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**Federal Tax Compliance Research:
Tax Year 2006 Tax Gap Estimation**

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Executive Summary

In February 2006, IRS released an estimate of \$345 billion for the Tax Year (TY) 2001 tax gap. IRS recently estimated all components of the tax gap for TY2006 using improved methodologies and more recent compliance data. The resulting estimate, \$450 billion, does not reflect a significant change in voluntary compliance since TY2001. Instead, the increase in the tax gap is due almost entirely to the increase in total tax liabilities over the intervening period. Table 1 provides a summary of the TY2006 tax gap estimates.

Table 1. Estimates of the TY2006 Gross Tax Gap (\$ billions)

Tax Gap Component	
Estimated Total Tax Liability	2,660
Gross Tax Gap	450
Overall Voluntary Compliance Rate	83.1%
Net Tax Gap	385
Overall Net Compliance Rate	85.5%
Nonfiling Gap	28
Individual Income Tax	25
Estate Tax	3
Underreporting Gap	376
Individual Income Tax	235
Non-Business Income	68
Business Income	122
Adjustments, Deductions, Exemptions	17
Credits	28
Corporation Income Tax	67
Small Corporations (assets under \$10M)	19
Large Corporations (assets of \$10M or more)	48
Employment Tax	72
Self-Employment Tax	57
FICA and Unemployment Tax	15
Estate Tax	2
Underpayment Gap	46
Individual Income Tax	36
Corporation Income Tax	4
Employment Tax	4
Estate Tax	2
Excise Tax	0.1

The gross tax gap is defined as the amount of true tax liability faced by taxpayers that is not paid on time. The voluntary compliance rate (VCR, defined as 1 minus the ratio of the gross tax gap to total liabilities) for TY2006 is estimated to be 83.1%. The VCR for TY2006 is not substantially different from the estimated 83.7% VCR for TY2001

The net tax gap is defined as the portion of the gross tax gap that is never paid, even after enforced and other late payments. The net tax gap for TY2006 is estimated to be \$385 billion. The estimated net compliance rate (NCR) for TY2006 is 85.5%. (The NCR is defined as 1 minus the ratio of the net tax gap to total liabilities.) The 85.5% NCR means that 14.5% of the estimated total tax liability for TY2006 will never be paid.

The \$65 billion difference between the net and gross tax gap estimates for TY2006 represents the amount of the gross tax gap that will eventually be collected through IRS enforcement efforts and other late tax payments. This amount does not include payments of interest and penalties, since those are not included in the gross tax gap. Additionally, enforced and other late payments related to TY2006 were likely lower than they otherwise might have been because of the reduced ability of taxpayers to pay these past-due liabilities during the recession of 2008 and 2009. Enforced and other late payments are typically received in years subsequent to the tax year in which the liability arose (in other words, those related to TY2006 would typically be received after the 2007 filing deadline).¹

Table 2 shows the VCRs by each type of major tax for TY2001 and TY2006 along with their distributions of tax liability. As with the overall VCR, the VCR for each major type of tax remained largely unchanged. There was a small decrease in the VCR for individual income tax from 79% in TY2001 to 77% in TY2006. However, individual income taxes as a share of total tax liability declined from TY2001 to TY2006. The decline in individual income tax liability was offset by an increase in corporation income tax liability. Since the corporation income tax VCR remained constant at 82%, the overall VCR for all types of tax remained substantially unchanged.

**Table 2. Voluntary Compliance Rates and Liability Shares:
Tax Year 2001 vs. Tax Year 2006**

Tax Gap Component	Voluntary Compliance Rates		Distribution of Liability	
	TY2001	TY2006	TY2001	TY2006
Overall (all taxes combined)	83.7%	83.1%	100%	100%
Individual Income Tax	79%	77%	54%	48%
Corporation Income Tax	82%	82%	8%	15%
Employment Tax	92%	91%	33%	33%
Estate Tax	77%	74%	2%	1%
Excise Tax	N/A	N/A	3%	2%

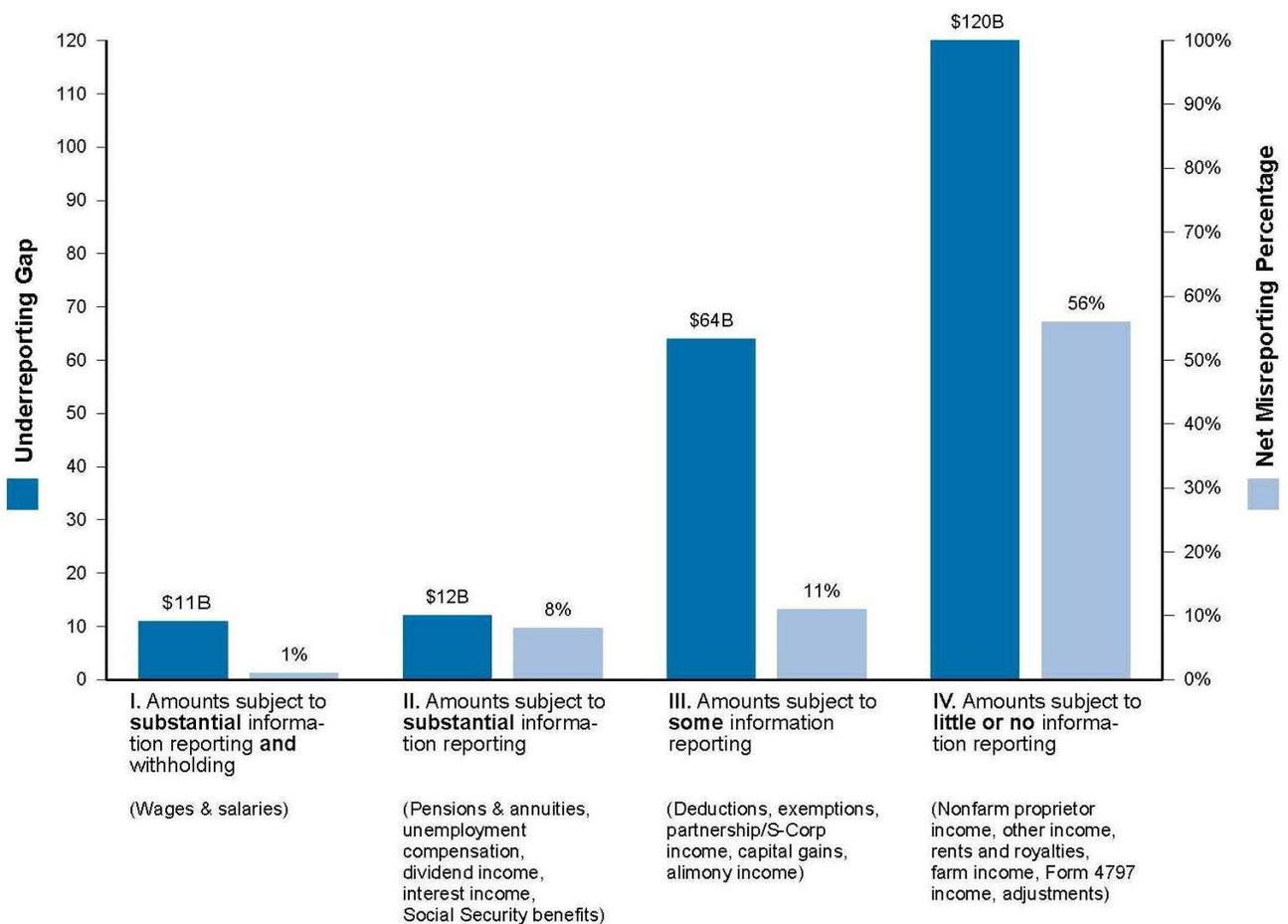
Note: The Voluntary Compliance Rates reflect all three types of noncompliance: Nonfiling, underreporting, and underpayment.

As with the TY2001 tax gap, IRS determined that compliance is far higher when reported amounts are subject to information reporting and, even more so, when subject to withholding. For example, as depicted in Chart 1, the net misreporting percentage, or NMP (defined as the net misreported amount expressed as a ratio of the true amount), for amounts subject to substantial information reporting and withholding is 1%; for amounts subject to substantial information reporting but no withholding, it is 8%; and for amounts subject to little or no information reporting, such as business income, it is 56%.

¹ Late payments are any payments received after the filing deadline. For individual income taxes, late payments would typically be any payment received after the April filing deadline.

Chart 1: Effect of Information Reporting on Taxpayer Compliance

Tax Year 2006 Individual Income Tax Underreporting Gap and Net Misreporting Percentage, by "Visibility" Category

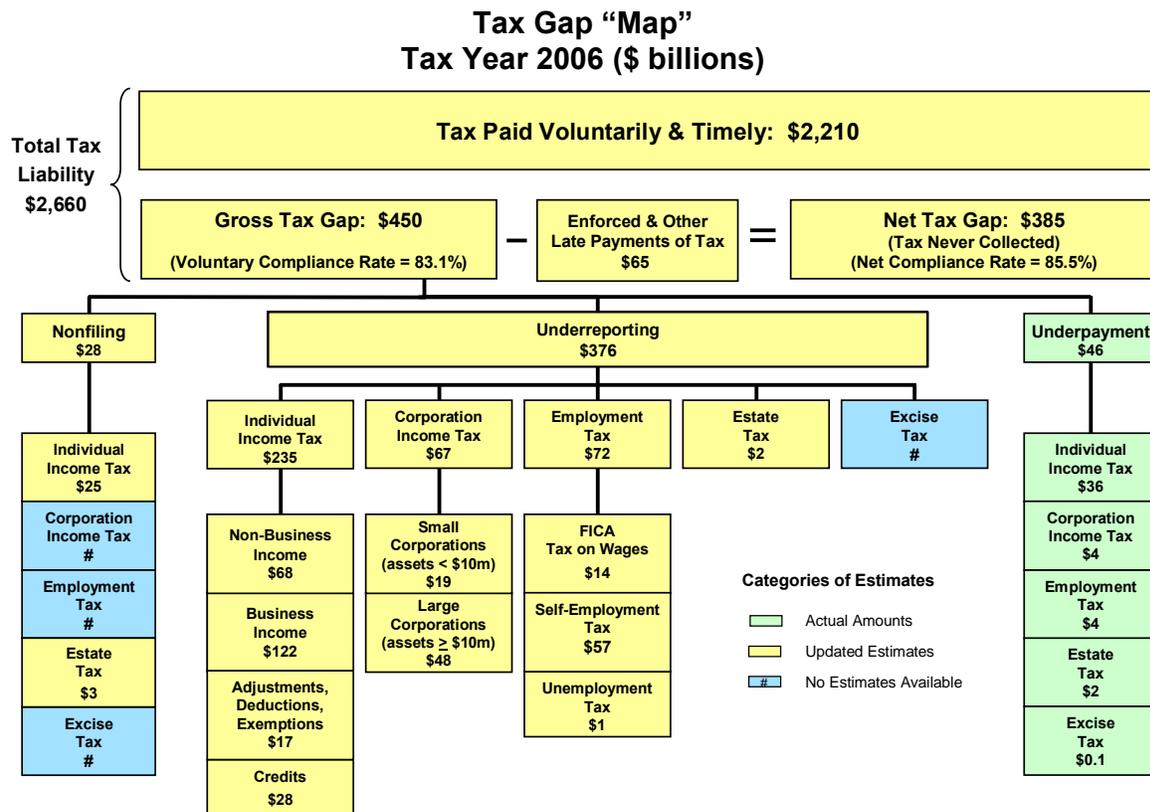


NOTE: Net Misreporting Percentage is defined as the net misreported amount of income as a ratio of the true amount.
Internal Revenue Service, December 2011

Introduction

This document describes the methods used to estimate the various components of the TY 2006 tax gap as depicted in the Tax Gap Map below. The estimation methods described herein represent enhancements, sometimes quite substantial, to the methods used to estimate the 2001 tax gap. Although some parts of the tax gap appear to have grown by more than the growth in tax liabilities, this generally reflects the effect of the new data and improved methodologies, and does not reflect changes in taxpayer compliance behavior.

The Tax Gap



Internal Revenue Service, December 2011

In addition to the methodological enhancements, the estimates are based on more recent data. Starting with TY2006, instead of selecting between 45,000 and 50,000 individual income tax returns for audit on a cyclical basis as had been done under the old Taxpayer Compliance Measurement Program (TCMP) and the more recent National Research Program (NRP) study for TY2001, the IRS began selecting a smaller number of returns for research audits on an annual basis. The annual samples are representative of the population, and can be combined over multiple years to reap the benefits of larger samples. Conducting smaller samples on a continuous basis potentially enables IRS to gather data on how compliance behavior changes over time. For example, IRS was able to design data collection instruments for the NRP studies prior to the implementation of legislation requiring capital gains basis reporting in order to capture information that may help to determine the eventual impact of that change.

Because the results of the TY2006 NRP individual income tax reporting compliance study were recently made available for analysis, the IRS updated the estimate of the tax gap for that year for all tax gap components. The TY2006 estimates are based on a combination of new data and improved estimation methodologies as summarized in Table 3 below and explained in the narrative that follows.

Table 3: Data and Methodologies for Estimating the TY06 Tax Gap

Component		Approach	
Nonfiling Gap	Individual	Data	IRS data for TY 2005
		Method	Matching and modeling of IRS administrative data (information documents, tax returns)
	Estate	Data	NCHS and HRS data from late 1990s and 2000
		Method	Wealth adjusted mortality curves
Underreporting Gap	Individual	Data	TY2006 NRP (about 13k audits), with TY2001 NRP data used to estimate DCE
		Method	<ul style="list-style-type: none"> • Line item DCE estimates, imputed to TY2006 NRP data • Tax calculator
	Corporation	Data	Operational Audits (TYs)
		Method	Small (assets < \$10 million): (1) Modified Yield Curve: 1996-2006 (2) Econometric model: 2004
			Large (assets ≥: \$10 million) (1) Extreme value VRR from Large Corps
	SECA	Data	TY2006 NRP individual random audits with new DCE based on TY2001 NRP
		Method	Tax calculator applied to DCE-adjusted NRP estimates
	FICA & FUTA	Data	TY1984 TCMP random audits
		Method	TCMP VRR applied to tax year reported liability
	Estate	Data	Calendar year 2004 operational audits
		Method	Econometric Model (same as TY2001)
	Underpayment Gap	All	Data
Method			Actual amounts

A. Underreporting Gap

Of the \$450B gross tax gap in TY2006, \$376B or 83% of the total tax gap stemmed from the underreporting of tax liabilities.

Individual Income Tax Underreporting Gap

The individual income tax underreporting gap for TY2006 is estimated to be \$235B. This estimate is based primarily on data collected through the TY2006 NRP individual income tax reporting compliance study. NRP results are adjusted using Detection Controlled Estimation (DCE) to account for income that taxpayers do not report on their

tax returns and the NRP auditors did not detect². DCE is an econometric method developed by Feinstein (1990, 1991) to estimate undetected noncompliance. Originally developed to reflect aggregate noncompliance, the methodology was refined by B. Erard & Associates (2005, 2006, 2007, and 2011) and Erard and Feinstein (2011) to estimate undetected income for each income line item as well as to reflect the processes used by IRS to classify and audit tax returns selected for research purposes under NRP³.

Audit results represent a combination of taxpayer compliance behavior and the ability of IRS examiners to detect noncompliance if it exists. The underlying intuition acknowledges that IRS examiners do not have all of the necessary information with respect to circumstances surrounding taxpayers true reporting obligations and that examiners have differing abilities to detect noncompliance. Furthermore, these differences are revealed consistently (rather than randomly) in the data. DCE takes into account the classification process and whether the issue was selected through the classification process or by the examiner as well as other information regarding the classifier and examiner⁴. DCE quantifies the extent to which the audit results depend on who conducted the audit, essentially constructing a statistical profile of the theoretical best examiner possible. With this profile, it is possible to estimate how much underreporting on each income line item on each return would have been detected if every examiner were as good at detecting underreported income as the theoretical best examiner⁵.

Since the NRP sample for TY2006 is too small to support the DCE analysis, DCE was estimated on TY2001 NRP data and then used to impute undetected income on the TY2006 NRP returns. In contrast to the original DCE methodology used in estimating the TY2001 individual income tax underreporting gap, which required grouping income items together, the improved DCE method was applied to each income line item. As a further improvement, a tax calculator was used to compute the resulting tax adjustment from both detected and undetected misreporting for each income line item on each return. This replaced the use of an estimated average marginal tax equation such as was used to compute the aggregate tax adjustments in the TY2001 individual income tax underreporting gap.

² Even thorough audits (like TCMP and NRP) may not detect all unreported income. For example, the 1976 TCMP examiners did not have third-party information ("IRP") documents (e.g., Forms W-2 and 1099) at their disposal during the audits. When their results were compared with what the IRP documents would have detected, they showed that for every dollar of unreported income that examiners detected without the aid of information documents, the information documents found (on average) another \$2.28 of unreported income. As a result, the IRS multiplied the amounts detected by TCMP examiners without the aid of information documents by 3.28 to estimate the full extent of underreporting. 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.

³ For a discussion of the processes used to select, classify, and audit tax returns under the NRP reporting compliance studies, see Brown and Mazur (2003) or Bennett (2005).

⁴ All identifiers for classifiers and examiners were masked for these analyses.

⁵ See Erard and Feinstein (2011) for complete description of the DCE models used to estimate undetected income underreporting.

Line Item DCE Estimates

The new DCE replaced the four multipliers based on income visibility (high or low) and type of taxpayer (business or nonbusiness) used for the TY2001 estimates. The probability of undetected income and a corresponding amount of undetected income were estimated for each line item on a given NRP return. As with the original DCE methodology, undetected income was estimated only for NRP returns that were examined by Revenue Agents or Tax Compliance Officers (i.e., face-to-face audits). Returns that were accepted as filed, accepted with adjustments, or audited via correspondence were not adjusted to account for undetected noncompliance. Unlike the multiplier methodology, however, undetected income was estimated for returns where no income for a particular line item was reported or detected.

Two-Stage Imputation of Undetected Noncompliance to TY2006 NRP Data⁶

Using the new DCE estimates for TY 2001, a random number was drawn for each TY2001 line item on face-to-face audits. If the random number was below the probability of undetected income, that return was allocated all of the estimated undetected income. This is stage 1 in the imputation process.

In order to impute the new DCE estimates to TY2006 cases (stage 2), the probability of undetected income and mean undetected income were calculated from the imputed undetected TY2001 amounts from stage 1 for each line item over weighted deciles of the reported amounts for that line item (or AGI for returns that did not report any income for the line item). So, each line item was effectively divided into a maximum of 20 bins (10 AGI deciles and 10 line-item deciles).

The TY2006 NRP returns were divided into the same deciles by line item. A random number was drawn for each TY2006 line item on face-to-face audits in order to determine which returns, based on the calculated probabilities, would receive undetected income. If the random number was below the calculated probability for the associated line item decile, then that return was allocated the mean undetected income for that decile. The imputed undetected amount was then multiplied by the ratio of the mean detected underreported income for that line item on TY2006 face-to-face audits to the corresponding mean from TY2001. This methodology essentially assumes that detection rates in TY2006 were the same as TY2001. This process (stages 1 and 2) was repeated 10 times producing 10 separate datasets for TY2006 containing both detected misreporting and imputed undetected underreporting.

Tax Calculator

For each of the 10 datasets resulting from the imputation process, the tax gap for a given income or deduction line was calculated by adding (or subtracting) the DCE

⁶Although data from the TY2007 NRP reporting compliance study were available for analysis, those data were not used to estimate the underreporting gap. Instead, the TY2007 data were used in conjunction with both the TY2001 and TY2006 data to assess overall data quality and trends. The TY2007 data did not need to be used for the imputation of DCE from TY2001 to TY2006, however, since there were enough TY2006 data available for this purpose.

expanded net misreported amount (detected misreporting + imputed undetected underreporting) to the reported amount for that line item (holding all other income items at the level of income as reported on the return) and comparing the calculated tentative tax before and after adding the income. The additional income for the first line item was dropped and the process repeated for the next line item. Credits and self-employment tax were calculated after adding all expanded net misreported amounts for incomes and deductions. The results of these 10 separate simulations were averaged to produce the tax gap estimate⁷.

Partnership, S-Corp, and Estate & Trust Income

The estimate generated by the above method for partnership, S corporation, and estate & trust income reflected a lower Net Misreporting Percentage (NMP) for individuals than the NMP that had earlier been estimated for S corporations (based on the S corporation NRP study). Although S corporation income cannot be separated from other types of income reported on this line, it seemed unreasonable that the NMP on the 1040 (which should reflect the noncompliance of both the flow-through entities and the individual shareholders) would be less than the NMP associated with the entities alone (even if only for S corporations, a large portion of the flow-through entities). This had not been the case with the DCE approach applied for the TY01 tax gap estimates, for which it was assumed that the old DCE approach generally accounted for entity noncompliance as well as shareholder noncompliance (since some of the NRP audits did make inquiries of the entities). The results from the new DCE approach for TY2006, however, suggest that that assumption is incorrect. So, the final estimate for this line item adds a small amount of underreported income to the total such that the overall NMP for the line item rises to the 15% level of the S corporation entities observed in the separate NRP study of S corporations. If one believes that detection at the entity level is not perfect and that the combined noncompliance for this line item is higher than what was observed just for S corporation entities from the NRP study, then the TY2006 estimate represents a lower-bound estimate.

Corporation Income Tax Underreporting Gap

While the TY2001 estimates were projections from earlier published estimates, the TY2006 corporation income tax underreporting gap estimates are based on a combination of new data and new methodologies. Much of the increase in the small corporation estimate reflects the new methodologies and the use of more recent data. It now appears that the TY2001 estimate was too small, not that there was a large increase in noncompliance between TY2001 and TY2006.

⁷ If undetected income were allocated to multiple line items simultaneously the tax calculator would, in many cases, yield higher marginal tax rates than the current procedure, which derives the tax gap by allocating undetected income to each line item. However, because the imputation procedure also includes other assumptions, such as the imputation of mean decile income to tax returns, it is unclear if the imputation methodology, taken as a whole, produces a tax gap that could be construed as a lower or upper-bound estimate.

General Approach

In the absence of NRP data, the TY2006 estimates of the underreporting gap for corporations are based on operational audit results. The methodologies used to estimate corporate underreporting were developed for use when randomly-selected audit data are not available and account for the non-random nature of operational audits.

Like the individual underreporting gap estimates, corporate underreporting is estimated based on the tax adjustment recommended by the revenue agent at the time the case is closed out of Examination, rather than on the amount actually assessed after appeals and subsequent adjustments. While the amount eventually assessed does represent a legal tax liability, there are three main reasons why the tax gap is based on the recommended amounts rather than on the corresponding assessed amounts: (1) The assessed amounts are the legal tax liability only for the issues and subsidiaries that were audited. Unlike the NRP audits, operational audits are not conducted to collect detailed compliance data on all the potential issues on the return. Instead, they are focused more narrowly on areas of suspected noncompliance. (2) Unlike the individual income tax, there is no technique available for estimating underreporting that is not detected by the corporation audits, and it seems unreasonable to expect that auditors perfectly detect all misreporting on corporation returns, which are typically more complex than individual returns. (3) The data available on corporation audit adjustments often understate the actual adjustments made in the examinations. Corporations can apply Net Operating Losses (NOLs) from other tax years to offset agreed upon audit adjustments. IRS systems capture the net audit adjustment after the application of any NOLs rather than the total audit adjustment. That is, if a corporation elects to apply sufficient NOLs at the time the audit is closed, the resulting audit adjustment will appear as a "no-change" audit in the data. Because of these three reasons, on any given return, the recommended amount may overstate or understate the true amount of noncompliance, while the assessed amount is clearly a lower bound. Therefore, the recommended amount is likely closer to the true gap.

Yield Curve Methodology to Estimate Small Corporation Underreporting

Quarterly Examination data from October 1996 through March 2006 were used to estimate the underlying yield curve equations. Simply stated, yield curves provide estimates of recommended assessments that are a function of audit coverage. For tax gap estimation, additional predictor fields such as examiner time, recommended taxes, returns examined, examinations closed, examinations opened, and all open examinations were used in the estimation of the yield curves. Examination specific data were augmented with tax return information and dollar amounts were converted to constant dollar amounts using the gross domestic product chained price index from the U.S. Bureau of Economic Analysis.

The availability of complete audit data for recent tax years is limited due to the complexity of corporate returns requiring lengthy examination cycle-times. Cycle-time is a key consideration in estimating corporate income tax underreporting. While most returns are closed relatively quickly, cases with significant dollar adjustments require

significantly more time. Thus, while TY2006 returns are timely filed in calendar years 2007 and 2008 and the majority of examined returns closed by 2011, significant dollars are still expected from open cases. Thus, coverage rates as historically defined by IRS (number of audit closed in a fiscal year divided by returns filed the previous calendar year) cannot be used⁸. Otherwise, coverage rates based on tax year would understate the eventual true coverage rate for more recent tax years relative to older tax years. In other words, the ratio of open to closed examinations for TY2002 is lower than it is for TY2006 because a higher percentage of the TY2006 returns are still being audited.

Exam vintage was used as a variable to resolve issues associated with tax and fiscal year data, as well as to include the effects of cycle-time on the yield curve. Exam vintage is defined as the elapsed time between the tax year and the year of exam closure. The use of exam vintage also resolves the problem of differentiating between fiscal year and tax year data. It also ensures that all the tax year data can be used even when the percentage of exams closed for recent tax years may be very low. There are three exam vintages defined for the yield curve model:

Vintage 1: Exams that close in less than three years

Vintage 2: Exams that close in three to six years

Vintage 3: Exams that close after six years

Prior IRS estimates for mid-size corporations were based on yield curves estimated using operational audit results and used, in part, to allocate resources more effectively (IRS 1988). For the TY2006 estimate, IRS adapted Jorgenson, Gollop, and Fraumeni (1987) work on U.S. productivity. Using exam vintage, the length of time necessary to close an audit, the yield curve model becomes an economic model of noncompliance detection where the yield can be modeled as a production function. This production function specifies that the output (detected noncompliance as measured by recommended tax adjustments) is dependent on labor and exams conducted as well as shift variables to control for the dynamics of cycle-time and exogenous time factors. Once the basic equation is estimated, it is then possible to simulate the amount of noncompliance auditors would detect were they to audit 100% of all corporations.

The general specification for the yield curve model is:

$$Q = f (L, E, S, T)$$

where:

Q = the noncompliance detected by the exam;

L = examiner time used to conduct the exam;

E = the number of exams conducted (or exams conducted as a share of returns filed);

⁸IRS routinely reports enforcement data such as the number of audits closed, audit coverage rates, recommended taxes, and enforcement revenue on a fiscal year basis. In a given IRS fiscal year, the audits closed by Examination include tax returns from many different tax years. To be consistent with other types of taxes and to align corporate underreporting gap estimates to a tax year basis, coverage rates are recast on a tax year basis.

- S = the closure rate used to control cycle-time thru-put, and;
T = time specific exogenous shift factors.

Modeling the above specification in log form, parameters were estimated using the quarterly data mentioned above. The estimated model was then used in counter-factual simulations to estimate the underreporting gap (detected noncompliance as coverage increases to 100%). As the simulated coverage increased, the total amount of labor required also increased. The simulation accounted for the increased probability of no-change outcomes by converging the per exam labor utilization to the no-change labor utilization as coverage increased to 100%.⁹

Closure rates were used to control for how quickly returns could be audited for each vintage. As simulated examinations aged through the audit life-cycle, a certain proportion of the exam openings were processed over time. For the simulation, this required aging the stock of exams over time. Closure rates ensured that the exams in each vintage class, as defined by the coverage rate, reached closure within a particular time frame. Because there are three exam vintages, a given number of exam openings (corresponding to a coverage rate) are likely to close over a number of years. Some exams will close early in the youngest vintage (less than 3 years), other exams will close after 3 to 6 years and the remaining exams will close after 6 years. The simulated mix of exam closures across the vintages also assumed that the probability of no-change cases is not dependent on closure rates within the vintages.

It was also assumed that the mix of exams that close in a given vintage was roughly the same at 100% coverage as compared to the average during the historical period.

Alternative Methodology to Estimate Small Corporation Underreporting

Another approach was also applied to small corporations as a check on the yield curve estimates. Updating an approach proposed by Erard (2004), an econometric model was estimated that accounted for the fact that operational audits are not selected randomly, but rather only when IRS believes there is significant noncompliance. Operational audits for TY2004 were merged with a random sample of unaudited TY2004 small corporation returns to estimate compliance rates. The methodology estimates five equations jointly:

- (1) the probability of a return being audited
- (2) the probability of detecting underreported tax conditional on an audit
- (3) the amount of underreported tax conditional on detected underreporting
- (4) the probability of detecting overreported tax conditional on an audit and no detected underreporting
- (5) the amount of overreported tax conditional on an audit and no detected underreporting.

⁹ The no-change rate of labor utilization is conceptually defined as that amount of labor for an exam that is required to review the pertinent information in a case and to determine that a corporate return is compliant. This rate represents the average time spent auditing a return resulting in no-change. The no-change rate of labor utilization can be thought of as the fixed cost of conducting an audit.

Based on the above models, a voluntary reporting rate (VRR) was estimated for TY2004 and then applied to TY2006 reported tax. This approach produced a similar overall estimate as produced by the yield curve methodology.

Pareto/Extreme Value Methodology for Mid-Size and Large Corporations¹⁰

The methodology adopted for the large corporation income tax underreporting gap used the general observation from operational audit results that the majority of underreporting is concentrated in a relatively small number of firms (Bloomquist 2008). Axtell (2001) found that the distribution of U.S. firm sizes follows a Pareto distribution. Both Krishnaji (1970) and Revankar (1974) show that underreported income also follows a Pareto distribution if: (a) income follows a Pareto distribution and (b) underreporting is a constant fraction of true income. Studies by Axtell (2001) and Johns and Slemrod (2010) provide support for the two conditions.

Through the use of the Pareto distribution applied to audit adjustment data, extreme values of noncompliance among large corporations can be used to estimate the noncompliance of the rest of the population. Operational audit data for large corporations for Tax Years 2001 to 2006 were used to identify the audits with extreme values in terms of the recommended adjustment to tax. The first step was to determine the top X number of operational audit results among the largest corporations (assets over \$250M) that account for all of the net audit recommendations (such that all other positive and negative recommendations offset). The coefficients of a linear relationship between the log (base 10) of the audit recommendation and the log of the rank of the return (in descending order so that the largest recommendation received a rank of one) were then estimated. This linear relationship was then used to estimate the total tax gap and voluntary reporting rate (VRR)¹¹ for the large firms for Tax Years 2001 to 2006. The average VRR was then applied to the reported tax liability of all corporation returns with reported assets over \$10M.

Increase in the Small Corporation Income Tax Underreporting Gap

The increase from TY2001 in the large corporation estimate described above closely tracks the overall increase in income tax reported by large corporations. However, income tax reported by small corporations (including no balance sheet returns) roughly doubled, while the new gap estimate is nearly four times as large as the TY2001 estimate. The increase in the small corporation estimate reflects the new methodologies and the use of more recent data. It was determined that the TY2001 estimate was too low; therefore, the large increase in that estimate reflects the changed methodology and not an change in compliance behavior. The TY2001 estimate was a

¹⁰ Mid-size corporations are defined as corporations with at least \$10 million in assets, but less than \$250 million. Large corporations are defined as corporations with at least \$250 million in assets.

¹¹ The VRR is defined as the aggregate amount of tax reported on the returns, expressed as a percentage of the estimated total amount of tax that should have been reported (in this case, as determined by the auditors and projected to the rest of the population).

projection of a TY1987 estimate that was based on results from the 1977 and 1980 small corporation TCMP studies.

The estimated VRR for the small corporations is 56%. While low, other information supports a low VRR. A low VRR is consistent with the compliance rate observed for sole proprietors, whom one might expect to have similar compliance characteristics as small closely held corporations. A low VRR (about 61%) is also consistent with the results of the 1987 small corporation TCMP underreporting study (Morton 1992).

Employment Tax Underreporting Gap

The TY2006 employment tax underreporting gap estimate is estimated to be \$72 billion. The self-employment tax component is based on underreported income data from the TY2006 NRP individual income tax reporting compliance study adjusted for undetected noncompliance with the resulting impact on tax being provided by the tax calculator. Since the DCE methodology does not allocate undetected income to particular spouses on jointly filed returns, the self-employment underreporting gap was calculated under two assumptions: (1) income subject to Social Security and Medicare taxes was allocated to just one spouse and (2) income was evenly split between the spouses. The tax gap estimate was the average of those two estimates. This is because the likelihood of someone reaching the maximum taxable income threshold for Social Security tax depends on how much of the undetected income is imputed to them. For TY2001 the average of the two estimates (\$35.3B and \$42.7B) 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 (\$52.4B and \$61.1B) was \$57B.

Due to the absence of NRP data, the estimates for both FICA and Unemployment Taxes are projections based on applying the estimated compliance rates for 1984 to current reported taxes.

Estate Tax Underreporting Gap

For TY2001, the estate tax underreporting gap estimate was \$4B. For TY2006, it was estimated to be \$2B. The TY2006 estimate reflects the application of the existing methodology to new data adjusted for the changes to the estate tax law. Operational audit data were combined with a random sample of tax returns filed timely in calendar year 2004 from the IRS Statistics of Income (SOI) in order to predict underreported tax on unaudited returns using an econometric model. The econometric model controlled for the use of non-random audit data by estimating the probability of audit for a given return and allowing for correlation between unobserved estate characteristics that influence both the probability of audit and the likelihood and magnitude of noncompliance. The 2004 estimate was projected to TY2006 by assuming a constant compliance rate since 2004.

B. Nonfiling Gap

For TY2006, the nonfiling gap was estimated to be \$28B. The nonfiling gap is that portion of the gross tax gap associated with returns that were filed after the filing deadline (or valid extension date) or not filed at all.

Individual Income Tax Nonfiling Gap

The TY2006 estimate is based on a different methodology than used in the past, but the estimate is virtually unchanged from the TY2001 estimate. Whereas the TY2001 estimate was based on the Census Exact Match study¹², the new approach relies more on IRS administrative data. Starting with a random sample drawn from the entire population of Social Security Numbers (SSN), each SSN was placed into one of three categories: (1) those SSNs that appeared on timely filed returns for TY2005; (2) those that appeared on late filed returns for TY2005; and (3) those that did not appear on any return for that tax year.¹³ Since the SSNs in the first category represent taxpayers who met the filing requirement, any noncompliance with their returns is included in the underreporting (and/or underpayment) gap estimate. The noncompliance of taxpayers in the last two categories constitutes the nonfiling gap.

The estimate associated with late returns begins with the balance due reported on those returns, but also takes into account additional income reported on information documents. The tax on those updated returns was then estimated using a tax calculator and then projected one year forward to TY2006, resulting in a \$12B contribution to the nonfiling gap.¹⁴

The estimate associated with people who did not file any return followed a similar procedure, but required the additional step of grouping those people into family units based on their ages and the Census profile of the overall population less those appearing on income tax returns (Lawrence, Udell, and Young 2011). Based on income and withholding reported on third-party information documents (since no return had been filed) these nonfilers contributed an estimated \$13B to the tax gap.

As with the older exact match methodology, this approach produces a lower-bound estimate, but for somewhat different reasons. The Exact Match approach had three major deficiencies, causing it to produce a lower-bound estimate: (1) The Census data understate some income types (sole proprietor income, pension income, etc.); (2) The method counts some late returns as timely, and therefore not contributing to the nonfiling gap; and (3) IRS data on timely payments made by nonfilers overstate the

¹² In the exact match method, the Census Bureau matches their annual survey data against records that the IRS provides to them by law and regulation. This enables the Census Bureau to estimate which individuals filed a tax return. Census also estimates the tax liability of those who did not file tax returns and provides IRS with aggregated tabulations of those estimates.

¹³ The nonfiler gap is the portion of the tax gap associated with both true nonfilers (those that never file a return) and late filers. Late filers are taxpayers who file a tax return after the extension deadline.

¹⁴ The estimates account for the fact that many of those who did not file a return were not required to do so and did not have any tax liability. By definition, they did not contribute to the nonfiling gap.

portion of those timely payments that represents true tax liability,¹⁵ so the estimated nonfiling gap (tax liability estimated from Census data minus timely payments from IRS data) is understated. The current method also understates the incomes of nonfilers; this is arguably less so for some types of income (e.g., pensions), but more so for others (e.g., business income that is not reflected on third-party information documents). But even if the two methods produce roughly the same lower-bound estimate, the new method has the advantage that it can provide much greater detail on the composition of the nonfiling gap, giving us insight into what drives fluctuations over time.

Estate Tax Nonfiling Gap

The TY2001 estimate was a projection of a prior TY1992 estimate by the IRS. The TY2006 estimate reflects the application of the existing methodology to new data and, unlike the TY2001 estimate, the tax reported on late filed returns. The estimate is based on data from the 2000 University of Michigan Health and Retirement Study (HRS) and pre-2000 data from the National Center for Health Statistics (NCHS), involving an estimate of the relationship between wealth and mortality and a prediction of the number of expected calendar year 2001 filers. The predicted number of filers was then compared to aggregate data on actual return filings and tax, resulting in an estimate of the number of returns not filed and the associated tax liability. The difference between the estimated number of returns with a filing obligation (based on the wealth-adjusted mortality curves and projected calendar year 2001 deaths) and the estimated number of estate tax returns filed (based on SOI data) was the estimated number of estate tax nonfilers. The tax liability of the nonfilers was estimated by assuming that their noncompliance was the average tax liability reported on estate tax returns with similar characteristics. The calendar year 2001 estimate (\$3B) was then projected to be \$2B for TY2006 based on reported estate tax liabilities.

A portion of the nonfiling gap consists of estates that file returns after the due date of the return or after the date of any valid extensions. The methodology for estimating the TY2001 nonfiling gap did not include late filed estate tax returns. Therefore a separate estimate of the tax gap associated with late filed returns was needed. The amount of tax reported on late filed returns (but not paid on time) summed to \$1B for TY2006. Therefore, the total estate tax nonfiling gap for TY2006 is \$3B.

C. Underpayment Gap

Total Underpayment Gap

For TY2006, \$46B of taxes reported on time were not paid when due. As with the TY2001 figure, this TY2006 amount is based on actual tabulations of taxpayer account transactions (both the amounts reported and the amounts paid are observed). One

¹⁵ This is because if returns had been filed, many of them would have justified a lower tax liability than can be assumed from information available to the IRS. Timely payments in excess of true tax liability by some nonfilers should not be subtracted from the true liability of other nonfilers; if they had filed, the excess would have been refunded, not applied to other nonfilers' deficiencies.

small component is estimated: withheld income tax that is not reported on time by employers, but is reported on time by the affected employees. Data on such withholdings that are recovered through enforcement served as the basis for that estimate.

D. Enforced and Other Late Payments

Total Enforced and Other Late Payments

The net tax gap is derived by subtracting an estimate of the amount of the tax gap (i.e., excluding interest and penalties) that IRS can expect to collect for the tax year in question through enforcement and other late payments.

“Other late payments” are those provided by taxpayers without any IRS intervention. They include, for example, amounts for timely balance-due returns that are paid after the due date but before IRS sends an assessment notice, amounts paid with returns that are filed late or even before an extended filing due date, and amounts paid with amended returns, etc.

For TY2006, the IRS is projected to eventually collect \$65B of the gross tax gap through enforcement activities and other payments. The enforcement portion of this was determined from the historical distribution of enforcement revenue across fiscal years for each earlier tax year, which was applied to the amounts collected to date for TY2006. This resulted in a projection of about \$40 billion expected to be recovered through enforcement. The amount of other late payments was determined based on the historical relationship of those payments to those payments received through enforcement activities: an amount of about \$25 billion was projected for TY06.

Research, Analysis, and Statistics, March 2012

References

- Robert L. Axtell, "Zipf Distribution of U.S. Firm Sizes," *Science*, 293:1818-1820, 2001.
- Charles Bennett, "Preliminary Results of the National Research Program's reporting Compliance Study of Tax Year 2001 Individual Returns", *IRS Research Bulletin* (Publication 1500), Internal Revenue Service, Washington, D.C., 2005.
- Kim M. Bloomquist, "Estimation of Corporate Tax Underreporting Using Extreme Values from Operational Audit Data," Paper presented at the 14th Anniversary Organization Science Winter Conference, Squaw Creek, CA, February 7-10, 2008.
- Robert E. Brown and Mark J. Mazur, "IRS's Comprehensive Approach to Compliance Measurement," *National Tax Journal*. 56(3):689-700, September 2003.
- B. Erard & Associates, "Development of a Strategy for Estimating the Federal Income Tax Reporting Gap Among Small Corporations," Draft Report for IRS Contract TIRNO-03-P-00429, July 16, 2004.
- B. Erard & Associates, "IRS Tax Gap Estimation: Preliminary Results of Detection Controlled Analysis," PowerPoint presentation to Internal Revenue Service Office of Research, November 1, 2005.
- B. Erard & Associates, "Preliminary Econometric Results," Results summary report submitted to Internal Revenue Service Office of Research, January 27, 2006.
- B. Erard & Associates, "Adjustment of Income Tax Underreporting Using Detection Controlled Estimation," Final Report for IRS Contract Number TIRNO-05-D-00050 0001, November 15, 2007.
- B. Erard & Associates, "Estimates of Income Underreporting Based on Generalized Detection Controlled Estimation Methodology," Task 1 Final Report for IRS Contract TIRNO-10-D-00021 0001, July 22, 2011.
- Brian Erard and Jonathan S. Feinstein, "The Individual Income Reporting Gap: What We See and What We Don't," Paper Prepared for IRS-TPC Research Conference on New Perspectives in Tax Administration, June 22, 2011.
- Jonathan S. Feinstein, "Detection Controlled Estimation," *Journal of Law and Economics*, 33(1):233-276, 1990.
- Jonathan S. Feinstein, "An Econometric Analysis of Income Tax Evasion and its Detection," *Rand Journal of Economics*, 22(1):14-35, 1991.
- Internal Revenue Service, *Income Tax Compliance Research: Estimates for 1973-1981, Appendix B*, Department of Treasury, 1983.

Internal Revenue Service, *Income Tax Compliance Research: Gross Tax Gap Estimates and Projections for 1973-1992*, IRS Publication 7285 (3-88), Washington, D.C., 1988.

Internal Revenue Service, *Tax Gap for Tax Year 2006: Overview*, January 2012, Available at http://www.irs.gov/pub/newsroom/overview_tax_gap_2006.pdf.

Andrew Johns and Joel Slemrod, "The Distribution of Income Tax Noncompliance," *National Tax Journal*, 63 (3):397-418, 2010.

Dale W. Jorgenson, Frank M. Gollop, and Barbara M. Fraumeni, *Productivity and U.S. Economic Growth*, Cambridge MA: Harvard University Press, 1987.

N. Krishnaji, "Characterization of the Pareto Distribution Through a Model of Underreported Incomes," *Econometrica*, 38(2):251-255. 1970.

Josh Lawrence, Michael Udell and Tiffany Young, "The Income Tax Position of Persons Not Filing Returns for Tax Year 2005," Paper presented at the 2011 IRS-TPC Research Conference on New Perspectives in Tax Administration, June 22, 2011.

Carolyn M. Morton, "Trends in the Compliance of Small Corporations," *The IRS Research Bulletin*, 1992.

Nagesh S. Revankar, Michael J. Hartley, and Marcello Pagano, "A Characterization of the Pareto Distribution," *The Annals of Statistics*, 2(3):599-601, 1974.