

## No longer tax exempt: income tax calculation in the Consumer Expenditure Survey

*BLS has developed an experimental federal income tax calculator that estimates taxes for Consumer Expenditure Survey participants to help address high nonresponse rates, unreliable reporting, and time-frame ambiguity; this calculator could improve the quality of the aftertax income data in the survey*

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The primary aim of the Consumer Expenditure Survey (CE) is to record the expenditure behavior of American households. The CE program conducts two surveys that collect data on the expenditures, income, and characteristics of consumer units: the Diary Survey and the Quarterly Interview Survey. The Bureau of Labor Statistics (BLS) publishes the results of these surveys at the aggregate level, and the microdata are studied by a wide variety of users. One of the main users of CE data is the Consumer Price Index, which employs the data to update the cost weights for its market basket of goods and to calculate the relative importance of these aggregate goods. CE data also are widely used by other government agencies, academia, and members of the public for research, policymaking, and other purposes, because the CE survey is one of the sole sources of high-quality, sample-based U.S. data that links expenditures and income at the household level.<sup>1</sup>

While the survey's primary objective is to collect information on expenditures, it is also important that it provide accurate data

on household income. However, some respondents may consider the income questions sensitive in nature, resulting in high nonresponse rates for some questions. To address this issue, in 2005 the CE began to include imputed income in its 2004 published tables and 2004 public use microdata. However, the CE has not yet implemented a method for estimating or imputing aftertax income. Considering the issues related to the quality of reported tax information in the CE, this study explores the possibility of calculating household tax liability using other highly reliable information from the survey.

### The federal income tax predicament

There are two main issues related to the income taxes reported in the CE. First is the question of high nonresponse rates and the quality of reported data. Many individuals surveyed in the CE do not respond to the tax questions. For those who do respond, it is unclear how accurate their responses are. Although some respondents may report correct taxes around the time they file their income tax return, it is not possible to determine how accurate their memory is without knowing whether they re-

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ferred to their records or documents. Second, the tax year to which the tax variables refer changes throughout the interview year because of the CE survey design and the wording of its tax-related questions.

The CE program currently estimates total income taxes using other variables because it does not measure them directly. Total tax paid is the sum of taxes withheld from the respondent's paycheck and additional tax paid, minus tax refunds. More specifically, total tax paid includes the following<sup>2</sup>:

- Annual federal income tax deducted from salary<sup>3</sup>
- Annual state and local income tax deducted from salary<sup>4</sup>
- Federal tax paid in addition to that withheld from paycheck in the past 12 months
- State and local tax paid in addition to that withheld from earnings in the past 12 months
- Personal property tax paid in the past 12 months
- Other taxes paid in the past 12 months which were not reported elsewhere

These refunds are then deducted in calculating total income tax:

- Amount of refund received from federal income tax in the past 12 months
- Amount of refund received from state and local income tax in the past 12 months
- Amount of other refunds received, including any other tax refunds, during past 12 months

Total federal tax is comprised of the *federal tax* elements from above and can be represented in the following way:

$$\text{Total CE federal tax paid} = \text{Tax deducted} + \text{Tax paid} - \text{Tax refund} \quad (1)$$

(Exhibit 1 depicts how these variables would be filled on the 1040 Individual Tax Form.) This estimate aims to include the earned income tax credit (EITC) and the additional child tax credit, which are given as refunds and tend to be an important part of individuals' income tax liability, but the CE cannot explicitly verify these two credits are accurately reported.

By calculating total tax paid in this manner, the CE attempts to capture what a consumer unit (CU)<sup>5</sup> actually owes the Internal Revenue Service (IRS) in order to determine aftertax income. The CE estimates after-tax income as follows:

$$\text{Income after tax} = \text{Income before tax} - \text{Total tax paid} \quad (2)$$

Income before tax is the total amount of income, including the dollar value of Supplemental Nutrition Assistance Program benefits (formerly called food stamps) and other transfers, before any taxes are paid. Total tax paid is the total amount of tax paid as described above. Aftertax income is the total amount of income after all taxes are paid. In other words, it is the income a CU has at its disposal to spend on goods and services. If total tax is zero because a respondent does not answer or does not know, aftertax income exactly equals beforetax income. In fact, this is the case for nearly 40 percent of the Quarterly Interview Survey sample in the third quarter of 2005.

The CE program's estimate of total tax is likely to be inaccurate for a large portion of the survey sample because of high rates of nonresponse or incorrect responses and ambiguity surrounding the time frame to which the tax variables refer. The following tabulation for the third quarter of 2005 shows a large majority of individuals report that taxes were deducted from pay:

*Interviewees' response to the question, "Was federal tax withheld from last paycheck?"*

<i>Taxes deducted?</i>	<i>Number of individuals</i>	<i>Percent</i>
Yes .....	8,409	87
No .....	838	9
Refuse or don't know.....	415	4

However, approximately two-thirds of individuals do not report how much federal tax was withheld from their last paycheck even when they report that tax was indeed withheld. As shown below, only 32 percent of individuals who reported federal tax was deducted from their wages or salary actually reported nonzero tax withholdings in the third quarter of 2005:

*Amount of tax withheld from paycheck of individuals who reported that federal tax was withheld*

<i>Amount deducted</i>	<i>Number of individuals</i>	<i>Percent</i>
Zero.....	5,740	68
Greater than zero.....	2,669	32

The next tabulation shows that this percentage is slightly greater at the CU level. Among the consumer units where at least one member reported that federal tax was withheld, 37.5 percent actually reported a nonzero value for total tax withholdings:

*Amount of tax withheld from paycheck for consumer units in which at least one member reported that federal tax was withheld*

<i>Amount deducted</i>	<i>Number of households</i>	<i>Percent</i>
Zero.....	3,340	62.5
Greater than zero.....	2,004	37.5

**Exhibit 1. Part of Form 1040 U.S. Individual Income Tax Return for 2006**

<b>Other Taxes</b>	<b>58</b>	Self-employment tax. Attach Schedule SE . . . . .	<b>58</b>		
	<b>59</b>	Social security and Medicare tax on tip income not reported to employer. Attach Form 4137 . . . . .	<b>59</b>		
	<b>60</b>	Additional tax on IRAs, other qualified retirement plans, etc. Attach Form 5329 if required . . . . .	<b>60</b>		
	<b>61</b>	Advance earned income credit payments from Form(s) W-2, box 9 . . . . .	<b>61</b>		
	<b>62</b>	Household employment taxes. Attach Schedule H . . . . .	<b>62</b>		
	<b>63</b>	Add lines 57 through 62. This is your <b>total tax</b> . . . . . ▶	<b>63</b>	<b>TOTTAX</b>	
<b>Payments</b>	<b>64</b>	Federal income tax withheld from Forms W-2 and 1099 . . . . .	<b>64</b>	<i>FAMTFEDX</i>	
	<b>65</b>	2006 estimated tax payments and amount applied from 2005 return . . . . .	<b>65</b>		
	<b>66a</b>	<b>Earned income credit (EIC)</b> . . . . .	<b>66a</b>	<i>EICAMNT</i>	
	<b>b</b>	Nontaxable combat pay election ▶ <b>66b</b> . . . . .			
	<b>67</b>	Excess social security and tier 1 RRTA tax withheld (see page 60) . . . . .	<b>67</b>		
	<b>68</b>	Additional child tax credit. Attach Form 8812 . . . . .	<b>68</b>	<i>ADDCREDIT</i>	
	<b>69</b>	Amount paid with request for extension to file (see page 60) . . . . .	<b>69</b>		
	<b>70</b>	Payments from: a <input type="checkbox"/> Form 2439 b <input type="checkbox"/> Form 4136 c <input type="checkbox"/> Form 8885 . . . . .	<b>70</b>		
	<b>71</b>	Credit for federal telephone excise tax paid. Attach Form 8913 if required . . . . .	<b>71</b>		
	<b>72</b>	Add lines 64, 65, 66a, and 67 through 71. These are your <b>total payments</b> . . . . . ▶	<b>72</b>		
<b>Refund</b>	<b>73</b>	If line 72 is more than line 63, subtract line 63 from line 72. This is the amount you <b>overpaid</b> . . . . .	<b>73</b>		
	<b>74a</b>	Amount of line 73 you want <b>refunded to you</b> . If Form 8888 is attached, check here ▶ <input type="checkbox"/> . . . . .	<b>74a</b>	<i>FEDRFNDX</i>	
	<b>b</b>	Routing number <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> ▶ <b>c</b> Type: <input type="checkbox"/> Checking <input type="checkbox"/> Savings . . . . .			
	<b>d</b>	Account number <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . . . . .			
<b>75</b>	Amount of line 73 you want <b>applied to your 2007 estimated tax</b> ▶ <b>75</b> . . . . .	<b>75</b>			
<b>Amount You Owe</b>	<b>76</b>	<b>Amount you owe.</b> Subtract line 72 from line 63. For details on how to pay, see page 62 ▶ . . . . .	<b>76</b>	<i>FEDTAXX</i>	
	<b>77</b>	Estimated tax penalty (see page 62) . . . . .	<b>77</b>		

NOTE: The variables in bold are values calculated by the tax calculator. The variables in italics are reported values in the Consumer Expenditure Survey.

SOURCE: U.S. Bureau of Labor Statistics, using Internal Revenue Service tax form.

The inconsistency presented by such a large portion of the interviewees' responses suggests nonresponse rates are sufficiently high to cause imprecise values for total federal tax at the micro and aggregate levels.

A second factor affecting the accuracy of the estimates is uncertainty surrounding the tax year to which the variables that are used to calculate income tax in the CE refer. Because the survey asks if taxes were paid or a refund was received in the past 12 months, there are three possible scenarios regarding to which tax year the taxes and refunds refer:<sup>6</sup>

- A. The tax paid and refund received are from the previous tax year if the CU has not filed taxes yet; that is, the interview took place in the first quarter of the year.
- B. They are from the current tax year if the CU has filed taxes and received a refund for the current year; that is, the interview took place in the second, third, or fourth quarter.

- C. They are from both the previous and current tax year, which could theoretically happen in any quarter; for example, the interview took place in May 2005 and the CU received two refunds in the past 12 months, which is possible if the CU just received a refund for the current tax year (2005) but had not received a refund for the previous year (2004) until June 2004.

It is unknown which scenario occurs given the current CE questionnaire. However, it is most likely that interviews which take place in the first quarter lead to scenario A, though a very small portion of the population will have already filed their taxes and received their refund. In the case of scenario A, the CE will underestimate tax liability because it assumes tax from last year will exactly equal the tax for this year, which is probably not the case. It is likely that interviews which take place in the third and fourth quarters lead to scenario B, though again a very small portion of respondents may have filed their taxes very late last year but early or on time this year, leading to scenario

C. In the case of scenario B, the CE will accurately reflect taxes. In the case of scenario C, the CE will overestimate taxes because the reported tax will reflect 2 years of taxes. Interviews which take place in the second quarter could reflect any of the three scenarios.

The CE also makes some important assumptions in using these variables to estimate aftertax income. (Recall equation (2) for total tax paid.) First, all of the income and tax questions refer to the previous 12 months, which means the CE assumes that the values for the last 12 months will be the same for the 12 months of the current tax year. (This situation is further confounded for CUs in their third and fourth interviews, whose income and tax values refer to an even earlier time frame. See endnote 6.) Second, the amount of tax reported as being withheld from pay is based on the amount of tax withheld from the latest paycheck. This assumes the rate of tax withheld from the latest paycheck will be the same for each paycheck that year. This assumption will be inaccurate for individuals whose paychecks vary enough throughout the year that their average tax rate is not consistent from one paycheck to another. These issues also apply to the CE's state and local tax variables.

Although it is not a simple matter to circumvent the fact that CE income and tax variables refer to the previous 12 months, the other points previously discussed regarding federal income tax can be readily addressed. We can calculate federal income tax directly using demographic characteristics and reported or imputed income and expenditures, all of which are highly reliable. This calculation avoids issues resulting from nonresponse or incorrect information and ambiguity of timeframe.

### The tax man: a potential solution

The tax calculator developed by BLS approximates federal income tax using various sources of income, expenditures, and CU characteristics reported by interviewees in the CE survey. The resulting estimates avoid relying on respondents who may not recall their tax liability or who refuse to answer tax questions, and the estimates overcome assumptions made because of the format of the CE questionnaire. The tax calculator uses the 1040 Individual Income Tax Return Form and supplementary forms and worksheets to calculate taxes as if respondents were filing their tax returns using the information reported to the CE. The main tax variable of interest for this report is the total federal income tax owed to the IRS including the earned income tax credit (EITC) and

the additional child tax credit:

$$\text{Total tax calculator tax paid} = \text{Total tax} - \text{EITC} - \text{Additional child tax credit} \quad (3)$$

Total tax is line 63 of the 1040 form, total tax before subtracting any payments. The EITC is line 66a, and the additional child tax credit is line 68. (See exhibit 1, 1040 Individual Income Tax Return Form 2006.) This is the closest possible approximation that can be made to a CU's total tax liability for the purpose of calculating aftertax income.

The tax calculator calculates taxes for tax units (TUs)—that is, groups of individuals who file together—rather than for consumer units, groups of individuals who live together and share certain expenses. The following tabulation shows the relationship between consumer units and tax units:

<i>Number of tax units per consumer unit</i>	<i>Percent of sample</i>
1 .....	76
2 .....	18
3 or more .....	6

The tax calculator includes the largest sources of income for a majority of the population, deductions for educational expenses, contributions to retirement accounts, and the standard and itemized deductions, as well as certain credits for which CE data are available. (See exhibit 2, which shows ingredients of the tax calculator.) Because of data constraints, the tax calculator does not accurately calculate total tax owed by the self-employed; the self-employment tax is included but business expenses are not deducted. The mean total income for income reporters was \$64,440.28, the mean total tax paid was \$2,354.31, and the mean average tax rate was 0.7 percent. (See table 1.)

The tax calculator must make some basic assumptions for simplification and to circumvent obstacles in the data. First, the tax calculator assumes everyone in the survey files the 1040 Individual Income Tax Return Form, everyone in the sample is a U.S. citizen, no one is clergy, and no one is blind. In addition, some simplifications are made when distinguishing between tax units and consumer units. There are three options for filing status:

1. Single: Any tax unit that contains only one “unmarried” adult, including widow(er)s and interviewees who report they are married but do not reside with their spouse<sup>7</sup>

**Exhibit 2. Ingredients of the BLS Consumer Expenditure tax calculator**

<p><u>Income</u></p> <ul style="list-style-type: none"> <li>• Wages and salary</li> <li>• Farm income (or loss)</li> <li>• Nonfarm business income (or loss)</li> <li>• Taxable Social Security benefits</li> <li>• Interest</li> <li>• Dividends</li> <li>• Taxable refunds</li> <li>• Alimony</li> <li>• Pensions, annuities, IRA distributions</li> <li>• Unemployment compensation</li> <li>• Other income</li> </ul> <p><u>Exemptions</u></p> <p><u>Credits</u></p> <ul style="list-style-type: none"> <li>• Credit for child and dependent care expenses</li> <li>• Credit for the elderly or disabled</li> <li>• Earned income tax credit</li> <li>• Additional child tax credit</li> </ul>	<p><u>Adjusted gross income (AGI) deductions</u></p> <ul style="list-style-type: none"> <li>• One-half of self-employment tax</li> <li>• Self-employed SEP-IRAs, SIMPLE, and qualified plans</li> <li>• Alimony paid</li> <li>• IRA deductions</li> <li>• Tuition and fees deduction</li> </ul> <p><u>Itemized deductions and the standard deduction</u></p> <ul style="list-style-type: none"> <li>• Medical and dental expenses greater than 7.5 percent of AGI</li> <li>• Taxes paid                         <ul style="list-style-type: none"> <li>State and local income taxes</li> <li>Real estate taxes</li> <li>Personal property taxes</li> <li>Other taxes</li> </ul> </li> <li>• Interest paid                         <ul style="list-style-type: none"> <li>Mortgage interest</li> </ul> </li> <li>• Gifts to charity</li> </ul>
<p>SOURCE: U.S. Bureau of Labor Statistics.</p>	

2. Married, filing jointly: Any tax unit in which the two spouses reside in the same home and are married to each other
3. Head of household: Any tax unit which contains dependents and an adult who is “unmarried,” including interviewees who report they are married but do not reside with their spouse, and also widow(er)s

1. Any person who is less than 19 years old
2. Children who are less than 25 years old, are in college, and do not work full time
3. Relatives who are any age and disabled
4. Relatives who earn no more than the maximum income to be considered a dependent

Taxes are also calculated for dependents who earn enough income that they must file separately.

In the third quarter of 2005, the proportion of survey respondents in each filing status was as follows:

<i>Filing status</i>	<i>Filing status of tax units</i>	<i>Percent of sample</i>
Single.....		51
Married, filing jointly .....		39
Head of household .....		8
Dependent, filing separately.....		2

There are four kinds of dependents:

Some additional assumptions are made to calculate income, adjusted gross income (AGI), itemized deductions, and tax credits. The tax calculator assumes the income and tax reported by the interviewee refer to the previous tax year even though the questionnaire refers to “the previous 12 months.” Capital gains and losses are not included as a source of income, and dividends are taxed at the same rate as all other income. Refunds from state and local taxes paid in the previous tax year (previous 12 months) are assumed to be taxable refunds for TUs that have a mortgage in the current period, because it is likely these households

**Table 1. Mean total income, federal income tax, and average tax rate for Consumer Expenditure Survey tax reporters, by type of consumer unit**

Type of consumer unit	Total income <sup>1</sup>	Total federal income tax <sup>2</sup>	Average tax rate <sup>3</sup>	N
All consumer units	\$64,440.28	\$2,354.31	0.7	1,876
Single, no children	38,889.55	1,833.77	4.3	584
Married, with or without children	91,653.79	3,400.65	2.7	855
Single parent, with children	32,168.51	37.29	-21.9	171
Other consumer units	57,521.74	1,736.01	1.1	266

<sup>1</sup> Total income refers to income for tax purposes only; it does not include workers' compensation or veterans' benefits, public assistance or welfare income, or the dollar value of food stamps.

<sup>2</sup> Federal income tax is the sum of the federal income tax values, including refunds, as described in equation (1).

<sup>3</sup> Average tax rate is federal income tax divided by total income.

NOTE: Data are from the Consumer Expenditure third quarter 2005 quarterly interview for consumer units that are in the second or fifth interview and report a valid response to each of the questions used to calculate total federal income tax. The data are weighted to be representative of the U.S. population at the aggregate level.

SOURCE: U.S. Bureau of Labor Statistics.

had a mortgage last year and itemized their deductions. Finally, limits are not placed on income losses, such as losses from self-employment or rental real estate.

For AGI, the tax calculator includes contributions made to retirement plans, half of the self-employment tax, and the deduction for tuition fees. It also assumes self-employed individuals have Simplified Employee Pension plans, and all other individuals have individual retirement accounts (IRAs). The tax calculator assumes everyone who has tuition expenditures will take the tuition deduction rather than the tuition credit, because the deduction leads to less tax owed, and because the CE cannot determine whether the student is eligible for the credit. A simplifying assumption is made for dependents who file separately: the tax calculator gives these dependents the deduction, although in reality the tax head who claims them takes the deduction. The aggregate effect of this assumption is minimal because the final tax is calculated at the consumer unit level.<sup>8</sup>

The assumptions made regarding itemized deductions are as follows: First, mortgage interest paid this quarter is consistent across the entire tax year. Second, all contributions to educational institutions, religious organizations, charities, and all other organizations (not including political organizations) are deductible, as outlined in the 1040 instructions. Third, no deductions are taken for casualty and theft losses, job expenses, or miscellaneous deductions because the CE does not have this information. Finally, health expenditures reported to the CE are assumed to reflect annual expenditures. The questionnaire asks for medical expenditures from the previous quarter, and thus includes only 3 months of health insurance pre-

miums, prescription drugs, and doctors' visits or hospital bills. This assumption will be inaccurate for CUs that cannot deduct insurance premiums (because they are paid with before-tax dollars) and CUs that can deduct all premiums incurred over the tax year.<sup>9</sup> It will also be inaccurate for CUs that make the same expenditures for prescription drugs or doctors' and hospital visits during each quarter of the tax year. However, only a small portion of the U.S. population takes the itemized deduction because of their high medical expenditures, and therefore this simplifying assumption was made.

The credits computed by the tax calculator include the credit for child and dependent care expenses, the credit for the elderly or disabled, the child tax credit, and the earned income tax credit. The credit for child and dependent care expenses does not require us to make any assumptions for the majority of tax units. For CUs with multiple tax units, each of which has dependents, the tax calculator will overestimate childcare expenses because the tax calculator does not divide expenses among dependents in different TUs. The credit for the elderly or disabled requires the tax calculator to make two assumptions: First, individuals will only take the credit if their reason for not working is that they are disabled. People are eligible to take the credit if they are older than age 65 or are "retired on permanent and total disability."<sup>10</sup> However, the CE groups reasons for not working into a single category that includes retired, taking care of the home and/or family, student, ill/disabled/unable to work, unable to find work, or doing something else.<sup>11</sup> Thus interviewees who retired on disability could respond that they are not working because they retired or because they are disabled, but

not both, and we will underestimate their credits. Second, the tax calculator must assume that all disability income is nontaxable and that all pensions are taxable because the CE does not distinguish between taxable and nontaxable income. This will cause the tax calculator to inaccurately estimate the credit for some TUs, such as those that earn nontaxable veteran's pensions. No additional assumptions are required for the child tax credit or the EITC.

The tax calculator, once created and tuned to the CE data needs, requires minimal maintenance. Annual updates must be made for new tax rates and thresholds, as well as for changes to the tax code. The tax calculator is designed in such a way that updating and incorporating the new tax rates and thresholds would require little work. In addition, the tax rates, thresholds, and changes to the code are all available in *Instructions for Form 1040, U.S. Individual Income Tax*, published by the IRS and available on the IRS website. All major changes to the tax code are outlined in the "What's New" section of the instructions. Thus the update process could be incorporated into the CE production schedule without placing great demands on CE staff.

### Comparison of the tax calculator results

To assess the accuracy of federal income tax estimated by the tax calculator, two analyses were conducted. First, interviewees' reported income tax liability was compared to the total federal taxes produced by the tax calculator. Second, BLS tax calculator estimates were compared to those of a tax calculator developed by the Congressional Budget Office (CBO). The results show that the BLS tax calculator accurately estimates federal income tax.

*Internal comparison to federal income tax reported in the CE.* This section analyzes the results of a matched-sample comparison between federal income tax reported by CUs and federal income tax estimated using the tax calculator. The sample was restricted to CUs that gave valid responses to the tax questions. Two variables are analyzed in this section: the difference in total tax and the difference in the average tax rate. As noted earlier, total federal income tax refers to the total amount of taxes the CU owes the IRS including subtractions for the EITC and the additional child tax credit. The tax calculator estimates the value of total taxes directly, whereas the CE survey estimates it using information on payroll tax deductions, additional taxes paid, and refunds received. Because the EITC and the additional child tax credit are distributed as refunds, it is not possible to distinguish them from overpayment of taxes in the CE.

Thus the two credits are included in both values of total tax. The difference in total tax is calculated as follows for each CU in the sample:

$$\text{Total tax difference} = \text{Tax calculator tax} - \text{CE tax} \quad (4)$$

The average tax rate is calculated as total tax divided by total income for each CU. Total tax is the same tax value used above, and total income is the sum of all taxable income sources, i.e., line 22 from the 1040 Individual Tax Return Form. The average tax rate is calculated in the same manner for both the tax calculator and the CE estimate:

$$\text{Average tax rate} = \text{Total tax paid} / \text{Total income} \quad (5)$$

For each CU, the difference is the average tax rate calculated by the tax calculator minus the tax rate estimated by the CE:

$$\text{Tax difference} = \text{Tax calculator average tax rate} - \text{CE average tax rate} \quad (6)$$

The data for this analysis are characterized as follows:

- The data are from the CE Quarterly Interview Survey for the third quarter of 2005, whose reference period includes April, May, and June; the third quarter was chosen because respondents are expected to have recently filed their taxes, increasing the accuracy of responses to questions on taxes and refunds.
- The tax calculator uses 2005 tax rates because most income reported refers to income earned in 2005.
- Imputed data are included.
- All CUs in the sample are in their second or fifth interview (the interviews when respondents are asked about income and taxes), contain only one TU, and report a positive value for both the CE total tax and the tax calculator total tax.

The results of this comparison are summarized in table 2, which compares income and federal income tax reported by respondents with those estimated using the tax calculator. The mean total tax for all filers reported in the CE survey is \$7,860.37, whereas the mean calculated by the tax calculator is \$2,446.89. The mean tax rate reported in the CE is 6 percent, and the value calculated by the tax calculator is 1.7 percent. The results of the matched-sample mean comparisons are varied but in general show that the tax calculator produces total taxes and average

**Table 2. Mean total income, total federal income tax, and average tax rate for Consumer Expenditure Survey tax reporters and BLS tax calculator**

Filing status	Tax reporters			Tax calculator			N
	Total income <sup>1</sup>	Federal income total tax <sup>2</sup>	Average tax rate <sup>3</sup>	Total income <sup>1</sup>	Federal income total tax <sup>2</sup>	Average tax rate <sup>3</sup>	
All filers	\$67,095.84 (80,598.31)	\$7,860.37 (24,603.43)	6.0 (.110)	\$67,320.87 (80,215.11)	\$2,446.89 (8,850.15)	1.7 (.268)	3,717
Single	54,683.16 (96,086.33)	7,002.17 (31,875.83)	7.9 (.075)	55,054.91 (95,808.56)	2,021.73 (6,117.77)	2.9 (.099)	1,744
Married, filing jointly	90,440.14 (61,757.97)	10,844.00 (16,343.49)	8.2 (.080)	90,416.15 (61,246.27)	3,477.09 (11,671.04)	2.6 (.099)	1,540
Head of household	34,064.65 (37,170.73)	705.41 (8,354.39)	-10.1 (.172)	34,584.39 (36,961.55)	495.35 (5,398.45)	-6.3 (.731)	433

<sup>1</sup> Total income refers to income for tax purposes only; it does not include workers' compensation or veterans' benefits, public assistance or welfare income, or the dollar value of food stamps.  
<sup>2</sup> Federal income tax is the sum of the federal income tax values, including refunds, as described in equation (1).  
<sup>3</sup> Average tax rate is federal income tax divided by total income.

NOTE: Data are from the Consumer Expenditure third quarter 2005 quarterly interview and reflect consumer units that are in the second or fifth interview, contain only one tax unit, and have positive total tax from both the tax calculator and the CE. Numbers in parentheses are standard deviations.  
 SOURCE: U.S. Bureau of Labor Statistics.

tax rates with differences that are large and statistically significant at the 5-percent level. (See table 3.) When the sample is partitioned by filing status, several of the cells no longer are statistically significant. For singles, the difference in the mean total tax is statistically significant, but the difference in the mean average tax rate is not. For CUs with a filing status of married, filing jointly, the differences in both mean total tax and mean average tax rate are significant. For head of households, neither is statistically significant. When these groups are further partitioned by income level, about half of the differences in total tax and tax rates are significant for each filing status, but the differences for CUs with income less than \$50,000 are not as large. The mixed results are likely due to the problems described above, including high nonresponse rates, unreliable reporting, and time-frame ambiguity. The large standard error associated with the differences in total tax and the average tax rate are likely due to small sample size (which is a result of restricting the sample to include only CUs with valid responses to the tax questions) and the large amount of variability in the input data.

*Comparison to the CBO tax calculator.* The CBO tax calculator, developed for its own internal use, produces tax tables identical to those published by the Statistics of Income Division of the IRS when it uses actual tax data from

the IRS. The CBO used its tax calculator to calculate taxes on the CE public use microdata. The comparison between the CBO tax calculator using the CE public use microdata and the BLS tax calculator using the CE microdata for internal use leads to the conclusion that the BLS tax calculator produces accurate estimates of total tax and average tax rates for CE consumer units.

The analyses of the difference in total tax and the difference in the average tax rate calculated by the BLS and CBO tax calculators follow the same methods as the internal comparison described in the previous section. The total tax difference and the average tax rate difference are calculated as follows:

$$\text{Total tax difference} = \text{Total tax from BLS tax calculator} - \text{Total tax from CBO tax calculator} \quad (7)$$

$$\text{Average tax rate difference} = \text{BLS average tax rate} - \text{CBO average tax rate} \quad (8)$$

The average tax rates are determined by dividing total tax by total income in the same manner depicted in equation (5).

The data for these analyses are characterized as follows:

- The data are from the CE Quarterly Interview Survey



**Table 3. Mean difference in total federal income tax and average tax rate between Consumer Expenditure Survey and BLS tax calculator, by filing status and total income level**

Filing status	Income level							
	All income levels	Less than \$20,000	Less than \$30,000	Less than \$40,000	Less than \$50,000	Less than \$75,000	Less than \$100,000	\$100,000 or more
<b>All filers</b>								
Federal income tax	<sup>1</sup> \$5,413.47 (\$24,284.92)	<sup>1</sup> \$-464.30 (\$2,228.43)	\$124.58 (\$2,375.45)	<sup>1</sup> \$910.41 (\$3,542.36)	<sup>1</sup> \$1,458.62 (\$3,920.43)	<sup>1</sup> \$3,443.00 (\$4,976.47)	<sup>1</sup> \$5,763.38 (\$7,204.46)	<sup>1</sup> \$18,993.52 (\$51,597.71)
Average tax rate	<sup>1</sup> 4.3 (.269)	-3.4 (.666)	2.2 (.101)	<sup>1</sup> 2.7 (.100)	<sup>1</sup> 3.3 (.089)	<sup>1</sup> 5.5 (.078)	<sup>1</sup> 6.7 (.083)	<sup>1</sup> 10.7 (.097)
N	3,717	533	385	423	407	734	502	733
<b>Single head of household</b>								
Federal income tax	\$4,980.43 (\$31,811.46)	<sup>1</sup> \$245.38 (\$1,829.61)	<sup>1</sup> \$824.71 (\$2,160.70)	<sup>1</sup> \$1,590.64 (\$2,693.89)	<sup>1</sup> \$2,052.78 (\$4,260.38)	<sup>1</sup> \$4,044.90 (\$5,229.87)	<sup>1</sup> \$7,342.97 (\$7,931.24)	<sup>1</sup> \$23,586.34 (\$87,882.38)
Average tax rate	5.1 (.111)	0.0 (.154)	<sup>1</sup> 3.4 (.087)	<sup>1</sup> 4.7 (.079)	<sup>1</sup> 4.6 (.097)	<sup>1</sup> 6.5 (.084)	<sup>1</sup> 8.6 (.093)	<sup>1</sup> 11.2 (.103)
N	1,744	339	236	257	212	319	167	214
<b>Married, filing jointly</b>								
Federal income tax	<sup>1</sup> \$7,366.91 (\$15,844.04)	\$-881.40 (\$3,140.77)	<sup>1</sup> \$-629.76 (\$2,268.82)	\$-45.17 (\$4,955.28)	<sup>1</sup> \$845.14 (\$3,265.72)	<sup>1</sup> \$3,125.01 (\$4,589.46)	<sup>1</sup> \$4,876.78 (\$6,637.20)	<sup>1</sup> \$17,108.24 (\$23,939.51)
Average tax rate	<sup>1</sup> 5.6 (.112)	0.0 (.380)	<sup>1</sup> -2.8 (.090)	0.0 (.130)	<sup>1</sup> 1.9 (.073)	<sup>1</sup> 4.9 (.070)	<sup>1</sup> 5.6 (.076)	<sup>1</sup> 10.5 (.094)
N	1,540	38	59	105	135	379	325	499
<b>Head of household</b>								
Federal income tax	\$210.06 (\$7,361.10)	<sup>1</sup> \$-1,904.89 (\$2,038.87)	<sup>1</sup> \$-1,216.81 (\$2,273.26)	\$-310.62 (\$3,104.14)	\$739.53 (\$3,738.32)	\$1,457.10 (\$5,849.08)	<sup>1</sup> \$8,198.78 (\$7,870.00)	<sup>1</sup> \$16,888.15 (\$25,104.81)
Average tax rate	-3.8 (.723)	0.0 (1.196)	<sup>1</sup> -6.0 (.105)	-1.4 (.098)	1.8 (.086)	2.3 (.095)	<sup>1</sup> 9.5 (.087)	<sup>1</sup> 9.6 (.106)
N	433	156	90	61	60	36	10	20

<sup>1</sup> Statistically significant at the 5-percent level.

NOTES: Data are from the Consumer Expenditure third quarter 2005 quarterly interview and reflect consumer units that are in the

second or fifth interview, contain only one tax unit, and have positive total tax from both the tax calculator and the CE. Numbers in parentheses are standard deviations.

SOURCE: U.S. Bureau of Labor Statistics.

for the third quarter of 2005.

- Both tax calculators use 2005 tax rates.
- Imputed data are included.
- All CUs in the sample are in their second or fifth interview, contain only one TU, and do not have top-coded data for any tax input values.<sup>12</sup>

Because the CBO tax calculator was not originally designed to be used with CE data, it does not account for some tax-related items included in the BLS tax calculator.

For this analysis, the following adjustments were made to the BLS tax calculator to mimic the CBO tax calculator:

- Dependents are limited to children or grandchildren of the reference person and are less than 19 years old or are less than 25 and in college.
- No dependents file separately, because the CBO tax calculator does not create multiple tax units.
- The credits calculated are limited to the child tax credit, the additional child tax credit, and the earned income tax credit.<sup>13</sup>

- Tax refunds are not considered taxable income.
- Deductions for contributions to retirement plans do not include payroll deductions.
- The self-employed do not pay an additional tax.

Tables 4 and 5 compare the results of the BLS and CBO tax calculators. The results are varied, but in general there are differences in the mean values of total income, total tax, and the average tax rates. Table 4 shows that the mean total taxes for the BLS and CBO tax calculators are \$4,091.16 and \$4,064.83, respectively. The mean average tax rate is 5 percent for both tax calculators. In table 5, which shows the mean difference in total federal income tax and average tax rate by filing status and income level, many of the cells are statistically different from zero at the 5-percent level of significance. The mean difference in total tax is \$26.33, and the mean difference in the average tax rate is 0.1 percentage points, both of which are statistically significant. The difference for singles in the total tax is \$20.89, which is not statistically significant, but the difference in the tax rate is 0.1, which is significant. The differences are significant for married, filing jointly CUs, with differences of \$34.18 in the total tax and 0.1 percentage points in the tax rate. The \$0.60 total tax mean difference for heads of households is not significant, but the tax rate difference of 0.1 percentage points is significant.

The statistically significant results are most likely due

to two major differences in the way the BLS and CBO tax calculators treat certain inputs to the tax calculators. First, the BLS calculator taxes all income sources at the same rate, whereas the CBO calculator treats dividends as capital gains, taxing them at 15 percent. Second, the CBO tax calculator converts quarterly medical expenditures to annual values, whereas the BLS calculator does not.<sup>14</sup> When these differences are controlled for, the number of cells with a statistically significant value drops, especially for the mean total tax difference cells.

Tables 6 and 7 display results where the sample does not include CUs who report positive dividend income or do not have equal medical expenditures in both the BLS and CBO tax calculators.<sup>15</sup> Table 6 reflects results similar to those in table 4, except that the means from the BLS and CBO tax calculators are greater than when no restrictions are applied, and the values calculated by the BLS calculator are closer to those calculated by the CBO. The mean total taxes for all filers are \$4,409.85 and \$4,400.58 for the BLS and CBO tax calculators, respectively. The mean tax rate is 6 percent for both calculators. Table 6 shows that the matched-sample comparison with CUs restricted to those without dividend income or medical expenditures results in a higher number of cells in which the difference is not statistically significant. In table 7, there are 16 cells in which the mean difference in total tax is significant and 14 for the mean average tax rate (out of a total of 30 cells),

**Table 4. Mean total income, total federal income tax, and average tax rate from BLS and CBO tax calculators**

Filing status	BLS tax calculator			CBO tax calculator			N
	Total income <sup>1</sup>	Federal income total tax <sup>2</sup>	Average tax rate <sup>3</sup>	Total income <sup>1</sup>	Federal income total tax <sup>2</sup>	Average tax rate <sup>3</sup>	
All filers	\$42,041.65 (39,969.98)	\$4,091.16 (6,419.01)	5.4 (0.056)	\$45,289.39 (37,508.81)	\$4,064.83 (6,432.70)	5.3 (0.057)	2,524
Single	23,078.67 (25,724.75)	2,685.35 (4,511.40)	5.5 (0.059)	27,005.67 (23,483.35)	2,664.47 (4,462.92)	5.3 (0.059)	991
Married, filing jointly	58,846.22 (43,248.52)	5,591.42 (7,535.16)	5.9 (0.054)	61,963.82 (40,020.32)	5,557.24 (7,581.59)	5.9 (0.055)	1,335
Head of household	23,648.78 (20,164.58)	1,011.84 (2,492.86)	1.9 (0.034)	24,374.26 (19,902.76)	1,011.24 (2,509.05)	1.8 (0.034)	198

<sup>1</sup> Total income refers to income for tax purposes only; it does not include workers' compensation or veterans' benefits, public assistance or welfare income, or the dollar value of food stamps.

<sup>2</sup> Federal income tax is the sum of the federal income tax values, including refunds, as described in equation (1).

<sup>3</sup> Average tax rate is federal income tax divided by total income.

NOTES: Data are from the Consumer Expenditure third quarter 2005 quarterly interview and reflect consumer units that are in the second or fifth interview, contain only one tax unit, and have no top-coded data. Numbers in parentheses are standard deviations.

SOURCE: U.S. Bureau of Labor Statistics, including data from the Congressional Budget Office.

**Table 5. Mean difference in total federal income tax and average tax rate between BLS and CBO tax calculators, by filing status and total income level**

Filing status	Income level							
	All income levels	Less than \$20,000	Less than \$30,000	Less than \$40,000	Less than \$50,000	Less than \$75,000	Less than \$100,000	\$100,000 or more
<b>All filers</b>								
Federal income tax	\$26.33 (\$542.30)	<sup>1</sup> \$3.81 (\$25.55)	<sup>1</sup> \$27.74 (\$137.57)	\$-36.46 (\$835.44)	<sup>1</sup> \$45.47 (\$266.70)	<sup>1</sup> \$50.52 (\$332.80)	<sup>1</sup> \$163.33 (\$612.51)	\$-16.71 (\$1,293.22)
Average tax rate	<sup>1</sup> 0.1 (.006)	<sup>1</sup> 0.1 (.004)	<sup>1</sup> 0.5 (.009)	<sup>1</sup> 0.1 (.007)	<sup>1</sup> 0.1 (.007)	<sup>1</sup> -0.1 (.007)	0.0 (.008)	0.0 (.007)
N	2,524	652	255	248	219	374	252	244
<b>Single head of household</b>								
Federal income tax	\$20.89 (\$505.57)	\$15.98 (\$33.03)	<sup>1</sup> \$46.85 (\$178.44)	\$-92.85 (\$1,263.55)	\$2.01 (\$242.60)	\$94.47 (\$525.00)	<sup>1</sup> \$250.33 (\$667.34)	\$331.80 (\$1,415.06)
Average tax rate	<sup>1</sup> 0.1 (.007)	<sup>1</sup> 0.2 (.005)	<sup>1</sup> 0.5 (.011)	0.1 (.009)	0.0 (.006)	-0.1 (.010)	0.1 (.011)	0.2 (.010)
N	991	370	118	108	76	83	40	15
<b>Married, filing jointly</b>								
Federal income tax	<sup>1</sup> \$34.18 (\$601.68)	<sup>1</sup> \$1.35 (\$9.52)	<sup>1</sup> \$21.55 (\$73.71)	\$11.47 (\$64.81)	<sup>1</sup> \$59.93 (265.32)	<sup>1</sup> \$45.61 (\$243.41)	<sup>1</sup> \$146.91 (\$601.88)	\$-39.54 (\$1,284.90)
Average tax rate	<sup>1</sup> 0.1 (.006)	0.0 (.001)	<sup>1</sup> 0.4 (.006)	<sup>1</sup> 0.2 (.004)	<sup>1</sup> 0.2 (.007)	<sup>1</sup> -0.1 (.006)	.0 (.008)	.0 (.007)
N	1,335	201	102	118	122	272	212	229
<b>Head of household</b>								
Federal income tax	\$0.60 (\$171.14)	\$0.00 (\$0.00)	\$-18.63 (\$109.88)	\$-16.75 (\$146.58)	\$118.67 (\$338.55)	\$-71.20 (\$350.05)	...	...
Average tax rate	<sup>1</sup> 0.1 (.006)	0.0 (.002)	<sup>1</sup> 0.5 (.008)	0.1 (.004)	0.3 (.007)	-0.1 (.008)	...	...
N	198	81	35	22	21	19	0	0

<sup>1</sup> Statistically significant at the 5-percent level.

NOTES: Data are from the Consumer Expenditure third quarter 2005 quarterly interview and reflect consumer units that are in the second or fifth interview, contain only one tax unit, and have no top-coded data.

Numbers in parentheses are standard deviations.

SOURCE: U.S. Bureau of Labor Statistics, including data from the Congressional Budget Office.

i.e., about half of the cells display a difference that is statistically significant. Table 7 contains only 2 cells with a statistically significant difference for total tax and 12 for the average tax rate. Thus the results from the restricted sample illustrate that the two tax calculators compute total tax and average tax values that are nearly equal. Furthermore, the differences are not large enough to make a substantial difference, even when they are statistically significant.

THE RESULTS FROM THESE ANALYSES provide additional support for implementation of a tax calculator or

other method to improve the federal income tax data in the CE. The internal comparison reveals that the BLS tax calculator produces total tax and average tax rates that have large and statistically significant differences when compared with those estimated using CE interviewees' responses. The comparison to the CBO tax calculator illustrates that the BLS tax calculator accurately computes total tax and average tax rates. Because tax calculators and other methods of estimating or imputing tax data can be difficult and time consuming to create, many parties stand to benefit from the implementation of an official CE tax calculator. It will improve the quality of the

**Table 6. Mean total income, total federal income tax, and average tax rate from BLS and CBO tax calculators, controlling for dividend income and medical expenditures**

Filing status	BLS tax calculator			CBO tax calculator			N
	Total income <sup>1</sup>	Federal income total tax <sup>2</sup>	Average tax rate <sup>3</sup>	Federal income total income <sup>1</sup>	Total tax <sup>2</sup>	Average tax rate <sup>3</sup>	
All filers	\$44,036.94 (40,984.87)	\$4,409.85 (6,611.91)	5.8 (0.057)	\$46,308.68 (38,895.15)	\$4,400.58 (6,624.41)	5.8 (0.057)	1,882
Single	24,282.60 (25,767.79)	2,904.65 (4,460.35)	6.0 (0.060)	27,307.47 (23,626.94)	2,894.03 (4,445.93)	5.9 (0.060)	759
Married, filing jointly	63,438.25 (44,057.62)	6,202.61 (7,880.48)	6.4 (0.055)	65,385.95 (41,496.43)	6,191.99 (7,907.38)	6.4 (0.056)	957
Head of household	22,509.79 (20,199.61)	956.62 (2,471.35)	1.8 (0.033)	23,206.11 (19,906.62)	961.40 (2,496.08)	1.7 (0.034)	166

<sup>1</sup> Total income refers to income for tax purposes only; it does not include workers' compensation or veterans' benefits, public assistance or welfare income, or the dollar value of food stamps.

<sup>2</sup> Federal income tax is the sum of the federal income tax values, including refunds, as described in equation (1).

<sup>3</sup> Average tax rate is federal income tax divided by total income.

NOTES: Data are from the Consumer Expenditure third quarter 2005

quarterly interview and reflect consumer units that are in the second or fifth interview, contain only one tax unit, have no top-coded data, have no income from dividends, and have no medical expenditure deductions in either tax calculation. Numbers in parentheses are standard deviations.

SOURCE: U.S. Bureau of Labor Statistics, including data from the Congressional Budget Office.

aftertax income data tables published by the CE, and it will widen the CE audience of researchers and other users to include those who are interested in studying after-tax income but do not have time, resources, or sufficient knowledge to create their own tax calculator. Although

the tax values produced by the BLS tax calculator are not perfect, this study demonstrates that a tax calculator such as the one discussed here greatly improves the quality of the tax data if tax inputs are properly defined and appropriate assumptions are made. □

**Table 7. Mean difference in total federal income tax and average tax rate between BLS and CBO tax calculators, by filing status and total income, controlling for dividend income and medical expenditures**

Filing status	Income level							
	All income levels	Less than \$20,000	Less than \$30,000	Less than \$40,000	Less than \$50,000	Less than \$75,000	Less than \$100,000	\$100,000 or more
<b>All filers</b>								
Federal income tax	\$9.27 (\$259.18)	\$1.36 (\$14.84)	\$1.36 (\$56.44)	\$4.50 (\$67.80)	<sup>1</sup> \$23.58 (\$165.80)	\$11.71 (\$193.69)	\$57.731 (\$612.51)	\$-16.02 (\$630.81)
Average tax rate	0.0 (.005)	<sup>1</sup> 0.1 (.004)	<sup>1</sup> 0.3 (.007)	<sup>1</sup> 0.1 (.003)	0.1 132.13	<sup>1</sup> -0.1 -0.002	0.0 (.007)	-0.1 (.006)
N	1,882	253	396	184	191	301	203	197
<b>Single head of household</b>								
Federal income tax	\$10.63 (\$182.09)	\$2.37 (\$19.51)	\$6.50 (\$37.20)	\$6.40 (\$37.59)	\$13.13 (\$181.84)	\$27.06 (\$249.02)	\$132.13 (\$540.61)	\$-88.72 (\$951.34)
Average tax rate	<sup>1</sup> 0.1 (.005)	<sup>1</sup> 0.1 (.005)	<sup>1</sup> 0.3 (.007)	0.0 (.003)	0.0 (.005)	-0.2 (.009)	0.0 (.009)	-0.1 (.008)
N	759	228	97	89	67	73	33	10
<b>Married, filing jointly</b>								
Federal income tax	\$10.62 (\$317.55)	\$0.00 (\$0.01)	\$4.68 (\$19.86)	\$8.15 (\$59.12)	\$11.12 (\$80.76)	\$15.43 (\$145.94)	\$43.28 (\$352.57)	\$-12.14 (\$612.56)
Average tax rate	0.0 (.005)	0.0 (.000)	<sup>1</sup> 0.2 (.005)	<sup>1</sup> 0.1 (.003)	0.0 (.002)	<sup>1</sup> -0.1 (.004)	0.0 (.006)	-0.1 (.006)
N	957	98	58	83	77	212	170	187
<b>Head of household</b>								
Federal income tax	\$-4.78 (\$170.31)	\$0.00 (\$0.00)	\$0.00 (\$0.00)	\$-22.47 (\$120.72)	\$-20.29 (\$157.98)	\$151.29 (\$338.99)	...	...
Average tax rate	<sup>1</sup> 0.1 (.005)	0.0 (.000)	0.0 (.000)	<sup>1</sup> 0.5 (.008)	0.1 (.004)	0.4 (.007)	...	...
N	166	19	70	29	19	13	0	0

<sup>1</sup> Statistically significant at the 5-percent level.

NOTES: Data are from the Consumer Expenditure third quarter 2005 quarterly interview and reflect consumer units that are in the second or fifth interview, contain only one tax unit, have no top-coded data, have no

income from dividends, and have no medical expenditure deductions in either tax calculation. Numbers in parentheses are standard deviations.

SOURCE: U.S. Bureau of Labor Statistics, including data from the Congressional Budget Office.

## Notes

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<sup>1</sup> For additional information on the Consumer Expenditure Survey, visit the CE webpage at [www.bls.gov/cex/](http://www.bls.gov/cex/).

<sup>2</sup> The definitions of variables that follow are from the 2005 CE data dictionary.

<sup>3</sup> Annual federal tax deducted from pay is calculated as the member's annual income from salary and wages multiplied by the percentage of the last pay check that went toward federal income tax. In other words, Annual federal tax = Annual salary and wages \* (Amount deducted for federal tax from last pay / Amount of last pay check before any deductions).

<sup>4</sup> Annual state and local taxes paid are calculated in the same manner as federal income tax (see endnote 3).

<sup>5</sup> A consumer unit is a group of individuals who share expenses of housing, food, and other goods, and who live in the same residence. Of the sample in third quarter 2005, 54 percent of CUs contained members of the immediate family (i.e., husband and wife with or without children, or one parent with children), 27 percent were single individu-

als living by themselves, and 19 percent were “other,” i.e., other relatives or nonrelated people living in the residence.

<sup>6</sup> These scenarios are true for respondents in their second and fifth interviews, when income and tax questions are asked. For respondents in their third and fourth interviews, the income and tax values are carried forward from the second interview. For those respondents, the time frame referenced will be even further in the past.

<sup>7</sup> Although single people with dependents should file as single rather than as head of household if they contribute less than 50 percent toward household costs, the IRS suspects many singles incorrectly file as head of household. Thus the tax calculator assumes all single people with dependents file as head of household. The tax calculator considers married people who do not live with their spouses as unmarried, because the CE does not collect data on family members who do not live at the residence. A recent widow(er) is also considered unmarried because the CE cannot determine whether the person is a qualifying widow(er).

<sup>8</sup> In the third quarter of 2005, two-thirds of the sample respondents who were eligible for the education deduction and credit owed less tax by taking the deduction. No dependents who filed separately had any tuition payments in that period.

<sup>9</sup> Data are available on employer provided health insurance plans in the CE and could be incorporated into a future tax calculator.

<sup>10</sup> Quoted from the 2006 Schedule R, Credit for the Elderly or the Disabled.

<sup>11</sup> From the CE data dictionary.

<sup>12</sup> The CE adds a top code to the public use microdata to remove

personally identifiable information in order to protect the privacy of CUs whose responses fall outside the normal range. These CUs are removed from this portion of the analysis because the top-coded inputs will produce inaccurate tax outputs.

<sup>13</sup> The previous three adjustments imply that the tax calculators assume no one is disabled.

<sup>14</sup> The CBO tax calculator multiplies the quarterly medical expenditures the CUs report by 4 to estimate annual medical expenditures. The BLS does not do this because the value of medical expenditures includes some large expenses which are not likely to occur each quarter, such as hospital visits. These large expenses significantly alter itemized deductions, and in some cases lead CUs to itemize when they would not otherwise do so. In some instances, this causes large changes in both total tax rates and average tax rates.

<sup>15</sup> Before restricting the sample in these two ways (dividend income is zero and deductions for medical expenses are equal in both tax calculators), the tables were constructed with first one and then the other restriction. The tables in which dividend income is zero resulted in smaller total tax and average tax rate values since total income was reduced. The tables in which deductions for medical expenses are equal resulted in greater total tax and average tax rates because medical expenses are only equal for CUs that do not take any deduction. For many CUs this means they do not itemize their deductions, and thus their taxes are greater. When both restrictions are applied at once, total tax and the average tax rate are slightly greater than when no restrictions are applied because the effect of deleting CUs with medical deductions outweighs the effect of deleting CUs with dividend income.