ESTIMATING THE DISTRIBUTION OF THE FEDERAL INCOME AND SOCIAL SECURITY TAXES - AN INTERIM REPORT ON A SIMULATION APPROACH

by

Roger A. Herriot*
Social and Economic Statistics Administration, Bureau of the Census

I. Introduction

In this paper I shall present some preliminary findings from a continuing research project at the Census Bureau on the distribution of taxes. In past studies,[1] we have presented estimates of the average amount of various taxes paid by families and unrelated individuals in each adjusted total money income class.[2] However, more work is needed to disaggregate and prepare estimates for various subgroups of the population. For example, how much tax is paid by people with "low income," or those over 65 years old?

In order to fulfill this need we have been developing a simulation procedure wherein we could simulate the amount of tax paid by each person or household covered in the Current Population Survey (CPS). Thus far we have simulated information for only the Federal income tax and the Personal Contributions for Social Security. While I had hoped to present some estimates of these taxes by race, age, and "low income" status, these estimates are not yet finished. We have however, completed some estimates of these taxes by household and family status. The next section of this paper will discuss the simulation methodology. This will be followed by a summary evaluation of the procedure. In the final section, a brief discussion of some of the results based on income for 1968 will be presented.

II. Methodology

A. Income Tax

Determination of Adjusted Gross Income

Although it is not possible to estimate, with precision, the Internal Revenue Service (IRS) concept of Adjusted Gross Income (AGI) from the money income information reported in the CPS, our approximation of their concept is believed to be sufficient for most purposes. This approximation of AGI will be referred to in this paper as "AGY". To approximate AGI, the following transfer payments were subtracted from Total Money Income (TMY): (1) Social Security and Railroad Retirement payments, (2) Public Assistance or Welfare, (3) Veterans' benefits, (4) Unemployment Compensation, (5) Money Workmen's Compensation, and (6) Government Employee Pensions. Although the last item should not have been excluded, it was reported in total money income with other transfers and thus had to be removed with them. The most serious faults of AGY as an approximation of AGI is in the underreporting and nonreporting of property income (i.e. interest, dividends, and net rent) in the CPS, and the fact that AGY does not include any "income" from capital gains. In addition, it is not possible to code in the CPS, an amount for an individual type of income in excess of $99,999. Although these shortcomings of the CPS permeate throughout the income distribution, they only become serious (for our purpose) at the higher income levels.

Determination of Filing Status and Type of Return

For each potential filing unit (a filing unit consists of either a married couple or a person), a series of tests was performed to determine their filing status. It was assumed that any potential filing unit whose AGY was greater than the legal limit required for filing in 1968 would file a return. The legal limits were $1,200 for a married couple in which both the husband and wife were under 65 years of age, $1,800 if either husband or wife (but not both) was 65 years or over, and $2,400 if both husband and wife were 65 years or over.

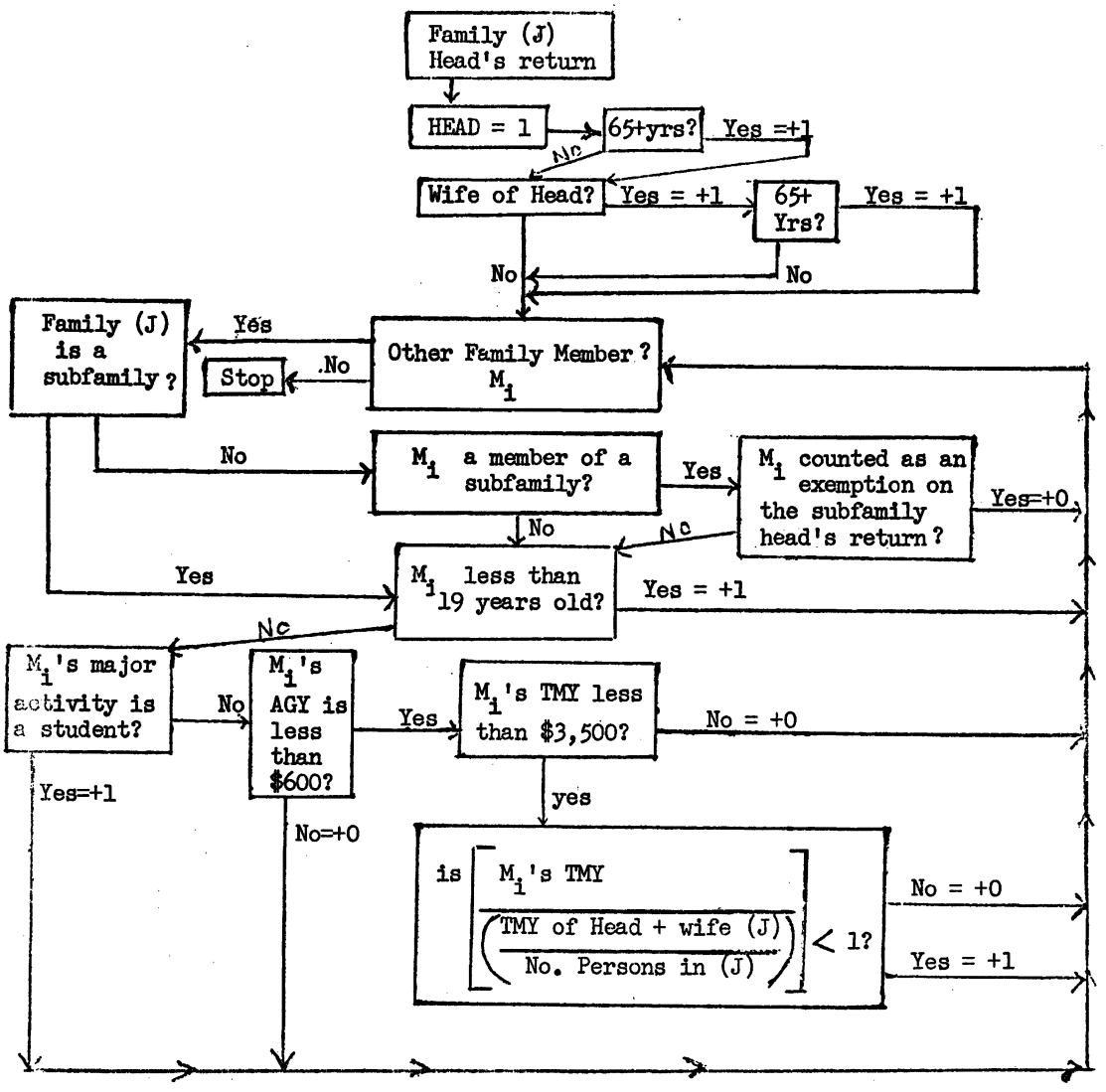
All other persons were assumed to be filers if they were less than 65 years old and had AGY of more than $600 or were 65 years or over and had AGY of more than $1,200. In addition, any potential filing unit which failed to meet the above test, but which received wage and salary income during the year was assumed to file a return to get its withholdings refunded.

To determine the type of return filed for each filing unit we made the following assumptions:

1) Family head returns:
   a) Married Couples.--all married couples were assumed to file joint returns.
   b) Qualified Heads.--these returns, which approximate IRS's "Heads of Household" and "Surviving Spouse" returns, were for heads of other than husband-wife families who met the qualification test. To qualify, the head's TMY had to be greater than the sum of the TMY of all other family members. All who qualified were assumed to file "Heads of Household" returns.
   c) Nonqualifying Heads.--returns of heads of other than husband-wife families who failed to meet the above qualification test. These persons were assumed to have filed "Single person not head of household or surviving spouse" returns.

Determination of Number of Exemptions per Return

To estimate the number of exemptions on family head returns, we used the procedure shown in the following flow chart:



A family unit can consist of a "primary family," including one or more "subfamilies" or a "secondary family." A subfamily is a married couple with or without children, or one parent with one or more single children under 18 years old living in a household and related to, but not including the head of the household or his wife. As members of a subfamily are also members of a primary family, the number of subfamilies is not included in the number of "families." A "secondary family" is similar to a subfamily except that the members of the secondary family are not related to the primary family members. Since subfamily members could be counted as exemptions on either a subfamily head's return or on a return of the head of the primary family, we begin with subfamily members. An exemption is granted for the head and additional exemptions are granted for a wife and for age (i.e., 65+ years). An additional exemption is also granted for other subfamily members if they are under 19 years of age, or their major activity is a student. In addition, if the person fails to qualify as an exemption on the above grounds, they can qualify if their AGY is less than $600 and they pass our crude "support" test. We assumed financial dependency if their TMY is less than $3,500 and in addition, their TMY is not greater than the TMY of the filing unit spread equally among all members of the family. After we have completed the process for all subfamily members, the process is repeated for all primary family members (including members of any subfamilies). The same set of procedures applies to the returns of primary and secondary family heads with the exception that members of the primary family who are also members of a subfamily cannot be counted as exemptions on the primary family head's return if they have already been counted as an exemption on the subfamily head's return.

For all returns other than those for family heads, one exemption was granted for the person and an additional one was granted if he or she was 65 years or over.

Determination of Deduction, Taxable Income, and Tax

To estimate the deductions (DED), taxable income (TY), and income tax (YT), for each return, the following procedures were used:

Assume a return (r) of type (i) having $AGY which is in the (jth) AGI interval.

Then:

$$\$DED_r = \frac{IRS\ \$DED}{IRS\ \$AGI_{ij}} \times (\$AGI)_r$$

$$\$TY_r = (\$AGY)_r - (\$DED)_r - (EXEMPT)_r \times (\$600)$$

$$\$YT_r = \frac{IRS\ \$YT}{IRS\ \$YT_{ij}} \times (\$TY)_r$$

Where:
r = type of return, i.e.
1. Joint return, head less than 65 years old.
2. Joint return, head 65 years or over.
3. Head of Household return.
4. Return of Single persons (not H. of H. or S.S.), less than 65 years
5. Return of Single persons (not H. of H. or S.S.), 65 years or over.

B. Social Security Contributions

For all persons who were estimated to be covered under the Social Security programs, we assessed a "contribution" of 4.4 percent of the first $7,800 of their wage and salary earnings and 6.4 percent of the first $7,800 of their self-employment earnings. However, if a person received both wage or salary and self-employment earnings, the contribution was limited to a maximum of 6.4 percent of the first $7,800 of their total earnings.

All persons receiving wage and salary income were assumed to be "covered" with the exception of those whose occupation of longest job was a government worker, a farm laborer, or a domestic. Since only a portion of the people in these occupations were covered, a probability algorithm was used to assign "covered" status. The proportion for each occupation which was covered was estimated from unpublished Social Security administrative data.

All persons whose class-of-worker of longest job was self-employed in agriculture or nonagricultural industries and who has $400 or more in net self-employment earnings were assumed to be covered. Actually, there are other options open to farmers allowing them to be covered even if they have less than $400 in net earnings, but we did not have sufficient information available in the CPS to allow for these options.

III. Summary Evaluation of the Simulation Procedure

Although many of our procedures only roughly approximated IRS concepts, the overall results appear to be adequate when compared with published IRS statistics. For example, in Table 1, the CPS estimated number of filing units, by type of return are compared with those reported by IRS.

Table 1.--Comparison of CPS Estimated Number of Filing Units Filing Each Type of Return With Those Reported by IRS for 1968
(In millions)

CPS				IRS	
Potential Filing Unit Description	Total	Estimated Filers		Filers	Filing Unit Description
Family Heads1/	51.4	46.1		NA	-
Married Couples1/	44.3	41.1		42.7	Joint Returns + ½ of Separate Returns of Husband and Wives
Qualified Heads1/	4.5	3.5		2.6	Returns of Head of Household or Surviving Spouse
Nonqualifying Heads1/	2.6	1.5			
Other Persons (14+) in Family	32.8	18.4	29.2	27.0	Returns of Single Persons not Head of Household or Surviving Spouse
Unrelated Individuals	13.8	9.4			
Total	98.1	73.9		72.3	Total

1/ Includes primary, secondary, and subfamily heads.

NA Not Available

Of the 51.4 million family heads (counting subfamily heads as the head of a family), it was estimated that 46.1 million were filers. Married couple filers accounted for about 41.1 million of these; correspondingly, IRS shows about 42.7 million husband and wife filing units. Of the remaining 5 million family head returns, we estimated that about 3.5 million qualified to be taxed at "Head of Household" rates. This is considerably more than the 2.6 million returns IRS shows filing as either "Head of Household" or "Surviving Spouse." The remaining returns consisted of 1.5 million Nonqualifying Head returns, 18.4 million returns from Other Persons in Families, and 9.4 million Unrelated Individual returns. These 29.2 million returns were assumed to file single person returns. The number of "single person" returns according to IRS was about 27.0 million returns. Much of the differences between these CPS and IRS numbers is believed to be accounted for by the way we handle the approximately 2 million persons who were married, not separated, but having a spouse who was absent. While many of these people might have actually filed joint returns to IRS, they are excluded from the married couple filing units in our procedure. As we had no information regarding income or other characteristics of the absent spouse, we treated these people as an "other family head" or an "other person in families" depending on their current living arrangement. We suspect that most of those to whom we gave filing status, and had children were counted in the "Qualified Head" category. If this is true it would account for much of the differences from the IRS figures for Married Couple and Qualified Head returns.

In Table 2, when we compared the CPS estimated number of returns, amount of income tax, and mean income tax per return with corresponding IRS figures by adjusted gross income intervals, we again found that overall, the estimates correspond reasonably well with those of IRS. The major exception to this general conclusion is in the CPS returns having more than $50,000 AGY. The $50,000 and over interval is seriously deficient in both numbers of returns and mean AGY and thus, in the mean income tax per return. This interval accounts for almost all of the differences between the CPS aggregate income tax and that reported by IRS. This can be seen by comparing the aggregates in the "Total" row with those in the "Total under $50,000" row.

Table 2 Comparison of CPS Estimated Number of Returns, Amount of Income Tax and Mean Income Tax Per Return by Adjusted Gross Income Interval with IRS Data, for 1968.

Adjusted Gross Income Intervals	CPS					IRS				
	Estimated Number of Returns		Estimated Amount of Income Tax		Mean Income Tax per Return	Number of Returns		Amount of Income Tax		Mean Income Return
	No.	Cum. No.	Amount	Cum. Amount		No.	Cum. No.	Amount	Cum. Amount	
	mil.	mil.	bil.$	bil.$	dollars	mil.	mil.	bil.$	bil.$	dollars
TOTAL	73.9	-	$63.7	-	$ 862	73.7	-	76.6	-	$1,039
Total Under $50,000	73.9	-	61.8	-	836	73.3	-	63.4	-	864
Under 1,000	11.4	11.4	0.0	0.0	0	7.7	7.7	X	X	1
1,000 - 1,999	5.8	17.2	0.2	0.2	41	7.5	15.2	0.4	0.4	51
2,000 - 2,999	4.6	21.8	0.6	0.9	134	5.9	21.1	0.9	1.2	146
3,000 - 3,999	5.2	27.0	1.3	2.2	252	5.6	26.7	1.5	2.7	264
4,000 - 4,999	4.9	32.0	1.8	4.0	370	5.3	31.9	2.0	4.7	381
5,000 - 5,999	5.1	37.1	2.5	6.5	490	5.0	36.9	2.5	7.3	509
6,000 - 6,999	5.1	42.2	3.2	9.7	529	5.0	41.9	3.1	10.4	635
7,000 - 7,999	5.2	47.4	4.0	13.7	758	4.7	46.6	3.7	14.1	781
8,000 - 8,999	4.5	52.0	4.1	17.8	892	4.6	51.3	4.2	18.3	913
9,000 - 9,999	3.9	55.9	4.1	21.9	1,044	4.0	55.3	4.3	22.6	1,068
10,000 - 14,999	12.2	68.1	18.4	40.2	1,509	12.0	67.3	18.3	40.9	1,527
15,000 - 19,999	3.5	71.6	8.8	49.0	2,506	3.7	70.9	9.3	50.2	2,535
20,000 - 24,999	1.1	72.7	4.2	53.2	3,695	1.2	72.1	4.4	54.6	3,730
25,000 - 50,000	1.2	73.9	8.6	61.8	7,428	1.2	73.3	8.8	63.4	7,084
50,000 +	Z	73.9	1.9	63.7	28,031	0.4	73.4	13.2	76.6	34,479

X = less than $50,000
Z = less than 50,000 returns

In addition, although it has little effect on the aggregate amount of tax, there is a less than satisfactory distribution of CPS returns among the lower intervals. For example, while the total number of CPS returns with less than $3,000 AGT is roughly comparable with the number of IRS returns under $3,000 AGI, there is considerable difference between the CPS and IRS numbers below $1,000.

A final anomaly is the mean tax per return in the $25,000 to $50,000 AGY interval. Although the estimated mean tax is a few dollars lower than the IRS counterpart for all other intervals (except the $50,000+ interval already discussed), the mean for this interval is several hundred dollars higher than the corresponding IRS amount. This condition is thought to result from the relatively greater concentration of returns in the upper half of this interval in the CPS compared to that of IRS. This would cause the CPS average income and hence the tax amount to be greater than the corresponding IRS figure. The relatively greater concentration of returns in the upper half of this interval in the CPS could result from the coding of people with $50,000+ AGI in the $25,000 - $49,999 AGY interval because of the exclusion of capital gains and underreporting of income in CPS. Both of these factors are particularly pronounced among very high income families.

Regarding the personal contribution to the Social Security program, there is not much outside data with which to compare. Our estimate of the aggregate amount of personal contributions for Old-Age Survivors, Disability, and Hospital Insurance was $16,873 million which was surprisingly close to the Bureau of Economic Analysis estimate of $16,859 million.

IV. Results by Total Money Income Class

Income Tax

Of the estimated 64.5 million returns filed by family members in 1968, about 45.1 million or 70 percent were filed by the heads of primary and secondary families (see table 3). These returns accounted for roughly 91 percent of total family income tax. The remaining 30 percent of family returns were filed by other family members (including the heads of subfamilies) and accounted for about 9 percent of family income tax. The proportion of family returns accounted for by returns of the family heads, tends to be highest for the middle income groups, however, the proportion of family's income tax bill picked up by the head increased with income but tends to be roughly constant among the middle income groups. For families above $4,000 total money income, the head becomes increasingly the primary taxpayer. This is reflected in the increasing divergence in the mean tax per return of the head's return and other family member's returns.

If one were to attempt to describe the Federal income tax situation of the "average" American family in 1968, one would probably not be far off if they looked at the families in the "medianth" income group (i.e., the income group which contained the median family). This would be the $8,000 - $8,999 income group in 1968. The roughly 4 million families in this group filed about 5.1 million returns in 1968, or about 1.3 returns per family. They paid around 3.1 billion dollars in Federal income tax, which works out to be about $613 per return and $789 per family. Virtually all, about 98 percent, of the family heads filed a return - paying, on average, $730 in income tax per return. The returns of these family heads accounted for about 77 percent of the returns and 91 percent of the income tax paid by these families. The remaining 23 percent of the returns were filed by other members of the family (excluding wives) and they paid, on average, $226 in income tax per return.

Social Security Personal Contributions

The estimates of the distribution of Personal Contributions for Social Security are presented in Table 4. There is little to say about these results since they pretty much speak for themselves. The average amount contributed per earner in families increases up to the $10,000-$14,999 Total Money Income interval. The average amount per family increases to at least the $50,000 money income class due to both the increasing average contribution per worker and the increasing number of workers per family.

1/ Herriot, Roger A. and Herman P. Miller, "The Taxes We Pay" The Conference Board Record, May 1971 and "Changes in the Distribution of Taxes: 1962-1968," Proceedings of the Business and Economic Statistics Section, American Statistical Association, 1971.

2/ The amounts of money income reported in the CPS were not adjusted for this study as they were in the above studies. While the adjustment procedures in our earlier studies appear adequate when applied to all families and unrelated individuals, they were judged to be inadequate when applied to certain subgroups of the population.

* I would like to thank my colleague, John Coder, who did all of the programming in this and our earlier studies.

Table 3.--CPS Estimate of Returns and Mean Federal Income Tax per Return by Family Status and Total Money Income Class for 1968

Unadjusted Total Money Income Intervals	Families									Unrelated Individuals		
	Total Number Families	Total Family Returns		Returns of Primary and Secondary Family Heads			Returns of Other Family Members			Total Number of Unrel. Indiv.	Total Unrel. Indiv. Returns	Mean Tax per Return
		No.	Agg. Tax	Percent of Total Fam. Ret.	Percent of Total Fam. Tax	Mean Tax per Return	Percent of Total Fam. Ret.	Percent of Total Fam. Tax	Mean Tax per Return			
	mil.	mil.	mil.$	percent	percent	dollars	percent	percent	dollars	mil.	mil.	dollars
TOTAL	50.0	64.5	54.4	70.0	91.2	$1,139	30.0	8.8	$258	13.8	9.4	$ 776
Under $1,000	0.9	0.6	0	57.8	-	0	42.2	-	0	2.0	0.6	0
1,000-1,999	1.8	1.2	z	64.2	14.3	1	35.8	85.7	14	3.4	1.1	46
2,000-2,999	2.6	2.0	0.1	69.9	55.2	23	30.1	44.8	44	1.8	1.2	132
3,000-3,999	3.1	3.0	0.3	74.1	74.1	89	25.9	25.9	89	1.5	1.4	295
4,000-4,999	3.1	3.4	0.6	75.1	78.9	171	24.9	21.1	137	1.1	1.1	487
5,000-5,999	3.5	4.2	1.1	76.6	84.8	282	23.4	15.2	166	0.9	0.9	683
6,000-6,999	3.8	4.7	1.8	77.6	87.8	433	22.4	12.2	207	0.7	0.7	902
7,000-7,999	4.1	5.1	2.6	77.2	89.8	587	22.8	10.2	226	0.6	0.6	1,102
8,000-8,999	4.0	5.1	3.1	76.6	91.4	731	23.4	8.6	226	0.4	0.4	1,320
9,000-9,999	3.7	4.8	3.5	74.4	90.7	878	25.6	9.3	263	0.3	0.3	1,498
10,000-14,999	12.5	18.0	17.5	68.7	91.8	1,296	31.3	8.2	253	0.7	0.7	2,148
15,000-19,999	4.5	7.6	10.4	59.0	90.1	2,087	41.0	9.9	331	0.1	0.1	3,656
20,000-24,999	1.5	2.7	4.9	55.4	89.3	3,040	44.6	10.7	452	0.1	0.1	5,283
25,000-49,999	1.3	2.2	9.0	59.4	94.0	6,621	40.6	6.0	619	0.1	0.1	9,839
50,000+	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

z = less than $500,000

NA = Not Available

Table 4 Amount of Personal Contributions for Social Security by Family Status - Total, per Family with Earnings, and per Workmen - by Total Money Income Intervals for 1968

Unadjusted Total Money Income Interval	Personal Contributions for Social Security				
	Contributions of Family Members			Contributions of Unrelated Individuals	
	Total Amount	Amount per Family with Earnings	Amount per Earner	Total Amount	Amount per Earner
	mil.$	dollars	dollars	mil.$	dollars
TOTAL	$15,442	$332	$182	$1,432	$167
Under $1,000	10	15	15	10	16
1,000 - 1,999	44	44	35	44	40
2,000 - 2,999	134	85	70	79	76
3,000 - 3,999	309	132	105	146	122
4,000 - 4,999	458	174	130	154	166
5,000 - 5,999	703	219	151	175	210
6,000 - 6,999	968	263	174	165	238
7,000 - 7,999	1,226	304	198	180	284
8,000 - 8,999	1,315	334	203	125	321
9,000 - 9,999	1,297	359	207	88	297
10,000 - 14,999	5,213	418	222	201	317
15,000 - 24,999	3,075	517	221	48	338
25,000 - 49,999	675	531	225	15	326
50,000 +	NA	NA	NA	NA	NA

NA = Not Available