fiscal forecast.

KAI's Enforcement and Compliance team is currently planning a step increase in the range and depth of HMRC's tax gap analysis. This will improve our understanding in the following dimensions:

- Components of the tax gap, the more detailed contribution of specific risks and behaviours to the overall gap; and
- Using this, tax gap analysis in real time to support active risk management.

HMRC also intends to ask academic researchers in the field of tax administration to review its tax gap analysis, to ensure it is robust, and fit for purpose.

Background and Discussion

HM Revenue & Customs (HMRC) is responsible for the administration and collection of the vast majority of national taxes in the UK (and the great majority of taxes in the UK are levied on a national basis). As part of its administration of UK taxes, HMRC estimates, on an annual basis, the overall extent of tax lost through noncompliance. These total tax losses are referred to as the tax gap, which is quite broadly defined, as the total amount lost compared to a baseline in which all taxes are collected as the UK Parliament intended.[3]

Within HMRC, the tax gaps are estimated using a range of approaches and analytical disciplines by analysts working in the Department's Knowledge, Analysis & Intelligence directorate (KAI). HMRC publish a full report of the results of this analysis and the methods used to estimate them at the links given above. External analysts have also estimated all or part of the UK tax gap, using a variety of methods and producing a wide range of results.

Over time, HMRC's tax gap estimates and associated analysis have become much more than the simple presentation of information. They are applied across the full range of the Department's remit, both within HMRC and externally. This paper presents some of the ways tax gap analyses are used in the UK, grouped under the following headings:

- Publication and dissemination
- HMRC's Vision and Strategic Objective
- HMRC's Performance Management Framework
- Resource allocation and business planning
- Evaluation and research

The paper ends with a short review of development work planned by HMRC to improve its tax gap estimates and their applicability.

This paper does not attempt to explain HMRC's tax gap methodology, but it is worth reflecting on the fact that the aim of the analysis is a robust assessment of tax lost through noncompliance. The analysis aims to measure the impact of activities that are not only not directly observed by either HMRC or their analysts, but many of those activities are deliberately concealed or obfuscated from both. It is therefore inherently not a precise measure that is produced, though it has been empirically observed to provide a reasonably robust indicator of major trends.

It is also worth stressing that the analysis covers all forms of tax losses, including those that result from bad debt or errors, or through avoidance[4] intended to get round Parliament's intended coverage of taxes. There are obvious definition issues that this coverage raises, which further challenge the precision with which the exact level of the tax gap can be estimated. However, our experience is again that, in broad terms, this does not fatally compromise the integrity of the analysis, so long as its limitations are borne in mind.

Publication and Dissemination

HMRC's tax gap estimates, and the methodology behind them, are published annually[5]; and the tax gap concept has achieved a widespread currency within the UK. This is particularly the case within HMRC itself, where it is central to the Department's compliance effort, but it is also the case in the public discourse on fiscal policy[6] and administration, for example in the recent parliamentary inquiry into HMRC's record at ensuring tax compliance[7] and the UK Government's austerity agenda.

The term is used commonly by HMRC's own operational staff and managers, for example in distinguishing between 'tax gap closing' and 'non-tax gap closing' work. The former contributes directly to the Department's progress toward its Strategic Objective No. 1; whereas the latter does not. Examples of tax gap closing work

including collecting tax debts, countering existing evasion and fraud and correcting tax under-declared in error. Nontax gap closing work most obviously includes work towards other strategic objectives, for example levels of customer service, and investment in IT and other infrastructure. However, it can also include critical compliance work to prevent future growth in the tax gap, for example testing the integrity of taxpayers' accounting arrangements, and education to prevent future error or action to prevent future growth in avoidance losses or fraudulent repayment claims. One of the challenges in using the tax gap currency in compliance performance is recognising the value of such work without overstating the tax gap closing compliance yield. Generally this is done using an operationalization of the concept of future revenue benefit that can be discounted to prevent double counting.

Externally to HMRC, 'closing the tax gap' is referred to in political debate to express the idea of helping to reduce the UK's budget deficit by increasing the collection of tax properly due as opposed to simply raising tax rates or extending the coverage of tax bases.[8] This has been something of a live issue in UK politics (and elsewhere) over recent years, and external commentators and lobbyists have produced alternative formulations for the tax gap and a consequent range of estimated values. These methodological arguments are not rehearsed here, but a recent, comprehensive example of HMRC's defence of its estimates against what it regards as a most egregious external analysis can be found in its response to a parliamentary enquiry into the tax gap by the UK Treasury Select Committee (cf footnote #7).

This debate, and its challenges to HMRC's tax gap analysis, is encouraged by HMRC, partly as a way of ensuring that the estimates are as good as they can be; but also as part of the Department's contribution to the UK administration's transparency agenda. HMRC recognises that there is a legitimate public interest in the results and their ability to help in holding the Department to account for their performance.

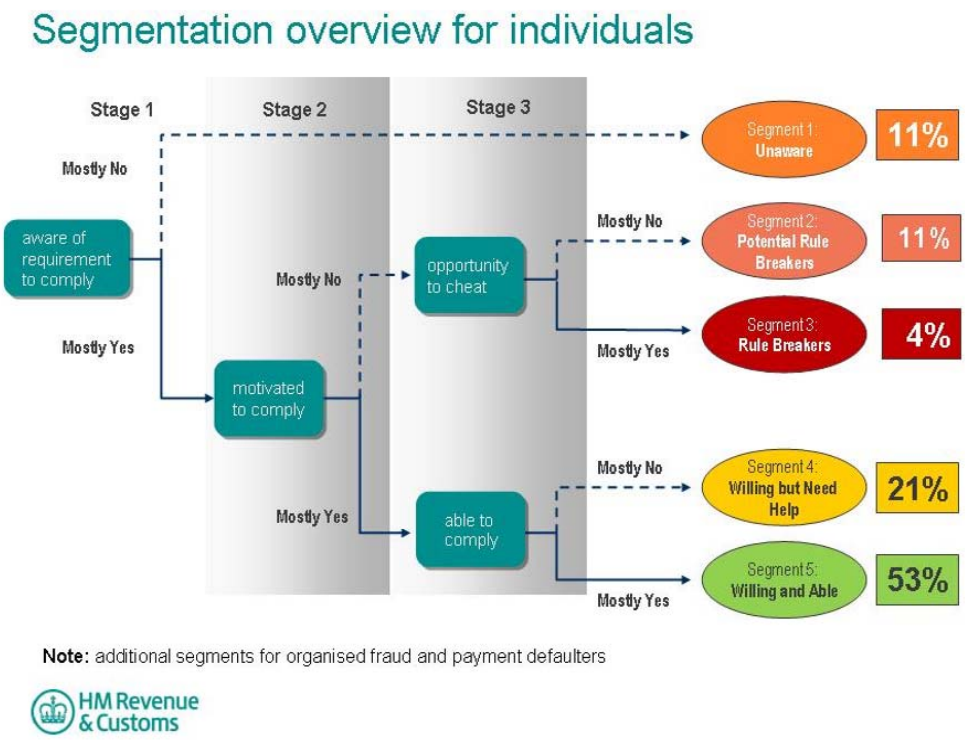
HMRC publish their tax gap estimates as Official Statistics, which are covered by the UK's Statistics and Registration Service Act 2007. This means that the estimates are produced to standards set by a Code of Practice established by the Act and maintained by the independent UK Statistics Authority. They are subject to scrutiny by the same Authority, which is directly accountable to the UK parliament. The code of practice covers not only quality standards but also processes to ensure transparency and independence from political and administrative interference in the production and presentation of the statistics.

HMRC's tax gap statistics are also regularly scrutinised by the UK National Audit Office as part of their scrutiny of the Department's performance and integrity. The National Audit Office is also an independent body reporting directly to parliament.

HMRC's Vision and Strategic Objective

As mentioned in the introduction, HMRC's departmental vision is to close the tax gap, that our customers will feel that the tax system is simple for them and even-handed, and that we will be seen as a highly professional and efficient organisation. This vision is published and widely disseminated within the Department to help give all staff a clear sight of our common purpose, which is to raise the revenue required to fund the UK's public spending in such a way as minimise compliance burdens and adverse economic impacts on taxpayers.

The first line of this vision is, 'to close the tax gap'; and this is reflected in HMRC's primary strategic objective, which is to maximise revenues so as to close the tax gap. Again, this is widely disseminated within the Department and reflected in the great majority of operational units' and individuals' business plans and objectives. As discussed above, this gives a very clear focus to compliance work within the Department. In particular, it reinforces the point that the purpose of a revenue authority is not just to maximise enforcement yield through 'downstream' compliance interventions but to maximise compliance overall through an optimal mixture of 'downstream', targeted compliance activities and 'upstream' processes and education that promote voluntary compliance.



HMRC's strategic approach to this aim is a customer-centric one, based on an analysis of taxpayers segments, illustrated for individuals in the diagram above. The challenge for analysts in this approach is to integrate a tax gap analysis based on observation and statistical inference of behaviours with a customer segmentation analysis based largely on attitudinal surveys.

HMRC's commitment to closing the tax gap has been reinforced by the current UK administration's Spending Review in 2010, which determined HMRC's expenditure over the period April 2011—March 2015. As part of this settlement, HMRC was allowed reinvestment funds of £917m based on its business case that this would enable the Department to achieve additional (compliance) revenues of £7bn pa by the end of the spending period. Although this target is not strictly one of closing the tax gap by this amount, the business case put forward by HMRC used the currency of the tax gap, as measured by KAI. To put HMRC's ambition in context, the additional revenues would be on top of £13.9bn achieved in the 2010/11 financial year, which was itself an increase of over the previous spending review period (an observed increase reflected by a decrease in the estimated tax gap in the same period).

Performance Management Framework

The senior management of HMRC use a monitoring framework developed within KAI called the Performance Management Framework (PMF) to monitor departmental performance and progress towards its strategic objectives. It should be stressed that, even though closing the tax gap is the Department's primary strategic objective, HMRC do **not** currently use its tax gap estimates to measure its performance. This is because of the significant uncertainties inherent in tax gap estimates, which preclude the level of precision necessary for performance monitoring. In addition, the tax gap will be affected by factors that are outside HMRC's control, for example economic changes and changes in social norms, so even a perfect measurement of the gap would not necessarily be a perfect measurement of HMRC's performance.

However, the 'currency' of tax gap analysis is used wherever practical in compliance measures and forecasts in the PMF. The gap estimates do not provide performance measures or operational targets in themselves, but provide a basis for the expression of such measures and targets. So, for example, the performance of

enforcement personnel in the field is calculated not just as the amount of additional revenue directly assessed or brought to bank (i.e., the amount assessed as due, discounted for collection shortfalls) but essentially as the sum of that and the identifiable indirect effects of their intervention. The indirect effects—deterrence, prevention and correction—are generally estimated on the basis of primary research conducted or collated by KAI analysts.

The intent behind this approach is to express such enforcement yield in broadly similar terms to HMRC's tax gap objective, so as to allow progress towards the objective to be monitored. The PMF metrics therefore reflect the (estimated) **outcomes** of compliance work, not just **outputs**, eg assessments raised, or **inputs**, e.g. audits conducted.

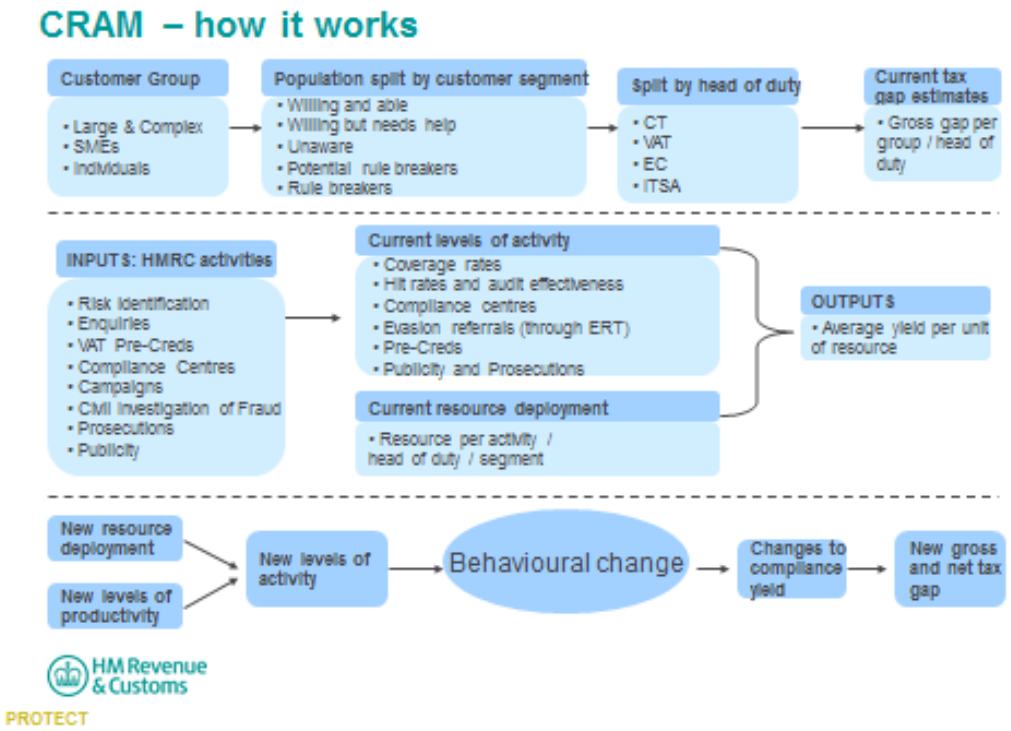
Corporate risk management within HMRC is facilitated by the Tax Compliance Risk Overview (TCRO), owned by the Risk and Intelligence Service directorate. The TCRO aims to provide a comprehensive register of the major compliance risks in the various tax regimes administered by HMRC. This allows a cross-cutting view of the risks, their relative scale and their management. The risk assessments in TCRO are baselined using KAI's tax gap analysis.

HMRC's tax gap analysis is also used in the UK Treasury's fiscal risk management process, and in the UK fiscal forecast produced by the independent Office for Budget Responsibility.

Business Planning and Resource Allocation

The revenue benefits of continuing baseline work and change propositions within HMRC are estimated in tax gap terms, rather than simple cash forecasts. Resource allocation, business simulation and scenario models developed within KAI and the business itself estimate both the direct cash impacts and the indirect impacts of behavioural change expected to arise from the Department's work and any proposed changes. This aligns HMRC's strategic revenue raising objective with its customer-centric strategy of improving voluntary compliance by systematically moving taxpayers from less compliant to more compliant customer segments.

A particular example of the strategic resource allocation models developed by KAI using tax gaps analysis is the Compliance Resources Allocation Model (CRAM) developed for HMRC's Local Compliance directorate. (Local Compliance is the part of the Department dealing with compliance issues for small and medium-sized



enterprises, individuals and other 'mass market' sectors.) CRAM is essentially a scenario model, projecting the impact of compliance resource allocations on the disaggregated tax gaps of particular customer groups and segments. The model is shown schematically in the diagram on page 97.

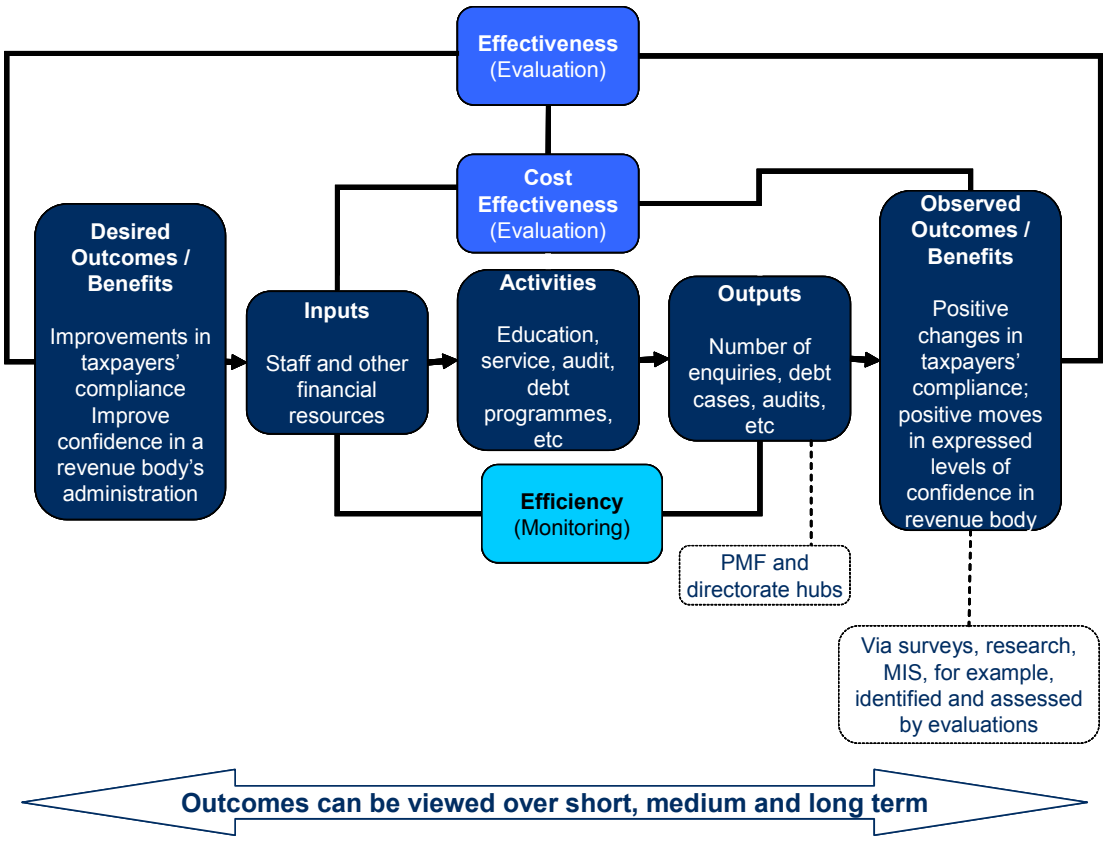
Evaluation and Research

Using the tax gap currency in place of traditional cash-based metrics places an added emphasis on the role of evaluation and research in gathering the evidence underlying tax gap analysis. In general (and almost by definition), tax losses can rarely be directly observed, and so tax gap changes generally have to be estimated on the basis of broader research and analytical techniques. Again, this complements HMRC's customer-centric strategy and its analysis of taxpayers' customer segments.

HMRC is increasingly using discrete compliance events such as targeted campaigns or task forces to improve compliance in specific areas such as particular industrial sectors or debt collection. These campaigns can be used by KAI analysts as natural experiments to garner evidence, not only of success or otherwise in the campaign itself, but also of the relative scale and impact of indirect effects. Such indirect effects are less easily observable in management information systems than more traditional compliance measures, so their analysis is often conducted on the basis of survey or other primary research.

The motivation behind this approach is to measure the outcome of HMRC's compliance effort, not just the outputs. The latter—inspectors' assessments, debt collection, filing compliance &c—are generally easier to measure, but they are not the ultimate purpose of a revenue authority. The purpose of HMRC is to collect taxes due, and it is using a customer centric strategy to minimise the total lost. It is these (tax gap) outcomes that KAI analysts research in their evaluation of campaigns and other compliance operations.

The following diagram sets out the OECD's distinction between monitoring and evaluation, and how both are achieved in HMRC.



Adapted from OECD Forum on Tax Administration: Evaluating the effectiveness of compliance risk treatment strategies

In this area, HMRC are committed to a rigorous evaluation of the impact of the £917m reinvestment in revenue maximising activities mentioned above. This is a major research programme synthesising HMRC's tax gap analysis, research into compliance behaviour and perceptions generally, and the evaluation of individual initiatives and programmes funded by reinvestment.

The aim of this evaluation is two-fold: first, to evaluate the impact of HMRC's compliance work; and second, to establish a strategic evidence base for the future direction of HMRC's work.

In addition, the Department has commissioned a laboratory experiment to investigate taxpayer behaviour. This research seeks to identify whether there is a difference in compliance levels between individuals who are able to communicate with a network of taxpayers within the context of the experiment and those who cannot exchange information with others. Information is also being collected about the impact of higher and lower audit and fine rates on levels of compliance.

HMRC provisionally plans to conduct further such experiments designed to identify the drivers of taxpayer behaviours, subject to a review of the outcome of the current experiment.

Future Work

KAI is currently in the process of developing its tax gap analysis to increase its ability to support HMRC's strategic planning and management. If successful, this will mean a step change to the level and amount of analysis produced. There are two principal dimensions to this development work.

1. Disaggregation

Currently, HMRC's tax gap analysis is built up from separate estimates for each of the main tax regimes. Generally these estimates are for total losses, and can be broken down only into some of the larger behavioural components (e.g., evasion, fraud, avoidance and error) for some of the taxes. Similarly, although it is possible to map some of these disaggregated estimates onto particular customer groups (e.g., individuals, large businesses &c) or customer segments, this is not always possible without brave assumptions. A fuller explanation of disaggregated tax gap estimates is provided in the HMRC's published tax gap estimates.

However, there is growing demand within HMRC for more comprehensive and reliable disaggregation of the higher level estimates, so that the gaps can be estimated by regime, behaviour, customer group and customer segment.

2. Projections and forecasting

Most of HMRC's current tax gap estimates are backward looking, in that they are necessarily based on historic data, so that the total tax gap published in 2011 was estimated for the financial year 2009/10. The exception to this is the estimate of the VAT Gap, where external household expenditure data and established forecast models allow a contemporary, albeit provisional, view of the gap.

There are sound analytical reasons for the historic nature of the current gap estimates, but their backward looking nature is a severe limitation to their use in business planning and risk models. For these purposes, the estimates need to be projected to the current year, and ideally forecast for future years.

These are both very challenging analytical requirements, because of the gaps and limitations in the currently available data. Moreover, it would be either prohibitively expensive or indeed not possible at all to overcome all these gaps and limitations through narrow quantitative analysis and research techniques. The current intention therefore is to take a mixed disciplinary approach to the issue, bringing together the existing analysis, leading indicators for the current gaps using tax receipts outturns, economic and other determinants, and input from other HMRC experts providing market, performance and risk intelligence. The synthesis of these inputs is expected to produce a robust view of the tax gaps in both of the above dimensions. If successful, this will allow HMRC to build its strategic evidence base on a more fully rounded and reliable tax gap analysis, bringing together the four areas discussed in this paper into a single analytical framework.

In addition to this, HMRC intends to invite proposals from external academics later this year for funded tax gap research to challenge, validate (hopefully!), but anyway improve HMRC's own estimates. HMRC will also continue its research programme into indirect effects of compliance work.

Further Reading on Tax Gaps

Measuring Tax Gaps 2012, HM Revenue & Customs, October, 2012 http://www.hmrc.gov.uk/statistics/tax-gaps/mtg-2012.pdf.

Methodological Annex for Measuring Tax Gaps 2012, HM Revenue & Customs, October 2012 http://www.hmrc.gov.uk/statistics/tax-gaps/mtg-annex2012.pdf.

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[1] Most recently in October 2012: http://www.hmrc.gov.uk/stats/mtg-2012.pdf (main publication); http://www.hmrc.gov.uk/stats/mtg-annex-2012.pdf (methodological annex).

[2] http://www.statisticsauthority.gov.uk/assessment/code-of-practice/code-of-practice-for-official-statistics.pdf.

[3] This is net of the tax collected through enforced and other late payments, so this concept is comparable to the "net tax gap," in U.S. parlance.

[4] Not just for analysts, but also for tax professionals, 'avoidance' is a very ambiguous term. For the purpose of tax gap measurement, HMRC defines avoidance as schemes that artificially minimise tax liability in a way that was not intended by the UK Parliament (i.e., those that HMRC would wish to block, all else equal). This definition excludes cases where the interpretation of law is disputed and does not include legitimate tax minimisation strategies that reflect accurately economic realities (e.g., the payment of reasonable royalties to a parent company for the use of a brand name or realistic management charges). This is clearly a definition that is open to wide differences in interpretation. In practice, the avoidance component of the tax gap is delineated by those schemes that are required to be disclosed to HMRC by law (a subset of the total) and partly as those that HMRC officials have deemed to be challengeable avoidance (absent court decisions or settlements to the contrary). It is accepted that this definition will include some amounts that are not avoidance, and that it will incorrectly exclude some avoidance.

[5] In addition to the annual publications, HMRC also publishes methodological papers, for example: http://www.hmrc.gov.uk/research/taxgap-workingpaper.pdf.

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3

Understanding Individual Tax Compliance Behavior

Bloomquist

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Incorporating Indirect Effects in Audit Case Selection: An Agent-Based Approach

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In selecting tax returns for its examination program the IRS historically has focused primarily on direct revenue maximization. According to Plumley and Steuerle (2004), "The appeal of direct revenue maximization is that, for the most part, it is measurable, and it provides a basis for making resource allocation decisions." However, Plumley and Steuerle (2004, page 329) also point out that by relying on direct revenue maximization the IRS "views enforcement in isolation from voluntary compliance. To the extent that IRS activities—whether enforcement or non-enforcement—indirectly affect the voluntary compliance of the general population, it is the combination of direct and indirect revenue that is important."

Bloomquist (2004) defines three types of indirect effects: *induced*, *subsequent period,* and *group* effects. *Induced effects* refer to a change in compliance behavior due to a change in enforcement level (e.g., audit rate or penalty rate). Thus, induced effects are analogous to the concept of probability of detection in the classic Allingham and Sandmo (1972) model of taxpayer reporting compliance. An example of induced effects would be if voluntary reporting compliance fell because IRS announced it was cutting 5,000 enforcement staff positions. *Subsequent period effects* refer to a change in an individual taxpayer's compliance behavior due to a prior tax audit. The first-hand experience of being audited reveals specific information to taxpayers about which issues the tax agency is interested in and how much it knows about taxpayers' finances. With this additional information, taxpayers may decide to increase or decrease their compliance (Gemmell and Ratto 2012). Finally, *group effects* are changes in compliance (also potentially in a positive or negative direction) by members of taxpayer *j*'s social network that can be attributed to communication with taxpayer *j* about his or her recent tax audit (Fortin, Lacroix, and Villeval 2007; Alm, Jackson, and McKee 2009). In this paper the term *indirect effects* refers to subsequent period and group effects only since tax agency resource levels are assumed to be fixed.

Indirect effects must be quantified if they are to be used in selecting tax returns to audit. The few studies that have looked at this issue find that tax audits produce positive indirect effects ranging in magnitude from $6 for every $1 detected by examiners (Dubin, Graetz, and Wilde 1990) up to $11.60 (Plumley 1996).[2] However, at best this research only tells us the *average* marginal indirect effect at a given point in time (or, for studies that rely on pooled time-series data, the average marginal indirect effect for the period of study). In order to incorporate indirect effects into the audit selection process we need to be able to model these, along with direct effects, at the level of the individual taxpayer.

A study by Long and Schwartz (1987) identified a group of taxpayers who were first subject to a Taxpayer Compliance Measurement Program (TCMP) audit of their 1969 tax returns and also selected for a TCMP audit in 1971. The authors found that the prior audit had a marginal impact on reducing the frequency of subsequent noncompliance, but not on the average magnitude of noncompliance of those taxpayers who were noncompliant in both years. However, since the initial TCMP audit experience was the result of random selection, it is possible that taxpayers did not respond in the same way they would if the first audit had been a "normal" operational audit (Andreoni, Erard, and Feinstein 1998). Erard (1992) analyzed reporting compliance for a group of taxpayers in the 1982 TCMP study who had been selected for an operational audit in 1980. He was unable to conclusively demonstrate that prior operational audits changed subsequent reporting behavior. However, Erard was able to show that this finding was sensitive to the method used to correct for sample selection bias.

Recently, Gemmell and Ratto (2012) find that random taxpayer audits can produce both negative and positive compliance effects depending on audit outcome and taxpayers' opportunity to underreport. Using

a difference-in-differences approach, the authors investigate a group of UK taxpayers selected for a random audit in the year 2000 versus a control group of unaudited taxpayers. They observed taxpayers who were found to be compliant during the audit are more likely to report lower tax amounts during the 3 years following the audit (relative to the control group). The authors attribute this change in behavior to taxpayers lowering their expected audit probability (and expected detection rate) during the period under study. In contrast, taxpayers found to be noncompliant were more likely to increase reported taxes (relative to the control group). Again, the authors reasoned this change in behavior was linked to an increase in taxpayers' perception of audit vulnerability.

While more research is needed to understand and quantify the indirect effect of audits,[3] a substantial body of knowledge on taxpayer compliance behavior has been built over the years using data from a variety of sources including taxpayer random audits,[4] field studies (Slemrod, Blumenthal, and Christian 2001), and laboratory experiments (Alm 2010). Using this information as a foothold we can build a computational model to investigate alternative audit selection strategies making explicit assumptions about taxpayer behavior. Such a model ideally would include both subsequent period and group effects. One approach with this capability is agent-based modeling and simulation (ABMS).

In this paper I describe the design and implementation of the Individual Reporting Compliance Model (IRCM), an agent-based model (ABM) that simulates the income tax reporting behavior of a community of 85,000 individual taxpayers. The model is programmed in Java using Repast Simphony (North et al. 2007), a software toolkit created specifically for building ABMs. The model design allows for new information about taxpayer behavior to be incorporated as such knowledge becomes available.

The outline for the rest of this paper is as follows. The next section gives an overview of the IRCM including scope, dataset construction, agents, model execution, and model validation and calibration. The following section presents a hypothetical case study demonstrating how IRCM can be used to evaluate alternative audit case selection strategies. The final section concludes and highlights topics for further research.

Overview of the Individual Reporting Compliance Model

Scope

As a "proof-of-concept" model, the decision was made to build an ABM for a small region. Two criteria were used to select the study area. First, the region should be as similar as possible to the nation with respect to key economic and demographic characteristics (e.g., age structure, industry structure, racial composition, per capita income, etc.). Such a region would likely be more representative of the tax compliance behavior of the entire taxpayer population and would facilitate model validation using NRP data. Second, the region must be small enough to model on a personal computer. Several candidate regions were screened based on these criteria. From these, a single county with nearly 85,000 individual filers in TY 2001 was selected.

Dataset Construction

In order to allow for independent verification and validation testing while preserving taxpayer anonymity, the model is implemented using a dataset of artificial taxpayers. The basic idea in creating a dataset of artificial taxpayers is to substitute cases in the 2001 Statistics of Income (SOI) Public Use File (PUF)[5] for tax returns of actual taxpayers in the study area. Although most fields in the PUF are derived from tax forms, SOI modifies the data in order to protect the identity of individuals. The IRS Master File is the source for tax return data.

Both the Master File data for the study region and the PUF data are partitioned[6] and a PUF record is selected to replace each taxpayer record in the Master File data.[7] Table 1 compares the resulting dataset of artificial taxpayers using the process described above to the Master File tax return data for the study area.

From Table 1 we can see that for the largest line items (e.g., wages, Schedule C income, taxable pension income, Schedule E income, deductions, exemptions, and total adjusted gross income (AGI)) there is close

agreement in the number of returns with nonzero values and total dollar amount. The region contains 21 zones based on postal Zip Code zones. In 20 of 21 zones (not shown in Table 1), the percentage difference in Total AGI between the artificial and Master File data is in the low single digits (Bloomquist 2012).

TABLE 1. Comparison of Actual vs. Artificial Taxpayer Data for Study Region

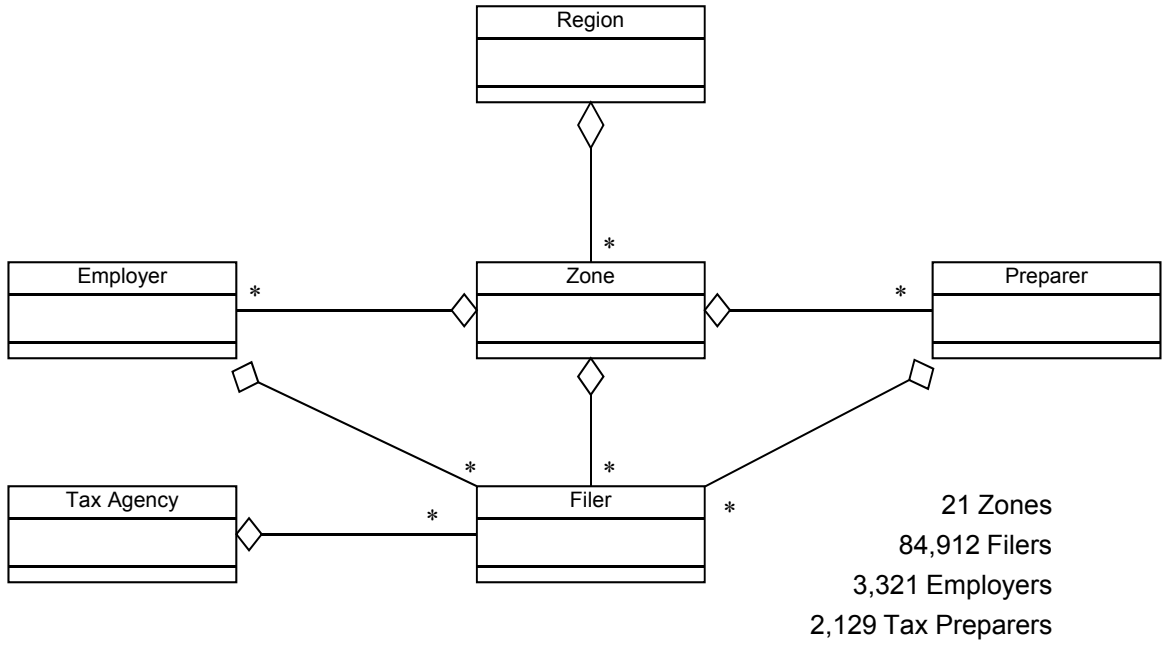
Income Item	Actual Data		Artificial Data		Percentage Difference in Sums
	N (nonzero)	Sum ($1,000)	N (nonzero)	Sum ($1,000)	
Wages	72,058	2,744,170	71,773	2,738,049	-0.2
Taxable Interest	47,768	138,156	42,582	125,803	-8.9
Taxable Dividends	22,951	77,716	19,590	65,905	-15.2
State Tax Refunds	14,955	6,098	10,764	7,287	19.5
Alimony	238	2,748	155	2,071	-24.6
Schedule C Income	8,728	92,480	7,610	90,104	-2.6
Schedule D Income	17,636	95,117	14,520	89,043	-6.4
Other Gains	930	81	690	802	887.6
Taxable IRA Income	6,820	68,681	5,315	59,328	-13.6
Taxable Pension Income	18,604	277,083	16,597	269,574	-2.7
Schedule E Income	8,769	116,042	7,185	120,370	3.7
Schedule F Income	1,143	1,154	841	2,252	95.2
Unemployment Compensation	6,203	19,783	4,774	15,311	-22.6
Taxable Social Security	8,461	73,374	7,821	68,003	-7.3
Other Income	4,576	9,194	4,573	222	-97.6
Total AGI	84,842	3,695,035	84,846	3,635,509	-1.6
Deduction Amount	84,851	731,363	84,907	743,302	1.6
Exemption Amount	75,870	455,524	75,905	453,310	-0.5

Agents

Figure 1 graphically displays the IRCM agent architecture. A single *Region* is composed of 21 nonoverlapping zones. Each *Zone* is assigned the actual number of filers who file tax returns from within its boundaries and also the number of tax preparers and employers that operate locally. A *Preparer* agent prepares tax returns for its clients. *Employer* agents have one or more employees. Both preparer-client and employer-employee relationships are based on actual tax return data. Form 1040 filers are represented by *Filer* agents.

Finally, a single tax agency (an instance of the *TaxAgency* class) audits a fixed number of filers each tax period (simulation time step). The tax agency selects filers for audit using one of three audit strategies: random, fixed, or constrained maximum yield. In the latter case, the tax agency applies a simple learning algorithm to incrementally improve its overall yield per return audited.

FIGURE 1. IRCM Agent Hierarchy



Model Execution

The steps followed in executing a simulation using IRCM are shown in Figure 2. The model first reads tax return data for the population of artificial taxpayers and instantiates agents. During instantiation, IRCM estimates a true amount for the most important Form 1040 income and offset items which is equal to the reported amount plus imputed misreporting.[8] Imputed amounts are based on audit results from the TY 2001 NRP study. For 18 of the 19 imputed items[9] an empirical Cumulative Distribution Function (ECDF) is created for each of the following four nonoverlapping groups of NRP cases: (1) self-prepared and zero reported amount, (2) self-prepared and nonzero reported amount, (3) paid prepared and zero reported amount and (4) paid prepared and nonzero reported amount. Next, a cubic function is fitted to each ECDF. During instantiation, the misreported amount for a line item is determined by drawing a random number from the interval [0, 1] and the misreported amount is generated using the cubic function for the appropriate preparation mode and reporting state.

Each time step represents one filing cycle (year). Tax calculations are performed twice for all taxpayers, once using reported amounts and a second pass using estimated true amounts. The difference in calculated tax using true and reported amounts is the tax gap for each filer. By default, IRCM assumes the difference between the true and reported tax amounts is the amount identified by the tax auditor. An option is provided to account for undetected underreporting by applying multipliers to the misreported amount detected by the examiner.[10]

Audits are performed at the next step. By default IRCM assumes audited tax returns are selected at random. An alternative to random selection is for the user to specify a fixed number of audits allocated among 17 mutually exclusive nonrandom audit classes (Table 2).

FIGURE 2. IRCM Execution Sequence: Top-Level View

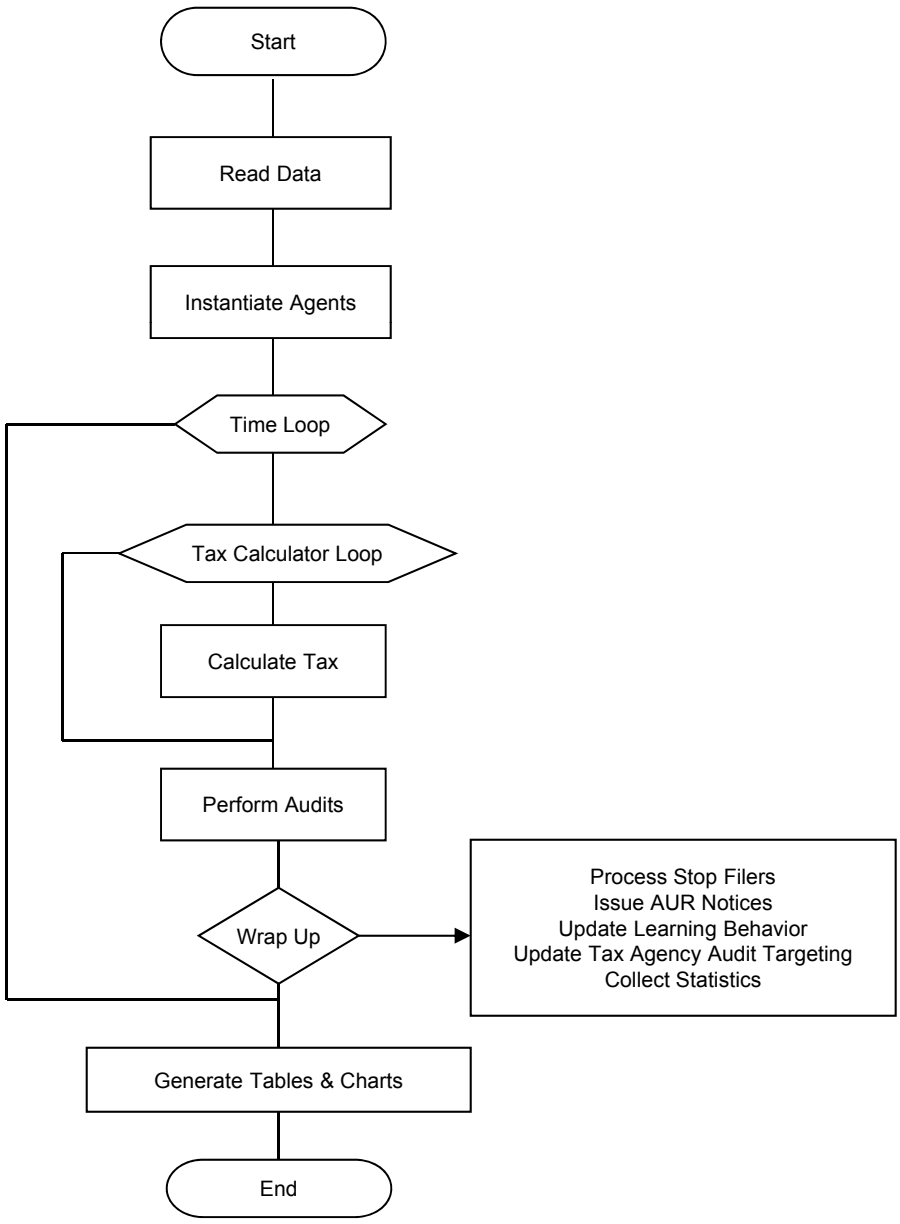


TABLE 2. IRCM Audit Classes

Audit Class*	Deduction Type	Business Unit	Income Category	Preparation Mode
1	Standard	SB/SE	TPI<100K	Self
2	Standard	SB/SE	TPI<100K	Paid
3	Standard	SB/SE	TPI>=100K	Self
4	Standard	SB/SE	TPI>=100K	Paid
5	Standard	W&I	TPI<100K	Self
6	Standard	W&I	TPI<100K	Paid
7	Standard	W&I	TPI>=100K	Self
8	Standard	W&I	TPI>=100K	Paid
9	Itemized	SB/SE	TPI<100K	Self
10	Itemized	SB/SE	TPI<100K	Paid
11	Itemized	SB/SE	TPI>=100K	Self
12	Itemized	SB/SE	TPI>=100K	Paid
13	Itemized	W&I	TPI<100K	Self
14	Itemized	W&I	TPI<100K	Paid
15	Itemized	W&I	TPI>=100K	Self
16	Itemized	W&I	TPI>=100K	Paid
17 Reported Taxable Income = 0				
18 Random				

NOTES: Standard = standard deduction, Itemized = itemized deduction, SB/SE = Small Business / Self-Employed, W&I = Wage and Investment, TPI = Total Positive Income, Self = self preparer, Paid = paid preparer.

* For audit classes 1 through 16, taxable income >0.

A third audit selection strategy available in IRCM is constrained maximum yield (CMY). Under this strategy the user specifies a maximum coverage rate and a minimum number of audits for the 17 nonrandom audit classes as well as the percentage of returns to select randomly (if any). At each time step the model identifies the audit classes with the lowest and the highest average yield (average yield = tax collected / number of audits performed).[11] The tax agency then randomly drops a single audit case from the class with the lowest average yield and randomly selects an additional tax return to audit from within the class with the highest average yield. This process continues until the user-specified minimum coverage (or zero audits) is reached. Once the minimum coverage is reached, the tax agency then reallocates a single audit from the second lowest yielding audit class. Similarly, if the user-specified maximum coverage rate is reached, then the tax agency reallocates audits to the second highest yielding strategy, and so on. This process continues until the user-specified number of simulation time steps is completed.

Following Gemmell and Ratto (2012) a filer's response to an audit is based on user-supplied probabilities that cover two mutually-exclusive states (the filer is either compliant or noncompliant) and four response categories: perfect compliance, increase compliance, decrease compliance and no change. In addition, the user may optionally allow taxpayers to change their reporting behavior if someone in their network of coworkers or social acquaintances is audited.

During the wrap-up phase of the simulation the tax agency issues Automated Underreporter (AUR) notices to taxpayers who are not audited but where computer checking of tax returns against information documents detects some underreporting.[12] In addition, filers may stop filing either because they leave the region or no longer have an obligation to file. Each "stop filer" is replaced by a new filer having identical income and network relationships as the filer he replaces but with reporting behavior reset to baseline levels and no memory of a prior audit experience (or audits of reference group members, if that option is selected). The reporting behavior of filers who are not "stop filers" is also updated at each time step, as is the audit selection

strategy of the tax agency. Finally, data collection occurs during the wrap-up phase. When the user-specified number of time steps has been completed the model generates output in the form of tables and charts that can be reviewed and saved for further analysis.

Model Validation and Calibration

A two-stage approach is used to validate and calibrate the IRCM. In stage 1 (validation) the model is executed using the reported amounts from the PUF (the "SOI reporting regime" option) and output is compared to IRS estimates of reporting noncompliance from the TY 2001 NRP data and published tax gap estimates. In stage 2 (calibration), values for the six parameters[13] that constitute the "rule-based reporting regime" option are set in order to replicate (approximately) the output produced by the SOI reporting regime option.

Axtell and Epstein [1994] propose a hierarchy of four levels at which an ABM can be validated. The approach is cumulative in the sense that a model determined to be valid at a higher level (e.g., 2) is also valid at all lower levels (0 and 1). A model with Level 0 validity is considered to be a *caricature of reality*. At this level the model needs to show only that the system as a whole exhibits behavior that is consistent with the available data (e.g., the aggregate response of agents to changing environmental conditions is in the appropriate direction). At Level 1 the model is expected to be in *qualitative agreement with empirical macrostructures*. This is demonstrated by comparing the distributional characteristics of the actual population to the modeled population. To be valid at Level 2 the model must show *quantitative agreement with empirical macrostructures*. Finally, at Level 3 the model exhibits *quantitative agreement with empirical microstructures*, as determined from cross-sectional and longitudinal analysis of the agent population. In practice, this means a model must be able to demonstrate that it can reproduce or predict with a reasonable degree of accuracy the behavior of individual agents. To validate a model at this level requires panel data on individuals' behavior.

IRCM provides onboard graphical and statistical routines to aid in model validation. Table 3 summarizes results for a Level 2 test that compares line item net misreporting percentages[14] (NMPs) produced by the model to NMPs calculated by IRS in the TY 2001 tax gap study (IRS 2007). Focusing on the column in Table 3 labeled "SOI Reporting Regime" we see that the model overestimates the NMPs on some items (e.g. ,Schedule C income, IRA distributions, unemployment compensation, social security benefits, and other income) and underestimates on others (e.g., Schedule E income, Schedule F income, deductions and exemptions). The model-generated NMP for total tax is within 1 percentage point of the IRS estimate. One reason for the difference in tax NMP is a lack of data on the PUF specific to children eligible for the earned income credit (EIC). Another factor is an overall average effective tax rate for the study area that is slightly lower than the national average.[15]

The goal of model calibration is to find a combination of values for the six rule-based reporting regime parameters that can closely replicate IRCM output using the SOI reporting regime. Formally, we want to minimize the sum of differences in calculated reported incomes between the model's SOI and rule-based reporting regimes:

$$\min \sum_i \left(\Lambda_i^{RB} - \Lambda_i^{SOI} \right) \tag{1}$$

In expression (1), Λ_i^{RB} is the calculated reported amount using the rule-based reporting regime in IRCM for income group *i,* and Λ_i^{SOI} is the calculated reported amount for income group *i* using the SOI reporting regime. A solution for expression (1) is found by inspection using multi-stage Monte Carlo simulation, the details of which are described in Bloomquist (2012). Based on the results of the calibration exercise the default parameter values are as follows:

- Percentage of filers who perceive misreporting can succeed on line items with
  - No information reporting (99 percent)
  - Some information reporting (48 percent)

- Substantial information reporting (10 percent)

- Marginal compliance impact of withholding on items with substantial information reporting (75 percent)
- Percentage of deontological filers (25 percent)
- *De minimis* reporting threshold on items with no information reporting ($1,000)

The last column in Table 3 shows line item NMPs produced by the model using the rule-based reporting regime option in IRCM with the above default parameter settings. The NMP for tax after refundable credits is a percentage point lower than the equivalent measure using the SOI reporting regime option. However, for most major line items (e.g., wages, Schedule C income, deductions, and exemptions) the NMP values are quite close.

TABLE 3. TY 2001 Line Item NMPs: IRS vs. Model Estimates for SOI and Rule-Based Reporting Regimes[1]

Item	IRS [2007] (percentage)	Reporting Regime (percentage)	
		SOI	Rule-Based
Wages and salaries	1	1	1
Interest	4	3	5
Dividends	4	4	5
State income tax refunds	12	14	7
Schedule C	57	63	63
Schedule D	12	13	24
IRA distributions	4	7	4
Pensions and annuities	4	3	5
Schedule E	35	28	28
Schedule F	72	63	62
Unemployment Compensation	11	15	6
Social Security Benefits	6	10	5
Other income	64	82	63
Taxable income	11	13	12
Tax	18	17	16
Adjustments	-21	-24	-41
Deductions	5	3	5
Exemptions	5	4	5

[1]Model validation and calibration exercises were performed assuming no group effects and default values for subsequent period effects. The default values for subsequent period effects are set to the following values. When the filer is found to be compliant, the probability of *decreasing* compliance on items with some or no information reporting is 50 percent and 50 percent no change in compliance. When the filer is found to be noncompliant, the probability of *increasing* compliance is 50 percent, the probability of decreasing compliance is 25 percent and 25 percent no change. See Gemmell and Ratto (2012) for a discussion of filers' response to random tax audits. Values based on model output in Table 3 represent an average of five simulations using different random number seeds.

Source: IRS [2007, Figure 4] and IRCM output (Figure 21) at t=50.

Case Study

This section presents a simulation experiment that shows how the IRCM can be used to assess the impact on taxpayer compliance of alternative audit case selection strategies. For this experiment the IRCM is executed using the rule-based reporting regime option with default values for the six parameters. In addition, the default values for subsequent period effects (see footnote 13) also are used. Finally, group effects are included by allowing filers to modify their reporting behavior based on the audit experiences of their neighbors and coworkers.

It is assumed that if taxpayer *j* is audited then each of *j*'s neighbors or co-workers have a 25-percent chance of increasing their compliance, a 25-percent chance of decreasing their compliance and a 50-percent chance of no change.[16] Both coworker and neighbor reference groups are assumed to have a fixed size of five members.[17] For all other model options, including the number of audits (378) to perform, default values were used.

Four nonrandom audit selection strategies were defined for this example. They are:

1. CMY 100/0—Constrained Maximum Yield with a 100-percent maximum coverage rate and no minimum coverage
2. CMY 10/0—Constrained Maximum Yield with a 10-percent maximum coverage rate and no minimum coverage.
3. CMY 1/0—Constrained Maximum Yield with a 1-percent maximum coverage rate and no minimum coverage.
4. CMY 10/5—Constrained Maximum Yield with a 10-percent maximum coverage rate and a minimum of five audits in each audit class.

Each of these strategies was simulated five times using different seeds for IRCM's random number generator. Each simulation was run for 300 time steps. Figure 3 displays the time series of the average tax NMP from these five simulation runs for the four nonrandom audit selection strategies as well as a strategy based on pure random selection.

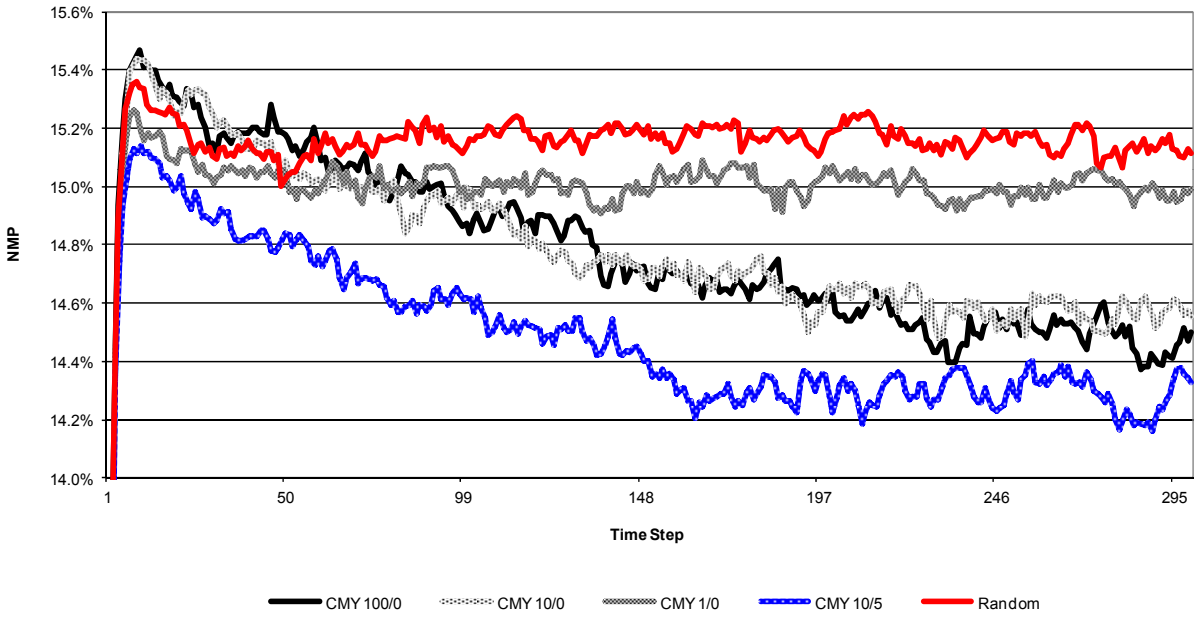


FIGURE 3. Model Time Series of Tax NMP for Five Alternative Audit Selection Strategies

Based on the plots displayed in Figure 3, the model reaches a stochastically stable solution for all strategies after about 250 time steps. Using the simulation output for the last 50 time steps, the pure random audit selection strategy has the highest tax NMP at 15.14 percent. The strategy with the next highest NMP is CMY 1/0 with 15.00 percent. The NMPs for the strategies CMY 10/0 and CMY 100/0 are quite close at 14.49 percent and 14.57 percent, respectively. The strategy with the lowest NMP (highest voluntary compliance) is CMY 10/5 with an NMP of 14.29 percent.

Table 4 compares the five audit selection strategies on the following measures: total estimated recommended audit results, total estimated misreported tax, and no change rate (i.e., the percentage of audit cases

with no recommended tax change). The deterrence multiplier is calculated as the reduction in misreported tax divided by the change in audit results. Table 4 shows that the strategy with the highest direct effect is CMY 100/0 with total recommended audit results of $2.991 million. However, the strategy with the highest combined direct and indirect effect is CMY 10/5 with total misreported tax of $89.789 million, an improvement of $1.228 million in additional tax revenue reported voluntarily over strategy CMY 100/0. The reason strategy CMY 10/5 produces a greater impact on voluntary compliance is due mainly to the influence of group effects. This is seen more clearly in Table 5, which displays the coverage rate and estimated recommended tax by audit class for the study area's actual TY 2001 audits and the four simulated audit selection strategies.

TABLE 4. Comparison of Alternative Audit Case Selection Strategies

Strategy	Audit Results ($1,000)		Misreported Tax ($1,000)		Deterrence Multiplier	No Change Rate (percentage)
	Total	Change	Total	Reduction		
Random	252		95,114			76.4
CMY 100/0	2,991	2,739	91,017	4,097	1.5	36.9
CMY 10/0	2,469	2,217	91,522	3,593	1.6	38.4
CMY 1/0	513	262	94,195	919	3.5	65.2
CMY 10/5	2,459	2,207	89,789	5,325	2.4	42.9

Table 5 shows that the strategies CMY 100/0 and CMY 10/0 select only tax returns that have income from a small business.[18] The CMY 1/0 strategy is able to pick up some nonbusiness tax returns but the required lower coverage of business audit classes reduces the likelihood of encountering cases with large recommended tax change amounts. The CMY 10/5 strategy is able to maintain sufficient high coverage of business audit classes while also having a net positive influence, via group effects, on the reporting compliance of nonbusiness filers.

Conclusion

In deciding which taxpayers to audit, the IRS ideally should take into account both direct and indirect effects (Plumley and Steuerle 2004). However, the IRS has lacked a computational framework for systematically modeling indirect effects. This paper has addressed this methodological gap by introducing the Individual Reporting Compliance Model (IRCM). The IRCM is capable of performing a wide range of "what if" analyses involving various aspects of taxpayer reporting compliance, including estimating the direct and indirect effects of taxpayer audits. This capability was demonstrated in a simulation experiment, which found that the audit strategy (of the four strategies analyzed) having the highest combined direct and indirect effect on voluntary reporting compliance was one with a relatively high coverage rate of business audit classes and a minimum coverage of nonbusiness audit classes.

As a proof-of-concept, the IRCM has demonstrated that agent-based simulation is able to incorporate many complexities of real-world tax systems, such as compliance differences at the line-item level and taxpayers' heterogeneous response to audits, which have proven difficult for existing analytical models to handle simultaneously (Alm 1999). In addition to their ability to model complex systems, ABMs are able to explicitly incorporate taxpayer behavioral influences. The value of having such a capability grows as our knowledge of taxpayer behavior improves. Therefore, in order to achieve the maximum productive use of these new modeling tools, the IRS must continue to invest in research on taxpayer behavior. Such research must necessarily address the complete array of cause-and-effect relationships between IRS service and enforcement activities and taxpayer compliance and burden, employing a range of data collection methodologies including laboratory experiments, field studies (including random and operational audits), and taxpayer surveys.

TABLE 5. Coverage Rates and Expected Tax Yield by Audit Class: Actual and Simulation Results

Audit Class	Total Returns	Actual		Nonrandom Audit Strategy							
				CMY 100/0		CMY 10/0		CMY 1/0		CMY 10/5	
		Coverage	Tax**	Coverage	Tax	Coverage	Tax	Coverage	Tax	Coverage	Tax
TI>0, Std Ded, SB, TPI<100K, Self	2,490	0.84%	$34,800	0.00%	$447	0.24%	$7,051	1.00%	$28,181	1.52%	$5,474
TI>0, Std Ded, SB, TPI<100K, Paid	4,044	0.72%	$202,300	0.17%	$10,929	0.59%	$38,304	0.99%	$63,230	1.30%	$11,276
TI>0, Std Ded, SB, TPI>100K, Self	78	*	$1,500	37.18%	$109,760	7.69%	$34,740	0.00%	$0	3.78%	$41,465
TI>0, Std Ded, SB, TPI>100K, Paid	203	*	$63,500	25.62%	$271,967	9.85%	$137,868	0.00%	$0	4.33%	$142,141
TI>0, Std Ded, WI, TPI<100K, Self	32,512	0.34%	$210,300	0.00%	$0	0.00%	$0	0.00%	$0	0.02%	$339
TI>0, Std Ded, WI, TPI<100K, Paid	20,784	0.63%	$311,800	0.00%	$0	0.00%	$0	0.37%	$7,746	0.03%	$442
TI>0, Std Ded, WI, TPI>100K, Self	205	*	$0	0.00%	$0	0.00%	$0	0.00%	$0	2.45%	$3,397
TI>0, Std Ded, WI, TPI>100K, Paid	170	*	$0	0.00%	$0	0.00%	$0	0.00%	$0	2.96%	$6,082
TI>0, Itm Ded, SB, TPI<100K, Self	1,740	0.69%	$38,100	0.17%	$4,210	1.03%	$29,321	0.98%	$26,352	2.42%	$13,136
TI>0, Itm Ded, SB, TPI<100K, Paid	3,165	0.76%	$52,700	0.41%	$25,601	1.45%	$94,650	1.01%	$66,070	1.99%	$54,655
TI>0, Itm Ded, SB, TPI>100K, Self	751	*	$8,600	4.66%	$152,742	9.99%	$287,522	1.01%	$32,476	4.23%	$282,869
TI>0, Itm Ded, SB, TPI>100K, Paid	1,837	1.31%	$140,900	13.01%	$2,415,281	9.96%	$1,839,466	0.98%	$236,550	4.37%	$1,861,434
TI>0, Itm Ded, WI, TPI<100K, Self	6,839	*	-$2,300	0.00%	$0	0.00%	$0	0.99%	$15,525	0.10%	$1,032
TI>0, Itm Ded, WI, TPI<100K, Paid	6,497	*	$5,600	0.00%	$0	0.00%	$0	0.98%	$14,372	0.13%	$1,314
TI>0, Itm Ded, WI, TPI>100K, Self	1,635	*	$2,300	0.00%	$0	0.00%	$0	0.96%	$10,379	0.40%	$3,117
TI>0, Itm Ded, WI, TPI>100K, Paid	1,455	*	-$6,200	0.00%	$0	0.00%	$0	0.94%	$12,384	0.81%	$3,510
TI<=0	507	*	$6,300	0.00%	$0	0.00%	$0	0.00%	$0	0.99%	$27,431
Total (excludes Random)	**84,912**	**0.45%**	**$1,070,200**	**0.45%**	**$2,990,936**	**0.45%**	**$2,468,922**	**0.45%**	**$513,265**	**0.45%**	**$2,459,113**

*Fewer than 10 observations.

**Rounded to nearest $100.

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Endnotes

[1] The content of this paper reflects the views of the author and does not necessarily represent the position of the Internal Revenue Service.

[2] These estimates of the indirect effects of audits implicitly include induced, subsequent period, and group effects. Summaries of empirical research on the indirect effect of audits is found in Andreoni, Erard, and Feinstein (1998) and Alm, Jackson and McKee (2009).

[3] Although the focus of this paper is on audit case selection, the need for more research on the compliance impact of other IRS service and enforcement programs exists as well. In fact, the impact on compliance of nonaudit programs together or even separately may be greater than operational audits alone. See Plumley (1996) for an empirical analysis of the impact on filing and reporting compliance of different IRS enforcement and service measures.

[4] In the U.S., the IRS National Research Program (NRP) annually selects a stratified random sample of about 13,000 tax returns for compliance assessment purposes (Brown and Mazur 2003). The phrase "random audits" or "taxpayer random audits" as used in this paper refers to audits of this type.

[5] The 2001 PUF (Weber 2004) is a stratified probability sample containing records for 143,221 tax returns.

[6] Partitions represent a unique combination of filing status (Single, Married Filing Joint/Qualifying Widow(er), Married Filing Separate, Head of Household), deduction type (itemized or standard deduction), wage income exceeding 50 percent of adjusted gross income (AGI) (in absolute value), AGI > median AGI by filing status, and presence of one or more exemptions for children at home.

[7] The selected PUF record is drawn from the same partition as the Master File record and minimizes the Minkowski distance based on Form 1040 income line items as well as the deduction and exemption amounts. Restricting cases to matching partitions improves the overall agreement between the actual and artificial taxpayer datasets by ensuring the same filing status profile and presence of exemptions.

[8] Imputed income items are: wages, interest, dividends, State tax refunds, alimony, sole proprietor income (Schedule C), capital gains income (Schedule D), other gains (Form 4797), individual retirement account (IRA) income, pension income, supplemental income (Schedule E), farm income (Schedule F), unemployment compensation, social security, and other income. Imputed offset items are: adjustments, deductions, exemptions and statutory credits (net the Child Tax Credit). Adjustments to certain credits (e.g., Child Tax Credit, Earned Income Credit, and Additional Child Tax Credit) that reflect a change in income are performed by a tax calculator. Each tax return consists of 180 elements based on the PUF data.

[9] Imputed misreported exemptions are based on the probability of a change in number of exemptions from the TY 2001 NRP study.

[10] Multipliers are applied to positive misreported amounts; that is, misreporting in the taxpayer's favor. An overview of the DCE methodology and a description of the multipliers used by IRCM are found in Erard and Feinstein (2011). This approach follows the methodology used by IRS to estimate the tax gap for TY 2001 and prior years. In its most recent tax gap estimate for TY 2006, the IRS began to impute additional income to individuals who had zero detected noncompliance. The difference in the overall tax gap calculated between these two approaches is within the margin of error. However, the more recent

imputation methodology is preferable since it explicitly assumes the statistical nature of estimates of undetected underreporting.

[11] In this paper the approach for selecting tax returns uses average yields for operational tractability. An alternative paradigm based on marginal yields is preferred on theoretical grounds by economists. However, there are practical obstacles to implementing a return selection algorithm based on marginal yields including: (a) the uncertainty associated with predicting direct yields from individual tax returns; and (b) the heterogeneous, stochastic, and time-variant nature of indirect effects. Moreover, to date, proposals to base return selection on marginal yields have been limited to consideration of direct effects only (see U.S. GAO 2012). Since the main focus of this paper is how to incorporate indirect effects in return selection, the author believes it is appropriate to base return selection on average yields.

[12] The threshold amount for issuing an AUR notice is set by the user. The default value is $1.

[13] The six rule-based reporting regime parameters are: the percentage of filers that perceive misreporting can succeed on line items with none, some, and substantial information reporting, the marginal compliance impact of tax withholding, the percentage of deontological filers, and the *de minimis* threshold amount for reporting. Deontological filers are filers who comply out of a sense of "duty" (Alm, Martinez-Vazquez, Torgler 2010) in contrast to the assumption of rational utility maximization (Allingham and Sandmo 1972).

[14] The net misreporting percentage is defined as the aggregate net misreported amount expressed as a percentage of the sum of the absolute values of the amounts that should have been reported.

[15] The nation's estimated mean effective tax rate in TY01 is 14.95 percent versus 14.69 percent for the study region.

[16] In IRCM reporting compliance can decrease on line items with some or no information reporting but not on items with substantial information reporting. Compliance is allowed to increase on all line items.

[17] For employers with fewer than six employees but more than one employee, the coworker reference group size is $N - 1$ where N is the number of employees.

[18] Small business income is defined as income reported on a Schedule C, Schedule F or Schedule E.

Estimating the Impact of Liens on Taxpayer Compliance Behavior and Income

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In Fiscal Year (FY) 2011, the IRS issued 1,042,230 liens.[1] Despite the "fresh start" initiative announced early in 2011 and intended to help struggling taxpayers, the IRS continues to file most Notices of Federal Tax Lien (NFTL) based on a threshold amount of liability.[2] Given the widespread use of this collection tool, it is important for the IRS to understand taxpayers' individual circumstances and financial situations prior to filing the NFTL. The National Taxpayer Advocate is concerned that the IRS's use of the NFTL may be harming taxpayers, especially those with economic hardships, while not significantly enhancing collection of delinquent liabilities. The National Taxpayer Advocate requested that TAS Research & Analysis investigate the impact of NFTLs on the compliance behavior of delinquent taxpayers to help the IRS better understand the effectiveness of NFTLs.

TAS Research analyzed a cohort of delinquent individual tax return filers (those who file Forms 1040, *U.S. Individual Income Tax Return*), who incurred unpaid tax liabilities in 2002 and had no such liabilities at the beginning of 2002.[3] We identified the subgroup of these taxpayers against whom IRS filed liens between 2002 and 2004, as well as a comparable subgroup against whom the IRS did not file liens. We compared the payment and filing compliance behavior of these two groups from inception of the liability through 2010 and examined the correlation that lien filing had with taxpayers' reported incomes during this time. We discuss in detail in the methodology section how we selected these two groups for analysis.

Background

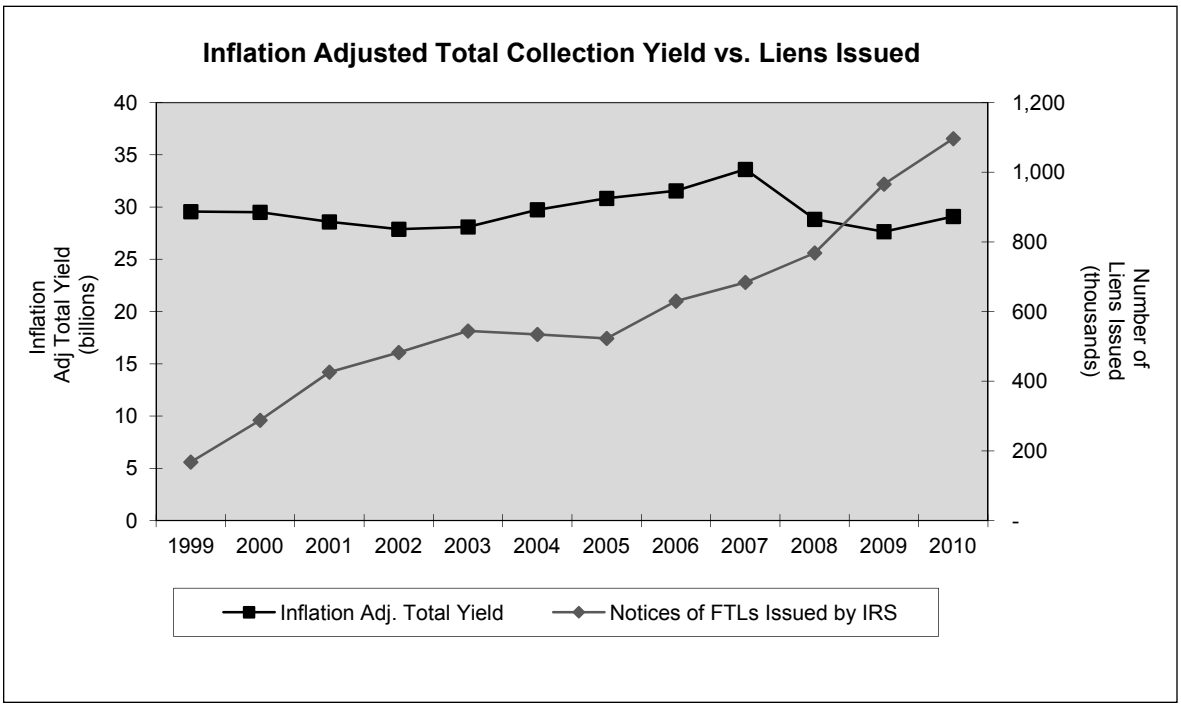
A Federal tax lien (FTL) arises when the IRS assesses a tax liability, sends the taxpayer notice and demand for payment, and the taxpayer does not fully pay the debt within 10 days.[4] An FTL is effective as of the date of assessment and attaches to all of the taxpayer's property and rights to property, whether real or personal, including those acquired by the taxpayer after that date.[5] This lien continues against the taxpayer's property until the liability has been fully paid or is legally unenforceable.[6] To put third parties on notice and establish the priority of the government's interest in a taxpayer's property against subsequent purchasers, secured creditors, and junior lien holders, the IRS must file an NFTL in the appropriate location, such as a county register of deeds.[7]

A lien filing determination is required for all unpaid assessed delinquencies.[8] The IRS Internal Revenue Manual (IRM) specifies various criteria for lien filings depending on the nature of the delinquency. The IRS is even supposed to file an NFTL on most accounts reported as currently not collectible (CNC) if the unpaid balance is at least $10,000.[9] Streamlined installment agreements (IAs) do not usually require an NFTL filing.[10]

The IRS files nearly half of its NFTLs through the Automated Collection System (ACS), and files many of these without any significant employee review of the cases.[11] The National Taxpayer Advocate does not believe the IRS should be precluded from filing NFTLs, but rather that it should use this powerful collection tool judiciously as warranted by the circumstances of the delinquency.[12]

While NFTL filings fell to an all-time low after the enactment of the Revenue and Reconciliation Act of 1998, they have since increased, and have risen steadily since 2005. In fact, the 2011 volume of 1,042,230 filings is about six times the number for 1999. The following chart shows the volume of IRS lien filings, and the total dollars collected since 1999.

FIGURE 1: Inflation-Adjusted Total Yield vs. Liens Issued[13]



As illustrated above, overall inflation-adjusted collection revenue has not kept pace with the increase in lien filings.[14] While IRS and taxpayer activities, economic conditions, and other factors certainly affect the total collection yield, the fact that increased lien filings do not necessarily increase collections makes the practice of filing an NFTL questionable in various situations.

Objectives

In this study, TAS Research sought to better understand the relationship between lien filings and delinquent taxpayer payment and filing behavior and the impact of lien filing on subsequent reported taxpayer income. Specifically, we explored four research questions:

1. Whether lien filing positively or negatively impacted taxpayers' payment behavior with respect to the original liabilities they incurred in 2002;
2. Whether lien filing positively or negatively impacted taxpayer payment compliance in subsequent periods;
3. Whether lien filing positively or negatively impacted taxpayer filing behavior in subsequent periods; and
4. Whether lien filing positively or negatively impacted taxpayer reported income in subsequent periods.

In this study we are using binary dependent variables in our models to explore basic yes/no questions about compliance and income, *i.e.*, was there an increase or a decrease. In a future study, we will conduct a sensitivity analysis to better understand when NFTLs are likely to be most effective as a collection tool. TAS does not envision that NFTLs are never effective, but rather that they may not be effective for certain taxpayers or in certain situations, such as for those with low incomes or few assets and those whose liabilities have been designated CNC.

Methodology

Our analysis employed a two-phase approach. Phase I involved a two-stage method of producing our cohort of comparable lien and non-lien taxpayers from the initial population of delinquent taxpayers. Phase II estimates the actual impact of the NFTL on taxpayer payment and filing behavior and on reported income.

The first stage of Phase I estimates the probability that a taxpayer will have a tax lien filed against his or her delinquent liability. This stage is also described as generating "propensity scores" for the taxpayers. The propensity score represents the probability that the IRS will file a lien with respect to a taxpayer's tax liability and ranges in value between 0 and 1. We used a logistic regression equation to estimate the propensity scores.[15]

This estimation method addresses the selection bias inherent in the lien filing process, which exists because of existing IRM lien filing criteria. Specifically, the IRS criteria that determine when tax lien filings should occur[16] introduce a selection bias that must be addressed, or the estimation of the tax lien's impact in the second phase (using a tax lien indicator) would produce biased results. A variety of circumstances prevents the IRM lien filing criteria from being consistently followed. For example, revenue officers in some geographical areas will work cases with lower balance dues, while inventories will be so high in other areas that a case with a similar balance due will remain in the Collection queue and not be assigned to a Collection employee. Accordingly, the IRS treats two very similar cases much differently. This variation actually helps us to correct for the selection bias that arises from the fact that taxpayers are not randomly selected for a lien.

To overcome the selection bias we used propensity scores and a matching algorithm to generate matched pairs of lien taxpayers and nonlien taxpayers who are very similar with respect to the characteristics the IRS uses to make a lien filing determination.[17] The result is a cohort of taxpayers that approximates a random sample of equivalent pairs of taxpayers.[18] This approach allows us in the second phase of our analysis to use a binary lien indicator (a variable with possible values of one or zero, where one indicates a tax lien has been filed against the taxpayer and zero indicates that a lien has not been filed) as an unbiased estimator of the lien effect. A more detailed discussion of both phases of the analysis follows.

Phase I Regression Analysis

In our first stage, we use regression to estimate a propensity score for each taxpayer (*i.e.*, the conditional probability of the taxpayer having a lien filed against him or her). We use a logistic regression where the dependent variable is a binary variable (one indicates a lien has been filed and zero indicates a lien has not been filed).[19] The independent variables are the covariates that capture the underlying conditions for tax lien filing, which are identified in the IRM.[20] Tables 1 and 2 report the lien filing criteria we identified in the IRS data and used to create our covariates.[21] These criteria were in place at the time these delinquent taxpayers faced lien filing determinations (from 2002 to 2004).[22] The use of this information permits the model to more closely reflect IRS practices.

The model estimates the relationship between these criteria and whether a lien was actually filed to generate propensity scores. Some lien filing criteria are absolute (such as when the unpaid balance of assessments totals at least $5,000). However, the IRS must consider even this criterion in conjunction with other factors. For example, a taxpayer who owed $15,000 has a debt that exceeds the $5,000 threshold and would be subject to an NFTL. If this same taxpayer worked out an installment agreement prior to NFTL filing, the IRS would not generally file an NFTL because the balance owed is less than $25,000. Other criteria such as the breaking of a promise are only a consideration for NFTL filing and must be weighed with other factors by Collection personnel.

TABLE 1. Criteria Captured in Model from IRM 5.12.1.13(2) & IRM 5.12.2.8(4) & (5)

ID	IRM Provision
1	The aggregate unpaid balance of assessment (UBA) is $5,000 or more.
2	If there is an UBA of any amount for an entity and the entity is not adhering to compliance requirements, such as Federal tax deposits, return filings, etc.
3	An installment agreement does not meet streamlined, guaranteed, or in-business trust fund express criteria.
4	An open account with an aggregate UBA of $5,000 or more is being reported as currently not collectable.
5	The property is exempt by the Federal Bankruptcy Code or State insolvency proceeding.

Source: IRM 5.12.1.13(2) (July 31, 2001); IRM 5.12.2.8(4) & (5) (Mar. 1, 2004).

TABLE 2. Criteria Captured in Model from IRM 5.19.4.5.2

ID	IRM Provision
1	Currently not collectible accounts, where aggregate assessed balance is at or above $5,000 and account is closed hardship (closing codes 24 - 32).
2	A lien has been filed and additional liabilities with aggregate assessed balance of $2,000 or more are received.
3	Consider lien filing in any situation where taxpayer has: • Broken a promise (defaulting on an installment agreement in our models). • Been warned of possible lien filing. • An aggregate assessed balance at or above $5,000. • Employee believes filing the lien immediately will be helpful in collecting the balance due.

Source: IRM 5.19.4.5.2 (Aug. 30, 2001).

The model generates a propensity score for each taxpayer based on the values the taxpayer has for each of these criteria. The higher the propensity score value, the greater the likelihood that the IRS will file an NFTL against the taxpayer under consideration. (See the graph in Appendix B for a comparison of the propensity scores between the lien and nonlien groups.) Table 3 shows the independent variables included in the model.[23]

TABLE 3. Independent Variables for Propensity Scoring Model

Label	Variable Description
X1	An indicator of aggregate assessed tax greater than $5,000.
X2	An indicator of collection at risk.
X3	An indicator of taxpayer having CNC modules.
X4	An indicator of taxpayer having an installment agreement.
X5	An indicator of taxpayer having a defaulted installment agreement.
X6	An indicator of taxpayer having a bankruptcy filing.
X7	Log of taxpayer total module balance. This variable is not in the IRM criteria, but significantly affected the lien filing determination.
X8	An indicator of CNC status, hardship.

Source: TAS Research & Analysis, Lien Analysis.

The second stage uses the estimated propensity scores to create matched pairs of tax lien taxpayers with non tax lien taxpayers. We used a propensity score matching technique known as the "nearest available neighbor" method.[24] The matched pairs allow the two groups (tax lien taxpayers and non-tax lien taxpayers) to be effectively identical over set covariates (observable characteristics pertaining to the IRS's lien filing determinations). This condition in the sample allows the estimate of the event (tax lien filing) effect to be less biased.

In the nearest available neighbor matching method, both lien and nonlien groups are randomly sorted. Then, the first lien unit is selected to find its closest non-lien unit match based on the absolute value of the difference between the propensity score of the selected lien unit and that of the non lien unit under consideration. The closest non lien unit is selected as a match. This procedure is repeated for all the lien units. This method matches lien and nonlien cases within a certain distance of the propensity score set by the user (.01 in our case). While the propensity score for each pair member is an estimate and the matches may therefore be subject to some uncertainty, we believe the aggregate comparison between the lien and non-lien groups is valid, as any imprecision at the pair level balances out in the overall groups.

TAS Research performed several propensity score matches that included or excluded different variables. We also modified how we constructed several independent variables. In all instances, we obtained similar results, suggesting model robustness.

Limitations

We matched about 93 percent of all lien cases (taxpayers against whom the IRS filed liens between 2002 and 2004). Fewer nonlien than lien cases are in the top fifteen percent of propensity scores. Therefore, this study does not pertain to those scores. We conducted two matches of lien cases against the population of nonlien cases to create more matches, so some nonlien cases were used twice and have a weight of two.

Also, although we believe that we captured the important characteristics that drive lien filing determinations, due to data limitations some characteristics that may influence lien filing behavior were not included in the propensity scoring process. Nevertheless, situations that could not be modeled (such as when Collection personnel believe that NFTL filing will be beneficial) should lead to favorable outcomes for the lien group. Therefore, results that suggest better outcomes for the non-lien group are conservative estimates. We will continue to explore this issue further. See Appendix A for an in-depth discussion of how we implemented the IRS's lien filing practices in the process.

Finally, researchers from the Office of Program Evaluation and Risk Analysis (OPERA) and the Small Business / Self Employed (SB/SE) Operating Division provided suggested changes to the model. Perhaps, most notably, they commented that our existing analyses considered any installment agreement, installment agreement default, bankruptcy, or IRS reporting of an account as currently not collectible in the propensity scoring, even though the event may have occurred after the lien filing date. We are currently doing the analysis again to include these events only if they occurred before the lien filing date. Although this paper does not contain the new results from our analyses, preliminary results for all of our models do not suggest any significant change in the impact of lien filing from the findings contained in this paper.

Phase II Regression Analysis

In Phase II we use logistic regression analysis to estimate the actual effect of the NFTL. As discussed above, we use the dataset that resulted from the Phase I propensity scoring and matching process. This dataset allows us to estimate the impact of lien filing on the outcome variables of interest, since the matched pairs are designed to control for the fact that liens are not filed randomly in the population—even among those who meet the basic criteria.

Following is a discussion of the regression models we used to estimate each of the outcome (*i.e.*, dependent) variables we explored. We have a separate model for each outcome we are interested in exploring (*e.g.*, taxpayer filing compliance or taxpayer payment compliance). The outcome variables are described below in the model discussions.

The independent variables included in the models capture the factors that we believe significantly influence the model outcome variables. For example, the models have independent variables for taxpayer characteristics and indicators that reflect IRS collection activities associated with the taxpayer's liability. Individual taxpayer characteristics include marital status, number of exemptions, and an age category. Additionally, income information is included in several forms such as total positive income,[25] average total positive income, presence of the earned income tax credit (EITC),[26] and business or partnership income.

Since taxpayer compliance may be influenced by IRS audit and collection activities, the models include independent variables that capture whether the taxpayer has undergone an audit, as well as information about important collection-related activities, such as whether the taxpayer had an installment agreement (IA) or defaulted on an IA, whether the taxpayer was placed in CNC status, or whether the IRS levied on the taxpayer.[27]

Additional independent variables include entity module balance (the total amount due) at lien filing time and nonfiler status. See Table 4 for a description of all of the independent variables in the models and which are included in each model.

The lien variable (X19) is the critical independent variable in these models. A positive or negative sign on the estimated coefficient on the lien variable shows whether lien filing had a positive or negative effect on the outcome variable being modeled. In Table 5 (in the Findings section), we report on the sign of the lien variable and its marginal effect for each of our models. The marginal effect shows the impact lien filing had on the

likelihood of the outcome we are modeling (*i.e.*, how much more or less likely lien taxpayers were to experience the outcome than nonlien taxpayers).

We use each regression model to estimate the lien effect on its outcome variable over six different timeframes: 2002–2005, 2002–2006, 2002–2007, 2002–2008, 2002–2009, and 2002–2010. Appendix B contains additional statistics on the propensity score matching and the final model results.

TABLE 4. Independent Variables for the Tax Compliance Models

Label	Variable Description	Current Payment	Future Payment	Future Filing	Future Income
X1	A vector of 11 Age Categories	X	X	X	X
X2	The log of the taxpayer's entity module balance on the date of lien filing (or proxy date for non-lien taxpayers[1])	X	X	X	X
X3	The log of the taxpayer's total positive income	X	X	X	
X4	The log of the taxpayer's average total positive income	X	X	X	
X5	An indicator that taxpayer filed for bankruptcy	X	X	X	X
X6	An indicator that taxpayer has self-employment or sole proprietorship income	X	X	X	X
X7	The number of exemptions claimed by the taxpayer	X	X	X	X
X8	An indicator that taxpayer is married	X	X	X	X
X9	An indicator that taxpayer claimed EITC	X	X	X	
X10	An indicator that taxpayer has an installment agreement	X	X	X	X
X11	An indicator that taxpayer did not timely file a required return[2]	X	X		X
X12	An indicator that taxpayer defaulted on an installment agreement	X	X	X	X
X13	An indicator that taxpayer has a levy	X	X	X	X
X14	An indicator that taxpayer has an offer-in-compromise status	X	X	X	X
X15	An indicator that taxpayer defaulted on an offer in compromise	X	X	X	X
X16	An indicator that taxpayer is in currently not collectible status	X	X	X	X
X17	An indicator that taxpayer has had an audit, during the study period	X	X	X	X
X18	An indicator that taxpayer has no filing requirement[3]	X	X	X	X
X19	An indicator that taxpayer has a tax lien	X	X	X	X

[1]We used the median days to the lien filing from inception of the tax liability as the proxy lien filing date for nonlien taxpayers.

[2]We did not include this variable in our future filing model, since a single instance of suspected nonfiling is sufficient to set our dependent variable.

[3]Based on operational assumptions (all income reported by third parties, Single filing status, etc.).

Current Payment Behavior

This model investigates the tax lien's impact on the probability of the taxpayer making sufficient payments during the study period to reduce the original liability incurred in 2002. The dependent variable is a binary variable,[28] where one indicates a reduction has occurred in the balance due for the original liability during the period we are investigating (*i.e.*, the balance due is lower at the end of the study period). As mentioned above, we investigate six different study periods for this model and all the models that follow: 2002-2005, 2002-2006, 2002–2007, 2002–2008, 2002–2009, and 2002–2010.

Future Payment Behavior

This model investigates the impact of the lien on the probability of the taxpayer staying compliant with his payment of tax liabilities in all periods subsequent to 2002 (*i.e.*, after the original liability was incurred). Any new liabilities incurred subsequent to 2002 and still in existence at the end of the study period are included in the calculation. The dependent variable is a binary variable, where one indicates that any tax liabilities incurred subsequent to 2002 have been paid in full. If a balance remains for any of these liabilities at the end of the study period, the dependent variable will be zero.

Future Filing Behavior

This model investigates the tax lien's impact on the taxpayer's timely filing behavior during the study period. The dependent variable in this relationship is the timely tax filing indicator for future returns. This is a binary variable where one signifies that all required individual tax forms (*i.e.*, Forms 1040) for all years subsequent to 2002 included in the study period were filed timely. Zero signifies at least one return was not filed timely.

We determined whether a taxpayer did not timely file a required return based on the status code posted to the taxpayer's entity module on the IRS Individual Master File (IMF). The following status codes indicate that at some point during the study period the taxpayer had not filed a required return:[29]

- Module established; return not filed [status 0];
- Return not posted; letter of inquiry mailed—Delinquency Status [status 2];
- Taxpayer Delinquency Investigation (TDI) Status; occurs after 4th notice [status 3]; or
- Delinquent return not filed [status 6].

Future Income Reporting Behavior

This model investigates the impact of the lien on the taxpayer‘s future reported income. The dependent variable in this relationship is the change in income as measured by the change in the taxpayer's reported total positive income between the beginning and the end of the study period.[30] The dependent variable is a binary variable, where one indicates that the taxpayer's total positive income increased.[31]

Findings

Our model results suggest that taxpayers with liens filed against them were less likely than comparable taxpayers without liens to be compliant on their 2002 liabilities, less likely to timely file required returns, and less likely to report greater total positive income after 2002. Lien filing did appear to have a positive effect on payment compliance subsequent to 2002. It is unknown if the lien filing actually improves subsequent payment compliance or if the lien filing is merely reducing the likelihood that a taxpayer will report subsequent liabilities, since the lien filing also shows a negative effect on subsequent filing compliance.

The results for the signs and the marginal effects of the lien indicator variable are given in Table 5 below. The marginal effect of the lien indicator shows the increased probability that taxpayers with liens will experience the outcome we are modeling when compared to non-lien taxpayers. For example, in the case of the future filing model, a positive marginal effect would show how much more likely taxpayers with liens were to file all required returns than nonlien taxpayers, and a negative marginal effect would show how much less likely lien taxpayers were to file all required returns. As shown in Table 5, lien filing was a significant factor that had negative marginal effects for most outcome variables and most periods we analyzed.

Table 5. Signs and Marginal Effects of Lien Indicator Variable

Models[1]	2002–2005	2002–2006	2002–2007	2002–2008	2002–2009	2002–2010	Average
Current Payment	-6.36%	-6.00%	-5.99%	-5.21%	-4.78%	-4.54%	-5.48%
Future Payment	5.58%	4.69%	3.70%	2.77%	2.18%	1.23%	3.36%
Future Filing	-0.87%	-1.51%	-2.12%	-2.48%	-2.83%	-2.78%	-2.10%
Future Income	-7.89%	-7.61%	-6.70%	-6.38%	-5.78%	-5.16%	-6.59%

[1] All models, except the future payment model, produced coefficients for the lien indicator that were negative and significant. The lien coefficients for the future payment model were positive and significant.

Source: TAS Research, Lien Analysis 2011.

We found that in 2005 (our first study end point) taxpayers with liens were about 6.4 percent less likely to reduce their initial liabilities than comparable non-lien taxpayers, and that through 2008, at least 4 years after the liens were filed, taxpayers with liens were still over 5 percent less likely to reduce their initial liabilities. In addition, lien taxpayers were less likely to file all required returns, with the increased likelihood of nonfiling ranging between about one and three percent during the full study period (*i.e.*, through 2010). Also, lien taxpayers were less likely to report an increase in their TPI, with the increased likelihood of negative outcomes starting at about 7.9 percent and gradually declining to about 5.2 percent by the end of the full study period. It should be noted that we did not adjust dollars for inflation. Therefore, the nominal decreases taxpayers experienced in TPI at the end of the study period (*i.e.*, 2010) relative to their 2002 TPI are greater in real terms than equivalent nominal losses experienced earlier in the study period. The positive effect for lien filing on future payment compliance started at about 5.6 percent and gradually declined to about 1.2 percent by the end of the study period (2010).

In summary, lien filings for this group of delinquent taxpayers were associated with negative outcomes for current payment activities, future tax filing activities, and future total positive income but with a positive outcome on future payment activities. The size of the negative impact associated with lien filing ranged from about one percent to about eight percent for the outcome variables we analyzed. In general, our results suggest that as the time increased, the impact associated with lien filing tended to decline.

Conclusions

In this study, we analyzed the impact of lien filing on comparable groups of lien and nonlien taxpayers who acquired individual income tax liabilities in 2002 and who had no such liabilities at the beginning of 2002. Our cohort of lien taxpayers included about 93 percent of all taxpayers who acquired new individual income tax liabilities in 2002 and against whom the IRS filed liens between 2002 and 2004. The results of our research suggest that lien filing was associated with negative outcomes for current payment activities, future tax filing activities, and future total positive income and with a positive outcome on future payment activities.

These outcome measures may be interrelated. For example, declines in reported TPI may affect taxpayers' ability (or desire) to pay down their tax liabilities. Conversely, lien filing may motivate taxpayers to stay current with new liabilities. More generally, existing tax liabilities may motivate both lien and non-lien taxpayers to become nonfilers to avoid incurring additional liabilities, but may affect lien taxpayers more because they have larger liabilities or less ability to pay due to decreased TPI. These are all possible areas for future research.

As indicated in the Limitations section, TAS Research is conducting additional analyses to determine the effect of including installment agreements, installment agreement defaults, bankruptcies, or IRS reporting of an account as currently not collectible in the propensity scoring, only if the event occurred before the NFTL filing. We also plan to develop models with economic indicators (*e.g.*, state unemployment rates) to determine if these factors have an effect on the evaluation of a lien's effectiveness. We will also perform more research to investigate when NFTLs are likely to be most effective as a collection tool. Other possible areas for future research include the impact of lien filing on taxpayers in CNC status, and whether removal of these taxpayers from our study cohort would significantly improve compliance outcome measures for the remaining lien taxpayers. We may also investigate whether lien filing is more effective for taxpayers who have significant assets. Finally, we may build on previous research and further explore the extent to which payments credited to lien taxpayers were attributable to sources other than the lien.[32] We will invite the IRS to collaborate with TAS on this research.

Although our results suggest that IRS lien filing practices during the study period were generally not productive for either the IRS or taxpayers, we expect that lien filing can be an effective collection tool when filing determinations are made after a careful analysis of each taxpayer's individual circumstances and financial situation.

Appendix A
IRM Lien Filing Requirements

Our analysis focuses on tax lien filings from 2002 through 2004. Consequently, we used IRM 5.12.1.13(2) with a revision date of 7/31/2001 and IRM 5.12.2.8.1(4) & (5) with a revision date of 3/1/2004.[33] These IRM sections cover IRS lien filing requirements. The criteria covered in IRM 5.12.1.13(2), revision date 7/31/2001, provide the following situations for tax lien filing:[34]

- The aggregate unpaid balance of assessment is $5,000 or more. [file an NFTL]
- An IA is $25,000 or more. [file an NFTL]
- An open account with an aggregate unpaid balance of assessment (UBA) of $5,000 or more is being reported as CNC. [file an NFTL]
- A case involving both assessed and preassessed periods will be reported CNC. [The filing of an NFTL may be held up to include both periods on the NFTL.]
- The property is exempt by the Federal Bankruptcy Code or State insolvency proceeding. [file an NFTL]
- The party on which a levy is to be served is likely to file a priority claim under IRC §6323(a) or (c). [file an NFTL even though there is no mandatory NFTL filing requirement prior to service of the notice of levy on wage, salaries, etc.]

The criteria covered in IRM 5.12.2.8.1(4) & (5), revision date 3/1/2004, provide the following situations for filing a tax lien:[35]

- The aggregate UBA is $5,000 or more. [file an NFTL]
- An installment agreement does not meet streamlined, guaranteed, or in-business trust fund express criteria. [file an NFTL]
- There are additional assessments of $5,000 or more. [file an NFTL]
- An open account with an aggregate UBA of $5,000 or more is being reported as currently not collectible. [file an NFTL]
- A case involving both assessed and unassessed periods will be reported CNC. [file an NFTL]
- The property is exempt by the Federal Bankruptcy Code or State insolvency proceeding. [file an NFTL]
- The taxpayer resides outside the U.S. and has known assets. [file an NFTL]

We looked at these criteria as the starting point regarding the filing of an NFTL. As we built the model for measuring the propensity for filing, we used these criteria as the benchmark for building our variables from the data. Additional information for building our variables also came from the IRM Enforcement Action chapter.

The Enforcement Action chapter, IRM 5.19.4, provides additional guidance on the lien filing determination. Again, because our analysis focuses on filings in 2002 to 2004, we used IRM 5.19.4.5.2(2)-(7) with a revision date of 8/30/2001.[36] IRM 5.19.4.5.2(2)-(7) states that liens should be filed in these six situations, some of which overlap with IRM 5.12.2:[37]

- Installment agreement: file a lien when both of the following conditions exist:
  - Aggregate assessed balance is at or above $5,000.
  - A Collection Information Statement (CIS) is required.
- Currently not collectible: file a lien when both of the following conditions exist:

  - Aggregate assessed balance is at or above $5,000.
  - Account is being closed under hardship provisions.
- R7 cases: these are older accounts with an aggregate assessed balance at or above $5,000 that are reassigned for follow-up to a systemically issued ACS Letter 39.
- File an NFTL if collection is at risk, such as:
  - A creditor plans to seize the taxpayer's assets or the taxpayer is preparing to sell them.
  - The taxpayer is about to file bankruptcy.
- If a lien has been filed and additional liabilities with an aggregate assessed balance of $2,000 or more are received, file an additional lien only if it significantly enhances the collectability of the account.

The employee may consider lien filing in any situation where a taxpayer has:

- Broken a promise;
- Been warned of possible lien filing;
- An aggregate assessed balance at or above $5,000; and
- The employee believes filing the lien immediately will be helpful in collecting the balance due.

The Enforcement Action guidance on tax lien filing appears to expand on the conditions for lien filing to allow Collection staff some discretion in filing the lien. We used this information to further enhance our understanding of IRS lien filing practices. We limited our modeling of filing determinations to information that could be captured on the criteria described above. Data limitations prevented us from capturing all of these situations for filing an NFTL, as detailed below.

Comparison of IRM NFTL Filing Criteria and Our NFTL Model

Data availability limited the IRM 5.12 section criteria that could be captured as covariates in our tax lien filing model. Table 1 shows the criteria that were captured.

We augmented the variable list for our analysis with information from the Enforcement Action section, IRM 5.19.4.5.2 (2)-(7). This area of the IRM expanded the lien filing criteria to allow Collection staff to exercise judgment when making lien filing determinations. Due to data limitations, we were unable to model some of these criteria. Table 2 shows the criteria that were captured.

We also allowed for the possible influence of the size of the liability on lien filing behavior by including a variable for the total module balance due. Although we were unable to capture some characteristic that influence lien filing determinations due to data limitations, situations that could not be modeled (such as when Collection personnel believe that NFTL filing will be beneficial) should lead to favorable outcomes for the lien group. Therefore, results that suggest better outcomes for the non-lien group are conservative estimates.

TABLE A.1. Variables Matched to IRM 5.12, Federal Tax Liens

ID	IRS IRM 5.12	In Model	Description of Variable in Model
1	Aggregate UBA is $5,000 or more. [Appears for IRM 5.12.1.13 & IRM 5.12.2.8.1]	Yes	Indicator of aggregate assessed balance equal to or greater than $5,000
2	Installment agreement is $25,000 or more. [Appears for IRM 5.12.1.13] Installment agreement does not meet streamlined, guaranteed, or in-business trust fund express criteria. [Appears for IRM 5.12.2.8.1]	Yes	Indicator of taxpayer having an installment agreement
3	There are additional assessments of $5,000 or more. [Appears for IRM 5.12.2.8.1]	No	Included in item 1
4	An open account with an aggregate UBA of $5,000 or more is being reported as currently not collectible. [Appears for IRM 5.12.1.13 & IRM 5.12.2.8.1]	Yes	Indicator of taxpayer having CNC modules and aggregate assessed balance equal to or greater than $5,000
5	A case involving both assessed and unassessed periods will be reported as currently not collectable. [Appears for IRM 5.12.1.13 & IRM 5.12.2.8.1]	No	NA
6	The property is exempt by the Federal Bankruptcy Code or State insolvency proceeding. [Appears for IRM 5.12.1.13 & IRM 5.12.2.8.1]	Yes	Indicator of taxpayer having a bankruptcy filing
7	The party on which a levy is to be served is likely to file a priority claim under IRC 6323(a) or (c). [Appears for IRM 5.12.1.13]	No	NA
8	Taxpayer resides outside U.S. and has known assets. [Appears for IRM 5.12.2.8.1]	No	NA

Source: IRM 5.12.; NA=Not Available.

TABLE A.2. Variables Matched to IRM 5.19.4.5.2

ID	IRS IRM 5.19.4.5.2	In Model	Description of Variable in Model
1	Installment Agreement, where aggregate assessed balance is at or above $5,000 and Collection Information Statement (CIS) is required.	No	Captured in prior variables
2	CNC, where aggregate assessed balance is at or above $5,000 and account is closed hardship (closing codes 24 through 32).	Yes	Indicator of hardship, TC530 with closing codes 24 to 32
3	R7 cases, older accounts where aggregate assessed balance is at or above $5,000.	No	NA
4	Collection is at risk, where creditor plans to seize the taxpayer's assets or the taxpayer is about to file bankruptcy.	No	NA
5	A lien has been filed and additional liabilities with aggregate assessed balance of $2,000 or more are received.	Yes	Indicator that taxpayer is a repeater, i.e., taxpayer incurred another balance due
6	Consider lien filing in any situation where taxpayer has: • Broken a promise; • Been warned of possible lien filing • An aggregate assessed balance at or above $5,000; or • Where the employee believes filing the lien immediately will help collect the balance due.	Yes	• Indicator of default of installment agreement • Indicator of taxpayer noncompliance with a filing requirement

Source: IRM 5.19.4.5.2; NA=Not Available.

Appendix B
Propensity Scoring and Final Model Results

TABLE B.1. Propensity Score (Tax Lien) Model Results

Variable	Coefficient	Standard Error	Marginal Effect (%)
Intercept	-5.7078*	0.0376	-
ltmodbal	0.1261*	0.00405	2.50[A]
bnkrpty_ind	-0.0833*	0.0143	-0.21
hardship_ind	0.381*	0.0233	1.16
CNC_ind	0.5493*	0.0155	1.76
col_noncompl	0.1473*	0.0117	0.37
instlmt	-1.1826*	0.0142	-3.19
default	0.6202*	0.0148	1.80
aggbal5000	4.8743*	0.0217	45.99
Log Likelihood Val			-114.586.65
Likelihood Ratio			236766.1
Wald			73375.34
Hosmer & Lemeshow			474.59
n=541,006[1]			

*(**) indicates at significance level of 1(5) percent.

[A] indicates that the marginal effect is not calculated as a categorical effect.

[1] All delinquent individual tax return filers (those who file Forms 1040, *U.S. Individual Income Tax Return*) in TDA status who incurred unpaid tax liabilities in 2002 and had no such liabilities at the beginning of 2002 are included in the propensity scoring process. Taxpayers enter TDA status if they do not resolve their liabilities in response to IRS notices.

FIGURE B.1.

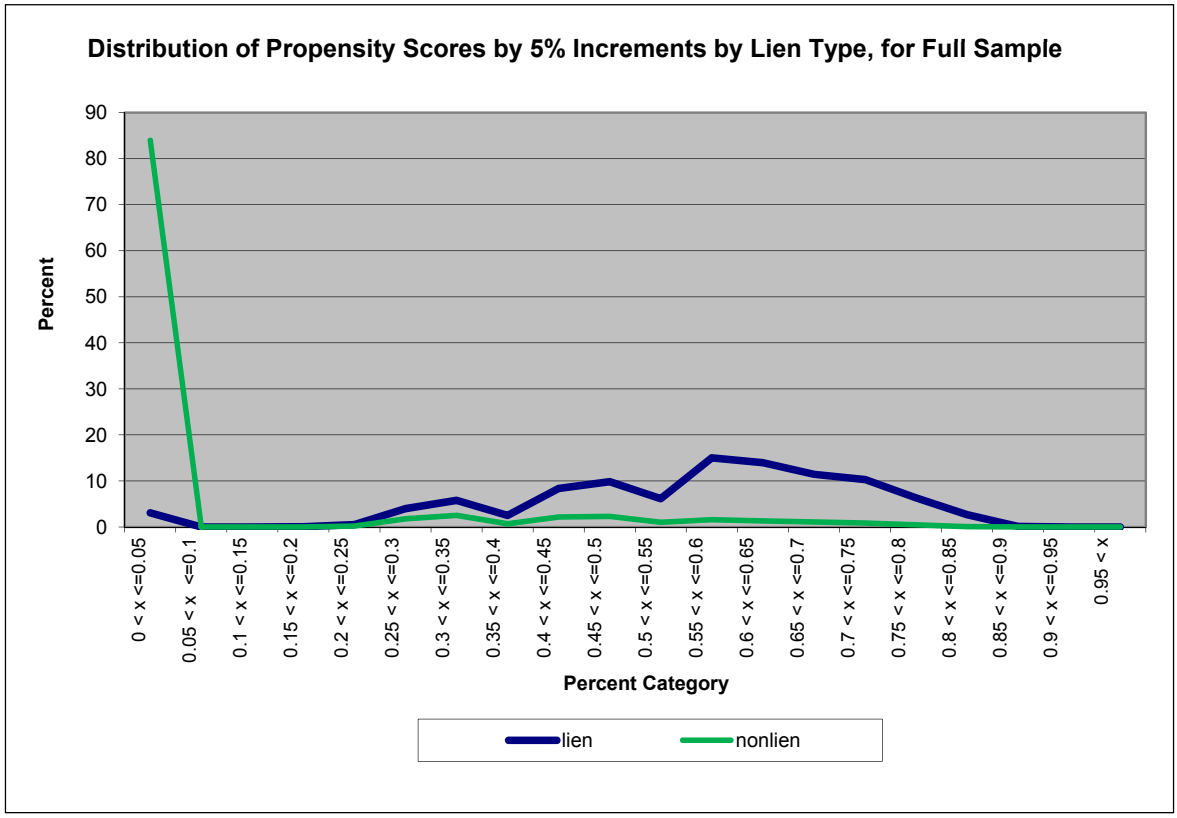


FIGURE B.2.

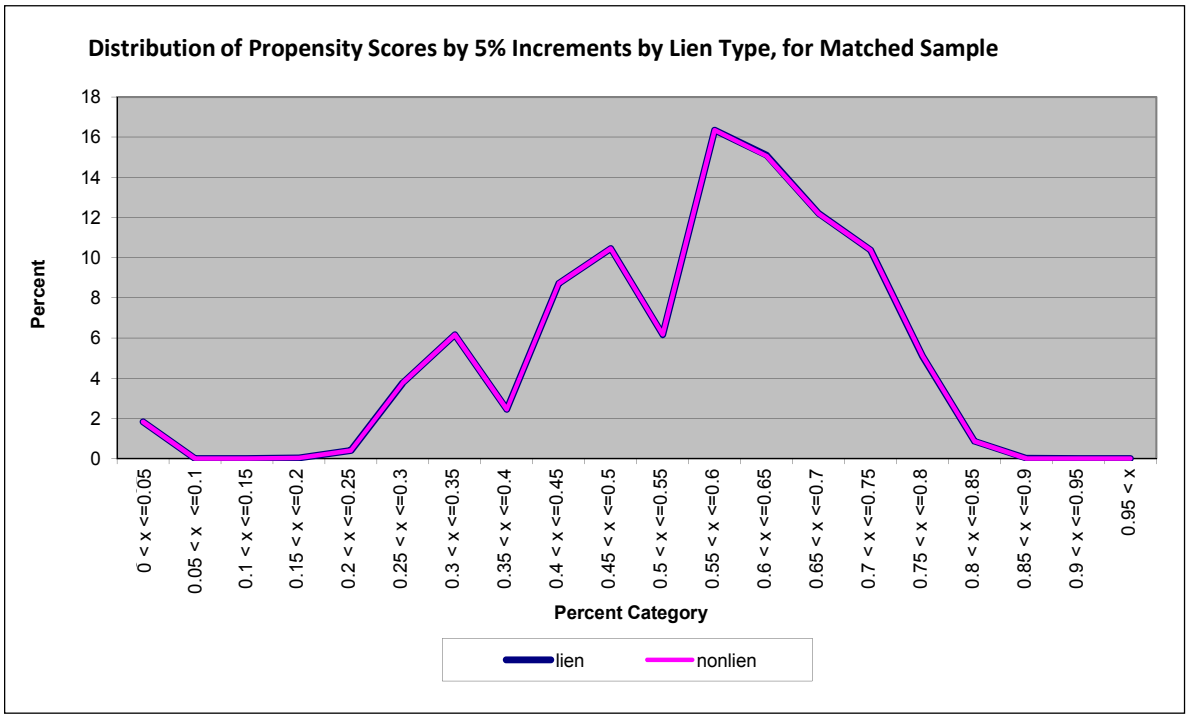


TABLE B.2.1. Current Payment Model Results[1]

Variable	2002–2005			2002–2006			2002–2007		
	Coeff.	SE	ME%	Coeff.	SE	ME%	Coeff.	SE	ME%
Intercept	1.5841*	0.0735	-	1.8171*	0.0766	-	1.8328*	0.0794	-
marry2	0.1083*	0.0154	2.58	0.2051*	0.0159	4.35	0.2868*	0.0164	5.4
TAP_age2	-0.0109	0.1084	-5.38	-0.0246	0.1489	-4.75	0.1361	0.1995	-1.4
TAP_age3	0.1497*	0.0453	-1.31	0.0785	0.0497	-2.38	0.0559	0.0568	-2.96
TAP_age4	0.2204*	0.0384	0.7	0.1887*	0.0399	0.26	0.1687*	0.0415	-0.56
TAP_age5	0.2463*	0.0362	1.63	0.1941*	0.0367	0.59	0.2092*	0.0376	0.45
TAP_age6	0.2044*	0.0354	0.63	0.1882*	0.0358	0.55	0.1926*	0.0363	0.2
TAP_age7	0.1972*	0.0351	0.46	0.2007*	0.0352	0.91	0.2166*	0.0355	0.79
TAP_age8	0.1992*	0.0355	0.41	0.1709*	0.0355	0.11	0.1984*	0.0357	0.35
TAP_age9	0.2247*	0.0364	0.95	0.1858*	0.0363	0.36	0.2155*	0.0366	0.6
TAP_age10	0.2385*	0.0392	1.08	0.2503*	0.0388	1.67	0.264*	0.0384	1.44
TAP_age11	0.4028*	0.0451	4.86	0.39778	0.0447	4.57	0.4233*	0.0438	4.17
TAP_age12	0.2253*	0.0537	0.48	0.2363*	0.0531	1.08	0.3416*	0.0527	2.55
depend2	0.2298*	0.0068	4.93[A]	0.2552*	0.0078	4.70[A]	0.2878*	0.00883	4.52[A]
l_totpos	0.0567*	0.00124	6.41[A]	0.066*	0.00132	6.57[A]	0.0655*	0.00139	5.67[A]
eic_ind2	-0.0477*	0.0167	-1.14	-0.0567*	0.0171	-1.21	-0.064*	0.0175	-1.2
l_avetotpos	0.0609*	0.00196	12.35[A]	0.0683*	0.00201	12.44[A]	0.0777*	0.00209	12.57[A]
bus_ind2	0.0236	0.0145	0.56	0.0257	0.0154	0.55	0.0367**	0.0162	0.69
nonfiler2	0.2271*	0.0141	5.39	0.2726*	0.0149	5.76	0.2315*	0.0155	4.32
ia_ind1	1.1219*	0.0299	22.69	1.2247*	0.0332	20.09	1.4811*	0.0389	19.12
ia_d	0.5082*	0.0151	11.91	0.6508*	0.0158	13.41	0.7567*	0.0164	13.69
lEmodbal_lien	-0.2101*	0.00693	47.86[A]	-0.2255*	0.0073	-45.64[A]	-0.229*	0.00762	-40.81[A]
levy3	-0.6949*	0.0143	-16.91	-0.5812*	0.0157	-11.93	-0.4416*	0.0169	-7.97
oic3	1.4709*	0.0751	26.64	1.6849*	0.0711	23.51	2.2145*	0.0813	22.25
oic_deflt3	-1.3395*	0.1398	-31.9	-1.5962*	0.129	-37.91	-1.8243*	0.1211	-42.33
dm530	-0.9602*	0.016	-23.4	-1.0701*	0.016	-24.43	-1.1427*	0.0162	-23.91
lien_ind	-0.267*	0.0137	-6.36	-0.2833*	0.0145	-6	-0.3212*	0.0152	-5.99
exam2	-0.1373*	0.0212	-3.31	-0.0241	0.0209	-0.51	-0.00792	0.0211	-0.15
No_File_req	-1.0128*	0.0887	-24.77	-1.0622*	0.0815	-25.41	-0.9987*	0.0778	-22.4
bk_ind	-0.1832*	0.0183	-4.42	-0.0211	0.0193	-0.45	0.1741*	0.0204	3.15
Log Likelihood Value	-69422.72			-63754.44			-59048.49		
Likelihood Ratio	34386.18			38226.13			40951.29		
Wald	24714.68			26169.49			26707.19		
Hosmer & Lemeshow	326.54			362.81			363.96		
n=127,406									

Footnotes at end of table.

TABLE B.2.1. Current Payment Model Results[1]—Continued

Variable	2002–2008			2002–2009			2002–2010		
	Coeff.	SE	ME%	Coeff.	SE	ME%	Coeff.	SE	ME%
Intercept	2.0252*	0.082	-	2.1687*	0.0839	-	2.3278*	0.0851	-
marry2	0.3244*	0.017	5.28	0.3612*	0.0174	5.3	0.3863*	0.0176	5.18
TAP_age2	-0.0436	0.2366	-3.78	-0.1256	0.2444	-4.55	-0.325	0.2488	-7.3
TAP_age3	-0.0166	0.0671	-3.29	-0.0326	0.0835	-2.98	-0.00828	0.1107	-2.16
TAP_age4	0.1161*	0.0437	-0.87	0.0816	0.046	-1.11	0.0322	0.049	-1.56
TAP_age5	0.1599*	0.0386	0.03	0.1161*	0.0396	-0.48	0.078	0.0405	-0.84
TAP_age6	0.1618*	0.0369	0.15	0.129*	0.0371	-0.2	0.097*	0.0373	-0.5
TAP_age7	0.1599*	0.0359	0.17	0.1291*	0.036	-0.17	0.1108*	0.0359	-0.25
TAP_age8	0.1709*	0.0359	0.36	0.158*	0.0357	0.34	0.1499*	0.0354	0.37
TAP_age9	0.1946*	0.0367	0.72	0.2033*	0.0364	1.02	0.1779*	0.0359	0.74
TAP_age10	0.2226*	0.0383	1.11	0.2008*	0.0378	0.89	0.1945*	0.037	0.91
TAP_age11	0.3607*	0.0431	3.18	0.3354*	0.042	2.73	0.3231*	0.0409	2.5
TAP_age12	0.3346*	0.0514	2.63	0.375*	0.05	3.1	0.4113*	0.0485	3.41
depend2	0.3057*	0.00985	4.14[A]	0.3346*	0.0107	3.97[A]	0.3743*	0.012	3.85[A]
l_totpos	0.0754*	0.00147	6.08[A]	0.0801*	0.00153	5.38[A]	0.0769*	0.00161	4.55[A]
eic_ind2	-0.0844*	0.018	-1.38	-0.0542*	0.0183	-0.79	-0.0315	0.0185	-0.42
l_avetotpos	0.0821*	0.00218	11.64[A]	0.0886*	0.00223	11.33[A]	0.095*	0.00228	11.08[A]
bus_ind2	0.0305	0.0169	0.5	-0.00831	0.0175	-0.12	-0.0182	0.0179	-0.24
nonfiler2	0.239*	0.0163	3.89	0.215*	0.0169	3.15	0.2117*	0.0174	2.83
ia_ind1	1.745*	0.0454	17.55	1.9184*	0.0503	16.18	2.0371*	0.0537	14.9
ia_d	0.8396*	0.0171	13.19	0.8892*	0.0177	12.54	0.9122*	0.0181	11.7
lEmodbal_lien	-0.248*	0.00793	-38.40[A]	-0.2614*	0.00817	-36.35[A]	-0.2785*	0.00832	-35.22[A]
levy3	-0.3499*	0.018	-5.48	-0.2377*	0.0189	-3.37	-0.1365*	0.0195	-1.78
oic3	2.5206*	0.0895	19.4	2.4674*	0.0865	16.9	2.7561*	0.0951	15.65
oic_deflt3	-1.65*	0.1154	-36.69	-1.6642*	0.1112	-35.4	-1.7873*	0.1114	-36.87
dm530	-1.1521*	0.0166	-21.63	-1.1747*	0.0169	-20.2	-1.2081*	0.0171	-19.21
lien_ind	-0.3212*	0.016	-5.21	-0.3283*	0.0165	-4.78	-0.3421*	0.0169	-4.54
exam2	-0.0185	0.0209	-0.3	-0.047**	0.0209	-0.69	-0.0253	0.0212	-0.34
No_File_req	-0.9073*	0.0739	-18.37	-0.8904*	0.0709	-16.61	-0.8882*	0.0688	-15.41
bk_ind	0.2643*	0.0214	4.07	0.359*	0.0224	4.84	0.4452*	0.0232	5.34
Log Likelihood Value	-54864.1			-52220.08			-50304.72		
Likelihood Ratio	42800.99			43744.41			43892.29		
Wald	26848			26618.48			26060.74		
Hosmer & Lemeshow	386.2			417.94			459.69		
n=127,406									

[1]* indicates significance level at 1 percent and ** indicates significance level at 5 percent. The following abbreviations are used: "coeff." for coefficient; "SE" for standard error; and "ME%" for percent marginal effect. An 'A' indicates that the marginal effect is not calculated as a categorical effect.

TABLE B.2.2. Future Payment Model Results[1]

Variable	2002–2005			2002–2006			2002–2007		
	Coeff.	SE	ME%	Coeff.	SE	ME%	Coeff.	SE	ME%
Intercept	2.8661*	0.0718	-	2.8268*	0.0711	-	2.9207*	0.0716	-
marry2	-0.0493*	0.0152	-1	-0.0559*	0.0151	-1.13	-0.0656*	0.0151	-1.29
TAP_age2	-0.25	0.1182	2.98	-0.1966	0.1632	2.74	-0.0181	0.2324	5.15
TAP_age3	-0.3691*	0.0511	0.39	-0.2882*	0.0538	0.81	-0.1749*	0.0597	2.29
TAP_age4	-0.4456*	0.0444	-1.66	-0.3425*	0.0445	-0.61	-0.3044*	0.0445	-0.51
TAP_age5	-0.4347*	0.0426	-1.8	-0.3419*	0.0419	-0.95	-0.3192*	0.0413	-1.14
TAP_age6	-0.425*	0.0419	-1.78	-0.3701*	0.0411	-1.77	-0.3307*	0.0404	-1.57
TAP_age7	-0.4226*	0.0417	-1.78	-0.3444*	0.0407	-1.26	-0.2965*	0.0398	-0.9
TAP_age8	-0.4397*	0.042	-2	-0.3652*	0.0409	-1.62	-0.3395*	0.0399	-1.81
TAP_age9	-0.4286*	0.0427	-1.5	-0.3823*	0.0415	-1.81	-0.3291*	0.0405	-1.39
TAP_age10	-0.4096*	0.0451	-0.73	-0.3539*	0.0435	-0.89	-0.316*	0.0419	-0.9
TAP_age11	-0.3615*	0.0504	0.55	-0.355*	0.0483	-0.66	-0.3112*	0.0462	-0.56
TAP_age12	-0.3067*	0.0593	1.78	-0.3168*	0.0563	0.27	-0.2483*	0.0544	0.84
depend2	0.0374*	0.00589	0.68[A]	0.0473*	0.00601	0.82[A]	0.0622*	0.00617	1.03[A]
l_totpos	-0.0245*	0.00123	-2.36[A]	-0.0204*	0.00124	-1.09[A]	-0.0139*	0.00124	-1.27[A]
eic_ind2	0.0939*	0.0161	1.89	0.1126*	0.0157	2.26	0.1387*	0.0155	2.69
l_avetotpos	-0.0504*	0.0022	8.71[A]	-0.0506*	0.00227	-8.76[A]	-0.0488*	0.00233	-8.33[A]
bus_ind2	-0.1263*	0.0139	-2.57	-0.1234*	0.0141	-2.48	-0.1193*	0.0143	-2.34
nonfiler2	-0.1562*	0.0136	-3.19	-0.228*	0.0136	-4.6	-0.246*	0.0136	-4.84
ia_ind1	-0.2059*	0.0252	-4.34	-0.1509*	0.026	-3.12	-0.0477	0.0278	-0.95
ia_d	-0.6759*	0.0146	-14.15	-0.7156*	0.0146	-14.76	-0.7077*	0.0147	-14.21
lEmodbal_lien	-0.0561*	0.00611	-10.89[A]	-0.0388*	0.00608	-7.47[A]	-0.0427*	0.0062	-8.03[A]
levy3	-0.2863*	0.0137	-5.76	-0.3962*	0.014	-7.8	-0.4525*	0.0145	-8.62
oic3	0.5748*	0.0623	10.2	0.6041*	0.0536	10.54	0.8132*	0.0538	13.06
oic_deflt3	-0.9798*	0.1235	-22.97	-0.886*	0.1116	-20.52	-0.7307*	0.1039	-16.42
dm530	-0.0884*	0.0162	-1.82	-0.1122*	0.0159	-2.29	-0.144*	0.0158	-2.88
lien_ind	0.2745*	0.0134	5.58	0.2329*	0.0135	4.69	0.1879*	0.0136	3.7
exam2	-0.2988*	0.02	-6.37	-0.3317*	0.0187	-7.03	-0.3818*	0.018	-7.97
No_File_req	0.2242**	0.1045	4.33	0.1346	0.0947	2.63	0.0823	0.0898	1.59
bk_ind	-0.0897*	0.0173	-1.84	-0.1381*	0.017	-2.84	-0.1669*	0.0168	-3.37
Log Likelihood Value	-73686.84			-73112.12			-72054.84		
Likelihood Ratio	7964.02			8345.7			8241.71		
Wald	7067.06			7398.53			7307.81		
Hosmer & Lemeshow	176.27			192.49			194.6		
n=127,406									

Footnotes at end of table.

TABLE B.2.2. Future Payment Model Results[1]—Continued

Variable	2002–2008			2002–2009			2002–2010		
	Coeff.	SE	ME%	Coeff.	SE	ME%	Coeff.	SE	ME%
Intercept	2.824*	0.0706	-	2.8671*	0.0707	-	2.8731*	0.07	-
marry2	-0.0693*	0.0151	-1.34	-0.0613*	0.0153	-1.15	-0.0567*	0.0152	-1.06
TAP_age2	0.5527	0.3397	12.81	0.7827**	0.3751	14.57	1.4533*	0.5168	19.09
TAP_age3	-0.1591**	0.068	2.16	-0.0188	0.0858	4.32	0.0332	0.1144	4.71
TAP_age4	-0.2688*	0.045	-0.15	-0.257*	0.0462	-0.1	-0.1426*	0.048	1.64
TAP_age5	-0.2742*	0.0408	-0.53	-0.2191*	0.0407	0.43	-0.2308*	0.0403	-0.23
TAP_age6	-0.3021*	0.0396	-1.31	-0.296*	0.0389	-1.36	-0.2623*	0.038	-1.09
TAP_age7	-0.3126*	0.0389	-1.67	-0.2839*	0.0382	-1.22	-0.2658*	0.0371	-1.28
TAP_age8	-0.3041*	0.0388	-1.44	-0.3194*	0.0379	-2	-0.2726*	0.0367	-1.46
TAP_age9	-0.2893*	0.0394	-0.96	-0.2813*	0.0385	-1.03	-0.2846*	0.0371	-1.61
TAP_age10	-0.3006*	0.0406	-1.03	-0.3068*	0.0395	-1.41	-0.2677*	0.038	-1.11
TAP_age11	-0.296*	0.0442	-0.71	-0.2909*	0.0427	-0.86	-0.2772*	0.0409	-1.1
TAP_age12	-0.2464*	0.0518	0.43	-0.2032*	0.0501	0.99	-0.1374*	0.0479	1.73
depend2	0.0705*	0.00632	1.14[A]	0.0725*	0.00647	1.11[A]	0.0767*	0.00664	1.11[A]
l_totpos	-0.0104*	0.00127	-1.00[A]	-0.00279**	0.00125	-0.24[A]	-0.00566*	0.00127	-0.47[A]
eic_ind2	0.122*	0.0153	2.33	0.1364*	0.0153	2.53	0.1306*	0.015	2.41
l_avetotpos	-0.0474*	0.00241	-8.02[A]	-0.0501*	0.00246	-8.27[A]	-0.0517*	0.00252	-8.49[A]
bus_ind2	-0.139*	0.0145	-2.68	-0.1545*	0.0148	-2.89	-0.1456*	0.0149	-2.7
nonfiler2	-0.2887*	0.0138	-5.57	-0.3088*	0.0141	-5.76	-0.3302*	0.0142	-6.09
ia_ind1	0.0693**	0.0292	1.32	0.12038	0.03	2.2	0.0987*	0.0298	1.8
ia_d	-0.646*	0.0147	-12.71	-0.602*	0.0148	-11.5	-0.5604*	0.0148	-10.62
lEmodbal_lien	-0.0242*	0.00614	-4.47[A]	-0.0158**	0.00618	-2.83[A]	-0.00858	0.00616	-1.53[A]
levy3	-0.5095*	0.015	-9.45	-0.6004*	0.0158	-10.64	-0.6418*	0.0163	-11.19
oic3	0.8662*	0.0531	13.43	0.9044*	0.0535	13.38	0.8724*	0.0521	12.91
oic_deflt3	-0.7958*	0.0961	-17.83	-0.7745*	0.0924	-16.97	-0.6503*	0.0895	-13.91
dm530	-0.1396*	0.0157	-2.75	-0.1434*	0.0157	-2.74	-0.1561*	0.0156	-2.96
lien_ind	0.1433*	0.0137	2.77	0.1161*	0.0139	2.18	0.0657*	0.0139	1.23
exam2	-0.3795*	0.0172	-7.78	-0.4166*	0.0168	-8.35	-0.4254*	0.0166	-8.47
No_File_req	0.1526	0.0871	2.85	0.0355	0.0814	0.66	0.0489	0.0796	0.9
bk_ind	-0.178*	0.0166	-3.54	-0.1581*	0.0168	-3.05	-0.1264*	0.0169	-2.41
Log Likelihood Value	-71327.64			-69947.13			-69628.73		
Likelihood Ratio	8067.12			8191.88			8215.79		
Wald	7123.29			7183.55			7151.52		
Hosmer & Lemeshow	202.45			167.73			108.1		
n=127,406									

[1]* indicates significance level at 1 percent and ** indicates significance level at 5 percent. The following abbreviations are used: "coeff." for coefficient; "SE" for standard error; and "ME%" for percent marginal effect. An 'A' indicates that the marginal effect is not calculated as a categorical effect.

TABLE B.2.3. Future Filing Model Results[1]

Variable	2002–2005			2002–2006			2002–2007		
	Coeff.	SE	ME%	Coeff.	SE	ME%	Coeff.	SE	ME%
Intercept	2.0417*	0.0675	-	2.0389*	0.0664	-	2.009*	0.0654	-
marry2	-0.1613*	0.0145	-3.93	-0.163*	0.0143	-4.07	-0.1718*	0.0142	-4.29
TAP_age2	-0.4882*	0.1103	11.69	-0.2092	0.1511	19.42	-0.3594	0.1899	16.07
TAP_age3	-0.7284*	0.0453	5.76	-0.8374*	0.0471	4.66	-0.8329*	0.0517	4.39
TAP_age4	-1.0601*	0.0383	-3.68	-1.1249*	0.0379	-3.95	-1.0728*	0.0377	-2.95
TAP_age5	-1.1699*	0.0363	-7.86	-1.2419*	0.0351	-8.65	-1.2411*	0.0344	-9
TAP_age6	-1.1517*	0.0355	-8.03	-1.232*	0.0344	-9.11	-1.2333*	0.0334	-9.62
TAP_age7	-1.1671*	0.0353	-8.64	-1.2216*	0.0339	-9.2	-1.191*	0.0328	-8.95
TAP_age8	-1.0687*	0.0357	-5.28	-1.1321*	0.0342	-6.12	-1.1171*	0.033	-6.46
TAP_age9	-1.0367*	0.0364	-3.71	-1.0621*	0.0349	-3.41	-1.0267*	0.0336	-3.14
TAP_age10	-0.8222*	0.039	2.86	-0.8839*	0.0369	2.39	-0.9028*	0.0351	1.06
TAP_age11	-0.6976*	0.0441	6.49	-0.689*	0.0416	8.1	-0.661*	0.0392	8.06
TAP_age12	-0.4647*	0.0529	11.99	-0.5549*	0.0493	11.64	-0.5181*	0.0466	12.09
depend2	0.1202*	0.00587	2.64[A]	0.1053*	0.00583	2.28[A]	0.1121*	0.00583	2.36[A]
l_totpos	0.0523*	0.00116	6.04[A]	0.069*	0.00117	8.08[A]	0.0645*	0.00116	7.48[A]
eic_ind2	0.553*	0.0158	13.03	0.5458*	0.0149	13.38	0.5134*	0.0144	12.73
l_avetotpos	0.0339*	0.00181	7.02[A]	0.0161*	0.0019	3.45[A]	0.014*	0.00195	3.03[A]
bus_ind2	-0.086*	0.0135	-2.09	-0.0558*	0.0135	-1.39	-0.0529*	0.0134	-1.32
ia_ind1	-0.0471**	0.0237	-1.15	-0.1595*	0.0239	-3.98	-0.1383*	0.0246	-3.45
ia_d	0.3439*	0.0142	8.3	0.1852*	0.0139	4.61	0.1344*	0.0138	3.36
lEmodbal_lien	-0.1387*	0.0061	-32.27[A]	-0.1308*	0.00604	-31.14[A]	-0.1264*	0.00599	-30.17[A]
levy3	-0.4033*	0.0131	-9.75	-0.4961*	0.0131	-12.26	-0.5629*	0.0131	-13.96
oic3	0.3287*	0.0527	7.75	0.1736*	0.0427	4.3	0.0592	0.0386	1.48
oic_deflt3	0.0336	0.1262	0.82	0.0416	0.1128	1.04	-0.0952	0.1015	-2.38
dm530	0.4719*	0.0154	11.17	0.4451*	0.0149	10.95	0.4178*	0.0146	10.38
lien_ind	-0.0358*	0.0128	-0.87	-0.0604*	0.0127	-1.51	-0.0848*	0.0127	-2.11
exam2	-0.0636*	0.0198	-1.56	-0.1947*	0.0184	-4.86	-0.2329*	0.0176	-5.8
No_File_req	-2.1825*	0.1152	-44.66	-2.1576*	0.1104	-41.4	-2.2431*	0.1097	-40.59
bk_ind	-0.0977*	0.017	-2.39	-0.1126*	0.0166	-2.81	-0.1175*	0.0162	-2.94
Log Likelihood Value	-79116.69			-79937.92			-80465.97		
Likelihood Ratio	15736.13			16461.45			15690.29		
Wald	13398.96			13993.38			13362.46		
Hosmer & Lemeshow	83.78			170.88			134.39		
n=127,406									

Footnotes at end of table.

TABLE B.2.3. Future Filing Model Results[1]—Continued

Variable	2002–2008			2002–2009			2002–2010		
	Coeff.	SE	ME%	Coeff.	SE	ME%	Coeff.	SE	ME%
Intercept	1.9482*	0.0645	-	1.9615*	0.0642	-	1.9608*	0.0636	-
marry2	-0.1869*	0.0142	-4.65	-0.1756*	0.0143	-4.34	-0.1903*	0.0142	-4.65
TAP_age2	-0.2797	0.223	18.07	-0.6176*	0.2222	10.3	-0.5757**	0.2371	10.8
TAP_age3	-0.8376*	0.0589	4.33	-0.8633*	0.0724	4.01	-0.7893*	0.0952	5.39
TAP_age4	-1.0702*	0.038	-2.7	-1.0925*	0.039	-2.78	-1.0488*	0.0405	-1.91
TAP_age5	-1.2499*	0.0338	-9	-1.2611*	0.0336	-8.64	-1.2494*	0.0336	-8.36
TAP_age6	-1.2581*	0.0326	-10.2	-1.2906*	0.0319	-10.63	-1.3005*	0.0312	-11.09
TAP_age7	-1.1946*	0.0319	-9.07	-1.2313*	0.031	-9.73	-1.2209*	0.0302	-9.74
TAP_age8	-1.1137*	0.0318	-6.56	-1.1546*	0.0308	-7.58	-1.1648*	0.0298	-8.38
TAP_age9	-1.0282*	0.0324	-3.42	-1.0286*	0.0313	-3.35	-1.0141*	0.0301	-3.58
TAP_age10	-0.9292*	0.0336	0.08	-0.9457*	0.0323	-0.31	-0.9208*	0.031	-0.34
TAP_age11	-0.6721*	0.0371	7.77	-0.6593*	0.0353	8.23	-0.6796*	0.0337	7.05
TAP_age12	-0.5099*	0.0438	12.3	-0.5489*	0.0415	11.54	-0.5179*	0.0392	11.76
depend2	0.1135*	0.00587	2.36[A]	0.1129*	0.00589	2.27[A]	0.1202*	0.00601	2.28[A]
l_totpos	0.0641*	0.00119	7.93[A]	0.0675*	0.00117	7.69[A]	0.0646*	0.00119	7.05[A]
eic_ind2	0.4772*	0.0141	11.87	0.4726*	0.0139	11.71	0.4452*	0.0138	10.95
l_avetotpos	0.00943*	0.00205	2.05[A]	0.00446**	0.00209	0.97[A]	0.00334	0.00212	0.72[A]
bus_ind2	-0.0359*	0.0135	-0.89	-0.0446*	0.0137	-1.1	-0.0543*	0.0138	-1.33
ia_ind1	-0.0931*	0.025	-2.31	-0.0904*	0.0251	-2.22	-0.0614**	0.0252	-1.5
ia_d	0.1028*	0.0137	2.56	0.0999*	0.0137	2.47	0.0879*	0.0138	2.15
lEmodbal_lien	-0.119*	0.00594	-28.30[A]	-0.117*	0.00595	-27.69[A]	-0.1162*	0.00592	-27.13[A]
levy3	-0.6438*	0.0132	-15.96	-0.7019*	0.0135	-17.34	-0.767*	0.0136	-18.84
oic3	0.0306	0.0368	0.76	0.0624	0.0358	1.55	0.0797**	0.0351	1.96
oic_deflt3	-0.1619	0.0949	-4	-0.177	0.0916	-4.32	-0.2612*	0.0884	-6.23
dm530	0.3697*	0.0145	9.21	0.3345*	0.0144	8.3	0.306*	0.0144	7.54
lien_ind	-0.0994*	0.0127	-2.48	-0.1146*	0.0128	-2.83	-0.1139*	0.0128	-2.78
exam2	-0.3096*	0.017	-7.62	-0.3317*	0.0167	-8.05	-0.3145*	0.0165	-7.54
No_File_req	-2.2939*	0.1094	-39.07	-2.3441*	0.1089	-37.76	-2.4291*	0.1091	-36.88
bk_ind	-0.12*	0.016	-2.98	-0.1061*	0.0161	-2.61	-0.0872*	0.0161	-2.12
Log Likelihood Value	-80301.74			-79533.54			-79135.12		
Likelihood Ratio	15681.45			16434.91			16235.58		
Wald	13290.02			13854.59			13682.83		
Hosmer & Lemeshow	200.14			187.57			205.2		
n=127,406									

[1]* indicates significance level at 1 percent and ** indicates significance level at 5 percent. The following abbreviations are used: "coeff." for coefficient; "SE" for standard error; and "ME%" for percent marginal effect. An 'A' indicates that the marginal effect is not calculated as a categorical effect.

TABLE B.2.4. Future Income Model Results[1]

Variable	2002–2005			2002–2006			2002–2007		
	Coeff.	SE	ME%	Coeff.	SE	ME%	Coeff.	SE	ME%
Intercept	-2.236*	0.0708	-	-2.2191*	0.0708	-	-2.0823*	0.0699	-
marry2	-0.0322	0.0154	-0.72	-0.041*	0.0154	-0.92	-0.0539*	0.0153	-1.22
TAP_age2	1.5131*	0.1112	11.61	1.3824*	0.1511	8.82	1.4648*	0.1934	11.06
TAP_age3	1.6144*	0.0536	15.36	1.664*	0.0555	16.82	1.5588*	0.0598	14.06
TAP_age4	1.4678*	0.0484	13.12	1.5074*	0.048	14.32	1.5076*	0.0475	14.31
TAP_age5	1.2473*	0.0469	8.56	1.2532*	0.0458	9.07	1.2782*	0.0448	9.76
TAP_age6	1.0746*	0.0464	4.64	1.0651*	0.0453	4.72	1.0708*	0.0441	4.95
TAP_age7	0.9879*	0.0463	2.55	1.0089*	0.0449	3.54	1.0251*	0.0436	4.16
TAP_age8	0.9869*	0.0465	2.07	0.9845*	0.0451	2.54	1.0238*	0.0436	3.84
TAP_age9	0.9463*	0.0472	0.5	0.954*	0.0457	1.22	0.9912*	0.0442	2.39
TAP_age10	0.9121*	0.0494	-1.15	0.8831*	0.0476	-1.26	0.9236*	0.0455	0.04
TAP_age11	0.6856*	0.0552	-6.62	0.6644*	0.0528	-6.66	0.6243*	0.0503	-7.33
TAP_age12	0.6474*	0.0637	-7.63	0.5371*	0.0616	-9.43	0.4479*	0.0594	-11.07
depend2	0.4871*	0.00597	9.78	0.5576*	0.00624	10.87[A]	0.5976*	0.0064	11.39[A]
bus_ind2	0.1349*	0.0135	3.01	0.1429*	0.0138	3.2	0.1306*	0.0139	2.95
nonfiler2	-0.3804*	0.0136	-8.4	-0.4904*	0.0136	-10.93	-0.4596*	0.0135	-10.38
ia_ind1	0.8833*	0.0242	21.25	0.9512*	0.0249	22.98	0.9322*	0.0257	22.6
ia_d	0.6405*	0.0143	14.55	0.6795*	0.0144	15.44	0.6676*	0.0143	15.24
lEmodbal_lien	0.0293*	0.00587	6.24	0.027*	0.00598	5.79[A]	0.0105	0.00597	2.27[A]
levy3	-0.2149*	0.0138	-4.82	-0.1683*	0.0141	-3.8	-0.1503*	0.0144	-3.43
oic3	0.4852*	0.0515	11.5	0.6475*	0.0434	15.57	0.6338*	0.0402	15.29
oic_deflt3	-0.1931	0.1393	-4.17	-0.4447*	0.131	-9.18	-0.2037	0.1133	-4.46
dm530	-0.4731*	0.017	-10.05	-0.485*	0.0168	-10.38	-0.4312*	0.0165	-9.4
lien_ind	-0.3539*	0.0136	-7.89	-0.3396*	0.0138	-7.61	-0.2964*	0.0138	-6.7
exam2	0.096*	0.0207	2.17	0.0872*	0.0198	1.98	0.1391*	0.0189	3.2
No_File_req	-1.3926*	0.1635	-22.55	-1.1738*	0.1446	-20.35	-1.1612*	0.1368	-20.5
bk_ind	0.0224	0.0179	0.5	0.0398**	0.0178	0.9	0.017	0.0175	0.39
Log Likelihood Value	-70769.68			-69198.87			-69250.04		
Likelihood Ratio	24929.31			28715.7			29196.35		
Wald	19350.7			21373.73			21457.89		
Hosmer & Lemeshow	1542.87			1724.95			2219.04		
n=127,406									

Footnotes at end of table.

TABLE B.2.4. Future Income Model Results[1]—Continued

Variable	2002–2008			2002–2009			2002–2010		
	Coeff.	SE	ME%	Coeff.	SE	ME%	Coeff.	SE	ME%
Intercept	-1.8959*	0.0682	-	-2.0157*	0.069	-	-2.1421*	0.0698	-
marry2	-0.0395*	0.0151	-0.92	-0.0221	0.0152	-0.5	-0.0449*	0.0154	-0.99
TAP_age2	1.6041*	0.2209	15.31	1.9418*	0.2245	20.53	2.305*	0.232	28.35
TAP_age3	1.5827*	0.0655	15.24	1.6306*	0.08	13.03	1.6408*	0.1045	12.08
TAP_age4	1.4651*	0.0464	13.72	1.6437*	0.0483	14.81	1.7062*	0.0508	14.97
TAP_age5	1.2935*	0.0428	10.76	1.4389*	0.0438	11.12	1.5374*	0.0448	12.24
TAP_age6	1.085*	0.0418	5.93	1.2771*	0.0424	7.91	1.3471*	0.0428	8.59
TAP_age7	1.0412*	0.0411	5.24	1.1787*	0.0417	5.89	1.2264*	0.0421	6.09
TAP_age8	1.035*	0.041	4.91	1.1721*	0.0415	5.72	1.2398*	0.0417	6.6
TAP_age9	0.955*	0.0416	2.19	1.1418*	0.0419	4.31	1.1877*	0.042	4.71
TAP_age10	0.8969*	0.0426	0.05	1.0366*	0.0428	0.95	1.0569*	0.0428	0.84
TAP_age11	0.633*	0.0465	-6.89	0.7556*	0.0463	-6.31	0.8463*	0.0459	-4.78
TAP_age12	0.4081*	0.055	-11.99	0.4395*	0.0548	-12.89	0.5502*	0.0534	-11.03
depend2	0.6628*	0.00672	12.93[A]	0.6471*	0.00669	11.96[A]	0.7042*	0.00693	12.08[A]
bus_ind2	0.0997*	0.0139	2.33	0.1182*	0.0141	2.68	0.1454*	0.0144	3.2
nonfiler2	-0.4279*	0.0135	-10	-0.4838*	0.0136	-11.02	-0.4324*	0.0139	-9.63
ia_ind1	0.8479*	0.0262	20.77	0.8487*	0.0264	20.58	0.734*	0.0267	17.5
ia_d	0.6427*	0.0142	15.08	0.6086*	0.0143	13.9	0.5509*	0.0145	12.28
lEmodbal_lien	-0.00352	0.00593	-0.79[A]	-0.00624	0.00598	-1.35[A]	-0.00794	0.00607	-1.68[A]
levy3	-0.0891*	0.0146	-2.09	-0.1158*	0.0149	-2.65	-0.1004*	0.0154	-2.24
oic3	0.5652*	0.0388	13.82	0.4847*	0.0378	11.6	0.4492*	0.0377	10.53
oic_deflt3	-0.2394**	0.1048	-5.41	-0.1926	0.1003	-4.24	-0.2478**	0.098	-5.24
dm530	-0.385*	0.0161	-8.75	-0.3998*	0.0162	-8.78	-0.3946*	0.0164	-8.43
lien_ind	-0.2731*	0.0138	-6.38	-0.2548*	0.0139	-5.78	-0.2335*	0.0141	-5.16
exam2	0.0516*	0.0182	1.21	0.0529*	0.0178	1.21	0.0607*	0.0178	1.35
No_File_req	-1.145*	0.1258	-21.47	-1.1984*	0.1273	-21.07	-1.2313*	0.1286	-20.57
bk_ind	0.0445*	0.0172	1.04	0.0369**	0.0173	0.84	0.0129	0.0176	0.29
Log Likelihood Value	-69827.86			-68794.5			-67190.82		
Likelihood Ratio	30495.93			30213.8			31091.19		
Wald	21780.82			21621.55			21788.07		
Hosmer & Lemeshow	2254.27			1932.74			2337.24		
n=127,406									

[1]* indicates significance level at 1 percent and ** indicates significance level at 5 percent. The following abbreviations are used: "coeff." for coefficient; "SE" for standard error; and "ME%" for percent marginal effect. An 'A' indicates that the marginal effect is not calculated as a categorical effect.

TABLE B.3. PHASE I: Propensity Score Model

Actual vs. Predicted	2002–2004	% of Actual
0 vs 0	428,349	79.2%
0 vs 1	29,012	5.4%
1 vs 0	28,509	5.3%
1 vs 1	55,136	10.2%
Total count	541,006	
Prediction Accuracy		89.4%

[Sum of percents may not equal 100% due to rounding.]

TABLE B.4.1. PHASE II: Current Payment Model

Actual vs. Predicted	2002–2005	% of Actual	2002–2006	% of Actual	2002–2007	% of Actual	2002–2008	% of Actual	2002–2009	% of Actual	2002–2010	% of Actual
0 vs 0	33,650	26.4%	26,345	20.7%	22,641	17.8%	19,907	15.6%	18,289	14.4%	16,681	13.1%
0 vs 1	19,684	15.5%	18,870	14.8%	17,679	13.9%	16,540	13.0%	15,892	12.5%	15,728	12.3%
1 vs 0	14,639	11.5%	12,045	9.5%	10,506	8.3%	9,471	7.4%	8,802	6.9%	8,249	6.5%
1 vs 1	59,433	46.7%	70,146	55.1%	76,580	60.1%	81,488	64.0%	84,423	66.3%	86,748	68.1%
Total count	127,406		127,406		127,406		127,406		127,406		127,406	
Prediction Accuracy		73.1		75.8		77.9		79.6		80.7		81.2%

[Sum of percents may not equal 100% due to rounding.]

TABLE B.4.2. PHASE II: Future Payment Model

Actual vs. Predicted	2002–2005	% of Actual	2002–2006	% of Actual	2002–2007	% of Actual	2002–2008	% of Actual	2002–2009	% of Actual	2002–2010	% of Actual
0 vs 0	1,878	1.5%	2,217	1.7%	1,775	1.4%	1,480	1.2%	1,280	1.0%	1,164	0.9%
0 vs 1	36,157	28.4%	35,373	27.8%	34,575	27.1%	33,999	26.7%	32,852	25.8%	32,665	25.6%
1 vs 0	2,138	1.7%	2,480	2.0%	1,956	1.5%	1,536	1.2%	1,314	1.0%	1,209	1.0%
1 vs 1	87,233	68.5%	87,336	68.6%	89,100	70.0%	90,391	71.0%	91,960	72.2%	92,368	72.5%
Total count	127,406		127,406		127,406		127,406		127,406		127,406	
Prediction Accuracy		70.0%		70.3%		71.4%		72.2%		73.2%		73.4%

[Sum of percents may not equal 100% due to rounding.]

TABLE B.4.3. PHASE II: Future Filing Model

Actual vs. Predicted	2002–2005	% of Actual	2002–2006	% of Actual	2002–2007	% of Actual	2002–2008	% of Actual	2002–2009	% of Actual	2002–2010	% of Actual
0 vs 0	26,314	20.7%	35,328	27.7%	39,926	31.3%	45,170	35.5%	49,998	39.2%	54,183	42.5%
0 vs 1	28,213	22.1%	25,363	19.9%	23,774	18.7%	21,810	17.1%	19,674	15.4%	17,719	13.9%
1 vs 0	15,265	12.0%	18,857	14.8%	21,531	16.9%	23,995	18.8%	25,307	19.9%	26,966	21.2%
1 vs 1	57,614	45.2%	47,858	37.6%	42,175	33.1%	36,431	28.6%	32,427	25.5%	28,538	22.4%
Total count	127,406		127,406		127,406		127,406		127,406		127,406	
Prediction Accuracy		65.9%		65.3%		64.4%		64.1%		64.7%		64.9%

[Sum of percents may not equal 100% due to rounding.]

TABLE B.4.4. PHASE II: Future Income Model

Actual vs. Predicted	2002–2005	% of Actual	2002–2006	% of Actual	2002–2007	% of Actual	2002–2008	% of Actual	2002–2009	% of Actual	2002–2010	% of Actual
0 vs 0	70,489	55.3%	70,339	55.2%	70,139	55.1%	67,777	53.2%	70,840	55.6%	73,896	58.0%
0 vs 1	11,077	8.7%	10,658	8.4%	10,326	8.1%	10,221	8.0%	9,526	7.5%	8,513	6.7%
1 vs 0	25,402	19.9%	24,119	18.9%	24,297	19.1%	24,178	19.0%	24,290	19.1%	23,883	18.8%
1 vs 1	20,438	16.0%	22,290	17.5%	22,644	17.8%	25,230	19.8%	22,750	17.9%	21,114	16.6%
Total count	127,406		127,406		127,406		127,406		127,406		127,406	
Prediction Accuracy		71.3%		72.7%		72.9%		73.0%		73.5%		74.6%

[Sum of percents may not equal 100% due to rounding.]

Endnotes

[1] IRS, Collection Activity Report NO-5000-23, *Collection Workload Indicators* (Oct. 30, 2011).

[2] IRS, Media Relations Office, IRS Announces *New Effort to Help Struggling Taxpayers Get a Fresh Start; Major Changes to Lien Process*, IR-2011-20 (Feb. 24, 2011).

[3] Our cohort includes only the delinquent taxpayers who entered taxpayer delinquent account (TDA) status. These are delinquent taxpayers who did not resolve their liabilities in response to IRS notices.

[4] Internal Revenue Code (IRC) §§6321 and 6322. IRC §6201 authorizes the IRS to assess all taxes owed. IRC §6303 provides that within 60 days of the assessment the IRS must provide notice and demand for payment to any taxpayer liable for an unpaid tax.

[5] See IRC §6321; Internal Revenue Manual (IRM) 5.12.2.2 (Oct. 30, 2009).

[6] IRC §6322.

[7] IRC §6323(f); Treas. Reg. §301.6323(f)-1; IRM 5.12.2.8 (Oct. 30, 2009).

[8] IRM 5.12.2.4 (Oct. 30, 2009).

[9] IRM 5.12.2.4.1 (Oct. 30, 2009). The lien filing threshold was increased to $10,000 as part of the IRS's "fresh start" initiative. See *Adjustments to IRS Lien Policies*, available at http://www.irs.gov/businesses/small/article/0,,id=239095,00.html (last visited Dec. 9, 2011).

[10] IRM 5.14.5 (Mar. 11, 2011). Lien filing is not required for taxpayers entering into a streamlined installment agreement, but a lien may be filed at the discretion of the revenue officer. Following are current IA criteria:

Streamlined installment agreements may be approved for taxpayers under the following circumstances:

a. The aggregate unpaid balance of assessments (the SUMRY balance) is $25,000 or less. The unpaid balance of assessments includes tax, assessed penalty and interest, and all other assessments on the tax modules. It does not include accrued penalty and interest.

b. If pre-assessed taxes are included, the pre-assessed liability plus unpaid balance of assessments must be $25,000 or less.

c. The aggregate unpaid balance of assessments will be fully paid in 60 months, or the agreement will be fully paid prior to the expiration of the collection statute, whichever comes first.

[11] IRS, Collection Activity Report NO-5000-C23, *Collection Workload Indicators* (Oct. 30, 2011). Of the 1,042,230 NFTLs filed in FY 2011, some 45.6 percent were filed by the ACS. An analysis TAS conducted prior to 2011 showed that about 58 percent of ACS liens were filed systemically and without significant employee review. *See* National Taxpayer Advocate 2010 Annual Report to Congress, vol. 2, 93 (Status Update: *Estimating the Impact of Liens on Taxpayer Compliance Behavior—an Ongoing Research Initiative*). On February 24, 2011, the IRS increased the threshold for systemically filing liens to $10,000 and raised it again to $25,000 on April 15, 2011. See IRS response to information request (Oct. 12, 2011). TAS will continue to monitor IRS lien filing volumes to determine the impact of these lien filing threshold changes.

[12] For a detailed discussion of the National Taxpayer Advocate's concerns about IRS lien filing policies, see National Taxpayer Advocate 2011 Annual Report to Congress 109–128 (Most Serious Problem: *Changes to IRS Lien Filing Practices Are Needed To Improve Future Compliance, Increase Revenue Collection, and Minimize Economic Harm Inflicted on Financially Struggling Taxpayers*). See also National Taxpayer Advocate 2010 Annual Report to Congress 302–310 (Status Update: *The IRS Has Been Slow To Address the Adverse Impact of Its Lien-Filing Policies on Taxpayers and Future Tax Compliance*).

[13] IRS, *IRS Data Books, Table 16, Delinquent Collection Activities, 1999–2010*; IRS, Collection Activity Report NO-5000-23, *Collection Workload Indicators* (Oct. 30, 2011).

[14] The inflation-adjusted totals reflect the yearly total collection yields adjusted to 2010 dollars using the U.S. Consumer Price Index-All Urban 2010, U.S. Bureau of Labor Statistics.

[15] The propensity score for this study is an estimate of the likelihood that the IRS will file a NFTL.

[16] See IRM 5.12.1.13(2), IRM 5.12.2.8.1(4) & (5) and IRM 5.19.4.

[17] While deviations from official procedures due to workload issues that vary by geographic area or other unknown factors could potentially influence the propensity scoring and matching processes, we note that the mean values for the official criteria included in the model are well balanced between the lien and non-lien groups.

[18] Our cohort of lien taxpayers included about 93 percent of all taxpayers who acquired their individual income tax liabilities in 2002 and against whom the IRS filed liens between 2002 and 2004.

[19] We actually model the dependent variable as a logit, which is the natural log of the odds derived from the dependent variable binary outcomes.

[20] Due to limitations in IRS data, we were not able to capture certain criteria for lien filings. See Appendix A for a more detailed discussion of how we implemented the IRS's lien filing criteria in the propensity scoring process.

[21] See Appendix A and the Limitations section for a discussion of the official lien criteria that we could not include in our analysis.

[22] In IRM 5.12, *Federal Tax Lien*, we used IRM 5.12.1.13(2) with a revision date of 7/31/2001 and IRM 5.12.2.8.1(4) & (5) with a revision date of 3/1/2004. In the Enforcement Action chapter, IRM 5.19.4, we found additional guidance on lien filing determinations. Because our analysis focuses on tax lien filings in 2002 to 2004, we used IRM 5.19.4.5.2(2)-(7) with a revision date of 8/30/2001.

[23] For a detailed description of how the model addresses the IRM lien filing criteria, please see Appendix A.

[24] We used a nearest-neighbor technique for matching the lien units and nonlien units that is called the "greedy" matching technique and was developed by Jon Kosanke and Erik Bergstralh.

[25] We captured the value of the TPI at the end of each year included in the study period and took the average of these values.

[26] This amount is EITC claimed on the return after IRS validity checks during math error processing.

[27] We controlled for the influence of IRS actions on taxpayer behavior. It is possible that in some cases taxpayer behavior influenced IRS actions, which might have affected the coefficient values of the independent variables representing these actions (such variables are known as endogenous variables).

[28] We actually model the dependent variable in all of our models as a logit, which is the natural log of the odds derived from the dependent variable binary outcomes.

[29] In some cases IRS will subsequently determine that the taxpayer did not have a filing requirement and will reverse this code. We did not check for reversals, but did check to see if the taxpayer subsequently filed the required return.

[30] TPI is calculated by summing the positive values from the following income fields from a taxpayer's individual return: wages; interest; dividends; distribution from partnerships, small business corporations, estates, or trusts; Schedule C net profits; Schedule F net profits; and other income such as Schedule D profits and capital gains distributions. Losses reported for any of these values are treated as zero.

[31] We plan to include the State unemployment rate in a future model to control for possible regional differences in economic activity.

[32] In prior research, TAS found that most payments for lien taxpayers were attributable to sources other than the lien, such as refund offsets. See National Taxpayer Advocate 2009 Annual Report to Congress vol. 2, 1–18 (*The IRS's Use of Notices of Federal Tax Lien*).

[33] The next revision to IRM 5.12.2.4.1 occurred 5/20/2005.

[34] IRM 5.12.1.13(2) (July 31, 2001).

[35] IRM 5.12.2.8.1(4) & (5) (Mar. 1, 2004).

[36] The next revision to IRM 5.19.4 occurred 8/1/2005.

[37] IRM 5.19.4.5.2(2)-(7) (Aug. 30, 2001).

Habitual Noncompliers

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1 Introduction

A habitual noncomplier (HNC, also known as an egregious repeater) is an individual with a history or pattern of noncompliance—a person who serially and deliberately does not comply—even after compliance intervention. HNCs are a risk to tax administrations in terms of lost revenue, integrity of the tax system, and reputational damage. They can also be costly to deal with through compliance interventions. The purpose of this paper is to outline research that was conducted to understand, quantify, and assess the risk posed by habitual noncompliers and discuss the management of this customer group going forward. The research project was initiated by tax administration investigators, and was a collaboration among researchers, managers, analysts, and investigators within the organisation.

Tax noncompliance is a problem for all jurisdictions and includes all facets of tax administration spanning registration, filing, paying, reporting, and entitlements. Repeated noncompliant behaviour by a person, a habitual noncomplier, is not unique to the field of tax. However, the study of habitual noncompliance within the tax context and an understanding as to how to effectively treat this behaviour is limited. The identification of HNCs as a population of interest for New Zealand Inland Revenue began with an internal discussion document that identified the need for a coordinated approach to managing the noncompliant behaviour of recidivist tax offenders. This paper will first briefly cover the literature on HNCs, followed by four interrelated research studies: 1) the creation of a research database of HNCs known by staff; 2) "Voice of the HNC"—qualitative indepth interviews with HNCs; 3) a profile of habitually late filers and payers; and 4) statistical modelling to identify key indicators of the "worst" noncompliers and using these indicators to detect other potential HNCs. Lastly, the paper will discuss the implications of the research findings and further research directions.

1.1 Literature Review

Habitual noncompliance and recidivism as theoretical constructs span many academic disciplines and research foci including criminology, psychology, sociology, white-collar crime, fraud, recidivism or habitual noncompliance, and tax. As the literature on the link between habitual noncompliance and tax is limited, a literature scan was undertaken across the confluence of disciplines and ideas.

Habitual noncompliance is a research topic in itself as well as often being the measure of the success of any treatment. For instance, within the New Zealand prison and correctional context, the recidivism rate is often a primary measure to assess the effectiveness of an intervention over time (e.g., Nadesu, 2008, 2009). However, this is not the case within taxation.

Arguably, the preeminent international source of tax compliance strategies and activities can be found in the reports published by the Organisation for Economic Cooperation and Development (OECD). In recent papers, however, few examples or instances of the habitual noncompliance, repeat offender, or recidivism concepts were published (refer to OECD 2011; 2010a; 2010b; 2009; 2008).[1] While recidivism is acknowledged as an issue it has not been widely and consistently considered or addressed. These references include: Her Majesty's Revenue & Customs (HMRC) managing deliberate defaulters programme; the use of audit revisit programmes to ensure repeat noncompliance does not occur; the need for longitudinal and repeated evaluation measures; and, that for HNCs a deterrence strategy involving recurring audit activity may be required.

Fundamentally, habitual noncompliance is not part of the common lexicon or language that taxation authorities use when they describe taxation in the context of treatment, evaluation, influence, or compliance improvement. Thus a gap exists between the language tax authorities use to describe noncompliance in comparison to the language used in the literature of crime, punishment, and effective treatment.

As HNCs span all areas of compliance issues there is an important distinction between areas where the noncompliance *reveals* itself and is clearly visible, such as filing and paying, compared to where it is largely *invisible* and requires the revenue authority to identify through enforcement action, such as in the cases of fraud, evasion, and aggressive tax planning. If a taxpayer is registered correctly then filing HNC behaviour is detectable and if the taxpayer files correctly then paying compliance is readily identifiable.

In contrast, issues of registration, reporting, and entitlements are far more hidden. For a taxpayer to be identified as noncompliant, enforcement actions generally need to have been undertaken, and for HNCs multiple actions. Known HNCs are identifiable through staff awareness of the behaviour and through analysis of instances of multiple compliance actions against a taxpayer and their related entities. Detection of this type of harm is therefore dependent on prevalence of HNC activity, and our ability to detect it and have it confirmed through enforcement (Sparrow, 2008).

1.2 General Causes of Habitual Noncompliance

Noncompliance is undoubtedly caused by the interactions of a wide variety of factors. In basic terms, and from a tax administration perspective, these causes can be split into three broad categories (see Appendix 1 for further description):

- *Individual*—personality, tax thinking (including motives, drivers, and rationalisations), and circumstances (such as addictions, financial situation, and business performance).
- *Administration*—the interaction between the individual and tax administration including tax knowledge, legislation, opportunities for noncompliance, rewards, and real and perceived consequences.
- *Social Influences*—other people, groups, and societal factors that directly and indirectly influence the HNC compliance behaviour.

Noncompliance occurs when there are sufficient underlying causes present and insufficient inhibitors to prevent it from occurring (Andrews and Bonta, 2010). From a tax authority perspective, the central difference between HNC behaviour and other forms of noncompliant behaviour is our inability to restrict, monitor, identify and treat the noncompliance successfully. Habitual noncompliant behaviour continues serially and deliberately. HNCs are more likely to be: people with personality issues or who have strong rationalisations and attitudes against tax; have repeated easy opportunities to not comply, with limited or no consequences applied; and where there is strong social pressure for noncompliance—such as from trusted advisors or where noncompliance within a population segment is the norm. HNCs highlight a gap between a tax administration's ability to restrict, monitor, detect, and treat noncompliance in a manner that changes an individual's tax behaviour to sustained compliance.

1.3 Treatment of Habitual Noncompliance Within Revenue Authorities

Although recidivism within tax administrations may not have a large body of published research, a number of agencies are focusing on taxpayers who repeatedly choose to not comply with their tax obligations—particularly filing and paying compliance.

Where identified, tax authorities' treatment of HNCs has been attempted through:

- Use of automated letters
- Issuing of arbitrary assessments
- Escalation of the case to a more advanced stage of the collection process (using fines and liens earlier in the collection process)
- Requiring increased disclosure
- Deterrence of phoenix activities
- Public Naming
- Prosecutions

Canadian Revenue Authority (CRA)

For example, the Canadian Revenue Authority (CRA, 2005; 2007) researched various treatment options for those who have not filed tax returns including the use of arbitrary assessments. The results suggest that initial treatments effected behaviour change, but that this change was not sustained over time, and that the arbitrary assessment process did not appear to be a major deterrent for committed noncompliers.

Internal Revenue Service (IRS)

The IRS has focused on identifying *balance due*[2] taxpayers who were likely to repeat noncompliant behaviour (i.e., filing and paying), and in particular, "hard core" ("egregious") noncompliers (Scott, Plueger, and Mendelson, 2010). Using filing and payment data, the IRS differentiated their egregious customers from other repeat nonfilers using administrative data variables. Once an egregious noncomplier is identified, the IRS accelerates the higher risk cases into a more appropriate stage of the collection process and tests alternative compliance treatments. The targeted approach increases overall efficiencies by initiating collection action in a more appropriate manner and potentially by eliminating unnecessary steps.

Her Majesty's Revenue and Customs (HMRC)

HMRC initiated a Managing Deliberate Defaulters (MDD) programme in February 2011 (HRMC 2010; 2011).[3] The programme aims to deter defaulters from returning to noncompliant behaviour, encourages a permanent shift to compliant behaviour, and deters potential evaders. The HMRC monitors and manages the compliance behaviour of deliberate evaders across all their compliance responsibilities with HMRC (registration, filing, reporting and payment). A key theme behind the approach is that evasive behaviour in one tax area highlights a wider risk across the whole of the evader's trading activities, and their relationship with HMRC.

Australian Taxation Office (ATO)

In treating phoenixing, a form of habitual noncompliant behaviour, the ATO favours an early intervention approach to discourage directors from becoming repeat offenders (Roach, 2010). The ATO's early intervention (and prevention) programme involves contacting phoenix operators sooner via targeted letter and phone campaigns. This is designed to deter fraudulent phoenix behaviour at inception before it becomes business as usual. The ATO also seeks out the worst offenders, subjects them to comprehensive audits and, where appropriate, refers them for prosecution.

1.4 General Treatment of HNCs

The literature has shown that a decision to not comply is influenced by a variety of factors both internal and external to the individual. In order to treat the root cause of HNC behaviour more effectively it is useful to consider how recidivist criminal behaviour in general is treated. Although there is a wide body of research on different aspects of treatment, two broad classes are important to the initial discussion of HNCs within tax—sanctions and behavioural approaches.

1.4.1 Sanctions and HNCs

At present, the main options for managing HNCs by tax authorities are generally education, penalties, and prosecutions. In criminal contexts, traditional mechanisms of greater penalties and sanctions such as imprisonment, although possibly effective as deterrents, have not been found to greatly impact recidivism rates. In fact, studies on the length and severity of punishment have found that increased severity leads to slight increases in recidivism compared to lesser punishments (Andrews and Bonta, 2010).

Ideally, for a sanction to be maximally effective there is a need for the early identification of offending, full discovery of all breaches, and prompt application of sanctions to fit the level of the offending. Obviously no enforcement system can deliver sanctions with such certainty. If detection of offending is less than certain, there is a strong likelihood that the extent and level of offending will remain unidentified, and punishments and sanctions not delivered, then recidivism becomes a more likely consequence.

1.4.2 Individual HNC Behaviour and Interventions

In terms of effecting behaviour change in HNCs most tax authorities face an obvious constraint in that they have no mandate to engage in individual behavioural interventions to treat underlying causes of noncompliance. One set of methodologies that have found wide success in reducing recidivism is the classes of treatment referred to as cognitive behaviour therapy (CBT). A number of meta-analytic studies have found CBT to be the most effective or one of the most effective treatment strategies for juvenile and adult offenders (i.e., Pearson, Lipton, Cleland, and Yee, 2002; Wilson, Bouffard, and MacKenzie, 2005). CBT looks to change how people think ('cognitive') as well as what people do ('behaviour'). However, tax authorities generally have no mandate or expertise to undertake this class of treatments.

HNCs or recidivists are an important segment to research and discuss. Within the tax literature HNCs are an area that has not been well researched and integrated in the compliance activities of tax authorities. Although there are initiatives in certain jurisdictions, tax authorities appear to be behind other agencies in their approach to reduce habitual noncompliance. Given the literature suggests sanctions may not be the best method to treat HNCs, and that the most effective class of treatments is beyond the mandate of most tax authorities, it is important to research the topic to identify more effective means of identifying, classifying, and intervening to maintain the integrity of the tax system.

2 Habitual Noncompliers Research Project

The HNCs research project was initiated following an internal discussion document written by a group of investigators in 2009. They identified HNCs as a segment requiring special attention and the need for a coordinated approach to managing the noncompliant behaviour of recidivist tax offenders.

The document noted that the behaviour of these types of people is costly and unlikely to change unless they were specifically targeted for intervention. As a result, a research project was set up to investigate HNCs as part of the wider compliance programmes and as outlined in Inland Revenue's compliance focus document.[4]

The project deliverables were:

- Study 1: A database of Tier 1 HNCs (the most serious offenders).
- Study 2: The 'Voice of the HNC'—qualitative research with HNCs (to gain insights into their perspective on tax compliance including their motivations and drivers).
- Study 3: A database of Tier 2 HNCs (those who repeatedly file or pay late—regarded as less serious).
- Study 4: Statistical modelling to identify indicators of HNC behaviour and exploratory analysis to ascertain those who are a HNC risk.

This paper presents an overview of the findings from each of the aforementioned project deliverables. These initiatives were exploratory and action research focused.

2.1 HNC Definition Used in the Research

HNCs are people who have a persistent history of noncompliance—individuals who intentionally choose not to comply, or who assist others to not comply, even after an Inland Revenue compliance intervention.

The working definition of a **"Habitual Noncomplier"** is a person who has a history of noncompliance who serially and deliberately:

1. commits tax evasion (including phoenixing and bankruptcy to evade payment)
2. makes fraudulent claims for pecuniary advantage
3. promotes, initiates or participates in tax avoidance schemes
4. fails to keep, maintain or provide documents and returns, or pay tax
5. has come to Inland Revenue's attention because of their noncompliance.

3 Study 1—Research Database of HNCs

3.1 Introduction

Many HNCs are known to tax authorities but are hidden by the fact that HNCs are not considered a separate risk population and staff have no mechanism with which to report them. Consequently the starting point of the research was to use staff knowledge to identify and describe their HNC encounters, which was then analysed.

3.2 Methodology

The HNC project working group developed a research form to collect information about known HNCs from Inland Revenue employees. The resulting HNC database became the central collection point of information relating to each individual HNC and covered:

- Demographic characteristics.
- Loss of revenue, tax entities involved, duration of offending.
- Risk areas of noncompliance (evasion, fraud, aggressive tax planning etc.).
- Tax types of noncompliance covering income tax, employer obligations, and social policy.
- Strategies used by the HNC to facilitate noncompliance (non-response, phoenixing, disputes, complaints, etc.).
- Treatments applied such as forms of investigations, penalties, bankruptcy etc.
- Responses to treatments—adaptability, financial risk, and time to re-offend.
- Noncompliance with other government agencies.

The database was promoted to all staff via the intranet, email reminders, and a number of articles on the Intranet home page. In addition to this, forums were held with business units likely to have engaged with HNCs in the five main regional centres. Presentations were delivered to management across different levels to promote the initiative.

3.3 Analysis

The analysis of the database illustrates that a small proportion of taxpayers are negatively affecting Inland Revenue through repeated noncompliance. The habitual noncompliance of some taxpayers is not a new phenomenon, as some of the behaviour identified within this database goes back many years.

Data was also extracted from internal systems to supplement the information contained in the HNC database. The analysis is broken into a summary of the demographics of HNCs, their noncompliant behaviour, and Inland Revenue's response to their activities. This analysis provides a richer understanding of HNC behaviour and their interactions with Inland Revenue.

3.3.1 HNC Population

The information collected in the HNC database related to 644 individuals. The list below provides a summary of the demographics:

- The HNCs were predominantly male (89 percent)
- Almost all were New Zealand residents (99 percent) for tax purposes.
- Individuals tended to be older with the majority (63 percent) of HNCs being 46 years of age or older. This is logical given habitually noncompliant behaviour requires multiple years of noncompliant activity and that it takes time for Inland Revenue to identify them.

3.3.2 Categorised Historical Value of Lost Revenue

Respondents were asked to estimate and categorise the historical value of lost tax revenue due to the actions of the HNC, and the other tax entities or individuals they enabled. Figure 1 shows the number of HNCs within each band of estimated revenue loss.

FIGURE 1. Estimated Lost Revenue

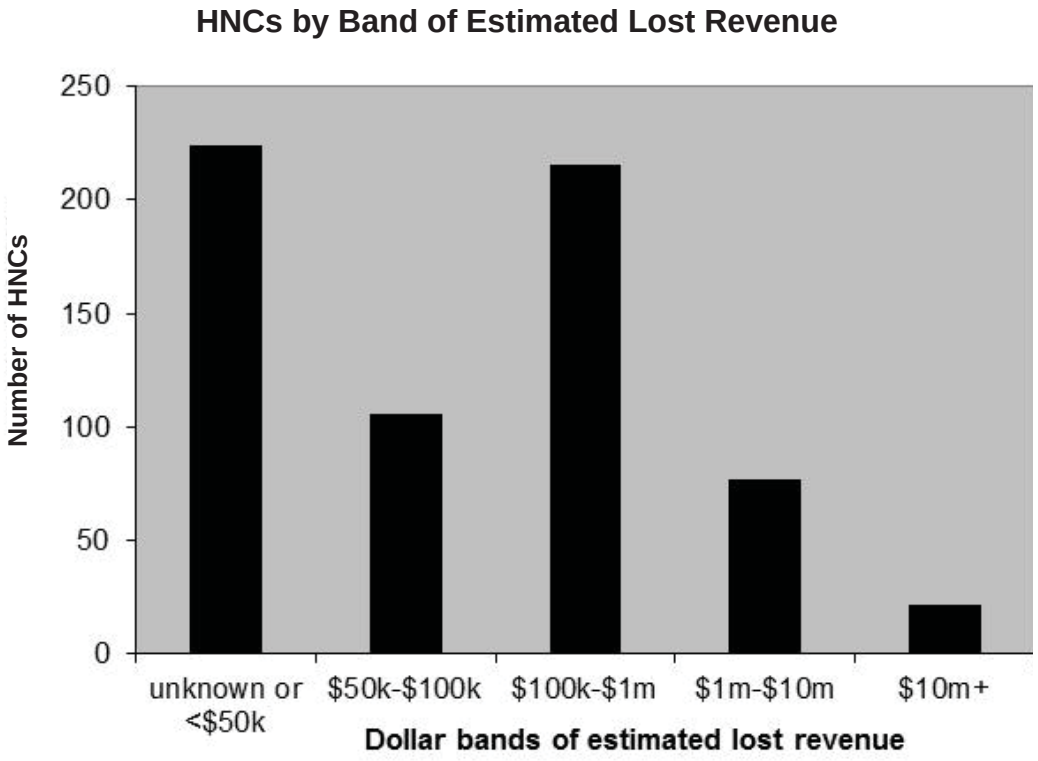


Figure 1 indicates that the dollar value (NZD—New Zealand dollars) of lost revenue is concentrated in a relatively small number of HNCs with 100 HNCs, or 15 percent of the sample, reported in bands of estimated lost revenue of $1m or greater. Note that there are also many identified as unspecified or less than $50,000.

3.3.3 Structure and Number of Entities Involved

Staff were asked to provide the number of entities linked to, or enabled by, the person that they were providing information about. The '1 entity' choice represents 1 entity or unspecified. As indicated in Table 1, approximately 75 percent of HNCs used structures with 5 entities or less. Fifteen percent of HNCs were associated with 11 or more entities. The structure and number of associated entities varied significantly.

TABLE 1. HNC Entity Structure

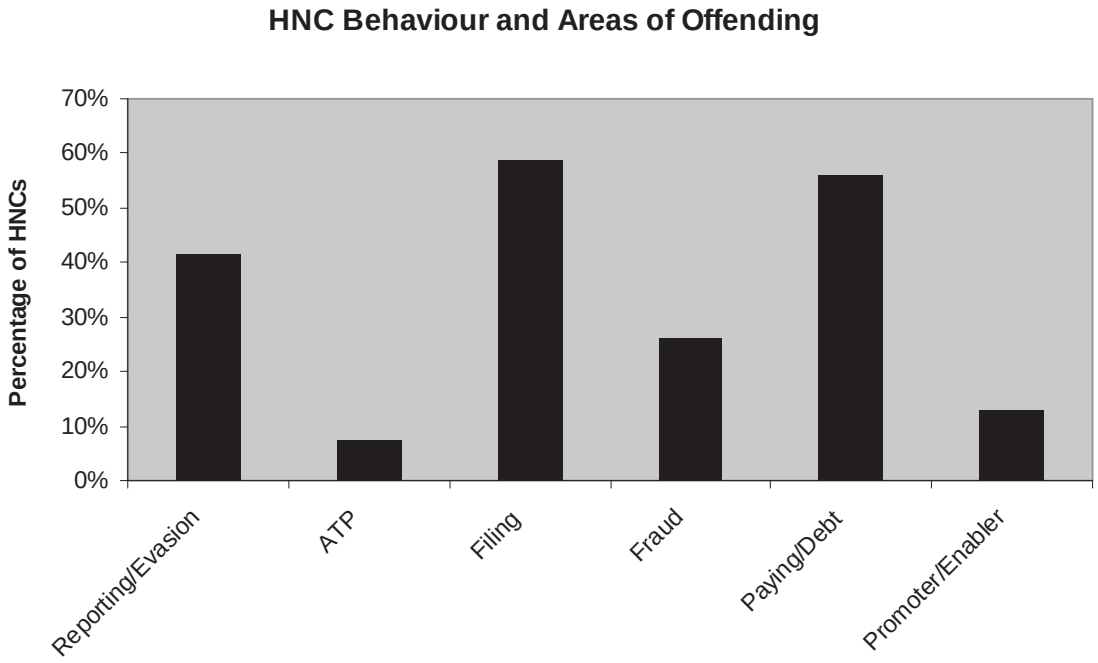
Entity Structure	Number of HNCs	Percentage of HNCs
1 entity/unspecified	293	46
2-5 entities	189	29
6-10 entities	65	10
11-50 entities	69	11
50+ entities	28	4
Total	**644**	**100**

Categorised revenue loss was also concentrated with HNCs with more complicated entity structures—those with 11 or more entities.

Areas of Offending

Respondents of HNC information were asked to identify the area/behaviour of HNC activity. They were able to choose from Reporting/Evasion, Filing, Paying/Debt, Aggressive Tax Planning, Fraud, Promoter/Enabler, and Other. Figure 2 shows the HNC areas of offending.

FIGURE 2. HNC Areas of Offending



The majority of HNCs were identified as being noncompliant in the areas of Filing (59 percent) and Paying/Debt (56 percent). Reporting/evasion noncompliance was displayed by two out of five HNCs. Some of the more significant areas indicating intent—Fraud and Promoter/Enabler—made up 19 percent of the offences. Approximately 3 percent of HNCs were identified as being noncompliant in the area of "Other". The *Other* category related primarily to the abuse of bankruptcy and the misuse of other people's identity.

Furthermore, the HNCs aged 55 and older participated in Aggressive Tax Planning to a greater proportion than the other age groups while those 35 and under were not identified as participating in Aggressive Tax Planning. This suggests that HNCs become more sophisticated in their activities as they mature. Filing and Paying/Debt were the two most frequent types of offending within the rest of the age brackets. When looking at the total number of areas of offending by age bracket, a greater percentage of older HNCs have acted across more areas than younger age brackets. This could be the result of gaining experience over time and learning how to most effectively be noncompliant.

The majority of HNCs (78 percent) had been noncompliant in one to three different areas of offending. However, HNCs associated with the highest band ($10m plus) had generally been noncompliant in four or more areas. This indicates that the most significant offenders exhibit noncompliant behaviour across the greatest number of areas.

3.3.4 Strategies Used by HNCs

Respondents were asked to identify strategies that HNCs use to facilitate their noncompliant behaviours. They were provided a list of strategies and were asked to select as many strategies as applicable. The strategies ranged from illegal (e.g., fake/stolen identity) to legal activities (e.g., Official Information Act request). Many of the HNCs used multiple strategies as part of their HNC behaviour.

Table 2 lists the noncompliance strategies used by the HNCs and the total percentage of HNCs that used them. Fundamentally HNCs are either trying to defraud the tax authority to generate income or they are trying to shield their income from tax. They were often identified as using multiple strategies. The strategies used range in sophistication from the simple (and most popular of *nonresponse* and *other delaying tactics*) to those requiring greater initiative and intent (creating *false identities* and *complex company structures*). The majority of HNCs had used *nonresponse* as a strategy. A smaller portion of the HNC population used the dispute process, filed complaints, made information requests, and initiated judicial reviews.

TABLE 2

Strategy	Number of HNCs	Percentage
Nonresponse to Requests	381	59
Other Delaying Tactics	222	34
Liquidation	122	19
Phoenix	93	14
Disputes	91	14
Complaints against Inland Revenue	83	13
Acting through Surrogate	71	11
Write-off	70	11
Change of Name	61	9
Fake/Stolen Identity	54	8
Judicial Review	32	5
Official Information Act Request	27	4
Privacy Act Request	19	3
No Strategy Identified	82	13

The HNCs estimated to be responsible for high revenue losses tend to employ a greater number of strategies while the lower dollar value HNCs tend to employ a fewer number of strategies. This may suggest that as HNCs learn about systems and processes, they learn about additional strategies to elude the administration of the tax acts.

The detailed comments reported in the strategies section highlight how HNCs change, or adopt new identities, structures, and tactics to be noncompliant. HNCs were reported to be clever, some being very well educated, and paid attention to responses, legal practices, limitations, and actively sought weaknesses in systems and processes. In this regard HNCs were known to:

- Abuse the bankruptcy process by changing identities.
- Claim that they have been victims of identity theft themselves.
- Use friends, work associates, and family member identities.
- Trade through struck-off companies.
- Use a wide network of agencies and employees to conceal their actions.
- Switch the names of trustees in a trust.
- Subtly alter names to prevent attempts to match bank accounts, customs records, etc.

3.3.5 Treatments Applied by Inland Revenue

The HNCs have been treated by the full range of options available to Inland Revenue. Table 3 provides a count of the treatments applied to HNCs and the total percentage of HNCs that received the treatment.

TABLE 3

Treatment	Count	Percentage
Debt Action/Investigation	255	40
Personal Audit/Investigation	210	33
Prosecution	196	30
Entity Audit/Investigation	181	28
Bankruptcy	140	22
Shortfall Penalties	120	19
Failure To Furnish	116	18
Court Order	113	18
Liquidation	98	15
Other	58	9
Community Relationship Visit	43	7
Banning of Directors	19	3

Investigations were carried out on 404 (63 percent) of the HNCs. Prosecution, one of the more costly treatment options, was applied to 30 percent of HNCs. Just over half of these prosecutions related to HNCs identified as committing Fraud. A Community Relations visit, a form of education, was applied to 7 percent of the HNCs.

Seven or more treatments were targeted at approximately 4 percent of the HNCs; the majority of these HNCs were categorised as having a historical loss of tax revenue of $1 million or more. Inland Revenue has applied three or fewer treatments to approximately two out of every three HNCs (68 percent).

3.3.6 Noncompliance Across Other Government Agencies

One out of six HNCs had either a nontax criminal record or had been investigated by another government agency. Thirteen percent of the HNCs were reported to have other nontax criminal records, 7 percent had been investigated by another government agency, with a small number having both. These percentages were based on information known by the respondents and are therefore conservative, as many would have other compliance issues that the staff member was unaware of. Analysis based on the submissions that were not linked to Child Support issues found approximately one out of four of the HNCs had either a nontax criminal record or had been investigated by another government agency.

3.3.7 HNC Response to Treatment

The responses that HNCs had to Inland Revenue treatments were recorded. Staff were asked a series of questions in regard to length of time for repeat noncompliant behaviour, how adaptive their behaviour became, how the financial risk changed, and how the HNC influences others to be noncompliant.

How Quickly Does the HNC Typically Re-offend?

Just about half of the respondents answered unsure/nonresponse for this question. Of those that did answer, Table 4 describes the length of time until the next noncompliant activity. Approximately 85 percent of the HNCs committed their next noncompliant activity within a year.

TABLE 4

Length of Time Until Next HNC Activity	Percentage
Over 1 year to the next noncompliance activity	15
6 months to 1 year	9
Within 6 months	10
Immediately	55
Sets up next HNC activity prior to resolution of the previous	11
Total (n=329)	**100**

How Adaptive Is the Re-offending (Modus Operandi)?

Just under half of the respondents answered unsure/nonresponse. Of those who did respond, 78 percent of HNCs used the same methodology or something similar for their next HNC activity—as shown in Table 5. Nearly a quarter of the HNCs showed the ability to change their HNC behaviour a reasonable amount in the attempt to exploit Inland Revenue's systems, processes, or other tax types.

TABLE 5

Level of Adaptive Change in HNC Methodology	Percentage
Exactly the same methodology—area, tax type, and channel	55
Minor changes in methodology—same tax type or method	23
Moderate changes—different tax type or method	10
Highly adaptive and changeable—different tax type and method	11
Changes nearly all aspects of the noncompliance activity	1
Total (n=342)	**100**

How Has the Financial Risk Changed in Re-offending Patterns?

About 60 percent of the respondents were unsure/nonresponse as to whether or not the HNC revenue risk changed. For those who responded, as shown in Table 6, in two-thirds of the responses the amount of revenue at risk from HNCs either stayed the same or decreased. For the other one-third of HNCs the amount of revenue targeted increased, perhaps in an effort to recoup previous losses caused by previous treatments.

TABLE 6

Change in Revenue at Risk	Percentage
Significant decrease in amounts	6
Minor decreases in amounts	5
Similar financial amounts	57
Minor increases in amounts	11
Significant increases in amounts	21
Total (n=257)	**100**

How Many Other Individuals Are Being Influenced/Contaminated to Noncompliance?

Table 7 shows that approximately two-thirds of the respondents answered unsure/nonresponse as to the number of people being influenced by the HNC. Of the one-third who responded, approximately 80 percent were influencing others with 33 HNCs influencing 50 or more other people.

TABLE 7

Number of Others Influenced	Percentage
Has not influenced any other individual	20
1-3 others	28
4-10 others	20
11-50 others	17
50+	15
Total (n=225)	**100**

3.4 Study 1—Discussion

HNCs negatively impact Inland Revenue in terms of lost revenue and their detrimental effect on the integrity of the tax system. HNCs inflict cost through defrauding social policy entitlements, underreporting and evading tax obligations, and through requiring a significant amount of attention and resource. Although this sample of HNC taxpayers is not necessarily representative of all HNCs nor comprehensive, the data as it stands demonstrate the need for greater attention to be paid to this segment.

Study 1 has a range of limitations that limit what can be inferred. The HNC database reflects a purposeful sample as opposed to a population, or random sample of a population, of HNCs. Staff members from across the country were given the opportunity to provide information, and responses were dependent on the motivations of staff and team leaders. Some noncompliant behaviour is also more readily identifiable, such as non-custodial parents neglecting to pay child support (as opposed to fraud or evasion), and therefore this class of HNCs was likely overrepresented in the database. Furthermore, one region suffered a catastrophic earthquake during the data collection phase which limited the HNCs that were entered into the database. All of these factors limit the conclusions that can be made from the data. However, the information does provide very useful insights into the various elements of habitual noncompliant behaviour and guides what tax administrations can do in order to improve compliance with this class of taxpayer.

The findings of this research have a number of clear implications for the types of activities tax authorities need to develop in order to address this compliance issue. This includes the value of a repository of HNCs, the benefit of coordinated activity that spans across government, and the need for monitoring. A centralised HNC registry would allow for a more consistent approach to the identification, classification, and treatment of HNCs. Also, since many of the HNCs were identified as being noncompliant with other government agencies, tax authorities could further explore information exchanges. However both information exchanges and an HNC registry have significant privacy and legal issues that would require being worked through before they could be implemented.

HNCs are people who have not complied even after interventions, which suggests that limiting the associated tax risk may require expanding the range of monitoring and treatments presently available. For instance, both passive and active monitoring could be developed; passive monitoring might be possible through sophisticated system tools for lower risk HNCs, while active monitoring would be required for those operating outside of the tax system, using multiple identities, or who enable others, since tax systems may not receive the information to appropriately monitor. Given there appears to be significant fiscal risk associated with a smaller number of taxpayers (within Study 1 there were 100 individuals classified associated with losses of $1 million or more) the level of monitoring should reflect both the behaviours and the individual risk.

The Study 1 analysis is based on the reactions, perceptions, and experiences of staff members who dealt with the HNCs; and as such, only presents one side of the story. It is reasonable to presume that many of these individuals would disagree with the way they are portrayed within the HNC database, and would describe their circumstances and actions in very different terms. Therefore, while the analysis and inferences gained through the study of the HNC database are valid, it provides only a partial view of the HNC issue as a whole and to obtain a greater understanding the perspectives of the HNC themselves should be considered (as in Study 2, below).

4 Study 2—Voice of the HNC

4.1 Introduction

Although we can research HNCs from an internal tax authority perspective by surveying staff (as in Study 1), this represents only part of the HNC view and is biased towards internal thinking. We therefore conducted a qualitative research project to solicit the view of the HNCs themselves.

4.2 Methodology

4.2.1 Research Approach

All fieldwork was conducted by an independent research company. Anticipating the possibility that HNCs' interest in participating in the research might be low, particular care was taken during the recruitment stage, to encourage participation—including telephone recruitment, followed by a letter, and a small financial incentive to participate.

The primary respondents for this research were HNCs and a sample was drawn from the Study 1 database. The sample was intended to be n=27 respondents. Despite recruiting and confirming n=27 (at least twice) there were nine 'no shows' which is unexpectedly high for normal social research but may represent the difficulties in working with this class of individual. The final number of HNCs interviewed was n=18. The 18 represented a cross section of HNCs as identified in Table 8 and the types and nature of offending.

TABLE 8. Types of Offending Amongst the Final Sample

Type of HNC Behaviour	Number of HNC Respondents
Type 1 (< 100K)	10
Type 2 (> 100K)	8
Social Policy	4
Evasion	6
Aggressive Tax Planning	7
Fraud	3
Enabler	6
TOTAL*	**18**

* Because any one HNC may have been involved in multiple types of offending, the total does not add up to n=18.

4.2.2 Interviewing Method

HNC respondents were interviewed on an individual, face-to-face basis, with the duration of most interviews being between 60-90 minutes. The researchers used a combination of elicitation interviewing and enabling techniques in their interviews with HNCs to encourage them to talk confidently and safely about their own and others' participation in noncompliant tax behaviour.[5]

4.3 Results

The factors leading to habitual noncompliant tax behaviours were explored through participants' motivations and pressures initiating the behaviour; justifications used for their behaviour; and the opportunities to participate. This was followed by four behavioural archetypes of HNCs identified by the research (Game Players, Opportunists, Pretenders, and Achievers) which can be differentiated on the basis of the sophistication of their noncompliant behaviours and their intention not to comply.

4.3.1 Motivations and Pressures

The initial motivations and pressures leading to noncompliant tax behaviour are one, or a combination of, the following:

- Greed and ambition.
- Personal problems.
- Professional or business problems.

The findings of this research suggest that, while the motivations and pressures leading to noncompliance (i.e., greed, personal and professional or business problems) may remain consistent for some HNCs, for others they may change over time. For example, greed may have been the motivator the first time they did not comply, but subsequent noncompliance may have resulted as a consequence of business or personal problems.

Financial Greed and Ambition

Some of the HNCs interviewed in this research were candid enough to admit that greed had been a driving force in their noncompliance. For some, financial wealth was part of an overriding ambition to be, and be seen as, successful (i.e., a desire for social status). As opposed to financial desire and ambition, personal and professional problems may be more about survival.

Personal Problems

Within this research, personal problems were alluded to that might lead individuals to wilfully avoid compliance (e.g., to help pay for an addiction), and personal problems that led to HNCs' inability to focus on and complete their compliance requirements (e.g., a wife's suicide, a heart attack).

Professional or Business Problems

Professional or business problems leading to noncompliance identified within this research included cash flow problems resulting from: a major creditor not paying a self-employed builder; inability to meet child custody payments because of the irregular commission based income of a salesman; and the sporadic work of a contractor.

The root of some of these problems was the poor business management of some small businesses and the self-employed (e.g., not keeping proper records and poor knowledge of how to comply).

4.3.2 Justifications

Justifications for different habitual noncompliant behaviours included: the social acceptability of noncompliant behaviours; negative attitudes to the tax system; and negative perceptions of the tax authority.

Social Acceptability of Noncompliant Behaviours

One of the intriguing findings of this research was the prevalence of beliefs amongst the HNCs interviewed about the social acceptability of tax noncompliance. For example, the view that it is acceptable to do some cash work to supplement a taxable income appeared to be commonplace. Rationalisations in this regard include: *I need the cash, you're stupid if you don't, and everyone's doing it*.

Attitudes towards the acceptability of tax minimisation were also found to be commonplace. In fact, some see it as their "moral duty" to minimise their tax (or the tax of their clients). Rationalisations in this regard include: *It's smart business practice, it's your obligation to your family to minimise your tax, you look after your own first, and I haven't broken the law*.

Attitudes Toward the Tax System

Attitudes toward the tax system and paying tax are used as a justification for noncompliance.

One of the surprising findings of the research was that most HNCs had no philosophical issues with the concept of paying some tax, in order to fund social services and infrastructure, which seems to be at odds with their noncompliant behaviour. However, despite this belief many expressed dissatisfaction of some sort with the tax system. As might be expected, those most dissatisfied are likely to feel the greatest justification for their behaviour.

More commonly, HNCs believed that the current tax system is unfair, because some people are carrying more than their share of the burden (e.g., salary and wage earners, the self-employed and SMEs), while others are paying nothing, or next to nothing (beneficiaries and the very wealthy). The rationalisation in this regard includes: *It's my money, I worked hard for it, and I need it more than anyone else.*

Others' concerns were in relation to how the tax purse was being spent (e.g., not enough focus on the things that matter, like education and health, and government officials spending money on their own leisure). Some believe that there should not be any sort of personal tax collected, or that tax should be collected only through a value added tax.

Perceptions of the Tax Authority

The HNCs interviewed in this research, although recognising the need for taxation in society, were united by their poor perception of the Tax Authority (the organisation and its staff). At worst, this was expressed as a passionate dislike, and at best, a lack of respect.

As with the attitudes to the tax system and social acceptability of noncompliant behaviours, negative perceptions of the tax authority are also used as a justification for noncompliant behaviours. Most criticisms are levelled at the way in which the organisation conducts itself if there is a question of noncompliance, in particular if it is a heavy-handed approach. This kind of approach was labelled as "**bullying**" and "**predatory.**"

Such perceptions are reinforced by the behaviour of some staff and their accusatory approach, summed up by many as "Guilty until proven innocent" (albeit others are regarded as exemplary in their behaviour). In this regard some HNCs are adamant that the organisation picks on the weak and the vulnerable, rather than focussing on the "big players" (individuals and corporations) who they perceive as getting away with paying little or no tax.

Other criticisms include Inland Revenue's stereotypical government department status, leading it to be described as "bureaucratic", "incompetent" and "slow to act." These same factors also leave the organisation vulnerable to being taken advantage of, and undermine the effectiveness of some of its treatments.

As a consequence of its reliance on technology and mail for communications and transactions, the tax authority is perceived as "faceless." The facelessness of the organisation, like its bureaucratic status, is also viewed as both a pro and a con by different HNC behaviour types. For some, the disadvantages are that it makes the organisation appear to be less approachable and as a result they avoid dealing with their tax issues which eventually spirals into repeated noncompliance. For other HNCs, the facelessness makes it "easier to rip it off."

4.3.3 Opportunities

Opportunities include reactions to Inland Revenue's treatments (including perceptions of the likelihood of being caught and level of concern about the consequences), as well access to enablers.

Reactions to Inland Revenue's Treatments

It is evident from this research that HNCs hold a perception that their treatment has not been effective and may justify further noncompliance. Factors that appear to be undermining the perception of treatments include:

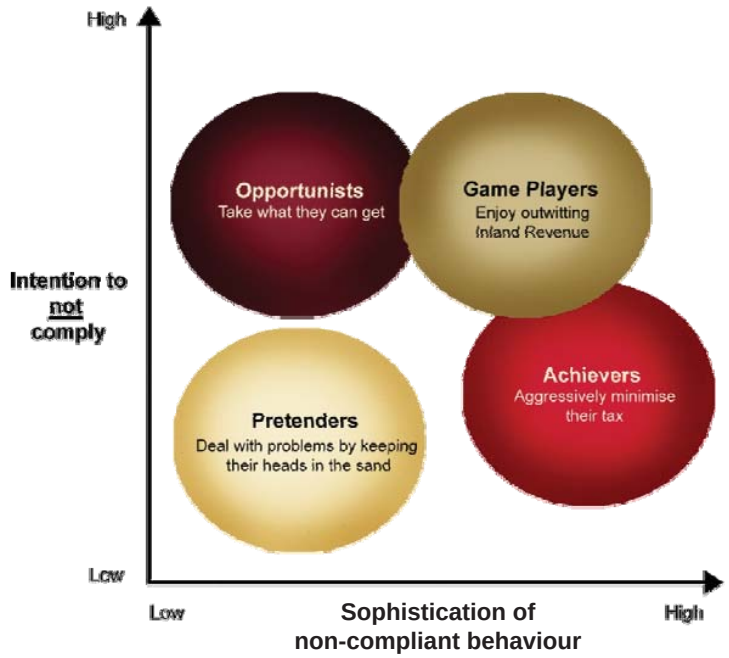
- The length of time it takes for the tax authority to identify noncompliant behaviour.
- The use of automated and impersonal communications (mail), rather than personal contact as soon as the problem has been identified.
- An inability/unwillingness to be flexible and to negotiate solutions (in the best interests of both parties).
- The lengthy delay (sometimes years) between the identification of a problem and its resolution (e.g., compounding penalties and long, drawn out court cases).
- The impact of compounding penalties that have become so enormous (hundreds of thousands of dollars) that it is inconceivable, if not impossible, to ever be able to pay these back.

Overcoming these collective perceptions against the tax authority and compliance is challenging. There may need to be different strategies depending on the particular motivations and intentions of the taxpayer.

4.3.4 HNC Behavioural Profiles

This research identified four behavioural profiles of HNCs, which can be differentiated on the basis of the sophistication of their behaviours and their intention to not comply:

DIAGRAM 1. Four HNC Behaviour Profiles



Opportunists Take advantage of the vulnerabilities and weaknesses of systems and processes. Often enablers, sharing knowledge with others. ▪ Little respect for Inland Revenue and the government. ▪ Take what they get, including taking advantage of IR's weaknesses. ▪ Comfortable being noncompliant, as long as they are below the radar. ▪ Believe they are of little interest to IR, because they are "small fry". ▪ Believe their behaviour is socially acceptable. ▪ May be overrepresented in cash-orientated industries. ▪ Don't use tax specialists; rely on informal enablers (e.g. friends).	**Game Players** A strong desire for business and financial success (to be a winner), general dislike of tax authority and take pleasure in the challenge of outwitting, or pulling one over them. ▪ Long and colourful relationships with IR. ▪ True entrepreneurs (e.g. multiple business interests). ▪ Strong desire for success. ▪ No strangers to IR's scrutiny. ▪ Enjoy outwitting IR. A challenge fuelled by their intense dislike for the organisation and its staff. ▪ See themselves as David up against Goliath, and enjoy the fight. ▪ Aggressive and stubborn.
Pretenders They do not share the same intentions for noncompliance as the other profiles and appear to be contrite and to want to remedy the problem. ▪ Good at their trades, but have irregular incomes and little financial acumen. ▪ Too frightened to approach the tax authority. ▪ Deal with their problems by burying their heads in the sand. ▪ Don't want to fight IR; are contrite, and want to remedy the problem. ▪ Genuinely appreciative of help. ▪ Generally don't use tax specialists, but are potentially vulnerable to the advances of enablers.	**Achievers** Single minded in their objective of minimising their tax liability (or helping their clients to this end) with an *intention* to work within the law. ▪ High profile and successful. ▪ Are either tax specialists, or use them. ▪ Important influencers. ▪ Confident and self-assured. ▪ Are single-minded in their objective to aggressively minimise their tax. ▪ Have little respect for the tax authority, and believe it fails to appreciate the importance of their contribution. ▪ No strangers to tax authority scrutiny. ▪ If need be, will mobilise whatever resources are required to minimise their losses.

4.4 Study 2—Discussion

The *Voice of Habitual Noncompliers* research provides valuable insight into the behavioural profiles of HNCs resulting in an increased understanding of this population. The results of Study 2 supports the literature review in further highlighting the complexity of HNC behaviour and the multifaceted causes interwoven through individual factors, interactions with the tax authority, and social influences.

It is important to note that this research was qualitative in nature (i.e., involved talking in depth to a small sample of respondents) and, as such, its value was in providing an understanding of what makes HNCs tick (e.g., their attitudes, drivers, etc.). The research does not purport to provide a comprehensive understanding of all types of HNCs. Many respondents differed in terms of the richness of information they were willing to provide. This appeared to be primarily based on how comfortable they were with their noncompliant behaviour (i.e., those who could justify their behaviour were the most open to discussing it). In particular, fraud related behaviour could not be explored in detail as they were more difficult to recruit, and those who had ostensibly committed tax fraud who were recruited, were relatively more guarded in talking about this behaviour. It was hypothesised that this may be because of the clearly illegal status of fraud and the negative social opinion of fraudulent behaviour.

Individual factors were clearly linked with HNCs with some exhibiting personality traits consistent with noncompliant behaviour such as grandiose perceptions of themselves and they held cognitions and rationalisations that supported noncompliant activity. In addition, the role that other individual factors play in turning noncompliant behaviour into HNC behaviour was illustrated with one of the HNCs attributing a personal life tragedy as the primary cause of his HNC behaviour. The HNCs' view of the tax administration confirms the importance of these considerations including the proportionality of penalties, timeliness of penalties, and fairness. Some HNCs specifically sought to exploit the grey areas of tax legislation and many felt that tax legislation design was too complicated.

The interviews with HNCs provided further support for the notion that social influences, both direct and indirect, can play a strong role in HNC behaviour. Tax agents known for exploiting the grey areas of tax legislation were seen as invaluable. The "don't ask, don't tell" policy for other intermediaries seems to be the way of doing business. For the less sophisticated HNCs, it was often a family member or other associate who encouraged the noncompliant behaviour. On this basis, HNCs of all types seemed to be heavily influenced by direct influencers.

The HNC interviews also highlighted the significant role that indirect influencers play in shaping HNC behaviour. Some expressed the opinion that tax noncompliance was just part of the industry they were working in. Others explained that 'everyone else is doing it' and that the hidden economy is huge. HNCs referred to the strong role that culture plays in tax noncompliance by relating their experiences with particular immigrant communities that settle in New Zealand and have difficulty with tax compliance. In their previous countries they did not pay tax and this was the norm. The interviews above indicated the strong effect social norms have on the behaviour of HNCs.

The drivers that shape HNC behaviour are complicated—personality traits, tax administration, and social influences are all strongly intertwined. The effective treatment of HNC behaviour requires assessing these different strands on an individual basis and developing treatment strategies that limit the effect of these factors. Whether an HNC's behaviour is due to their personality, their world view, or other events, to successfully intervene requires developing new treatment strategies beyond the current approaches.

5 Study 3—HNC Filers and Payers

5.1 Introduction

Studies 1 and 2 focused on more serious HNCs, but a second wider group also operates: those who repeatedly fail to meet their filing and payment obligations on a regular basis. This second group of HNCs (Tier 2), who are habitually late, are the focus of this study.

5.2 Methodology

Filing and payment compliance information for Goods and Services Tax (GST—a value added tax), Employee deductions (Pay-as-you-earn PAYE), and Income Tax was extracted for individual Inland Revenue Department numbers. The period of analysis covered the 2003 to 2009 Tax Years.

Customers eligible for analysis must have had an "active" status for at least 4 of the 7 tax years between 2003 and 2009. Customers must also have been active in the 2009 Tax Year. Customers who had been prosecuted or who had a shortfall penalty imposed in more than one financial year were excluded from the sample as they would more likely represent Tier 1 HNC and covered in Studies 1 or 4.

Customers were divided into four main categories. The categories, their type of activity and numbers are shown in Table 9 below:

TABLE 9. Categories used in the Analysis.

	GST/PAYE activity over 7 Year period?	Income tax activity over 7Year period?	Number of customers in each category
Sel-Employed	YES	YES/Likely	238,290
Non-Business Individuals	NO	YES	952,521
Business—GST/PAYE	YES	YES/Likely	492,323
Business—Income tax only	NO	YES	266,433

Each customer was given an overall compliance rating based on their filing and paying obligations. A Tier 2 HNC was defined as a person whose overall filing and paying compliance was late 75 percent or more of the time.

5.3 Results

5.3.1 Characteristics of HNCs in Each Category

Table 10 provides a summary of the characteristics of HNCs in the four main categories, based on the analysis of Tier 2 customers.

The table highlights the similarities in HNC characteristics across customer categories. A YES indicates that HNCs in a category are more or less likely to have a particular characteristic.

TABLE 10. Characteristics of HNCs in Each Customer Category.

	Business—GST/PAYE	Business—Income tax only	Non-Business Individual	Self-Employed
More likely to have fewer tax returns	YES	YES	YES	YES
Less likely to be linked to an agent	YES	YES	YES	YES
More likely to be in debt	YES	YES(L)*	YES	YES
Debt value is higher	YES	NO	YES	YES
More likely to have a shortfall penalty	YES	YES(L)*	NO	YES
More likely to be a younger organisation	YES	YES(L)*	N/A	N/A
More likely to have GST income < $80,000	YES	N/A	N/A	YES
More likely to have GST income < $250,000	YES	N/A	N/A	NO
Less likely to have employees	YES	N/A	N/A	YES
More likely to be under 55 years old	N/A	N/A	YES	YES
More likely to be male	N/A	N/A	YES	YES
Personal Income more likely to be under 40K	N/A	N/A	YES	N/A

*Note: Yes (L), means 'Yes'—a little.

HNC characteristics common across all categories were:

- More likely to have filed fewer tax returns.
- Less likely to be linked with an agent.
- HNCs in most categories were more likely to be in debt.
- Debt value tended to be higher.

Additional common HNC characteristics between the Business—GST/PAYE and Business Individual categories were:

- GST Income tended to be lower.
- More likely to have no employees.
- More likely to have a shortfall penalty imposed (although the rate is low, at 3 percent or less of customers).
- Small businesses employing only some of the time have much higher HNC rates in regard to PAYE, compared to those employing regularly.
- HNCs in business categories were more likely to be in debt.

Common characteristics between the Self-Employed and Non-Business Individuals were:

- More likely to be male.
- More likely to be less than 55 years old (i.e., between 26 and 54 years of age).

5.4 Discussion

Within the business sector, small businesses[6] were most likely to be habitually late in terms of filing tax returns and paying tax. This pattern applied to both the Self-Employed group and small businesses with some formal structure (e.g., company or partnership). Small businesses with some structure performed better on GST and PAYE compliance compared to the Self-Employed group.

The results of Study 2 and Colmar Brunton (2004) identified that business owners do not always have the business skills or cash flow to meet tax obligations. This may provide some explanation for higher HNC rates among small businesses. Furthermore, there was a significant link between submitting fewer tax returns and higher rates of habitual noncompliance, which suggests that those with less experience or who don't file regularly are more likely to be late. Similarly, small businesses employing occasionally were much more likely to be habitually late in regard to PAYE returns. This poses the question whether different treatments for irregular filers could be implemented and suggests that more support could be needed for this part of the business sector.

Educational interventions may also be better targeted at certain industries and business structures. For instance, construction and related industries, and agriculture made up a significant proportion of Tier 2 Business individual HNCs (i.e., self-employed). Certain areas may also be better targets for debt recovery as the incidence and value of tax debt was higher among business HNCs when compared with individuals.

The results of Study 3 make it clear that HNCs are present in all forms and types of compliance. Studies 1 through 3 have looked at various aspects of HNCs but an ultimate goal is to be able to identify and intervene early on these types of taxpayers and consequently Study 4 looks at the identification of indicators of habitual noncompliant behaviour.

6 Study 4—Indicators of Habitual Noncompliance and Prediction of HNCs

6.1 Introduction

From Study 1 it is clear that staff knowledge can successfully be used to identify HNCs. However, identifying HNCs in this manner is limited by the motivations and awareness of staff and there may be greater benefit in detecting potential HNCs prior to multiple re-offenses to enable early prevention. Consequently, identifying

key variables or indicators of HNC behaviour would not only allow for the detection of more HNCs but also potentially allow tax administrations to intervene early before behaviours become entrenched. Firstly, study 4 seeks to identify a core group of noncompliers for which indicators of habitual noncompliance can be identified and modelled; secondly, we use the indicators and model to classify other individuals as potential HNCs; and lastly, we test the classification efficacy using experts.

6.2 Methodology

Identifying a Group To Model

As a starting point to exploring analytical identifiers of HNC behaviours a dataset was created from which modelling could be developed. The dataset was created with known points of more serious noncompliance from which a group could be identified to model. This included bankrupts, banned directors, those with audit shortfall penalties, and prosecutions. This group comprised 54,000 individuals (Serious Noncomplier group) with bankrupts (46,000) making up the largest portion. Note that the Serious Noncomplier group was based on an individual's attributes and therefore did not include links to associated entities or the compliance history of associated entities.

This population could not readily be pared down to a core group of repeat offenders so a decision was made to create a core group to be modelled from three sources: those identified by staff in Study 1; those who have been prosecuted as generally only very serious offenders are prosecuted; and those who have had two or more shortfall penalties applied for separate interventions. There was around a 5 percent overlap for these three data sources representing 2,200 individuals (Modelling group).[7]

A range of additional data was extracted for the Modelling group to look for possible underlying attributes. This analysis involved descriptive statistics (Appendix 2), cross-tabulations, and two-way interactions, to draw out underlying relationships in the data. The lack of a single outcome variable was problematic, due to these individuals coming from different datasets with different measures of noncompliant behaviour. In order to produce a single measure for all the Modelling group an index was created by summing multiple variables that related to noncompliance. This method of creating indexes is fairly common practice in the management research methods literature, most typically used when combining Likert scales in surveys to provide an index of similar questions (Currell, Hammer, Baggett, and Doniger, 1999; Driscoll, Appiah-Yeboah, Salib, and& Rupert, 2007; Feyers and Macin, 2000).[8] Combining multiple factors into a single interval (or ratio) variable allows its use as an overall outcome variable.

There were 18 variables included in the construction of this index. To ensure consistency, these were either standardised or recoded to an ordinal variable before summation. These 18 variables were:

- Total number of audits
- Gender (male = 1)
- Age strata
- Prosecutions
- Audit discrepancy total
- Shortfall penalties value
- Link to liquidated company
- Client status not active
- Debt write-off total
- Current days in debt
- Current total debt
- Voluntary administration
- Beneficiary
- Loss returns
- Loss amount
- Donations
- Number of agents
- Address changes

On inspection, the distribution was very right skewed so a natural log was taken. This transformed variable approximated a normal curve sufficiently to fit a general linear model. The sum total of these variables was therefore transformed LnINIndex = Ln(1+INIndex).

6.2.1 Variable Reduction

To reduce the number of variables a general linear model was fitted to the LnINIndex. After some exploratory analysis was undertaken on a range of variables and factors the number of indicators were pared to

six predictor variables (fitted as factors): Bankruptcies, shortfall penalties (NoSFP), write-offs, aAnonymous information, tax types associated with agents (NoTaxTypes), and current Debt elements. Note: These were not the exact same variables used in construction of the LnINIndex, but essentially a combination of other variables, as broad as possible, both qualitative and quantitative, combined to give an overall 'score' of the data. These were all highly statistically significant, and the overall model is highly significant, *indicating* reasonable predictive ability. This model was trained on the original 2,200 Modelling group. The model developed was:

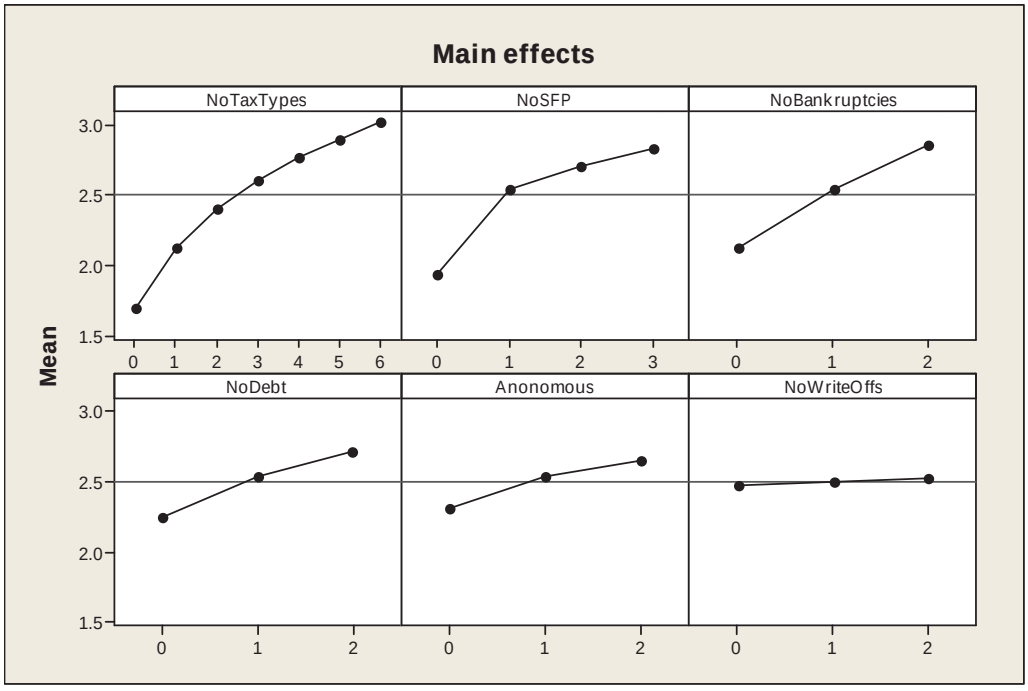
Ln(1+INindex) =

$$(coef_1(Taxtypes(i)i =_0^6) + coef_2(NoSFP(i)i =_0^3) + coef_3(No\ Bankruptcies(i)i =_0^2) + coef_4(No\ Debt(i)i =_0^2) + coef_5(ANON(i)i =_0^2) + coef_6(No\ WriteOffs(i)i =_0^2)).$$

To determine the robustness of this model, the same model was fitted on the Serious Noncomplier group. The model was statistically significant, both the overall model and each of the component F tests, for each of the explanatory factors. Some 93 percent of the variation in the data was explained by the model, so that the overall predictive ability of the model is good. This means it is reasonable to take these indicators and use them to predict potential HNC individuals within the overall data.

Figure 3 shows the main effects of each of the fitted factors on the Serious Noncomplier group. A main effects plot represents the change on the overall (grand) mean given each level of each of the factors *if everything else is held constant.* This is based on all of the Serious Noncompliers, and shows the effect on the overall mean for each of the levels of each of the factors, one at a time; holding all other factors constant. The graph shows the increasing effect on the transformed index is increasing for each of the factors.

FIGURE 3. Main Effects Plot



6.2.2 Identifying Potential HNCs

To further validate this model, and as a quick method to determine potentially other HNCs, the Modelling group subset were flagged, and a discriminant function analysis was performed on the Serious Noncompliant group using the same predictor variables used in the model.

Table 11 displays the discriminant function (DFA) classification matrix. The results showed only a 12 percent misclassification rate with 47,756 classified correctly. This also suggests a further 6,000 (Potential HNC group) entities that are similar to the Modelling group and therefore potential HNCs.

TABLE 11. Classification by Model: Misclassification Rate

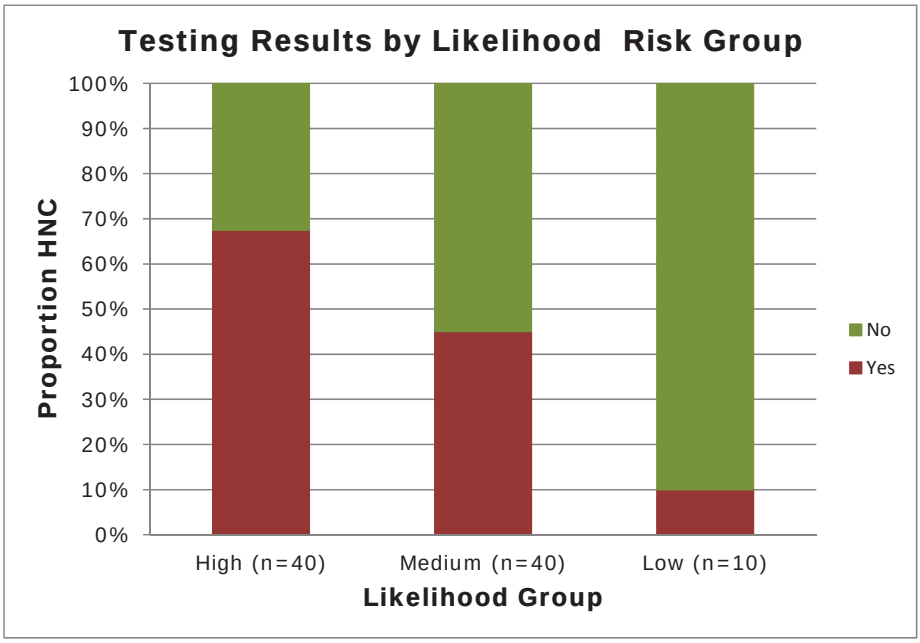
	Serious Noncomplier (SNC) Group		
	Balance of SNC Group	Modelling Group Subset	
DFA Modelled/ Original SNC Group	No	Yes	Total
No	46,083	545	46,628
Yes	6,027	1,673	7,700
Total	52,110	2,218	54,328

6.3 Model Testing

To assess the model's usefulness, the model was tested through selecting a stratified sample of the Serious Noncomplier group to see how well the model fits according to expert opinion. Ninety individuals were selected across the fitted value range from which investigators would review and evaluate (by filling in a template) whether the individual was likely to be a HNC or not. This comprised 30 high likelihood and 40 medium likelihood from within the 6,027 of Table 11 and 10 low likelihood that were not predicted to be HNCs. Additionally there were 10 high likelihood that had high-fitted value scores but who were not within the 6,027. The Modelling group of 2,200 was excluded from the test population given they had been used to model the data.

To determine whether an individual was a HNC, investigators were asked to spend 1-2 hours assessing an individual's audit, debt, and filing history as well as their interaction with the tax authority and complexity of business operations. Summary results are presented in Figure 4 and show that over 65 percent of the high likelihood were considered HNCs whereas 45 percent of the medium and just 1 out of 10 of the low. Overall the model predictions and investigators' classifications had a reasonable fit.

FIGURE 4: Model Testing Results



Analysis of what characterised the classification of a HNC and not HNC was additionally undertaken, and notably it was observed that:

- Taxpayers who are slow to respond within audits, who have a poor attitude towards Inland Revenue and fail to respond in a timely manner, were more likely to be judged a HNC.
- A significant characteristic of HNC individuals was that they were more likely to not file tax returns when required and are uncooperative and/or fail to meet repayment schedules in regards to debt.
- People who have abused processes like bankruptcy and liquidation in order to continue income production or avoid prosecution are highly likely to be HNC taxpayers.

The experts were also asked to classify the HNC individuals into the behavioural typologies identified as part of the qualitative interviews of Study 2—Voice of the HNC (see HNC Behavioural Profiles subsection). Those placed in a typology most were identified as Opportunists (55 percent) and Pretenders (30 percent). This is unlikely to reflect the proportion of all HNCs, given the data used were less likely to identify Achievers or Game Players.

6.4 Study 4—Discussion

This study represents exploratory analysis undertaken to identify indicators of HNC behaviour and potential HNCs. It was found that the combination of six ordinal factors can go some way to characterising habitual noncompliance and HNCs. These six indicators were: Shortfall penalties, number of write-offs, number of debt elements, number of bankruptcies, number of tax types linked to an intermediary, and number of pieces of anonymous information held on the taxpayer. Expert assessment judged that 60 percent of those predicted by the model to be HNCs were HNCs. Given that this represents the first modelling iteration, and that there were limitations on the data available for both prediction and assessment, this is a very positive result.

There are a number of limitations to this data and analysis. Firstly, the data are based on information associated with an individual taxpayer. Where noncompliance and other concerns are associated with tax entities that the individual HNC controls (i.e., companies and trusts) this analysis is less likely to have identified them. Secondly, given the nature of the data available, it is likely that the model identified certain classes of HNCs (such as defaulting noncustodial parents on child support payments) to a greater extent than other classes of HNCs. Thirdly, a number of the variables were 'current' data and did not include the history or pattern of noncompliance. Lastly, Study 1 indicated the relevance of data sources outside the tax authority, such as offences against other government agencies, but these were unable to be included.

In the model testing through experts there were a number of methodological and data limitations, which meant that the percentage of HNCs in the group is possibly higher. For example, in a number of instances there was little information held on the individual and their behaviours within systems and therefore they were judged to not be a HNC. Also, in reviewing some of the investigators' notes on individuals judged not to be a HNC, it was apparent that the assessment was made due to the low value of offending rather than the behaviours exhibited that were recidivist in nature.

The best predictor within the model developed was the number of different tax types that are linked with an agent. This raises a number of questions regarding the role that agents and intermediaries play, as well as potential temporal aspects. For instance, is the recidivist behaviour occurring in part due to the influence of the agent or does the use of an agent occur after repeated noncompliant interventions, that is, is it an antecedent or more often a consequent?

All research has limits, but even within the boundaries of the data and analyses undertaken the model developed was reasonably effective at identifying certain classes of potential HNCs. Additional information could be used to improve the model, such as factors representing a continued opportunity and temporal factors like recency of offending. There is wide scope for future endeavours to take the indicators and modelling of HNCs further through: more indicators including opportunity, links to noncompliant entities, and data from other government agencies; developing additional models and applying other statistical techniques; and actively identifying HNCs as part of ongoing business processes.

7 Overall Discussion and Implications

The HNC research project improves the understanding of the HNC issue by consolidating experiences on the topic and by exploring the causes of their behaviour. Analysis of the sample of HNCs provided insight into their motivations, behaviour, and strategies. The research confirms that the HNC population is a high tax risk population and has many complexities—some of which appear able to be modelled through statistical procedures.

The extent of the noncompliance committed by HNCs is difficult to measure. Firstly, much of the noncompliant behaviour of HNCs is hidden from tax authorities. They often engage in nonfiling, underreporting, non-payment, and fraud. Secondly, HNCs are often described as "conscious opponents" (i.e., their noncompliant behaviour adapts and evolves over time based on what they learn from their interactions with the tax authority and others). Their actions often reflect a wilful intent to be noncompliant and in many instances they align themselves with aggressive tax advisors or they are tax specialists themselves.

Most tax authorities do not appear to have an organisation-wide approach to identifying HNCs or to managing the tax risks posed by HNCs. HNCs are not necessarily viewed as a separate population, rather, anecdotally they are known as the worst of the worst taxpayers. As a result staff members involved in compliance interventions with HNCs may handle them on an individual and reactive basis rather than in a coordinated manner.

The common link among HNCs is their repeated noncompliance. The high level findings of the HNC research adds to this understanding by showing that HNC behaviour may be caused by personality and internal cognition, tax administration factors, opportunity, and by both direct and indirect social influences. HNC behaviour often overlaps among one or more risk areas (High Wealth, Aggressive Tax Planning, Property, Hidden Economy, Debt, etc.).

Aspects that may cause habitual noncompliance, like personality and cognition are beyond most tax authorities' operational mandate to "fix." Yet an awareness of these dispositions may assist with HNC identification and should be taken into account when designing treatments. Other factors, such as opportunity (which can be limited by tax authorities) or social influences (which can be shaped by tax authorities), can be targeted to limit the HNC risk. In this regard recognition of HNCs as a risk population will enable tax authorities to more effectively manage noncompliance across multiple risk areas and to direct the appropriate interventions.

The HNC research involved the completion of a number of related projects to identify potential HNCs and to analyse their behaviour. Study 1 found that a proportionally small number of HNCs produced the majority of revenue losses. These HNCs were linked with more entities, were noncompliant across multiple risk areas, and used more strategies to be noncompliant. Many of the HNCs were identified as re-offending within one year while using the same or a similar method of noncompliance. Study 4 identified further potential HNCs and Study 3 identified considerably more habitually late payers and filers.

Some HNCs are identifiable within tax authority systems and some will be operating outside the system. What this research has demonstrated is that HNCs could be identified through:

- collecting information concerning HNC behaviour identified by staff,
- by analytical models,
- social network analysis, and
- by exchanging information with other government agencies regarding noncompliers.

Additionally, HNCs could be identified through a random audit programme or through enhanced post audit compliance checks.

The nature of HNC behaviour requires a multi-pronged approach to their identification. Since habitual noncompliant behaviour occurs repeatedly over time, one implication of this research is the development and maintenance of a central registry which would enable tax authorities to preserve institutional knowledge, to

analyse the known HNC population, to operate more efficiently, and to limit the HNC risk. However, such a registry would be subject to legal and privacy considerations.

Each HNC poses a different level of risk. The research indicates that HNC behaviour varies in its sophistication, intent, and impact on revenue collection and tax administration integrity. For instance, HNC behaviour ranges from nonfiling (unsophisticated but which could still be responsible for any range of revenue at risk) to more sophisticated operations involving numerous entities and aggressive tax planning. Some HNCs operate in isolation while others are promoters. Some are tax specialists themselves while others act as tax advisors and enable others into habitual noncompliance. Furthermore, based on their words and attitudes, the HNCs exhibited differences in their capability to be noncompliant, their ability to influence others to be noncompliant, and their remorsefulness for being noncompliant.

As a result of this variation, tax authority response to the risk should match the level of risk posed by the HNCs and seek to address the causes where practicable. To name a few examples, risk assessment and prioritisation could be based on previous compliance history and engagement with the tax administration, sophistication of operations, intent, size or potential size of social networks, likelihood of increased activity, likelihood of recovering lost revenue, judgment of remorsefulness, and amount of tax revenue at risk.

Monitoring could be used as a form of on-going risk assessment. The HNC research indicates that HNCs often repeat their noncompliant behaviour soon after interventions and in many situations they use the same or similar tactics. The monitoring of identified HNCs could be either direct and/or indirect. Direct monitoring (active monitoring) would be applied to the most severe HNCs and would include ongoing supervision by staff while indirect monitoring means the HNC's activities are passively monitored through the likes of system tools. The level of monitoring reflects the potential risk and therefore priority of the HNC.

HNCs, by their definition of repeated noncompliance, require an alternative intervention strategy. In some instances, the only successful intervention may be to control their opportunity for noncompliance through ongoing direct or active monitoring and audit activity. In other instances, the appropriate response may be providing education in regard to taxpayer obligations.

A robust analysis of HNC behaviour is crucial to selecting an appropriate and effective intervention response. Besides varying in the sophistication of their activities, HNCs also vary considerably in regard to their intent. Some HNCs refuse to pay tax because they see it as a game or because they question the legitimacy of the tax administration. They adjust their behaviour to maximise noncompliance as they learn from their interactions with Inland Revenue and others. Other HNCs appear to have become noncompliant by accident, either because of poor business acumen or because of a personal situation or emergency. The *Voice of the HNC Research* (Study 2) illustrates these differences by classifying the HNCs they interviewed into four categories based on factors of sophistication and intent. The variety of HNC behaviour and the range of strategies they use suggest that an assortment of interventions may be required to successfully limit the tax risk of HNCs.

Since HNCs continue to be noncompliant despite interventions, it is necessary for tax authorities to develop and consider new treatments to limit the negative effects of their noncompliance. Interventions will have to be continuously tested, refined, and evaluated. Possibilities include reducing opportunity through tax system and legislative changes, targeted messaging that appeal to specific cognitive perspectives, and providing business and tax obligation education to those who could benefit by it.

For instance, additional reporting requirements for serious HNCs could:

- help to better understand noncompliance activities and to improve the assessment of them;
- encourage HNCs to be compliant since the costs for noncompliant activity will be ongoing; and
- reassure the public that Inland Revenue is focused on the significant noncompliant taxpayers and re-offending will not be tolerated.

Overall, a positive outcome will be seen in an increase in tax revenue received from HNCs and it will also be seen by improvements in registration, rates of filing on time, accuracy of reporting, claiming what they are entitled to, and paying the correct amount on time. While the rate of return for investigative discrepancies will

be important, additional measures will need to be developed to ensure overall compliance behaviour is measured. This is particularly important since effective treatment results in compliant taxpayers and reductions in the traditional measure of audit discrepancy.

The goal of the HNC research project, being exploratory in nature and action research focused, is to ultimately turn these findings into implementable organisational processes to reduce the negative impact of HNCs. However, given the knowledge gap between HNCs in the tax context, and recidivism knowledge in the criminal context, there is extensive scope for further research initiatives that extend what was undertaken in Studies 1-4. This includes moving beyond identification and prediction into various treatments of HNC behaviour and measuring the effectiveness of these interventions.

8 Appendix 1. Key Indicators of Noncompliance

The key indicators of noncompliance derived from a review of the literature review summarised in Table 12.

TABLE 12

Individual Factors		
Area	**Key Indicators**	**Description**
History & Habit of Noncompliance	Frequency, recency, & extent of noncompliance against: • Tax Authority • Other Government Departments & Agencies • Other laws • Society in general	A history of noncompliance is reported to be a reliable and robust predictor of future noncompliance (Withers, 1984; Weisburd, Chayet, and Waring, 1990; Worthington, Higgs, and Edwards, 2000; Ratcliffe, 2008). Weissmann & Block, (2007) report recidivism rates for fraud and theft offenders with a criminal history exceeds 50 percent.
Personality	• Lack of remorse • Lack of empathy • Manipulative • Desire to win • Grandiose sense of self-importance • Sense of entitlement • Low social conscientiousness	Current evidence suggests that personality and specific traits are increasingly been seen as an important element in criminality and noncompliant behaviour (i.e., Listwan, Piquero, and Voorhis, 2010). Personality factors of increasing intensity define characteristics of social problems including tax noncompliance (Paulhus and Williams, 2002).
Cognitions Refers to mental processes such as thinking, knowing, remembering, judging, problem-solving, perception and planning.	• Denial of harm • Belief that laws are unjust or even unnecessary • Business or individual survival • 'Everyone else is doing it' • Expectations of others • Deserve the money • Contempt	From a HNC perspective cognitions incorporate values, attitudes, beliefs, rationalisations, and a personal identity that is favourable to compliance or noncompliance (Andrews and Bonta, 2010). Research in the tax specific domain has generally found a consistent but weak link between attitudes and self-reported evasion (Kirchler, 2007). Taxpayers can adopt many rationalisations to allow them to maintain a positive self-image while engaging in noncompliance (Coleman, 1987).
Other Individual Factors	• Addictions including gambling, alcohol, and drug habits • Relationship problems • Business performance • Personal philosophies	Personal and business issues have an impact on compliance behaviour. Such individual and circumstantial factors are dynamic and their influence varies (Andrews and Bonta, 2010).

TABLE 12—Continued

Tax Administration		
Area	**Key Indicators**	**Description**
Fairness	Aspects of fairness including: • Distributive • Procedural • Retributive—such as are others penalised for transgressions	Taxpayer perceptions and beliefs regarding fairness are closely related to inclinations and/or justifications to not comply with tax obligations (Wenzel, 2003; Braithwaite, 2003; Kirchler and Holzl, 2006; Murphy, 2004). Perceptions of fairness are specific forms of tax cognitions developed in the interplay between the individual, tax administration, and other social influences.
Opportunities & Controls	• Internal tax processes & controls • Governance • Tax knowledge & skill to pay the right amount at the right time • Tax knowledge to exploit vulnerabilities, legislation, as well as systems & processes • Opportunities available (i.e., cash transactions) • Use of our systems and processes against us (delaying tactics, complaints, publicity exercises, etc.)	Within the tax literature, opportunity to not comply has consistently been found to be the most important determinants of noncompliance (Kirchler, 2007). Opportunity has been consistently identified across jurisdictions using various research methodologies (e.g., Webley, Cole, and Edijar, 2001), surveys (i.e., Warneryd and Walerud, 1982; Porcano, 1988), and patterns of convictions (Wallschutzky, 1984). Opportunities for noncompliance also arise from personal or business internal tax processes and governance systems, including tax knowledge and ability to pay the right amount of tax at the right time.
Rewards, Consequences & Deterrence	• Length of time undetected • Frequency and expediency of consequences • Prior rewards greater than consequences • Prior consequences greater than reward (creating defiance)	Consequences for noncompliance serves two purposes—a general deterrence to prevent others offending, and provision of consequences for undesirable behaviour (Weissman and Block, 2007). Poor delivery of consequences and punishment may lead to an increase, in HNCs rather than a reduction (Andreoni et al., 1998). Defiance towards tax compliance may increase following enforcement if there are perceptions of unjustness or unfairness about the application of penalties and this may promote further offending (Sherman, 1993).
Social Influences and Compliance Norms		
Area	**Key Indicators**	**Description**
Direct Influencers	Enablers that influence, facilitate, and educate noncompliance: • Family and friends • Associates / gangs / organised crime • Professionals (i.e., influential accountants & advisors) • Subculture • Celebrities	Direct influencers are those within the social environment who have a more explicit impact on a taxpayer's behaviour. Associates who are noncompliant may provide both the opportunities to learn techniques and practices to be noncompliant, and promote associated attitudes and rationalisations (Andrews and Bonta, 2010). Noncompliance can be a learned behaviour. Enforcement may also create a greater alliance with noncompliant associates than with compliant references (Braithwaite, 2009). If the immediate social environment of a noncomplier supports noncompliance, then HNC activity is more likely to occur.
Indirect Influencers	• Industry norms • Culture • Social norms	The term 'indirect influencers' refers to social influences that are less represented by individuals, and more by groups and social values in general. Such influencers include national and local cultures, industry and political messages, and prevailing social norms. There is evidence that within industries illegal practices spread from one organisation to another by the dispersion of motivations and rationalisations, as well as specific techniques to enable noncompliance (Coleman, 1987). Taxpayers are also strongly influenced by their perceptions of the compliance of other taxpayers (Frey and Torgler, 2007).

9 Appendix 2. Exploratory Data Analysis of the Modelling Group

The 2,200 Modelling group were examined for age, gender, and a selection of other attributes. Categorical (underlying ordinal) variables were: number of debt elements (recoded), number of write-offs, anonymous information, shortfall penalties, number of audits, tax types, category of taxpayer and bankruptcies were all examined along with location, gender and age group. Cross tabulations were used to discover underlying relationships in the data, thus providing an indication as to what combinations may be drivers for HNC behaviours.

TABLE 13. Age

Age Group	Number	Percentage (%)
Unknown	258	11.6
<30	43	1.9
30-40	242	10.9
40-50	612	27.6
50-60	649	29.3
60-70	347	15.7
70+	67	3.0
Total	**2,218**	**100**

Clearly, age is clustered around the 40-60 age group.

TABLE 14. Gender

Gender	Number	Percentage (%)
Male	1,612	72.7
Female	388	17.5
Unknown	210	9.8
Total	**2,218**	**100**

Males outnumber females by 4 to 1. This is very inconsistent with the general population. As the data werecoded from prefix to name (such as Mr, Mrs, Ms) not all could be coded to gender (such as Dr).

TABLE 15. Write-offs (Recoded)

Write-offs	Number	Percentage (%)
None	1,046	47.1
One	161	7.3
Two or more	1,011	45.6
Total	**2,218**	**100**

The original variable for write-offs is extremely right skewed, and the recode shows around half have not had write-offs. The category two or more includes all multiple write-offs, some into hundreds. This U-shaped distribution is interesting (as the result of truncation of the right-skewed distribution), in that it quite effectively dichotomises those who have and those who have not had write-offs.

TABLE 16. Anonymous Information

ANON Information	Number	Percentage (%)
None	2,050	92.4
One	131	5.9
Two or more	37	1.7
Total	**2,218**	**100**

This shows how rare an event anonymous information is, even for this population.

TABLE 17. Shortfall Penalties (Recoded)

Shortfall Penalties	Number	Percentage (%)
None	954	43.0
One	135	6.1
Two	884	39.9
Three or more	245	11.0
Total	**2,218**	**100**

A high percentage have two shortfall penalties, but this drops off for three or more. The Modelling group was in part selected from those who had two or more shortfall penalties which explains these proportions.

TABLE 18. Tax Types [with Agent] (Recoded)*

Tax types	Number	Percentage (%)
None	528	23.8
One	181	8.2
Two	394	17.7
Three	378	17.0
Four	241	10.9
Five	128	5.8
Six or more	368	16.6
Total	**2,218**	**100**

*Tax types represent the number of tax types linked to an agent.

Tax types have a classic beta distribution (ignoring the zeros) that is right skewed, with the rise in the six or more category accounted for by the truncation of the tail. There are sufficient numbers in each category to fit as a factor. Tax types refer to the number of tax types linked to a tax agent or intermediary. As a result of this, those with a higher number of tax types (linked to an agent) could be considered to be more complex in their tax affairs, which is why this was considered to be a proxy for complexity.

TABLE 19. Bankruptcies (Recoded)

Bankruptcies	Number	Percentage (%)
None	1,559	70.3
One	603	27.2
Two or more	56	2.5
Total	**2,218**	**100**

It would appear bankruptcies are almost as rare an event as anonymous information, again even in this population.

TABLE 20. Debt (Number of Current Debt Elements) Recoded

Debt Elements	Number	Percentage (%)
None	1,568	70.7
One	370	16.7
Two or more	280	12.6
Total	**2,218**	**100**

Debt is another relatively rare event, although not as rare as either anonymous information or bankruptcy.

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Endnotes

[1] Strings searched were "habit," "recid," and "repeat."

[2] A "balance due" account occurs when the taxpayer has an outstanding liability for taxes, penalties and/or interest.

[3] Approximately 900 taxpayers are in the MDD programme, and they are made aware that they have been placed in the programme.

[4] The *Our compliance focus—helping you get it right* document is Inland Revenue's annual publication that is externally released. It details current compliance issues and focus themes, and advice on how taxpayers could maintain and improve their tax compliance. Refer to: www.ird.govt.nz/taxagents/compliance/focus/.

[5] Elicitation techniques utilise a semi-structured question and answer approach. Responses, therefore, tend to be at a rational level. Enabling techniques used in this research included photo sorts (animals and people), which were used as a projective device, in order to provide greater depth of response, including at an emotional level.

[6] In relation to both lower business income and no employees.

[7] The overlap is relatively small due to two factors: 1) individual taxpayer data were used, which did not include links to entities, and much of the recorded noncompliance is at a tax entity level; and 2) often shortfall penalties or a prosecution is applied but not always both.

[8] Also see http://en.wikibooks.org/wiki/Social_Research_Methods/Indexes,_Scales,_Typologies retrieved 19/03/2012.

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4

The Tax Implications of Business Complexity

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Development of Financial Products Business Rules Using Business Intelligence Technology

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In recent years there has been growing concern with the financial and tax compliance risks associated with use of complex financial instruments by large companies. The increasing complexity, sophistication and aggressiveness of these arrangements make them more difficult to detect using traditional return scoring and screening techniques, and also make it more important that the Internal Revenue Service (IRS) find improved methods for risk detection in this area. This paper discusses the Large Business and International Division of IRS (LB&I) use of advanced technology and availability of electronic data to improve risk identification and return selection for corporate taxpayers who are involved in these transactions.

The target audience for our paper is LB&I upper management. The message of our paper is that the Financial Products Filter Model can successfully be deployed as a production model for return selection. Two key algorithms developed for the Financial Products Filter Model can improve the performance of other LB&I filter models. The first algorithm consolidates the risk selection filter results from multiple IRS forms attached to the corporation's tax return. The second algorithm weights results from multiple risk assessment rule sets based on risk scores and the number of filter hits.

The Financial Products Filter Model will be combined with the results of other filters—such as international (Forms 5471, 5472, 8858) issues, partnership (Form 1065) issues, and 1120 Schedule M-3 issues—to arrive at a final risk assessment selection.

Why Financial Products Filters?[1]

The issues examined by Financial Products Specialists are among the most complex transactions encountered by the IRS. Complex Financial Products are used in every industry both domestically and internationally and are also used by wealthy individuals. In many cases Financial Products are at the heart of tax avoidance schemes. These schemes frequently attempt to use U.S. pass-through entities (disregarded entities, trusts, partnerships, and S corporations) and/or foreign entities in order to disguise the transaction or to attempt to gain a technical advantage. Issues examined by the Financial Products Team include: structured transactions (CARDS, BOSS, and Son of Boss), debt/equity issues, and foreign currency transactions. Financial Products Specialists also work in concert with other specialties within the IRS; such as International Examiners and Economists. One such issue that is often worked jointly between the Financial Products specialists and the International Examiner is a foreign tax credit generator transaction. The Financial Products specialists examine derivative instruments involved in these transactions, leaving the international law aspects to the expertise of the international examiners.

The LB&I Financial Products Specialist (FP) program and LB&I Planning, Analysis, Inventory and Research (PAIR) saw the need to develop a set of business rules to assist Case Managers and Financial Products Specialists to select suitable returns for examination by the FP program. With accurate business rules results, FP team managers would have one more tool in their arsenal to identify features of returns that require FP Specialists support. Other benefits include; improved risk identification, increased consistency in FP specialists involvement, improved capabilities to forecast FP specialists resource needs, and better use of FP specialists resources.

History of Financial Products Rules

In 2005, a team comprised of Financial Products specialists and LB&I Research analysts developed the Financial Products business rules using both SEC Form 10-K and tax return data. The rules were applied to

returns filed in processing years 2000, 2001 and 2002. The resulting hits were compared against issues raised by FP specialists in completed examinations. The team concluded that the rules identified LB&I cases with potential FP issues but did not identify the specific FP issues.

In 2009, PAIR was requested to revisit the Financial Products business rules with the goal of identifying productive returns for the program. A team of Financial Products Subject Matter Experts (SMEs) and Program Analysts (Analysts) from PAIR was formed to revise the prior financial product business rules and to suggest new rules. Each of the SMEs have over 10 years experience as a Financial Products specialists and enjoy a reputation of being leading experts in their field. The new rules were designed to respond to either tax law changes or enhanced data capture by IRS. We started with Form 1120.

Form 1120 Financial Products Rules

The Form 1120 Financial Products Rule Set was transformed from the steps an experienced Financial Products Specialists performs in putting together a risk assessment of an entity. These steps may include reading the SEC Form 10-K, looking for certain key words, performing comparisons between tax years, calculation of ratios and certain key statistics, such as implied interest rates and reviewing related party returns.

The Financial Products business rules by themselves cannot replace the intuition and experience of a Senior Financial Products Specialist. They can, however, narrow the population of returns that the specialists review so that they can select productive returns for examination.

The Form 1120 rule set was divided into many smaller rule sets according to form type. These form types included the Form 1120 itself, Schedule M-3, Form 5472, Form 8858, Form 8858M, Form 8886, Form 6781, and Form 8916A.

Initial Strategy

The SMEs and Analysts followed seven initial steps:

1. Updated existing or created new business rules for the tax year under study.
2. Assigned a risk level to each of the business rules.
3. Built Financial Product business rules on Blaze Advisor.
4. Ran each business rule separately on each tax return form analyzed to validate the rules using sample returns to test validity.
5. Aggregated risk scores across tax return forms to determine the "Highest Risk Return."
6. Selected a sample of returns to test the validity of the aggregate risk scores [the 1120 Financial Products Rule Set].
7. Sent information reports to the field for feedback.

Tax Return Forms Analyzed

- Form 1120, *U.S. Corporation Income Tax Return*, reports a corporation's income, gains, losses, deductions, credits, and income tax liability.
- Schedule M-3 reconciles financial net income (loss) of a corporation to the taxable income on Form 1120, Page 1, Line 28.
- Form 5472 is an information return of a 25% Foreign-owned U.S. Corporation or a Foreign Corporation Engaged in a U.S. Trade or Business.
- Form 8858 is used by U.S. Corporations that own a foreign disregarded entity (FDE) directly, indirectly, or constructively.

- Form 6781 is used by taxpayers that report gains and losses on Section 1256 contracts under the mark-to-market rules and under Section 1092 from straddle positions.
- Form 8916A is a supplemental form for Schedule M-3 to provide detailed information for cost of goods sold, interest income, and interest expense.

Business Rules and Risk Score

The SMEs reviewed the prior Form 1120 rules and discarded some rules, modified other rules and added new rules. The decisions made by the SMEs were principally based on their professional judgment, years of experience, and audit results by issue. We also relied on SME experience to assign an initial risk score to each of the business rules.

The risk score is based on a risk formula calculated to determine if the rule was a "hit". For example, if we calculated the debt/equity ratio for a specific taxpayer, the risk score would be based on the debt/equity ratio hypothetically as follows:

Debt / Equity Ratio	**Risk Level**
>5 and < 10	1
>= 10 < 20	2
>= 20 < 30	3
>= 30 < 40	4
Over 40	5

In this example, the major issue we are concerned with is inbound financing transactions where the U.S. subsidiary pays material interest payments to a foreign parent, which offsets all or most of their U.S. taxable income. The issue is whether the interest payments are disguised dividend payments.

Initial Run of Each Form Rule Set

A Form rule set is the collection of analytical business rules developed to analyze a tax return form. Once the initial Form rule set was completed, the rules were input into Blaze Advisor. Each Form rule set was applied separately to validate the rules for that particular form. To validate the Form rule set, the scores for each business rule were summed together to arrive at the highest risk return.

This Financial Products risk assessment model generated a report that consists of a summary page, a listing of corporate returns ("hits") that are ranked by risk scores (categorized by "High Risk," "Medium Risk," "Medium-Low Risk," and "Low Risk") and risk level definitions. The summary page contained statistical information regarding number of hits, and risk score distribution, using bar and pie charts to present the statistics of filter hit distributions.

PAIR then selected sample returns that were scored high, medium, and low to forward to the SME for filter validation. The SMEs performed their normal risk analysis on each of the returns. They were not told which of the returns were scored high, medium, or low. They recorded whether or not the return should be selected for examination.

Some of the rules were working as expected and no further action was taken. That is, the SMEs would have recommended the returns ranked "high" as suitable for examination and the returns ranked "low" as not suitable for financial products involvement. Other business rules required adjustment to either the rule formula or risk score.

Combining the Form Rule Sets To Identify the Highest Risk Returns

Once each of the Form rule sets was validated as working correctly, the Form rule sets were combined into one rule set in Blaze Advisor. The rule set was applied to the entire LB&I filing Form 1120 population, and all

returns were ranked by summing the risk scores for each individual rule. The result was a ranking of all LB&I returns from highest to lowest risk score.

Once again, sample returns were selected for "high," "medium," and "low" risk scores and forwarded to our SMEs for review. A problem became immediately apparent in looking at the overall results. The SMEs were not always in agreement with those returns marked high risk versus those returns marked low risk. There were numerous instances where the SMEs would have given a return marked low risk a higher ranking based on their risk assessment of the return.

The problem was in combining the Form rule sets into one financial products rule set. When the Form rule sets were combined, those Form rule sets that had fewer rules were dominated by the rule sets with numerous rules. Those rule sets with many rules sometimes were identifying the same issue using different ratios or calculations. Other issues were identified by just a single rule.

To make sure that all issues contributed equally to the overall risk score of a taxpayer, each rule was given a weight. The filter weight solved the problem of one Form rule set skewing the overall results. The weighted results gave us a higher percentage of returns ranked high that had positive filter hits from the Form rule sets with fewer rules.

For example, the following filter hits were scored and weighted:

Filter	Rank	Weight	Filter Score
A	3	2	6
B	5	1	5
C	1	4	4
D	2	5	10
E	4	1	4
Total Return Score			29

In the above example Filter D has a higher probability of contributing to the overall risk assessment of the entity than Filter B because the raw score of D is weighted five times more than Filter B.

After the introduction of weights, a review of sample tax returns by the SMEs revealed that the overall results were in line with expectations. That is, the SMEs would recommend for examination those returns ranked "high" and the returns ranked "low" as not suitable for financial products involvement. The assignment of weights to each of the rules solved the problem in combining the Form rule sets.

Information Reports to the Field

Information reports were sent to the field using Microsoft Reporting Services. We selected returns in Status 10[2] that were deemed "high" or "medium" risk for field delivery.

The Information Reports were delivered to case managers through email. The reports contained a table of contents listing each filter that was a positive hit. Each filter is then discussed, listing the purpose of the filter and audit technique suggestions. The "purpose of the filter" and "audit techniques" were drafted by the SMEs based on their years of experience working the same issue. The report did not contain any information on how the return was selected, such as risk score, risk level, or risk formula. The SMEs did not want to taint the Financial Products Specialists' view of the significance of the issue by providing these statistics.

Field Feedback

A survey was sent to Financial Products Specialists requesting feedback on the usefulness of the Financial Products Information Report for risk assessment purposes. Based on the number of responses received and the comments made by the Specialists, the Information Reports proved to be a valuable resource in performing the risk assessment phase of the examination.

The Specialists believe that the risk assessment is a quality document that will assist them in developing their audit plan and in more quickly identifying key audit issues. The project allows the Service to leverage the expertise of experienced financial products specialists (SMEs) in working with financial product issues. The SMEs also indicated that the Financial Products Information Report will expose issues to other financial product specialists who may not be familiar with a particular area. Example comments received from the field were:

1. "The report was useful in identifying the Financial Products potential audit areas. It showed the applicable Internal Revenue Code sections and other guidance."
2. "As always, I find the risk report very useful at the beginning of an examination. It indicates potential areas for audit."
3. "The topics covered by the Risk Report were interesting and offered me additional insights as far as possible Financial Product and International issues. I provided a copy to my [International Examiner] IE. My IE is currently preparing an Exam Plan. I don't have an FP [Specialist] assigned to this case and I am doing a limited scope exam."

How Technology Helped the Financial Products Filter Project

Overview of the Financial Products Rule Process[3]

We have developed and tested rules to apply to an automated process to identify potential noncompliant returns for examination by specialists in Financial Products. This process will also contribute to LB&I use of an overall risk scoring model built upon a set of specific risk assessment formulas.

This process uses the "Blaze Advisor" Business Rules Management System software. We grouped the related Financial Products rules into one group (we call it a ruleset).[4] We then designed and developed a scoring model to assess the risk of the entire LB&I corporate population and to identify high risk corporations. Once the score modeling has been defined and implemented, it is capable of receiving tax data on any given tax year and processes the data to generate reports. This automated process will bring a consistent approach to risk identification for Financial Products issues, which will increase the quality of issues raised by the program. This methodology has also been applied to other specific risk areas, including international characteristics that are examined by International Program Specialists.

The Use of Blaze Advisor

We built multiple Blaze Advisor rule projects for the Financial Products filters.[5] Each rule project contains all the code that supports running one set of Financial Products filters. Each rule project generally controls one rule process. In most cases, we built one rule project for each tax form type. We also put all the Financial Products rule projects into one rule repository.

Besides building the Financial Products Filters in a Blaze Advisor rule project, we also needed to develop code modules that support the rule process. The rule repository was structured based on reusability, maintainability and manageability. A few libraries were built based on reusability. A technical library contains the rule templates, providers and defined constants of the entities frequently used by rule developers. The business library contains RMA[6] instances that are built for SMEs. SMEs can change the rules through RMA web pages.

The Financial Products Rule Project connects to the database tables, which contain the Financial Products return data. The rule process reads the return data that relates to the Financial Products and it turns the return data into a data object. The rule process puts data objects into an array of objects. During this process, it eliminates any duplicated return data before it runs on the Financial Products filters. For instance, if Company A has filed multiple times for the same tax year, the rule process would eliminate all returns except the latest return object.

Next, the rule process passes one data object at a time and invokes the Financial Products ruleset (a group of related rules forms a ruleset). The rule engine runs on one filter at a time. If it is fired (the rule condition is met), the rule process collects a set of information and stores the information in multiple arrays. Those data

arrays contain the data objects of the filter results. For example, if a filter is invoked, the filter name will be recorded as well as the filter risk score, which is calculated based on the weight and risk level.

After the Blaze engine runs through all the rules for one return, it then builds the summary data, such as total number of filter hits and total risk score for this return. The total risk score for a return comes from the summation of the individual filter scores.

Finally, the rule process generates a risk assessment summary page for the output. By choice, it can output the filter result for individual returns, as well.

What To Do When a Taxpayer Files the Same Schedule Multiple Times?

For some Form 1120 returns, there is a special situation that must be handled differently. A U.S. corporation can have multiple schedules of Forms 8858, 8858M or 5472 attached to its Form 1120 return. There can be hundreds of the same schedules attached to a single return.

The Financial Products Form 8858 rule process does the same thing as other Financial Products rule processes do. It passes each Form 8858 return data object to the Form 8858 ruleset of Financial Products and collects information about filter hits, risk scores etc. However, the SMEs were not interested in individual filter results for Forms 8858 or 5472 returns, but the overall risks of all attached Forms 8858 or 5472 returns associated with a U.S. corporation. For example, SMEs want to know how many of Forms 8858 or 5472 returns associated with a U.S. corporation have been selected (selected means at least one filter has been triggered). They would also like to know the average risk score and the average number of hits, which are based on selected returns.

To accommodate this scenario, we developed a special module that uniquely addressed this issue after all the return data objects went through the filters. The module consolidates the filter results of all selected Forms 8858 or 5472 returns and proceeds according to the following steps:

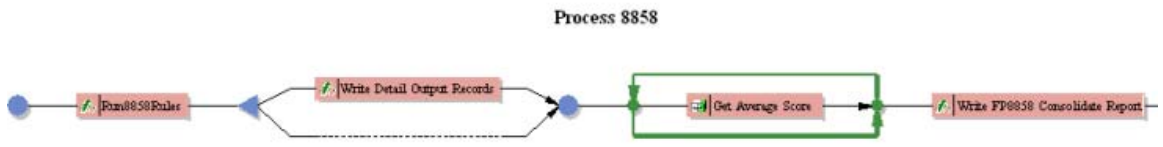
Step 1: Blaze runs Form 8858 filters on each Form 8858 attached to a return and then it gathers information on those selected returns (at least one filter hit) for that U.S. corporation.

Step 2: Once the selected Form 8858 returns are collected, it then calculates the average risk score and the average number of hits based on all the *selected* Form 8858 returns of that U.S. corporation.

Step 3: The rule process prepares the final consolidated output, which includes a company's information, an average number of hits, and an average risk score of the Form 8858 returns of that U.S. corporation.

This Form 8858 process is illustrated in Figure 1.

FIGURE 1



The Financial Products Filter Reports

There are many ways to direct the rule output. While we were developing and testing the Financial Products filters, we printed out information about the rule process for debugging and testing purposes in the output pane of Blaze Advisor IDE (Integrated Development Environment). After we verified that the rule process ran as we expected, we enabled the rule process to write the results to a database table. For various reasons, we can print out the filter results in the output pane in Blaze IDE and write the filter results to a database table simultaneously.

Building the RMA for the Financial Products Specialists

After the Financial Products rule process was built and tested we then turned our attention to build the Rule Maintenance Application (Web Rule Editing application).

A key aspect of the Blaze Advisor business rules management system is the ability to develop an RMA that allows business experts to edit the rules in an intuitive, domain-specific environment. An RMA allows the rule writers to focus on the business rules while the rule developers focus on the technical details of the service implementation. The RMA application enables the Financial Products Specialists to change the Financial Products filters through a web browser.

As mentioned in the second section, the Financial Products filters use the data that comes from many different tax forms or schedules. We have built multiple Blaze Advisor rule projects for the Financial Products filters. Each rule project contains all the code that supports running one set of Financial Products filters. Each rule project generally controls one rule process. In most cases, we built one rule project for each tax form type. We also put all the Financial Products rule projects into one rule repository.

We built a decision table for the Financial Products filters project as illustrated in Figure 2 and Figure 3. The decision table enables us to configure the settings for the report generation. Anyone who has edit rights in the FP RMA website can select reports they would like to be generated.

FIGURE 2

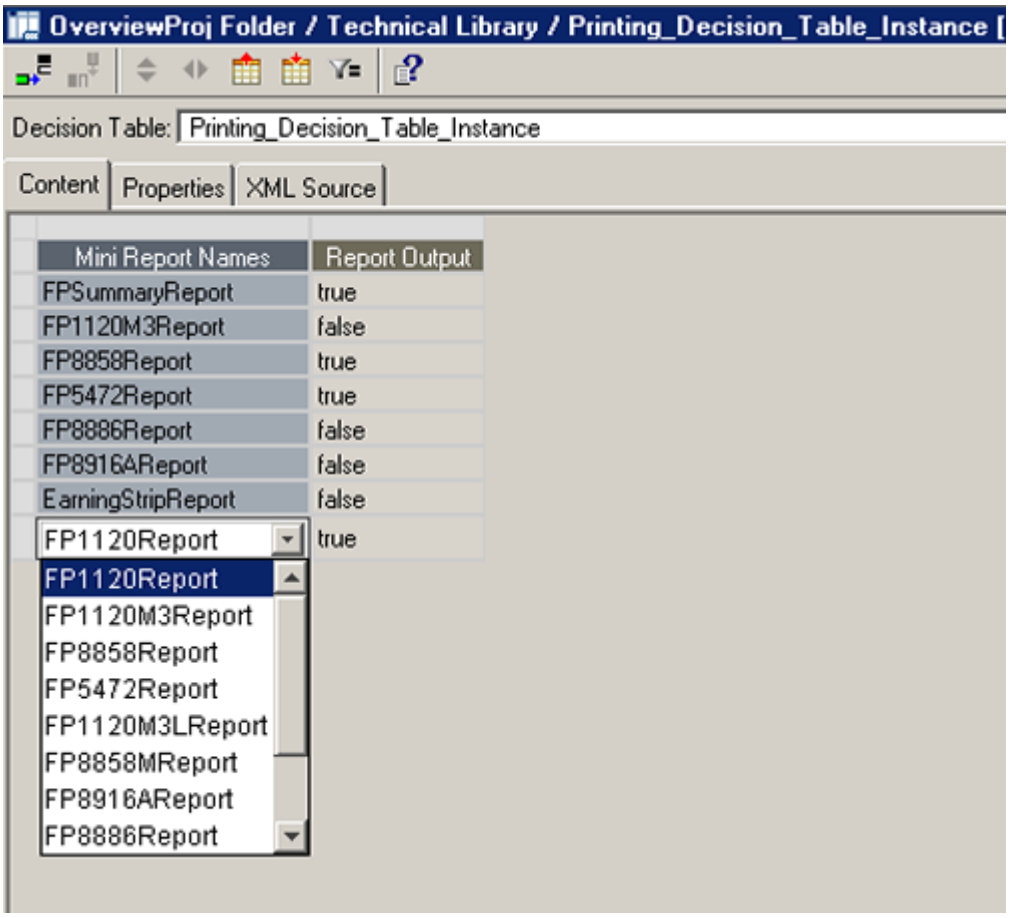
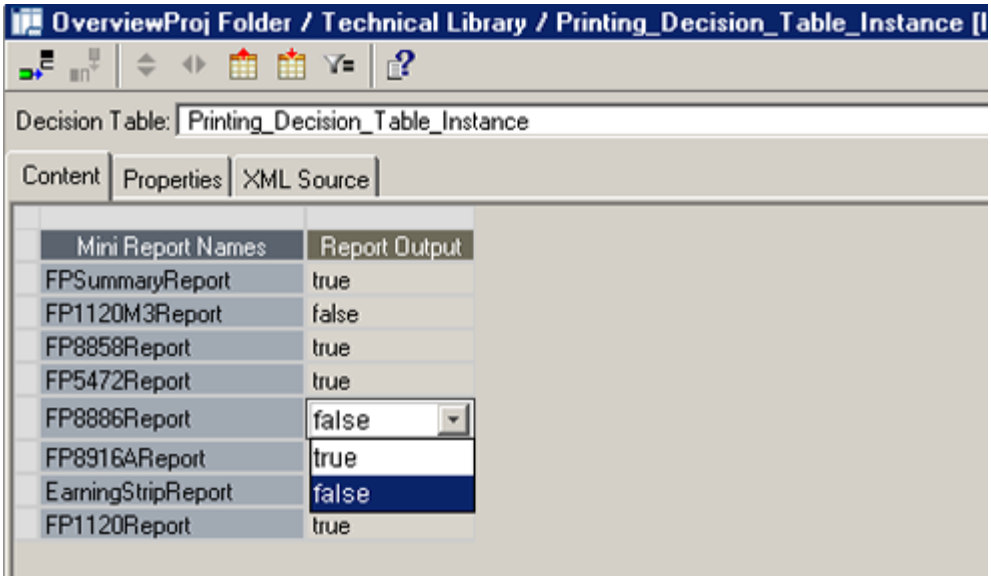


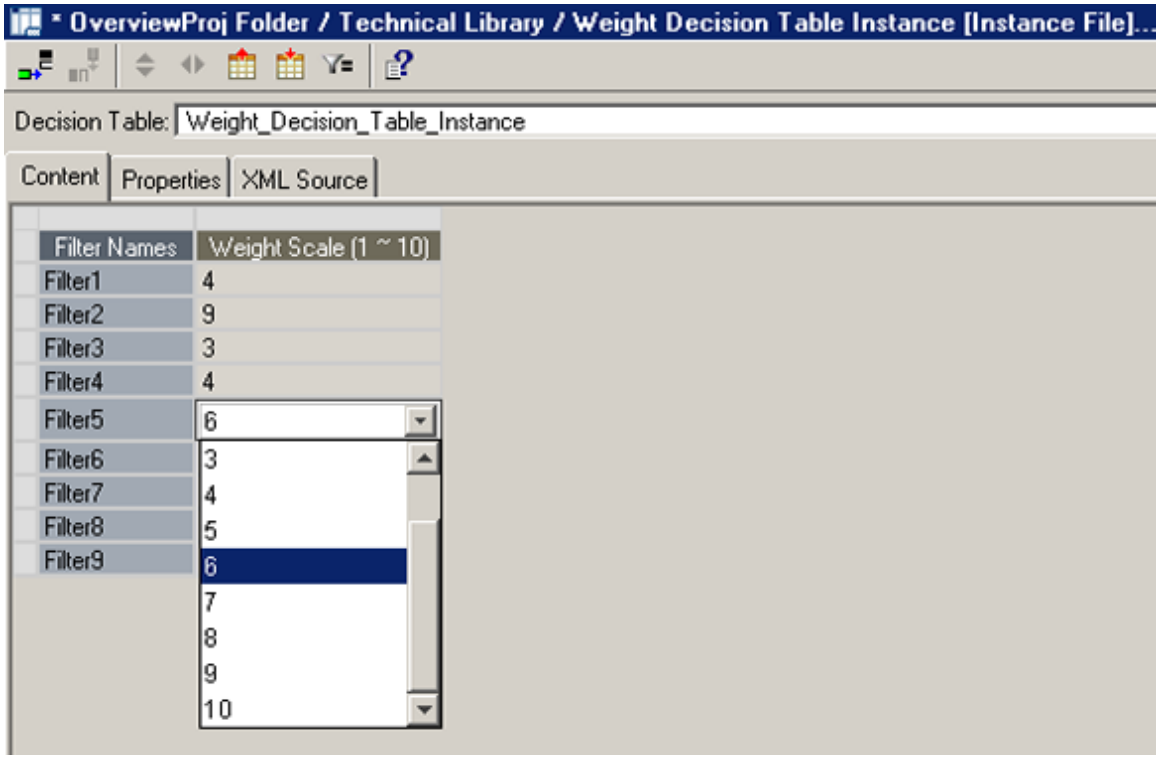
FIGURE 3



Another feature of the RMA allows SMEs to add or modify the filters. This allows us to update the rules to accommodate tax laws changes.

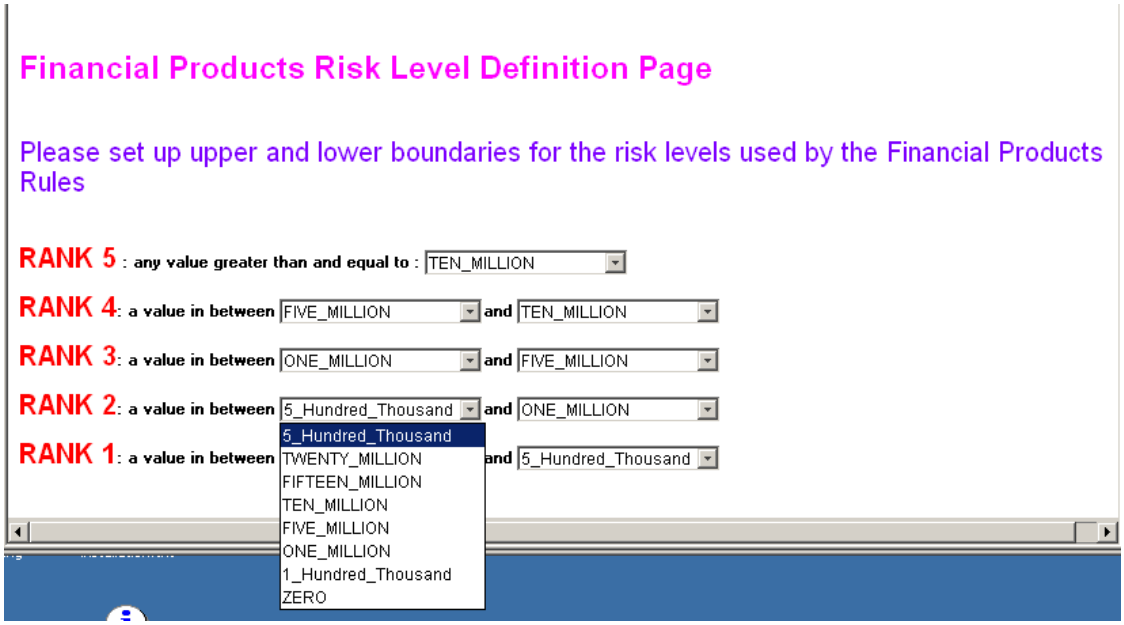
We built a decision metaphor that allows the Financial Products Specialists to change the weight of a filter. Currently we define the weight scope value as ranging from 1 to 10, where '1' is the lowest weight, and '10' is the highest weight. Because of this mechanism, SMEs are able to change the weight of any filters that need to be updated, as illustrated by Figure 4.

FIGURE 4



We also built the Financial Products Risk Level Definition web page, which enables SMEs to reconfigure the risk levels for each rank, as illustrated by Figure 5.

FIGURE 5



Future Plans

Emerging Issues

The Financial Products SMEs will be aware of emerging issues being developed by the Field. When an emerging issue becomes promising, the SMEs will propose that a rule be developed to identify other taxpayers who may have similar issues.

Enterprise Risk

The limitation of current filters is that they look at one tax return at a time. They do not take into account the risk that can be identified only when the entity is looked at in a holistic manner over several years. LB&I SME's routinely compare information found in related tax returns and financial statements when risk assessing a specific tax return, and a major task for PAIR is to find a way to expand data access and the application of rules to include related returns and financial information in order to replicate the risk identification process used by experts. Some of these are described below.

Prefiling Risk Assessment

PAIR performs a prefiling risk assessment of selected SEC Registrants, paying particular attention to the income tax footnote disclosures required by FIN 48. PAIR particularly seeks to indentify those taxpayers with a high likelihood of having a requirement to report a material Uncertain Tax Position (UTP) on Schedule UTP. These Pre-filing risk assessments will give us a better picture of the taxpayer's income tax risk characteristics than a filter report by itself.

Schedule UTP

PAIR captures Schedule UTP information that enables the identification of specific types of issues. We have cross-referenced UTP concise descriptions that identify specific types of issues associated with financial products risk to validate that our filters are working.

Form 1065 Partnership Filters

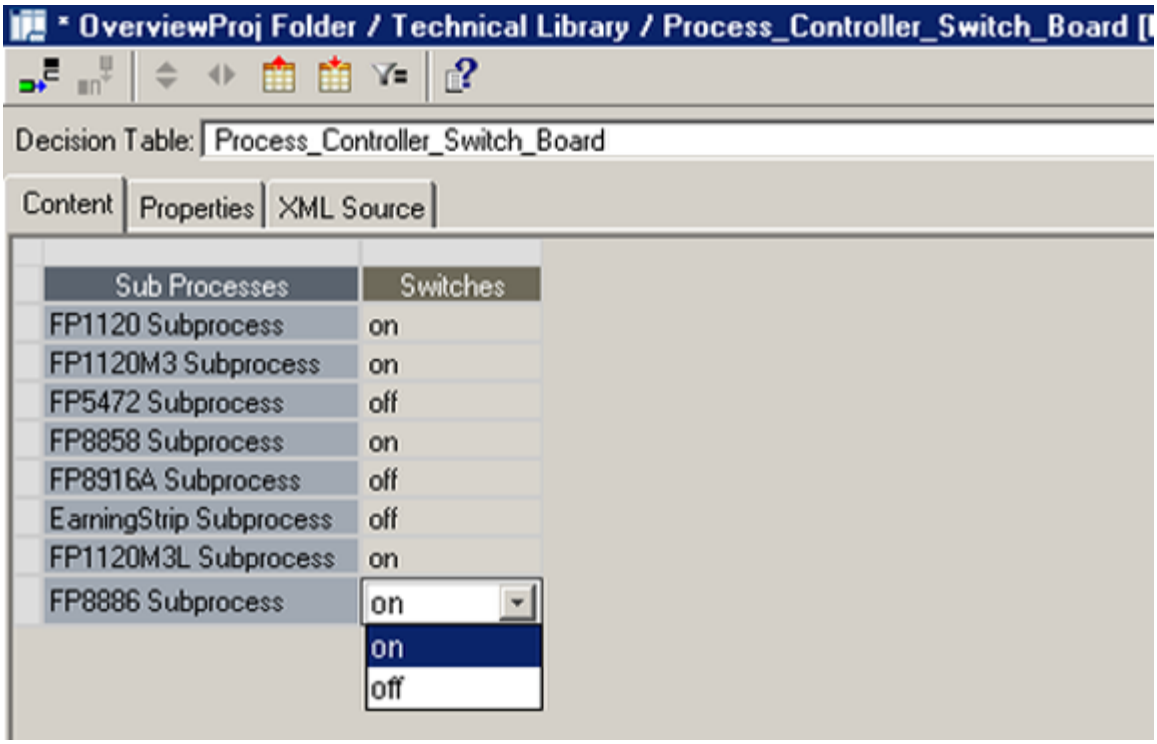
For 2010 returns, we are expanding the financial products filtering effort to include Partnership Returns (Form 1065). LB&I has experienced a large growth of partnership returns in the last ten years. LB&I is placing higher emphasis on the selection and examination of partnership returns that truly warrant examination. One tool is the link analysis/multi-tiered ownership structure (Yk-1) software program. Yk-1 displays a diagram of a taxpayer's ownership structure including subsidiaries of the taxpayer as well as flow-through entities. Yk-1 also gives selected line information from the respective tax returns, including taxable income, total tax, total assets, etc.

Technology Issues

We have successfully built all the Financial Products filters based on the requirements of the Financial Products Specialists. As mentioned earlier, we have created multiple rule projects, and each rule project in general controls one rule process and runs on the filters related to a particular tax form. We can generate filter output by running an individual subprocess. In addition to all these rule projects, we built a rule project which compiles all the output from each subprocess and marshals all Financial Products filter results to a final integrated result set. The final result set is sorted based on risk scores and number of filter hits. From the integrated output, our SMEs are able to identify those returns with high risk scores regardless of which tax forms the corporation has filed.

As we move forward, we will build a web application that allows SMEs or a filter administrator to control subprocess running. As hypothetically illustrated by Figure 6, SMEs can turn switches 'on' or 'off' to enable or disable an individual Financial Products subprocess.

FIGURE 6



A special decision node will be built based on the configuration of subprocessing. See a hypothetical illustration in Figure 7.

FIGURE 7

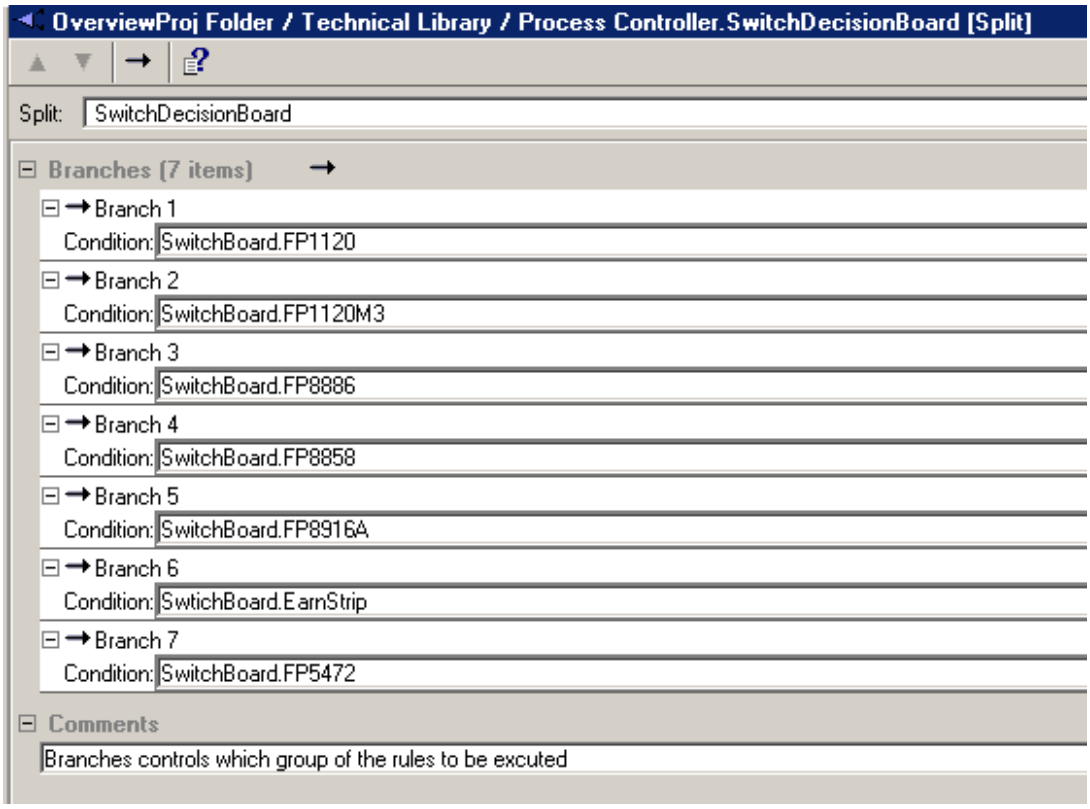
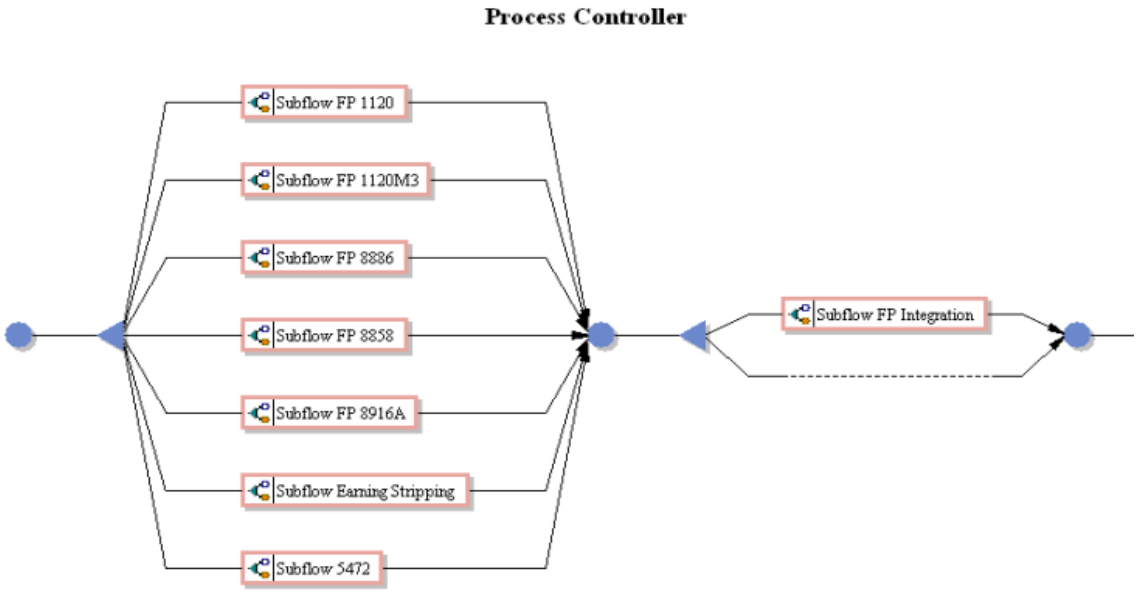


Figure 8 is illustrates the Process Controller flow chart. The main process starts from the left, and runs towards the right. A triangle is a decision node. The decision node determines which branch(es) to run. Each branch contains one sub-process. Multiple subprocesses can run at the same time. The second decision node from the left determines whether it needs to run the Financial Products Integration subprocess. If it runs, then the final integrated result set will be generated.

FIGURE 8



Conclusion

The development of business rules for return selection reflects the complexity of LB&I tax returns themselves. The design and testing of rules to detect Financial Products risk is one of several similar projects, which include other major risk areas such as international activity, book-to-tax differences, and transactions reported on related passthrough tax returns. These various rule sets need to be combined into an overall "rules engine" for return selection The rules engine must also be able to accommodate rules calibration and weighting processes for factors such as industry, size and actual examination results. This ongoing effort is a major challenge for LB&I and PAIR researchers and experts as they seek to improve IRS ability to address the compliance risk associated with increasing tax and financial complexity.

Endnotes

[1] Filter has the same definition as rule; we use the terms interchangeably.

[2] Status 10 is an unopened tax return sitting in an examination field group.

[3] A rule process is a business process that parses data objects, executes ruleset(s) and generates rule results.

[4] A ruleset is a group of related rules in Blaze Advisor.

[5] A rule project in Blaze Advisor is an entity in Blaze Advisor that holds other entities such as Folders, Business Object Models, Rulesets, functions etc.

[6] RMA: Rule Maintenance Application.

Corporate Tax Compliance: The Role of Internal and External Preparers

Kenneth Klassen, University of Waterloo; Petro Lisowsky,University of Illinois at Urbana-Champaign; and Devan Mescall, University of Saskatchewan

The current corporate tax environment is characterized by a high degree of uncertainty. Uncertainty in the tax law can create opportunities for planning, but can also create challenges in compliance. To evaluate the compliance responsibilities and implications surrounding business transactions, companies employ internal tax specialists and/or hire external advisory firms. The effect of the tax advisor in compliance decisions of corporations is very important, but has not been subject to much archival empirical research due to the lack of available data. This paper begins to overcome that shortcoming by using confidential large-sample data from the Internal Revenue Service (IRS) on who signs the corporation's tax return to study the link between the tax service provider and the compliance decisions involving the corporation's tax positions. We also evaluate the ability of publicly disclosed tax fees to reveal the identity of the corporate tax return preparer.

An extensive literature has examined the relation between auditors providing tax services and their effect on the audit process (e.g., Davis et al., 1993; DeFond et al., 2002; Abbott et al., 2003; Kinney et al., 2004; Francis and Ke, 2006; Pittman and Fortin, 2008; Lim and Tan, 2008; and Zamar et al., 2011). There continues to be a debate over whether auditors providing tax services impair independence, create knowledge spillover, or both. However, the literature remains mostly silent on the role of a broader set of tax preparers—including internal tax departments and non-auditors—and their effect on corporate tax-related decisions.

Examining the relationship between tax preparers and corporate tax aggressiveness is important for several reasons. First, overall tax service work is economically significant yet vastly under-studied due to data limitations. In their 1992 survey of about 1,300 large corporations, Slemrod and Blumenthal (1996) estimate that the average aggregate annual cost of complying with Federal and sub-Federal income taxes is about $2 billion. Our sample firms alone pay over $815 million in total to their auditors for tax work in 2008 and 2009; as the results in Slemrod and Blumenthal (1996) suggest, surely this number is higher if we could observe the costs related to internal tax departments or external non-auditor tax work.

Second, the IRS has long been interested in the effect of tax preparers on compliance. However, the focus has mostly been on individual tax compliance (e.g., Slemrod and Sorum, 1984, and Slemrod, 1989). For example, Long and Caudhill (1987) and Christian, et al. (1993) examine the determinants of individuals' choice in hiring a paid preparer using archival data, while in an experiment, Hite and McGill (1992) examine whether individuals retain or dismiss their preparer if they disagree with the preparer's advice to report a tax position aggressively.

More recently, Neuman, et al. (2011) explore the not-for-profit sector where the identity of the preparer is disclosed in publicly available tax returns (i.e., on IRS Form 990). In testing the effect of preparer type on donations (their measure of credibility), they find that external preparers are positively associated with donations. They interpret this evidence to suggest that the public views self-prepared returns as less credible. Although they infer that their results generalize to the for-profit sector, direct evidence on the role of tax preparer type in a corporate setting remains elusive. Our objective is to fill this void. In particular, our research questions ask whether tax preparer type is associated with tax aggressiveness; and how accurately public data on tax fees paid to a firm's auditor capture the actual tax return preparer type.

To answer these questions, we use confidential data from the IRS on who signs the tax return for 1,533 firm-years during 2008 and 2009. The tax return data allow us to focus on whether the compliance activities of the company are primarily administered by the internal tax department, the company's financial statement

auditor, or an external non-auditor preparer. Until now, researchers have been able to observe only the dichotomous choice of a corporation using or not using its auditor for tax services (e.g., Lassila, et al., 2011); and even so, it remains unclear the degree to which the "tax services" pertain to tax compliance or something else.

We extend the theoretical model of Mills, Robinson, and Sansing (2010) to form predictions of the relationship between the type of tax preparer and the observed aggressiveness of the company's tax-related decisions. Following Mills et al., we define tax aggressiveness as claiming a tax position (e.g., tax credit, deduction, income exclusion, or income character) with relatively weak underlying facts. From this model, we predict that internally prepared tax returns are more aggressive than externally prepared returns, on average, because theory suggests that companies who do not hire an external preparer tend to undertake uncertain positions more frequently if they face lower total reputation costs. We also predict that, in equilibrium, companies are more likely to claim aggressive tax positions with the non-auditor than the auditor preparer when tax law ambiguity is present.

Using current-year changes in FIN 48 tax reserves as our proxy for tax aggressiveness, and linking them to the tax preparer identity from the tax return, our empirical tests support these two hypotheses. In particular, we find that internally prepared tax returns take more aggressive tax positions than externally prepared returns, and that external *non*-auditor-prepared tax returns claim more aggressive positions than returns prepared by the firm's auditors. We conduct various robustness tests using measures for tax shelter use (also obtained from the IRS), tax haven subsidiaries, and financial reporting aggressiveness, as well as by subsamples of high versus low cash-effective tax rates and discretionary accruals, and find that these inferences hold.

In a final analysis, we examine how accurately tax-preparer type can be inferred from public data on tax fees paid to a firm's auditor. We do so to assess whether the signal available to investors and researchers in financial reports on tax services is useful to infer tax compliance work. We find that more than 80 percent of our sample firms publicly disclose tax fees paid to their auditor, but only 20 percent of tax returns are in fact prepared by the auditor. Using a variety of proxies using tax fee data to infer preparer type, we attempt to replicate our main results based on actual tax return preparer identities, but are unable to do so. This finding suggests that tax fees have limited use in correctly identifying the tax preparer, and thus the primary tax compliance advisor of the company.

Given the paucity of archival research on tax preparers generally, our study makes a significant contribution in understanding their important role in the U.S. tax system. Specifically, our research is the first to document the identity of tax return preparers for a large sample of U.S. companies, to report its links to tax aggressiveness, and to evaluate how tax fees mostly do not accurately capture tax compliance activities that are observed directly from the tax return.

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Using Link Analysis To Identify Indirect and Multi-Tiered Ownership Structures

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Partnerships are a fundamental business structure in the American economy. They permit groups of investors to combine their resources toward a common effort without the administrative overhead of a formal corporation. Their tax treatment also allows each investor to be responsible for their own portion of federal taxes by passing through the proportional amounts of tax items to the individual investors to be reported on their separate tax returns. Partnerships, along with the other entities that allocate tax items to their investors (mostly Subchapter S corporations and trusts) are collectively referred to as pass-through entities. A partnership or other pass-through entity can also combine its collective resources with the resources of others to form a second level pass-through entity or tier. This tiering strategy can repeat for many levels. As capitalization efforts grow for large endeavors, such as oil & gas exploration, medical research & development, or large commercial real estate development, the depth and complexity of these pass-through structures also grows. Many other valid business reasons, such as liability constraints, contribute to the ever increasing complexity of pass-through structures. Tax law must accommodate these business arrangements; however, in doing so, it has afforded the opportunity for unscrupulous taxpayers to diffuse and obfuscate bogus transactions to obtain unjustified tax benefits.

This paper will detail efforts to use link analysis to bring together these multiple tax entities, summarize their activity, and enhance transparency. Specifically, the paper will discuss the analysis of enterprise structures. Enterprise structure analysis is an attempt to identify, summarize, and analyze the collection of pass-through entities controlled by a common taxpayer. It is focused on an investor and the pass-throughs that investor is able to control. Only linkages collectively representing 50% or more ownership are retained as part of the structure.

Background

The tax law is founded on the premise of unrelated parties engaged in activity for their own economic interest. Many abusive schemes are accomplished by the structure of a transaction at less than arm's length. Unscrupulous individuals will attempt to obtain benefits by structuring transactions between separate legal entities that are, in fact, ultimately owned and controlled by the same taxpayer. There are valid business reasons for the segregation of one's business operations into separate legal entities but it also introduces the opportunity for abuse. As such, it is important for the IRS to recognize these segmented operations and asses their compliance risk as a single cohesive unit.

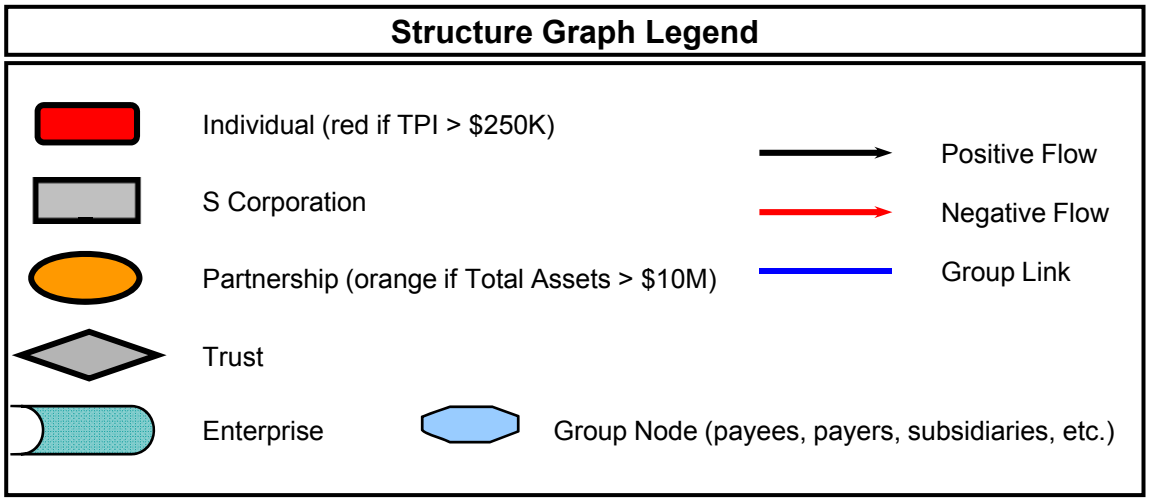
Creating enterprise structures is an initial attempt to identify all economic activity under the common control of a taxpayer. Current analysis is limited to pass-through relationships, parent/subsidiary links, and primary/secondary SSN associations. The investments of secondary spouses and subsidiary corporations are considered 100% owned by the primary spouse or parent corporation. This, by no means, covers all relationships that establish common control; others include non-flow-through business ownership (stock in a C corporation), related family members, and significant employer/employee relationships. Since the intent of enterprise structures is to identify economic relationships, it is also limited to structures with at least two business entities.

Currently we define common control as direct and indirect ownership of 50% or more of another entity conceptually consistent with Internal Revenue Code section 267(c) and section 707(b). Frequently, the ownership percentage requested on K-1 documents is not expressed as a number. Entries such as "various," "avail-

able" and "per agreement" make this data field unreliable for analysis. To mitigate this, an individual investor's proportion of total positive or total negative allocations is used as a proxy for ownership percentage.

Before addressing methodology and results, it is appropriate to provide an icon legend for the investment structure graphs presented in this paper:

FIGURE 1. Investment Structure Legend



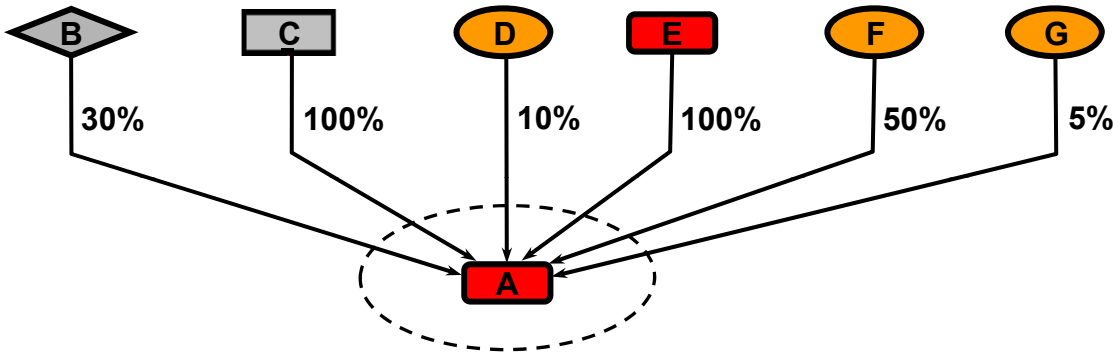
Aggregation Methodology

Creating enterprise structures is a fairly straightforward technique:

1. Start with an entity that does not allocate income to other entities, usually an individual or a corporation. Consider this initial entity the enterprise.
2. Identify all investment entities in which the enterprise has 50% or more direct ownership.
3. Merge the entities identified in step 2 into the enterprise.
4. Repeat steps 2 and 3 until no additional entities are added to the enterprise.

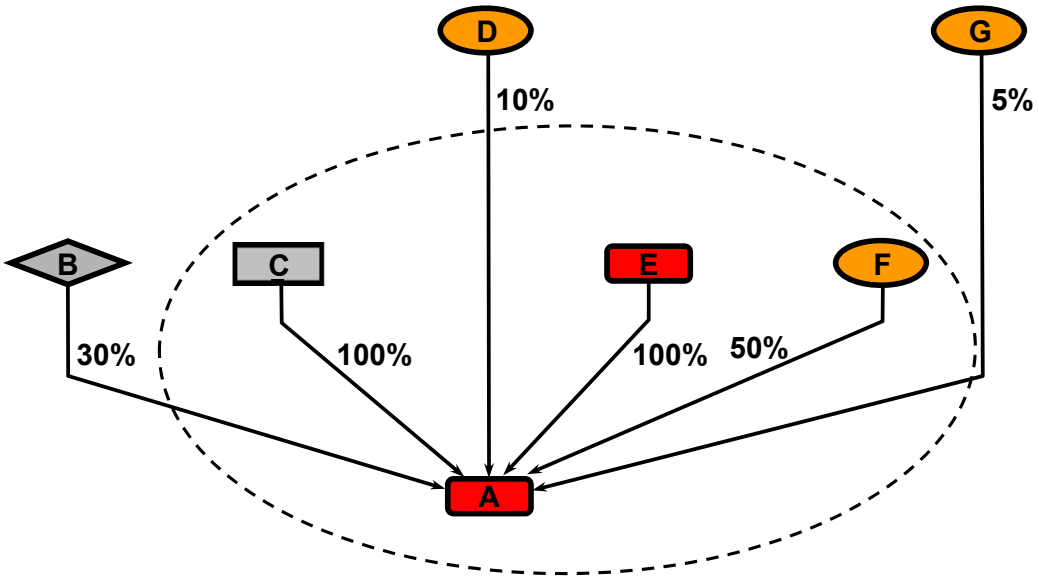
To illustrate this technique, Figure 2 shows a high-income individual (A) with a spouse (E), a trust (B), a wholly owned subchapter S corporation (C) and 3 partnership investments (D, F, G). The structure includes the ownership percentage for each entity. The enterprise boundary is represented with a dashed line.

FIGURE 2. Initial Investment Structure (Direct Investments)



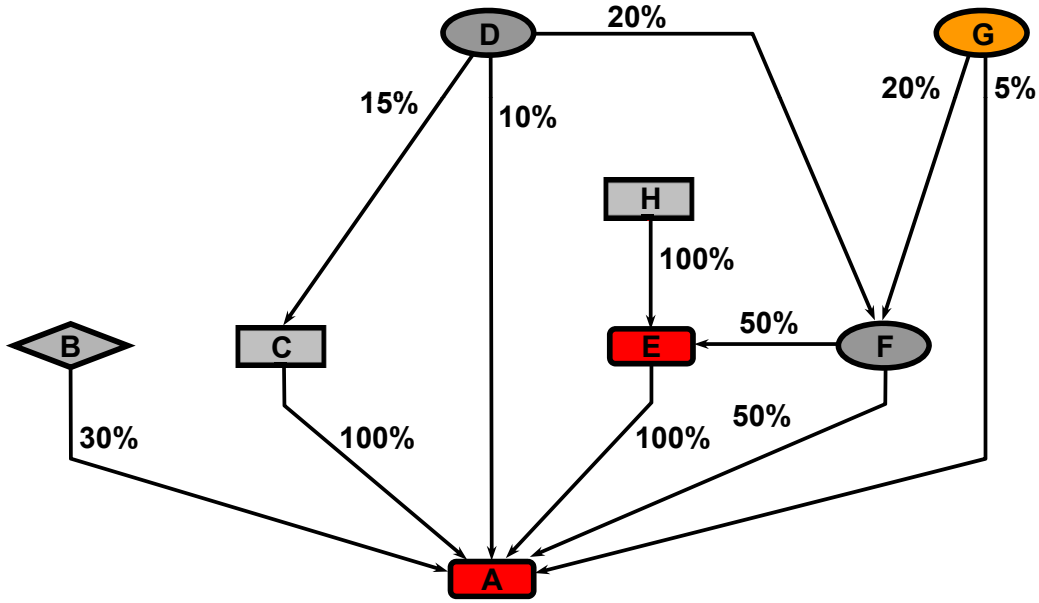
The spouse of the individual is pulled into the enterprise because the taxpayer is deemed to own the spouse's investments. Further, the individual owns 50% or more of the Subchapter S Corporation "C" and partnership "F"; so, they, too, are included in the enterprise.

FIGURE 3. Enterprise Investment Structure After 1st Pass



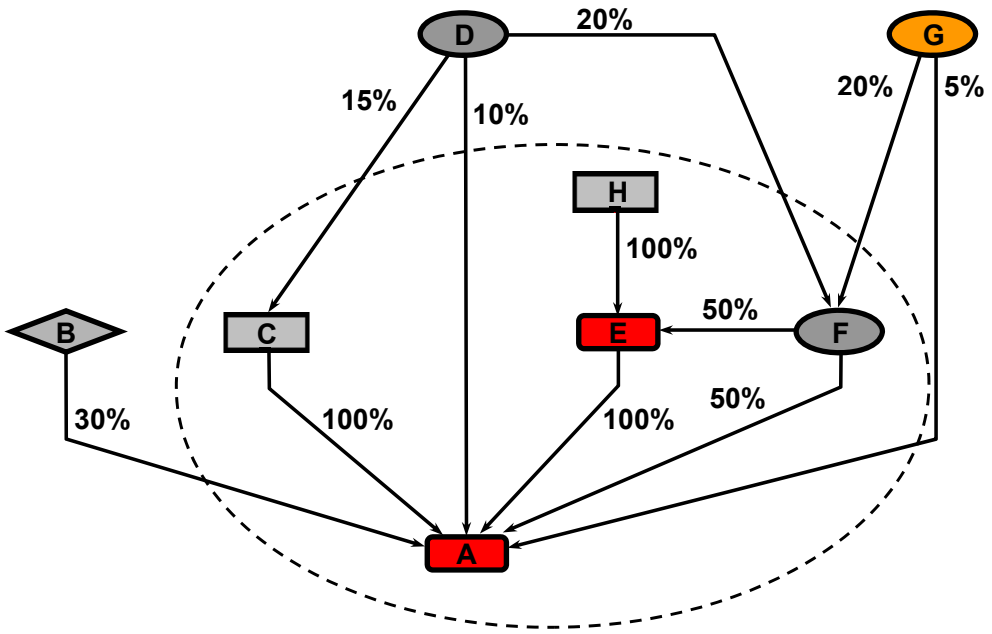
Steps 2 and 3 are now repeated. We expand our scope and look at the direct investments of the spouse, the subchapter S corporation "C" and partnership "F". The spouse has a 50% investment in partnership "F". This is really immaterial since both the spouse and partnership "F" are already part of the enterprise. The spouse also has a 100% investment in a new entity; a subchapter S corporation (entity H). Partnership "F" has a 20% interest in both Partnership "D" and Partnership "G". We also find that subchapter S corporation "C" has a 15% interest in Partnership "D." The updated graph with the new entities and lines of allocation is shown in Figure 4.

FIGURE 4. Enterprise Investment Structure Addition of 2nd Pass Linkages



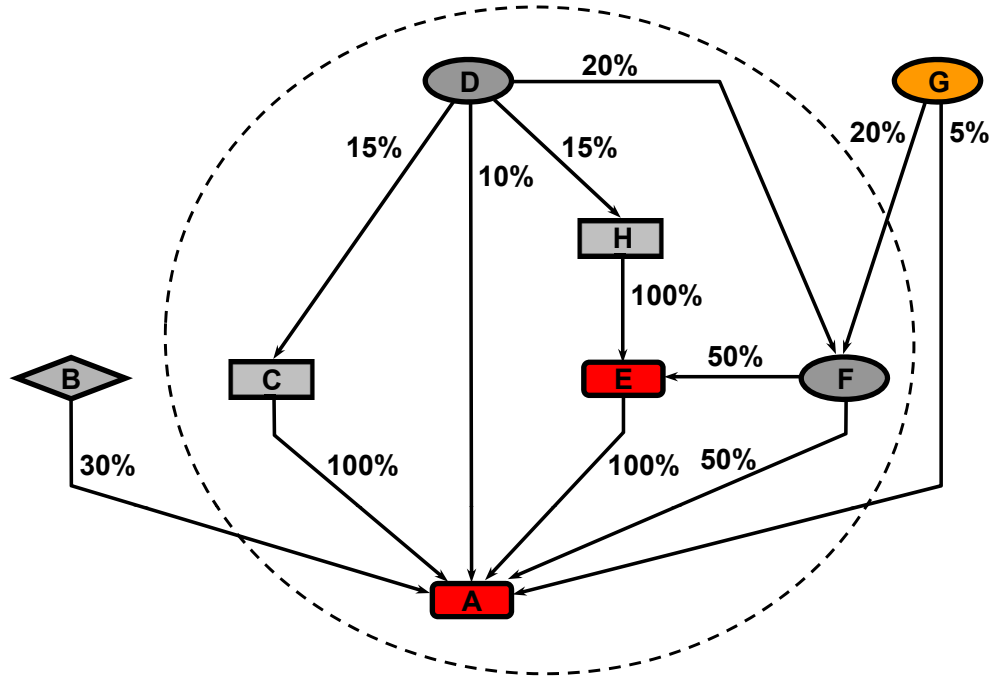
The enterprise ownership of "D" has increased from 10% to 45% and the ownership of "G" has increased from 5% to 25%. Neither has crossed the 50% threshold. However, the newly added Subchapter S Corporation "H" is owned 100% by the enterprise and is merged into it.

FIGURE 5. Enterprise Investment Structure After 2nd Pass



Having merged "H" into the enterprise it is time to repeat steps 2 and 3 again. "H" has one investment; it is a 15% investment in "D." This increases the enterprise investment in "D" from 45% to 60% and "D" collapses into the controlled enterprise structure.

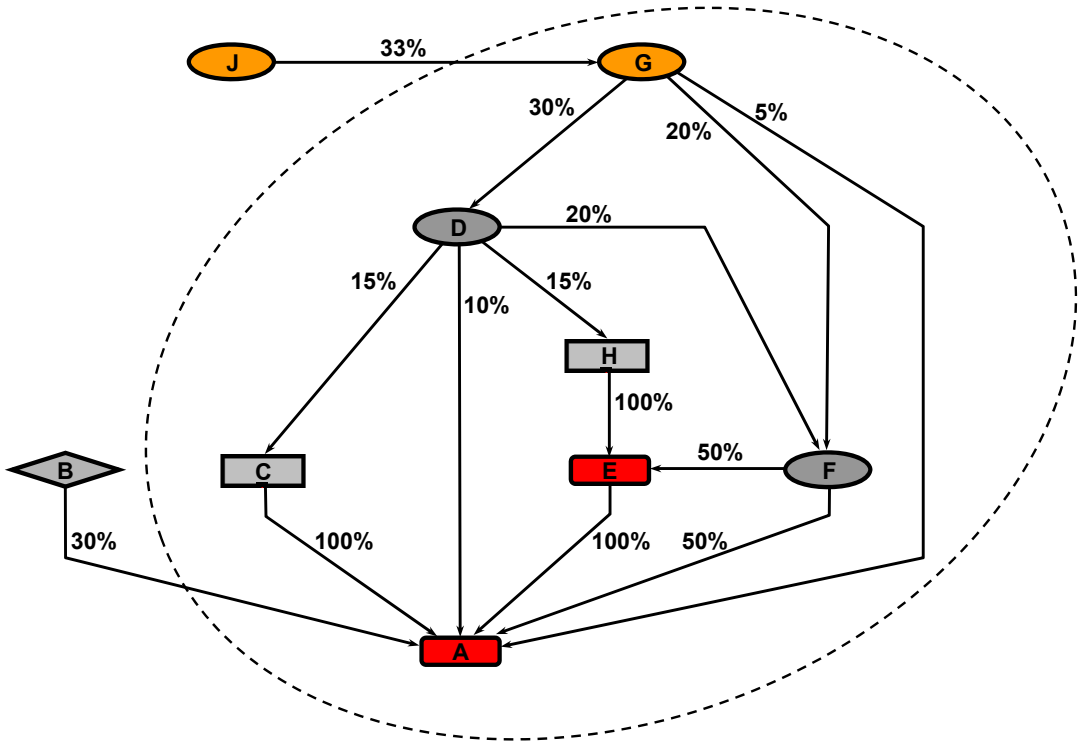
FIGURE 6. Enterprise Investment Structure After 3rd Pass



Repeating steps 2 and 3 again for the newly added entity "D" reveals a 30% investment in "G." This raises the enterprise's ownership of "G" above the 50% threshold to 55% and "G" becomes the 7th entity in the enterprise. Looking at the investments of "G" reveals a 33% investment in a new partnership (J). The investments of entity "G" did not create a controlling interest in either an existing or new entity so expansion stops.

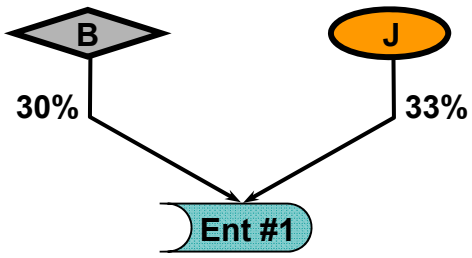
Our final enterprise structure consists of two individuals (A and E), two subchapter S corporations (C and H), and three partnerships (D, F and G). Note that partnerships "D" and "G" are not owned 100%. There are other investors; however, "A" owns directly or indirectly 60% of "D" and 55% of "G." "A's" enterprise has two investments that don't rise to the level of a controlled entity; a 30% interest in trust "B" and a 33% interest in partnership "J."

FIGURE 7. Enterprise Investment Structure; Final Structure



The above graph can be greatly simplified if the detail of the enterprise structure is represented as a single enterprise icon:

FIGURE 8. Enterprise Investment Structure Using Enterprise Icon



The process outlined so far is applied to all entities that do not allocate income to another entity and also have a direct controlling interest (or spousal/subsidiary interest) in at least one other entity. Once completed, entities not incorporated into an enterprise that do allocate income to another entity and also have a direct controlling interest in at least one other entity are used as seed entities and the process is run again. The first pass builds enterprises for non-pass-through owners such as individuals and corporations. The second pass builds the enterprises of partnerships that are not controlled by an individual partner.

To accomplish this enterprise build it seemed logical to identify the seed entities, place them into an array and process them through a loop one at a time. While this method functioned well, it was inefficient and was estimated to take months to complete. This row-by-row processing is a common approach taken by programmers moving into database applications and is referred to as "slow-by-slow." The more efficient approach is to process all seed entities at once. The seed entities are identified in a sub-query (grouped by a unique enterprise number) and all controlled entities identified in the primary query are assigned the associated enterprise number. The query is rerun until no additional entities are assigned to an enterprise. In actual application, this recursive query runs 10 or 11 times before exhausting linkages. This approach completes in a matter of hours—substantially more efficient than the row-by-row approach.

Results

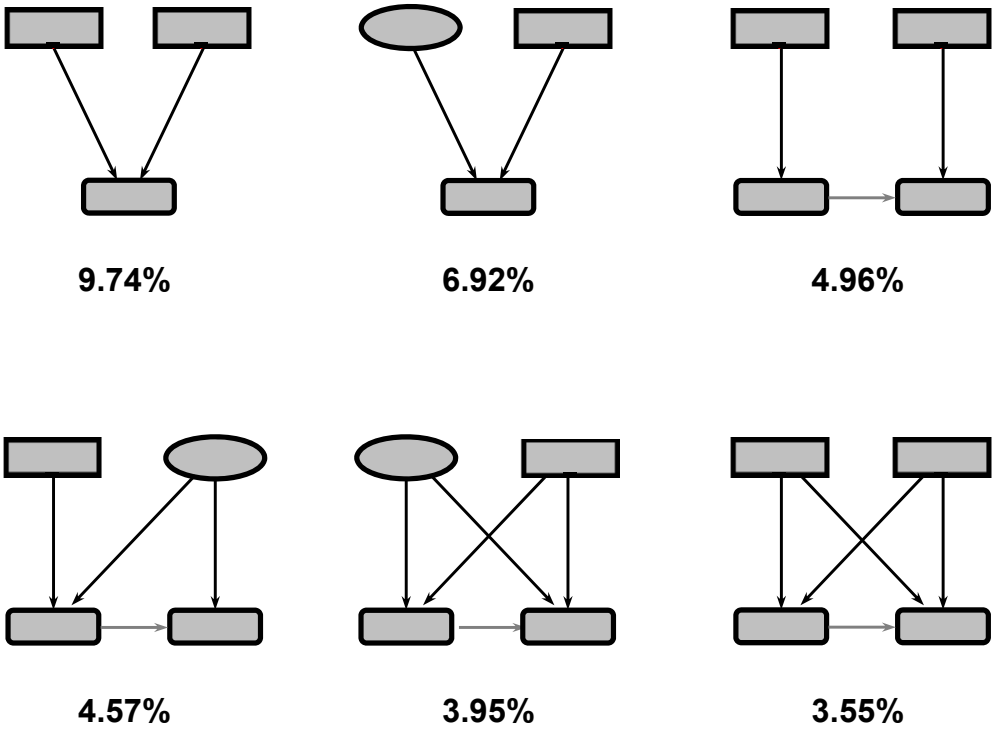
For Tax Year 2008, the above methodology produced 1,060,493 enterprises consisting of 4,737,064 entities. Table 1 summarizes this population by the number of entities within each enterprise compared to the number of tiers deep. The vast majority of enterprises, 95.4%, have 10 or fewer entities and extend only 2 or 3 tiers deep. As with many distributions of financial data, this high concentration of enterprises in smaller amounts is expected. These smaller enterprises represent simple business structures where the assets of the business are held in a separate legal entity from the operating entity. An exploration of these smaller enterprises revealed the six structures in Figure 9 that comprise one-third of all enterprises. The specific attributes of the entities and linkages are not considered for this grouping. For example no distinction is made regarding an entity's asset or income level nor the positive or negative amount of linkages.

TABLE 1. Total Population Enterprise Summary Statistics TY2008 (source: yK1 September, 2010)

		Tiers										
Entity Range	Data	2	3	4	5	6	7	8	9	10	11	Grand Total
a. 5 or fewer Returns	Enterprises Average Entities	611,938 3	295,298 4	11,023 4	265 5							918,524 3.6
b. 6 to 10 Returns	Enterprises Average Entities	40,642 7	63,839 7	10,237 7	1,238 8	120 8	11 9	1 10				116,088 7.0
c. 11 to 25 Returns	Enterprises Average Entities	5,516 14	10,902 15	3,844 15	1,000 16	172 17	24 17	10 21	2 18			21,470 14.7
d. 26 to 50 Returns	Enterprises Average Entities	525 34	1,394 33	766 34	260 34	82 35	19 36	6 38	1 31			3,053 33.7
e. 51 to 100 Returns	Enterprises Average Entities	107 68	323 67	294 74	117 67	36 72	16 69	3 75	2 56	1 53	1 74	900 69.5
f. 101 to 500 Returns	Enterprises Average Entities	38 154	103 159	135 176	96 185	29 212	17 274	1 141			1 349	420 178.6
g. 501 or more Returns	Enterprises Average Entities		4 786	3 634	10 1,248	12 1,317	5 1,035	3 771	1 2,135			38 1,130.1
Total Enterprises		658,766	371,863	26,302	2,986	451	92	24	6	1	2	1,060,493
Total Average Entities		3.7	5.2	9.7	24.6	69.4	131.6	130.3	385.3	53.0	211.5	4.5

Percent of Total Enterprises	
95.40%	2.16%
1.78%	0.66%

Figure 9. Common Enterprise Structures



Appendix A presents a number of tables stratifying the enterprise population by various attributes. Some notable highlights from these tables include:

- About 50,000 of the 1 million enterprises belong to an owner in the Large Business & International Division, (Table 2).
- The Real Estate Industry dominates enterprises just as it dominates partnerships in general, (Table 3).
- Although enterprises were assigned the NAICS Industry Code most prevalent on the entities within the enterprise, usually less than half of the returns shared that NAICS sector, (Table 3).
- About 20% of the enterprises contained either an initial year return or a final year return, (Table 5).
- Fifty percent or more of the returns in an enterprise were usually prepared by the same preparer, (Table 6).
- Enterprises usually have very few investors other than the controlling owner. Fewer than 60,000 enterprises had more than ten other investors, (Table 7).
- Over 900,000 of the 1 million enterprises are controlled by an individual, (Table 9).

Large Enterprises

While few enterprises contain more than 10 entities, a few are quite large. In 2008 the enterprise with the largest number of entities had 4,680 entities spanning 6 tiers. Typically, one or two entities are used to gain an indirect controlling interest in another entity; however, in an extreme example an enterprise owner used hundreds of entities to establish a controlling interest in other entities. The next few figures show the investment structure of a number of the larger enterprises.

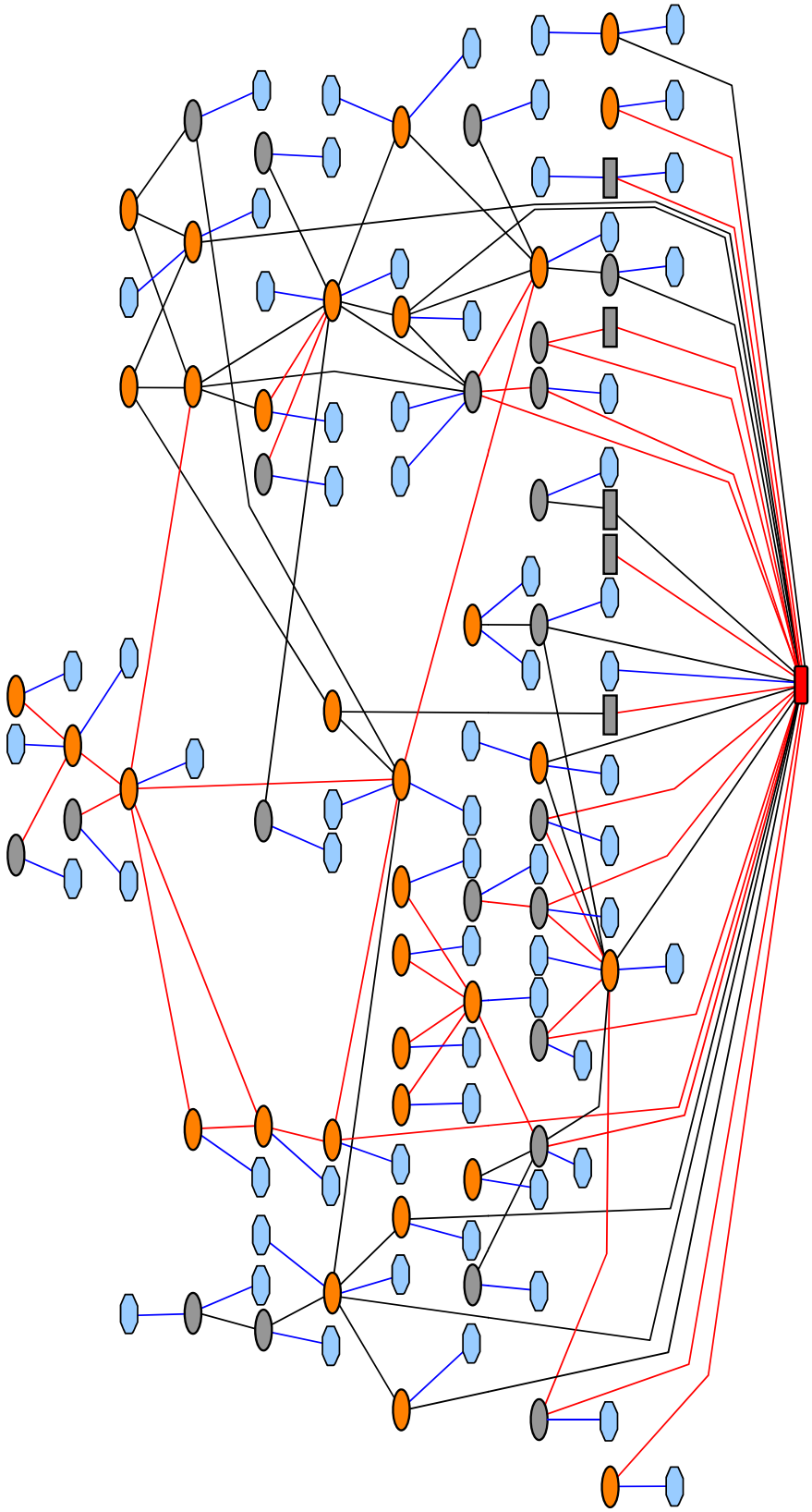


FIGURE 10. 74 Entities, 11 Tiers Deep Controlled by a High-Income Individual

Enterprise Summary Data

A number of summary metrics have been gathered for each enterprise. Most of these are descriptive counts of specific attributes, such as the number of foreign entities included in the enterprise or the number of tiers deep the enterprise extends. Some financial data has been collected—like the K-1 allocations received from entities outside the enterprise and the K-1 allocations between enterprise members. However, a significant barrier exists in gathering meaningful quantitative financial data: duplication. As entity structures are tiered, their representation of one entity's operational assets becomes an investment asset of the tier below them. Depending on the level of direct ownership and the accounting methods employed, there can be no duplication in enterprise asset figures all the way to complete duplication. Accounting for inter-company sales is even harder. For example, in our initially developed enterprise in Figure 7, it is impossible to tell how much of the sales of Partnership "G" were made to Subchapter S Corporation "C". These intercompany transactions need to be accounted for to develop a picture of the enterprise's economic activity with the outside world. Tax return data is insufficient to employ a traditional consolidated financial statement approach. An alternative estimate needs to be developed and this is an area of future research.

Future Research

Many other challenges remain in this area. Some broad research questions that remain open include:

- What is the best way to describe enterprise structures?
- Aggregation methods for data: How can the economic activity of an enterprise best be represented?
- Risk Assessment: What is the tax compliance risk of an entire enterprise structure, and how much of that risk is associated with the way the enterprise is structured compared to the compliance risk of the individual entities?
- Can techniques be developed to identify what entity or small group of entities comprise the operational center of an enterprise?
- Develop other heuristics of relationship and control, including name similarity analysis and familial relationships.
- Boundary Refinement; merging overlapping enterprises.
- Enterprise Profile: What does the population of enterprises look like?

Conclusion

The methodology outlined in this paper has proven to be an interesting first step in looking at the economic operation controlled by a single taxpayer. It has given the IRS the ability to see the scope and potential complexity of these controlled structures. However, extensive work remains in this area to achieve operationally useful information.

Appendix A
Supplemental Tables

TABLE 2. Number of Enterprises by Enterprise Owner Type,* Number of Entities, and Assets

Enterprise Owner Type	Grand Total Number of Enterprises	Number of Entities in Enterprise				Enterprise Assets		
		5 or fewer	6 to 10	11 to 25	26 or more	< $1M	$1M to < $10M	≥ $10M
LB&I Owner	**49,944**	**32,596**	**9,561**	**5,485**	**2,302**	**1,637**	**4,483**	**43,824**
Corporation	**23,024**	**16,337**	**3,350**	**2,170**	**1,167**	**1**	**2**	**23,021**
Regular 1120 Filer	20,462	14,277	3,086	2,013	1,086	1	2	20,459
Other 1120 Filer	2,543	2,054	261	150	78			2,543
Subsidiary	19	6	3	7	3			19
Individual	**16,305**	**7,634**	**5,112**	**2,655**	**904**	**1,630**	**4,477**	**10,198**
HIHW Tier 1 - TPI ≥ $30M	1,805	640	600	381	184	101	292	1,412
HIHW Tier 2 - TPI $5M to < $30M	14,500	6,994	4,512	2,274	720	1,529	4,185	8,786
Uncontrolled Flow-Through	**9,965**	**8,125**	**1,000**	**623**	**217**	**5**	**4**	**9,956**
Partnership	7,975	6,357	862	556	200	4	4	7,967
S-Corporation	1,979	1,762	137	64	16	1		1,978
Trust	11	6	1	3	1			11
Form 990 Filer (TEGE)	**412**	**320**	**63**	**21**	**8**			**412**
Not a yK1 Filer	**238**	**180**	**36**	**16**	**6**	**1**		**237**
SB/SE Owner	**1,010,555**	**885,932**	**106,529**	**15,985**	**2,109**	**618,894**	**322,741**	**68,920**
Corporation	**37,093**	**35,508**	**1,079**	**335**	**171**	**15,887**	**17,410**	**3,796**
Regular 1120 Filer	30,696	29,734	766	160	36	13,623	15,067	2,006
Other 1120 Filer	6,313	5,760	292	156	105	2,205	2,321	1,787
Subsidiary	84	14	21	19	30	59	22	3
Individual	**906,371**	**790,323**	**100,579**	**14,135**	**1,334**	**581,145**	**276,280**	**48,946**
HIHW Tier 3 - TPI $1M to < $5M	83,507	53,516	22,387	6,696	908	16,806	42,625	24,076
HIHW Tier 4 - TPI $200K to < $1M	326,839	271,427	49,520	5,636	256	167,683	140,839	18,317
Non-HIHW Individual	452,190	425,050	25,772	1,301	67	365,706	82,121	4,363
TPI Unknown	43,835	40,330	2,900	502	103	30,950	10,695	2,190
Uncontrolled Flow-Through	**45,664**	**43,076**	**1,846**	**615**	**127**	**13,947**	**22,018**	**9,699**
Partnership	33,493	32,117	979	328	69	10,211	16,316	6,966
S-Corporation	6,339	6,198	108	27	6	2,301	3,230	808
Trust	5,832	4,761	759	260	52	1,435	2,472	1,925
Form 990 Filer (TEGE)	**230**	**199**	**23**	**6**	**2**	**15**	**116**	**99**
Not a yK1 Filer	**21,197**	**16,826**	**3,002**	**894**	**475**	**7,900**	**6,917**	**6,380**
Grand Total	**1,060,499**	**918,528**	**116,090**	**21,470**	**4,411**	**620,531**	**327,224**	**112,744**

* LB&I: Large Business and International Operating Division of the IRS

SB/SE: Small Business / Self-Employed Operating Division of the IRS

HIHW: High-Income High-Wealth

TPI: Total Positive Income

TABLE 3. Number of Enterprises by Dominant Industry Sector and Return Concentration

Dominant Industry Sector	Percentage of Returns in Dominant Sector					Grand Total
	100%	75% to < 100%	50% to < 75%	< 50%	Not Determined	
11. Agriculture, Forestry, Fishing and Hunting	2,311	1,124	9,481	2,805	1	15,722
21. Mining, Quarrying, and Oil and Gas Extraction	1,558	438	3,017	1,626		6,639
22. Utilities	279	36	259	137		711
23. Construction	4,831	2,072	29,254	10,746		46,903
31-33. Manufacturing	4,929	233	5,673	5,702		16,537
42. Wholesale Trade	3,302	446	8,814	7,579		20,141
44-45. Retail Trade	3,434	1,824	21,677	22,887		49,822
48-49. Transportation and Warehousing	1,535	496	6,665	8,427		17,123
51. Information	2,007	389	3,864	3,771		10,031
52. Finance and Insurance	12,925	2,694	22,344	19,336		57,299
53. Real Estate and Rental and Leasing	38,803	23,412	135,328	175,782		373,325
54. Professional, Scientific, and Technical Services	6,298	1,432	34,714	79,944	5	122,393
55. Management of Companies and Enterprises	5,825	95	4,671	8,310		18,901
56. Administrative & Support and Waste Management & Remediation Services	1,085	264	6,196	22,121		29,666
61. Educational Services	345	50	1,049	4,068	66	5,578
62. Health Care and Social Assistance	3,797	1,381	18,577	41,635	30	65,420
71. Arts, Entertainment, and Recreation	1,096	502	5,932	16,786	11	24,327
72. Accommodation and Food Services	2,649	2,323	19,418	35,235		59,625
81. Other Services (except Public Administration)	1,840	573	13,038	51,173	62	66,686
92. Public Administration	8		6	45		59
XX. Sector Unknown	2,751	421	11,406	37,598	1,409	53,585
Grand Total	**101,608**	**40,205**	**361,383**	**555,713**	**1,584**	**1,060,493**

TABLE 4. Number of Enterprises by Percentage of Enterprise Tiered and by Tier Depth

Percentage of Entities Tiered	Number of Tiers				Grand Total
	2	3	4	5 or more	
Less than 50%	394,723	12,154	383	50	407,310
50% to < 90%	132,847	160,237	7,209	780	301,073
90% or more	131,196	199,477	18,710	2,733	352,116
Grand Total	**658,766**	**371,868**	**26,302**	**3,563**	**1,060,499**

TABLE 5. Number of Enterprises by Initial/Final Return Status and Number of Entities in Enterprise

	Number of Entities in Enterprise				Grand Total
	5 or fewer	6 to 10	11 to 25	26 or more	
Initial or Final Returns Present	171,367	32,750	8,996	2,797	215,910
No Initial or Final Returns	747,161	83,340	12,474	1,614	844,589
Grand Total	**918,528**	**116,090**	**21,470**	**4,411**	**1,060,499**

TABLE 6. Number of Enterprises by Preparer Concentration and Number of Entities in Enterprise

Percentage of Returns in Enterprise Prepared by Same Preparer	Number of Entities in Enterprise				Grand Total
	5 or fewer	6 to 10	11 to 25	26 or more	
100%	268,120	13,809	2,313	240	284,482
75% to < 100%	206,917	40,004	8,772	1,324	257,017
50% to < 75%	286,333	40,017	5,057	692	332,099
< 50%	93,831	17,047	4,145	1,760	116,783
No returns filed	523	60	48	48	679
(blank)	62,804	5,153	1,135	347	69,439
Grand Total	**918,528**	**116,090**	**21,470**	**4,411**	**1,060,499**

TABLE 7. Number of Enterprises by Number of Minority Investors and Number of Entities in Enterprise

Number of K-1's Issued to "Minority" Investors	Number of Entities in Enterprise				Grand Total
	5 or fewer	6 to 10	11 to 25	26 or more	
26 or more	10,958	3,514	4,207	2,723	21,402
11 to 25	19,924	10,132	7,846	589	38,491
1 to 10	590,719	84,416	7,444	746	683,325
No other investors	296,927	18,028	1,973	353	317,281
Grand Total	**918,528**	**116,090**	**21,470**	**4,411**	**1,060,499**

TABLE 8. Number of Enterprises by Allocation Amount and Number of Entities in Enterprise

Absolute Value of Allocations in Enterprise	Number of Entities in Enterprise				Grand Total
	5 or fewer	6 to 10	11 to 25	26 or more	
$250K or more	177,291	63,789	17,899	3,901	262,880
< $250K	741,237	52,301	3,571	510	797,619
Grand Total	**918,528**	**116,090**	**21,470**	**4,411**	**1,060,499**

TABLE 9. Number of Enterprises by Asset Range and Owner Type

Enterprise Assets	Enterprise Owner Type					Grand Total
	Corporation	Individual	Uncontrolled Flow-Thru	TEGE 990 Filer	Not a yK1 Filer	
≥ $10M	26,817	59,144	19,655	511	6,617	112,744
$1M to < $10M	17,412	280,757	22,022	116	6,917	327,224
< $1M	15,888	582,775	13,952	15	7,901	620,531
Grand Total	**60,117**	**922,676**	**55,629**	**642**	**21,435**	**1,060,499**

5

Appendix

Conference Program

New Research on Tax Administration: An IRS-TPC Conference

Urban Institute, 2100 M Street, N.W., Washington, DC • June 21, 2012

Program

8:30 – 9:00 Check-in, Continental Breakfast

9:00 – 9:05 Welcome and Introductions
Eric Toder (Urban Institute) and Rosemary Marcuss (IRS:RAS)

9:05 – 9:15 Opening Remarks

9:20 – 10:50 **Session 1: Understanding the Taxpayer Experience**

Moderator: *Javier Framiñan (IRS: W&I Research & Analysis)*

- Tax Compliance Costs for Corporations and Partnerships: A New Look
George Contos, John Guyton, and Pat Langetieg (IRS: RAS), Allen Lerman and Susan Nelson (Department of the Treasury, Office of Tax Analysis)
- 2012 Taxpayer Experience of Individuals Living Abroad: Service Awareness, Use, Preferences, and Filing Behaviors
Tiffanie N. Reker and David C. Cico, and Saima S. Mehmood (IRS: W&I Research & Analysis)
- Behavioral Experiments of Alternative Reporting Regimes: Transparency vs. Burden
Laura Kalambokidis (University of Minnesota), Marsha Blumenthal (University of St. Thomas), and Alex Turk (IRS:SB/SE)

Discussant: *Elaine Maag (Urban Institute)*

10:50 – 11:00 Break

11:00 – 12:30 **Session 2: Measuring the Tax Gap**

Moderator: *Mary-Helen Risler (IRS:RAS)*

- Estimates of the TY2006 Individual Income Tax Underreporting Gap
Kim Bloomquist, Ed Emblom, Drew Johns, and Pat Langetieg (IRS:RAS)
- Advances in Nonfiling Measures
Mark Payne and Alan Plumley (IRS:RAS), and Brian Erard (B. Erard & Associates)
- Tax Gap Analysis in the United Kingdom
Mick Thackray (HMRC, UK)

Discussant: *Eric Toder (Urban Institute)*

12:00 – 1:30 Lunch and Keynote Speaker

Fred Goldberg, Former IRS Commissioner

1:30 – 3:30 **Session 3: Understanding Individual Tax Compliance Behavior**

Moderator*: Barry Johnson (IRS:RAS)*

- Incorporating Indirect Effects in Audit Case Selection: An Agent-Based Approach
  Kim M. Bloomquist (IRS:RAS)
- Estimating the Impact of Liens on Taxpayer Compliance Behavior and Income
  Terry Ashley, Jeff Wilson, and Tom Beers (IRS: Taxpayer Advocate Service)
- The Administration's Worst Customers—Habitual Noncompliers
  Michael Duggan, Martyn Knottenbelt, and Jason Byrnes (Inland Revenue, New Zealand)

Discussant*: Janet Holtzblatt (Congressional Budget Office)*

3:00 – 3:15 Break

3:15 – 4:45 **Session 4: The Tax Implications of Business Complexity**

Moderator*: Rahul Tikekar (IRS:RAS)*

- Development of Financial Products Business Rules Using Business Intelligence Technology
  Dave Macias and Jennifer Li (IRS, LB&I)
- Corporate Tax Compliance: The Role of Internal and External Preparers
  Kenneth Klassen (University of Waterloo), Petro Lisowsky (University of Illinois, Urbana-Champaign), and Devan Mescall (University of Saskatchewan)
- Using Link Analysis To Identify Indirect and Multi-tiered Ownership Structures
  Larry May (IRS:RAS)

Discussant*: Lil Mills (University of Texas)*

4:45 – 5:00 Wrap-up

Janice Hedemann (Conference Chair, IRS:RAS)