

Attrition in the Individual Income Tax Return Panel Tax Years 1999-2005.

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Introduction

Tax policy research is increasingly relying on panel data to study behavioral changes. Longitudinal files allow researchers to study how the same taxpayers react to tax law changes and how the tax system affects these taxpayers over a number of years as taxpayers' incomes rise and fall. While panels have many significant benefits to behavioral research, they are not without problems. Attrition, for example, can undermine the validity and misrepresent the results of many policy analyses. This paper looks at attrition as found in the 1999 Individual Income Tax Return Panel (Edited Panel), produced by Statistics of Income (SOI). This paper will focus on the magnitude and sources of attrition within the panel, spanning seven years from 1999 through 2005.

Two previous papers¹ have described the design of this panel and presented a first look at the data. This paper will go beyond these papers by scrutinizing the presence and magnitude of attrition over a seven year period. First, the paper will take a brief look at the data. Second, the paper will define and analyze the presence of attrition in the Edited Panel. Third, it will look closer by examine the possible causes and predictability over time. And finally, it will summarize the results and discuss future research.

The Data

The 1999-2005 Edited Panel is a prospective panel sampled from individual tax returns filed for Tax Year 1999. Selection was based on a stratified subsample of the 1999 SOI cross sectional file, or Complete Report, which was then reweighted to match the Complete Report population estimates. The panel follows both the primary and secondary taxpayers reported on selected 1999 tax returns; after initial weights are computed; subsequent years' weights in general will not change². If a base year taxpayer files a return in any subsequent year, either as a primary or secondary taxpayer, the return is selected for inclusion.

It is normal for a panel to lose members as time progresses. The important questions are the magnitude and causes of that loss. Table 1 compares the yearly weighted sum of the 1999-2005 Edited Panel against the SOI Complete Report, for 1999 and 2005. For 1999 both the Edited Panel and the Complete Report represented 127 million tax returns. By 2005 the Complete Report represented 134 million returns while the Edited Panel only represented approximately 105 million returns, a more than 20% difference. Most differences are for AGI classes of below \$25,000; these differences range from 24% to 63%. This most significant drop, 63%, is for the AGI class of \$1 to \$5,000. AGI classes above \$50,000 show limited loss.

As mentioned before, the panel does not follow tax returns; it follows taxpayers who file tax returns. Table 2 shows the number of taxpayers present in each year of the panel. As compared to Table 1, 177 million taxpayers were reported on the 127 million returns for 1999. While the panel begins with 177 million taxpayers, by 2005, 27 million or 15% of taxpayers are lost, leaving only 150 million taxpayers present in 2005.

Table 1: Comparison of Tax Return Totals between the Edited Panel and the 1999 and 2005 Cross Sections, by AGI

Size of Adjusted Gross Income	Number of Tax Returns, 1999			Number of Tax Returns, 2005		
	Cross Section	Edited Panel	Difference	Cross Section	Edited Panel	Difference
All taxpayers, total.....	127,075,144	127,033,386	0%	134,372,678	104,631,132	22%
Taxpayers on returns reporting:						
No adjusted gross income.....	1,066,171	1,016,365	5%	1,761,041	1,225,033	30%
\$1 under \$5,000.....	13,349,971	13,266,914	1%	11,476,415	4,207,812	63%
\$5,000 under \$10,000.....	12,979,714	12,945,300	0%	12,114,236	6,040,020	50%
\$10,000 under \$15,000.....	12,275,717	12,226,560	0%	11,635,684	7,415,327	36%
\$15,000 under \$20,000.....	11,783,174	11,742,379	0%	11,126,599	7,830,323	30%
\$20,000 under \$25,000.....	9,967,211	9,963,957	0%	9,784,167	7,409,485	24%
\$25,000 under \$30,000.....	8,392,769	8,395,154	0%	8,738,107	7,312,297	16%
\$30,000 under \$40,000.....	13,288,379	13,370,852	-1%	13,940,405	12,055,500	14%
\$40,000 under \$50,000.....	9,870,199	9,812,207	1%	10,618,506	9,769,666	8%
\$50,000 under \$75,000.....	16,755,560	16,897,458	-1%	18,351,037	17,347,218	5%
\$75,000 under \$100,000.....	7,811,626	7,755,507	1%	10,449,989	10,047,796	4%
\$100,000 under \$200,000.....	7,104,712	7,186,048	-1%	10,810,367	10,557,383	2%
\$200,000 under \$500,000.....	1,876,561	1,891,573	-1%	2,737,802	2,588,000	5%
\$500,000 under \$1,000,000.....	348,256	355,705	-2%	524,506	529,159	-1%
\$1,000,000 or more.....	205,124	207,407	-1%	303,817	296,113	3%

¹ See Weber, (2005) and Weber (2006).

² See Weber (2005).

Table 2: Number of Edited Panel Taxpayers Present for each Tax Year

Filing Year	Number of Taxpayers	Percent of Base Year
Base Year, 1999	177,004,496	100%
2000	169,207,774	96%
2001	165,234,603	93%
2002	161,331,140	91%
2003	158,155,749	89%
* 2004	154,784,743	87%
* 2005	150,006,545	85%
Total taxpayer loss	26,997,951	15%

*Information subject to change in future years due to late file!

Table 3: Number of Taxpayers Filing for all Previous Tax Years and the Difference Due to Intermittent Filing or Dropping out

	Number of Taxpayers	Percent of Base Year	Difference Each Year
Present in listed year and all prior years			
1999	177,004,496	100%	
2000	169,207,776	96%	4%
2001	162,846,071	92%	4%
2002	156,940,781	89%	3%
2003	151,657,972	86%	3%
* 2004	146,389,679	83%	3%
Balanced Panel * 2005	140,201,283	79%	3%
Total missing from balanced panel	36,803,213	21%	
Intermittent filers	12,867,629	7%	
Total attrition	23,931,579	14%	

*Information subject to change in future years due to late filers

Figure 1

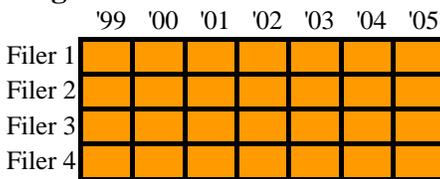


Figure 2

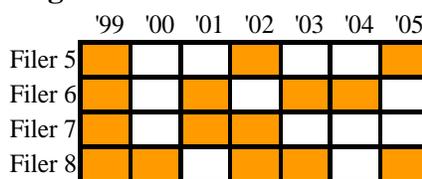
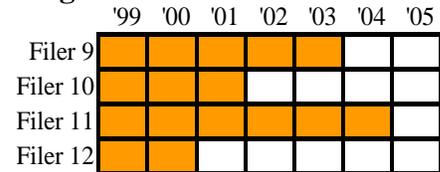


Figure 3



Definition and Distinctions of Attrition

Balanced panels, where each base year unit is present in all years, are the most straightforward type of panel to use in analyzing behavior, requiring no data manipulation or additional analysis assumptions. Figure 1 expresses this concept by showing colored blocks for each year taxpayers’ 1-4 filed a return. When working with an unbalanced panel, records missing will fall into one of two forms, intermittent filers and attrition.

Intermittent filers are present in the base year, missing for at least one year after, and then later return for at least one additional year. To clarify, suppose Filer 5 of figure 2 was selected into the Edited Panel in 1999. Filer 5 has a low paying job and usually is not required to file a return. In 2000, 2001, 2003, and 2004 his income was below the minimum threshold and therefore he chose not to file. In 2002 and 2005, however, his income was above the minimum and therefore he did file. Filer 5 is an intermittent filer. Note that while Filer 5 appears in 2005, a 2005 return is not required to be classified as an intermittent filer. While patterns of intermittent filing are interesting and should be examined, this is reserved for future work.

Attrition, on the other hand, is defined as filers that are present in the base year and every subsequent year until dropping out before 2005 and not returning. For example, suppose Filer 9, of figure 3 was selected into the Edited Panel in 1999. Filer 9 continues to file through 2003. At the end of 2003 she retires and her income drops below the minimum requirement to file. Thus for 2004 and 2005 she does not file a return.³ This definition plays off the notion that these taxpayers would have been included in the balanced panel had they continued filing. Contrary to intermittent filers, whose missing-ness may be due to a taxpayer’s periodic changing circumstance, attrition provides information pertaining to a permanent taxpayer change.

Table 3 addresses the progression towards a balanced panel by showing the number of taxpayers who were present in all years of the panel. Through 2005 only 140 million taxpayers remained present in all years; a loss of 37 million taxpayers, or 21% over the seven year period. Of the 37 million taxpayers lost from the balanced panel, 13 million were intermittent filers and 24 million, 65% of the missing, dropped out. The third column shows the difference between years. The change, while fluctuating between 3% and 4%, is very consistent over time and suggests that each year we can expect to lose approximately 3.5% of taxpayers.

Table 4: Number of Taxpayers who Filed Intermittently

	Number of Taxpayers	Percent Intermittent
Total	12,867,629	100%
Present in 1999 and 2005, ceasing in middle year(s)	9,805,260	76%
Stopped filing during TY(1)		
2002	236,266	2%
2003	466,722	4%
* 2004	828,577	6%
* 2005	1,530,804	12%

(1) Need minimum of three years to establish intermittency, One year present, one year missing, and one year back

³ For the 1999-2005 file, these filers are defined as dropping out. Later files may pick up a late return and thus, redefine these filers as either intermittent filers or balanced panel filers.

Table 5: Number of taxpayers who were present all seven years by year in which they filed and corresponding tax year

Processing	Filing year						
	1999	2000	2001	2002	2003	2004	2005
1999	138,417,227	0	0	0	0	0	0
2000	1,355,947	138,551,438	0	0	0	0	0
2001	428,110	1,296,859	138,560,756	0	0	0	0
2002	0	227,437	1,211,785	138,692,796	0	0	0
2003	0	74,267	298,532	1,116,019	138,593,541	0	0
2004*	0	15,204	85,877	242,507	1,253,203	138,754,299	0
2005*	0	36,079	44,334	149,962	354,540	1,446,984	140,201,283
Total	140,201,284	140,201,284	140,201,284	140,201,284	140,201,284	140,201,283	140,201,283

*Information subject to change in future years due to late filers

Note: A return filed in listed processing year refers to the current tax year at the time, processing years larger than filing years are late filers

Table 6: Number of intermittent taxpayers who were present in 1999 and 2005, by absent year

Tax Year	Number of Taxpayers	Percent of Intermittent
Total	9,805,260	100%
2000	2,812,351	29%
2001	2,200,731	22%
2002	1,946,675	20%
2003	1,589,398	16%
* 2004	1,256,105	13%

*Information subject to change in future years due to late filers

Table 7: Number of taxpayers who filed a 1999 return and also filed in every subsequent year until permanently leaving, by first absent year

Total taxpayers who permanently left before 2005	Number of Taxpayers
	23,931,579
Stopped filing before tax year	
2000	3,719,911
2001	3,295,433
2002	3,347,999
2003	3,369,678
* 2004	4,012,187
* 2005	6,186,371

*Information subject to change in future years due to late filers

As mentioned before, intermittent filers introduce missing data into the panel but, due to their subsequent return, may not provide researchers with information pertaining to a change in filing behavior. Table 4 examines the prevalence of intermittent filers across all seven years. Of the nearly 13 million taxpayers who filed intermittently, over 75%, or 9.8 million, filed a 2005 return. The second largest group of intermittent filers is those who filed in 1999, left some time after, returned and filed a 2004 return and left without filing a 2005 return, with 1.5 million taxpayers. An explanation for a large portion of this 1.5 million is due to later filers. To better understand this, Table 5 compares the Tax Year of a return versus the year it was processed. For simplification only, returns in the balanced panel are examined. We find this same trend occurs for the unbalanced panel as well. For Tax Year 1999 over 1.8 million taxpayers filed late, for Tax Year 2000 1.6 million taxpayers filed late. This trend continues on through Tax Year 2004 with 1.4 million taxpayers filing late. Thus of the 1.5 million intermittent taxpayers not present in 2005, we can expect a majority to file a Tax Year 2005 return. Table 6 breaks down the 9.8 million taxpayers, noted above, into the first year the intermittent filer was absent. The percent of taxpayers' first year missing seems to decline over time. More work on intermittent filers will need to be conducted to determine if this is in fact predictable over time.

Tax policy analysts are still debating the appropriate imputations for these intermittent filers. This is an area of further research but most likely would involve imputation attempts using the

methods of Multiple Imputation or Maximum Likelihood⁴. These methods would solve the missing data problem created by intermittent filers. The application of these approaches is beyond the scope of this paper and is left for future work. Looking back at Table 4, if a method is in place for computing missing data, the 9.8 million taxpayers present in 1999 and 2005 can be redefined as in balance and added to the count of balanced panel members and 3 million taxpayers may be re-categorized as attrition. Again, however, this is left for future work.

Assuming we can correctly impute intermittent filer information, attrition becomes the difference between the balanced panel (with imputation of intermittent filers) and the overall unbalanced panel. As mentioned above, of the 37 million taxpayers who are missing from the balanced panel, nearly 24 million, or 65% of missing taxpayers, are missing due to attrition. Table 7 shows the number of taxpayers who have dropped out by the filing year they stopped appearing, i.e. no return was filed for the listed year. In general, the amount dropping out per year is steady over time.

Partitioning Attrition

Again, we found the rate of attrition each year consistent over 5 of the 6 years in which attrition is measured. Several reasons for attrition are available. The most cited reason throughout attrition work is death. When looking at death rates, we expect to see consistency over time. Table 8 breaks out the number of taxpayers dropping out by year of death. Of the 23.9 million taxpayers who dropped out over the life of the panel, over a quarter, or 6.3 million taxpayers, drop out because of death. Notice however, that the death rate in Tax Year 2005 is driving down the overall rate of attrition due to death; by removing this year the overall rate is

⁴ See Allison (2002) for more detail.

Table 8: Attrition due to death, by year of death

Year of Death	Number of Taxpayers	Number of Deaths	Percent of Total Attrition
All taxpayers, total(1)..	23,931,579	6,261,171	26%
2000	3,719,911	1,093,105	29%
2001	3,295,433	1,048,083	32%
2002	3,347,999	1,082,684	32%
2003	3,369,678	1,017,504	30%
* 2004	4,012,187	1,036,157	26%
* 2005	6,186,371	983,638	16%

* Information subject to change in future years due to late filers

(1) Must have been present in all previous tax years

a third of overall attrition. Much like the total rate of attrition, the rate of attrition due to death is consistent over 5 out of 6 years ranging from 26% to 32%. Given the late filing of returns, we expect the final 2005 attrition rate to drop and consequently the percent of yearly attrition due to death to increase to approximately match earlier years.

While deaths explain nearly a third of attrition tax return filing requirements explain much of the remainder. The overarching requirement for filing a tax return is based on one's gross income level. In general, for Tax Year 1999 an individual should have filed a return if their gross income was over \$7,050 if single and \$12,700 if married⁵, with exceptions. Table 9 examines the number of taxpayers who drop out by their last reported Adjusted Gross Income (AGI) in 1999 dollars. Because of the IRS minimum requirement to file, it is not surprising to see that for those taxpayers who stopped reporting after 1999, the distribution is skewed around lower AGI classes, with 63% of total attrition in the AGI classes below \$15,000. Census reported in 2000 that the second lowest quintile for mean household income in 1999 was \$24,436⁶. Thus, in 2000 alone 63% of the panel's attrition occurs in the bottom quintile of the household income distribution. Subsequent years show the same pattern persisting; taxpayers who drop out in the following year tend to have a low AGI. The only year in which the amount drops below half, at 45%, is 2005. In the future we plan to match taxpayers to information documents (e.g. W-2) and hopefully this will support the low-income explanation for attrition.

The Edited Panel uses the Taxpayer Identification Number (TIN) to identify members of the panel and to sample their returns in subsequent years. While most tax returns list Social Security Numbers (SSN) provided by the Social Security Administration (SSA), many nonresidents, resident aliens, or other taxpayers who cannot get a Social Security Number report an Individual Taxpayer Identification Number (ITIN) provided by the Internal Revenue Service. When a taxpayer using an ITIN receives an SSN, they are required to use the SSN on subsequent returns instead of the ITIN. SOI does not possess a crosswalk of ITINs and SSNs, and so unless these taxpayers file jointly with another panel member, the returns will not be sampled for the Edited Panel. Table 10 looks at attrition based on ITINs. Overall only 1.6% of those dropping out have an ITIN; consequently, ITINs are a minor cause of attrition. However, additional analysis of ITIN attrition still needs to be done because of the unique population it represents.

Other causes of attrition examined included age, marital status, gender, and number of dependents. Independent of other previously examined causes, none showed any discernable trends. This is most likely due to the fact that requirements to file are based solely on amount of income, set at different limits based on filing status and age. Therefore the tendency for lower income filers to drop out at higher rates than upper income filers is the underlining cause for any other patterns in the examined demographics.

We have seen attrition is distributed evenly from 2000 through 2005, death accounts for a third of attrition and of the remaining two thirds the majority of attrition may be explained by filing requirements. Going forward, more work is needed to determine whether attrition in the Edited Panel is a random event. If attrition is deemed random, then analysis excluding attrition is justifiable and therefore analysis will provide valid inferences. If, however, attrition is not random then analysis can lead to invalid inferences. This ultimately reduces the explanatory power.

⁵ IRS, Publication 17, Table 1-1.

⁶ Table C of "Money Income in the United States", Current Population Report, Sept. 2000, page xii.

Table 9: Attrition by last reported Adjusted Gross Income in 1999 dollars

Adjusted Gross Income	Number of Taxpayers in 1999	Taxpayers who Attrite								
		AGI in 1999			AGI in 2000			AGI in 2001		
		Number of Taxpayers	Percent of AGI Class	Percent of Attrition	Number of Taxpayers	Percent of AGI Class	Percent of Attrition	Number of Taxpayers	Percent of AGI Class	Percent of Attrition
All taxpayers, total.....	177,004,496	3,719,912	2%	100%	3,295,434	2%	100%	3,348,000	2%	100%
Taxpayers on returns reporting:										
No adjusted gross income.....	1,389,937	121,068	9%	3%	74,022	5%	2%	128,001	9%	4%
\$1 under \$5,000.....	13,896,882	877,546	6%	24%	778,057	6%	24%	696,449	5%	21%
\$5,000 under \$10,000.....	14,337,330	807,906	6%	22%	648,963	5%	20%	661,066	5%	20%
\$10,000 under \$15,000.....	14,308,884	544,291	4%	15%	490,055	3%	15%	471,305	3%	14%
\$15,000 under \$20,000.....	14,514,677	337,464	2%	9%	321,718	2%	10%	332,332	2%	10%
\$20,000 under \$25,000.....	12,693,114	243,194	2%	7%	232,462	2%	7%	219,589	2%	7%
\$25,000 under \$30,000.....	10,932,736	135,817	1%	4%	102,939	1%	3%	152,368	1%	5%
\$30,000 under \$40,000.....	18,700,685	195,776	1%	5%	196,020	1%	6%	189,210	1%	6%
\$40,000 under \$50,000.....	15,152,781	119,287	1%	3%	115,248	1%	3%	142,467	1%	4%
\$50,000 under \$75,000.....	29,063,192	160,512	1%	4%	165,871	1%	5%	172,833	1%	5%
\$75,000 under \$100,000.....	14,183,382	73,375	1%	2%	66,444	0%	2%	66,291	0%	2%
\$100,000 under \$200,000.....	13,287,376	66,982	1%	2%	76,875	1%	2%	91,175	1%	3%
\$200,000 under \$500,000.....	3,509,441	31,740	1%	1%	18,362	1%	1%	18,129	1%	1%
\$500,000 or more.....	1,034,079	4,954	0%	0%	8,398	1%	0%	6,785	1%	0%

Table 9: cont.

Adjusted Gross Income	Number of Taxpayers in 1999	Taxpayers who Attrite								
		AGI in 2002			AGI in 2003			AGI in 2004		
		Number of Taxpayers	Percent of AGI Class	Percent of Attrition	Number of Taxpayers	Percent of AGI Class	Percent of Attrition	Number of Taxpayers	Percent of AGI Class	Percent of Attrition
All taxpayers, total.....	177,004,496	3,369,679	2%	100%	4,012,188	2%	100%	6,186,370	3%	100%
Taxpayers on returns reporting:										
No adjusted gross income.....	1,389,937	104,940	8%	3%	118,630	9%	3%	188,100	14%	3%
\$1 under \$5,000.....	13,896,882	625,842	5%	19%	732,447	5%	18%	970,857	7%	16%
\$5,000 under \$10,000.....	14,337,330	692,750	5%	21%	757,304	5%	19%	985,208	7%	16%
\$10,000 under \$15,000.....	14,308,884	534,319	4%	16%	529,513	4%	13%	650,929	5%	11%
\$15,000 under \$20,000.....	14,514,677	318,837	2%	9%	378,989	3%	9%	565,325	4%	9%
\$20,000 under \$25,000.....	12,693,114	225,783	2%	7%	298,224	2%	7%	428,470	3%	7%
\$25,000 under \$30,000.....	10,932,736	158,060	1%	5%	167,472	2%	4%	286,012	3%	5%
\$30,000 under \$40,000.....	18,700,685	221,900	1%	7%	321,190	2%	8%	459,031	2%	7%
\$40,000 under \$50,000.....	15,152,781	121,050	1%	4%	198,610	1%	5%	392,499	3%	6%
\$50,000 under \$75,000.....	29,063,192	193,171	1%	6%	264,084	1%	7%	568,166	2%	9%
\$75,000 under \$100,000.....	14,183,382	80,250	1%	2%	115,713	1%	3%	261,031	2%	4%
\$100,000 under \$200,000.....	13,287,376	67,639	1%	2%	98,180	1%	2%	320,303	2%	5%
\$200,000 under \$500,000.....	3,509,441	20,328	1%	1%	28,479	1%	1%	87,258	2%	1%
\$500,000 or more.....	1,034,079	4,810	0%	0%	3,353	0%	0%	23,181	2%	0%

Table 10: Attrition by ITIN listed Taxpayers

	Number of Taxpayers	Number of ITINs	Percent of Attrition
All taxpayers, total.....	23,931,579	385,814	1.6%
Taxpayers last reporting in:			
2000	3,719,911	88,608	2.4%
2001	3,295,433	59,897	1.8%
2002	3,347,999	77,163	2.3%
2003	3,369,678	30,809	0.9%
* 2004	4,012,187	83,672	2.1%
* 2005	6,186,371	45,665	0.7%

Conclusions

The goal of this paper was to examine the magnitude and source of attrition within the 1999-2005 Individual Income Tax Return Panel. Because many longitudinal models use balanced data, we looked at taxpayers missing from the balanced panel falling into two forms; intermittent filers and attrition. Looking back to Table 3, of the 37 million taxpayers who failed to survive all seven years of the panel, 13 million were classified as intermittent filers; we later saw that 76% of these filers returned to file a Tax Year 2005 return. This left nearly 24 million taxpayers, 65% of all missing returns, falling under the category of attrition.

When examining attrition we observed the overall rate was consistent and reasonably predictable. To determine possible sources, we examined several demographics and were able to narrow the list to three independent causes. These were deaths, low incomes, and Taxpayer Identification Number changes. We saw that deaths caused 26% of overall attrition and was reasonably consistent at 30% for five years of the six years possible. If prior year Adjusted Gross Incomes are good proxies for actual current year incomes then of the remaining attrition over 70% of drop outs have an AGI lower than \$20,000. Finally, we were able to conclude that having an ITIN supplied by IRS had very little affect on attrition over time, being at most found in 2000 with only 2.4% of attrition. No other possible causes we examined seemed to affect attrition when taken independent of the three previously mentioned causes.

While the focus of this paper was on the demographic configuration of attrition in the 1999-2005 Edited Panel, we are looking to expand the research in several different directions. The next step is test the hypothesis of random attrition. Once this has been determined we can more accurately impute this missing data. We are interested in attaching information documents to each of the panel members to extrapolate possible reasons for dropping out, this also will be beneficial in the imputation of missing data. Finally, we hope to examine trends in late filing to see if some taxpayers who we categorized as dropping out, would have in fact been present had we extended the length of this panel.

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