

The Distribution of Payroll and Income Tax Burdens, 1979–99

Abstract - This paper presents new evidence on the level and distribution of income and payroll tax burdens for U.S. families over the 1979–99 period. During this period, payroll taxes have become an increasingly important component of the tax burden for many low- and middle-income families. This paper uses a new and expanded version of the National Bureau of Economic Research (NBER) TAXSIM program to analyze the impact of legislative changes in income and payroll taxes. Averaged over all families, the combined 1999 payroll and income tax burden was quite similar to what it would have been if the 1979 income and payroll tax laws had remained in force for the last two decades, with only inflation-based adjustments to tax brackets. The mix of income and payroll taxes has changed, however. As a result of the expansion of the Earned Income Tax Credit in the late 1980s and early 1990s, as well as other changes in the federal personal income tax, payroll tax liabilities now exceed income tax liabilities for nearly two-thirds of families. In 1979, payroll taxes exceeded income taxes for 44 percent of families.

INTRODUCTION

The relative importance of income taxes and payroll taxes in the federal fiscal system has shifted dramatically in the last four decades. Until 1963, federal receipts from the individual income tax were more than twice as great as federal payroll tax revenues. In 1995, payroll tax receipts were approximately equal to income tax receipts. While income tax revenues rose more sharply than payroll taxes in the late 1990s, the long-term projections of growing outlays for Social Security and Medicare suggest that the payroll taxes used to finance these programs will remain a central component of the fiscal landscape.

The importance of considering the tax burden from both income and payroll taxes is evident in earlier studies that combine payroll and income taxes, such as those by the Joint Committee on Taxation (1993) or the Congressional Budget Office (1998). The expansion of the Earned Income Credit during the 1990s has reduced and in some cases eliminated personal income tax liability for many low-income families. Payroll taxes nevertheless remain significant for most of these families. Recent changes in the payroll tax, notably elimination of the taxable earnings maximum for the

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Hospital Insurance tax, have also affected the magnitude of payroll tax liabilities for many upper income families.

This paper investigates the relative importance of income and payroll tax burdens for families at different points in the income distribution. The analysis focuses on the period 1979 to 1999, and it includes an investigation of how the Taxpayer Relief Act of 1997 (TRA97) affected the distribution of personal income tax burdens in the late 1990s. The analysis relies on an expanded and updated version of the National Bureau of Economic Research's TAXSIM model. We extend this model, which has historically been used to study only changes in the distribution of income tax burdens, to include payroll taxes as well.

The paper is divided into four sections. The first summarizes the key legislative changes in both the payroll tax and the income tax over the 1979–99 period. It describes the Taxpayer Relief Act of 1997 in particular detail, since that reform receives special emphasis in our analysis. The second section presents summary information on the distribution of income and payroll tax liabilities over the 1979–99 period. It considers the average income and payroll tax burden on families in various income categories, as well as the fraction of families for which payroll taxes exceed income taxes. The analysis highlights the role of the Earned Income Tax Credit in affecting family tax burdens. We compare tax burdens under different tax regimes using two baseline distributions of family income, one based on income tax returns and other data from 1995, and the other based on similar data from 1979. The third section presents a detailed summary of how the Taxpayer Relief Act of 1997 affected income tax burdens for families in different income categories. A brief concluding section outlines several issues that remain for future research. A substantial appendix describes the TAXSIM payroll tax calculator. It also explains the algo-

rithms that we use to identify families that do not file income tax returns, to allocate labor income between spouses in married couples, and to impute eligibility for various tax credits that were enacted in the Taxpayer Relief Act of 1997.

FEDERAL INCOME AND PAYROLL TAX CHANGES, 1979–99

There have been four major legislative changes in the federal personal income tax code in the last two decades. The payroll tax has also been changed several times, but the changes have been less dramatic than those in the income tax code. This section summarizes these legislative changes.

Federal Income Tax Changes, 1979–99

There were four major federal income tax reforms during the 1979–99 period. These were the Economic Recovery Tax Act of 1981 (ERTA), the Tax Reform Act of 1986 (TRA86), the Omnibus Budget Reconciliation Act of 1993 (OBRA93), and the Taxpayer Relief Act of 1997 (TRA97). These reforms are described in detail elsewhere, for example Steuerle (1992), so with the exception of TRA97, we will not provide an in-depth summary.

ERTA significantly reduced personal income taxes across the board. It incorporated a three-year period of tax reduction, with marginal rates on all but the highest income taxpayers declining substantially during the 1981–4 period. The top marginal tax rate on earned income was 50 percent before as well as after ERTA, but the legislation reduced the top marginal rate on unearned income from 70 percent to 50 percent beginning in 1981. This reform also reduced the top statutory marginal tax rate on long-term capital gains from 28 percent to 20 percent. We consider tax burdens in 1984 in our analysis below, because by 1984 the ERTA reforms were fully effective.

TRA86 continued the reduction in top marginal tax rates that had been part of ERTA, but it also eliminated the capital gains tax preference for most taxpayers. For taxpayers at the highest income levels, TRA86 reduced marginal tax rates from 50 percent in 1986 to 39 percent in 1987 and 28 percent in 1988. TRA86 introduced a hump shaped pattern in marginal tax rates, with some taxpayers below the highest income groups facing a 33 percent marginal tax rate. It also eliminated the tax preference for capital gains, although the tax rate on such gains was capped at 28 percent. This change increased the statutory tax rate on gains for many high-income taxpayers. TRA86 raised the standard deduction and the personal exemption, thereby reducing the number of low-income families that needed to file income tax returns. It also expanded the Earned Income Tax Credit, which reduced income tax liabilities for low-income families with earned income. Because some provisions in TRA86 phased in over two years, we consider tax liabilities in 1989 as an illustration of tax burdens under the TRA86 regime.

OBRA93 partially reversed the changes in the top marginal tax rate that had been enacted in 1986. In many ways it extended and amplified changes that were enacted as part of the Omnibus Budget Reconciliation Act of 1990. The 1990 Act eliminated the “hump shaped” distribution of marginal tax rates that was embodied in the 1986 law and replaced it with a top marginal tax rate of 31 percent. This led to a three-bracket income tax rate schedule, with rates of 15, 28, and 31 percent. OBRA93 raised the top marginal tax rate to 36 percent for joint filers with incomes above \$140,000 (\$115,000 for single filers). In addition, it raised the marginal tax rate to 39.6 percent (36 percent plus a 10 percent surtax) for individual or married taxpayers with taxable incomes of more than \$250,000. Many high-income taxpayers face tax rates above this statutory maxi-

mum of 39.6 percent as a result of the phase-out provisions governing various deductions. OBRA93 also raised the share of Social Security benefits that could be taxed from 50 to 85 percent.

The Taxpayer Relief Act of 1997

TRA97 included a number of new tax credits and once again altered the tax rate on long-term capital gains. The first such credit is the Child Tax Credit, which provides a \$500 credit (\$400 for 1998) for each qualified child of a taxpayer. To qualify, a child must be under the age of 17. This credit was fully available to married joint filers with modified adjusted gross income (AGI) of less than \$110,000, and to single taxpayers or heads of household with modified AGI of less than \$75,000. For each \$1,000 of modified AGI in excess of these thresholds, the Child Tax Credit is reduced by \$50 per child until the credit is exhausted.

The Child Tax Credit is not refundable, and it is only available for dependent children who are under the age of 17. It does not generate any benefit for low-income families with no federal income tax liabilities. Our estimates, which are described in more detail in the appendix, suggest that the Child Tax Credit reduced family income tax liability for only 69.4 percent of under-17 dependents in 1999. (We estimate that 76.3 percent of all dependents claimed on tax returns in 1995 were under the age of 17.) Although some low-income families cannot use the Child Tax Credit to reduce their income tax liability, a large fraction of the tax benefits associated with the Child Tax Credit accrue to low- and modest-income families. We estimate that 35 percent of the under-17 dependents whose families benefit from the Child Tax Credit have family incomes of less than \$40,000.

TRA97 also reduced the maximum tax rate on long-term capital gains from 28 percent to 20 percent, effective May 7,

1997. For taxpayers in the 15 percent income tax bracket, the maximum long-term capital gains tax rate became 10 percent. TRA97 also introduced an "intermediate" capital gains tax rate that applied to gains held from 12 to 30 months, but this rate was eliminated in 1998. Because we consider tax liabilities for families facing the 1999 tax law, we do not consider the impact of the intermediate capital gains tax rate.

Finally, TRA97 included a number of new tax incentives for college attendance. The two most significant are the HOPE Credit and the Lifetime Learning Credit (LLC). The HOPE Credit is a non-refundable credit of up to \$1500 per student. It can be used to offset educational expenses in a student's first two years of post-secondary education. It is a 100 percent credit on the first \$1000 of tuition and fees, and a 50 percent credit on the next \$1000 of such fees. The full value of the credit is available to married joint filers with modified AGI of less than \$80,000. The credit is completely phased out for married joint filers with modified AGI of more than \$100,000. For heads of household and single filers, the HOPE credit phases out between \$40,000 and \$50,000 of modified AGI. The HOPE credit can be claimed by the taxpayer, the taxpayer's spouse, or on behalf of any of the taxpayer's dependents.

For families with a single HOPE Credit recipient, the phase-out of the credit raises marginal income tax rates by 7.5 percent in the relevant AGI range. Some tax returns might have more than one beneficiary, and for such returns, the marginal tax rate effects can be very large. To illustrate this, consider a family with two children, ages 19 and 20, who are attending college. Assume that the family has an adjusted gross income of \$90,000. Before TRA97, this family faced a marginal federal income tax rate of 28 percent. The HOPE phase-out raises this tax rate to 43 ($28 + 2 * 7.5$) percent. For a single-parent

family, the effect is even more dramatic, since the phase-out occurs over the \$40–50,000 income range. A single parent household with two HOPE credit recipients could therefore face a 30 percent increase in marginal income tax rates as a result of the phase-out provisions.

One important feature of the HOPE Credit, emphasized in Cronin (1997) and Dynarski (1999), is that it applies to *net* tuition and fees. Federal Pell grants and other financial aid that post-secondary schools provide to low-income enrollees can reduce the value of the HOPE credit, and for some students, they may render the HOPE credit worthless. (This fact has led to interesting discussions, summarized in Dynarski (2000), about the ultimate incidence of the HOPE credit and the extent to which it benefits students attending college or is offset by increases in the net price charged by post-secondary institutions.)

The Lifetime Learning Credit provides taxpayers with a credit equal to 20 percent of net educational expenditures, up to a maximum credit of \$1,000. Like the HOPE Credit, the LLC is phased out for married joint filers over the \$80,000–\$100,000 modified AGI range, and for single filers over the \$40–50,000 modified AGI range. The LLC is available to anyone enrolled in a post-secondary educational institution. The phase-out raises marginal tax rates by up to 5 percentage points for families in the phase-out income range. The LLC is computed on a per-return basis, rather than a per-student basis, and it is not possible to claim *both* a HOPE Credit and a Lifetime Learning Credit for the same eligible student. Because the HOPE credit offers a 100 percent or a 50 percent credit, depending on the amount of tuition outlays, and the LLC offers only a 20 percent credit, those who can use the HOPE Credit will presumably choose to use it before utilizing the Lifetime Learning Credit. The LLC is not restricted to two years of higher education spending, as the HOPE Credit is.

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We estimate the distributional effects of the tax credits embodied in TRA97 by “aging” tax returns from 1995 to 1999, and then imputing information on whether families are likely to have dependents who are eligible for these credits. While detailed information on individual income tax returns filed for the 1998 tax year will not be available for some time, the IRS has released preliminary data on the use of education tax credits in 1998, and we compare our estimates with these actual data.

Changes in Payroll Tax Rates and the Payroll Tax Base, 1979–99

The payroll taxes that are used to finance the Social Security and Hospital Insurance (Medicare) programs have not changed as dramatically as federal income taxes during the last twenty years. In 1979, the combined employer and employee payroll tax rate was 12.26 percent. In 1999, this rate was 15.3 percent. Table 1 shows the changes in the combined employer and employee tax rate over the last two decades, as well as in the taxable maxi-

imum level of earnings for both payroll taxes. For high-earning taxpayers, the most significant payroll tax changes during the last two decades were the increase in the Hospital Insurance maximum taxable earnings from \$51,300 to \$125,000 in 1991, and the subsequent elimination of the upper limit on taxable earnings in 1994. The payroll tax rates have been 12.4 percent for Social Security, and 2.9 percent for Hospital Insurance, since 1990.

THE DISTRIBUTION OF INCOME AND PAYROLL TAX LIABILITIES, 1979–99

The NBER TAXSIM model is a computer program that calculates federal income tax and payroll tax liabilities for a representative sample of U.S. families. The program analyzes data from the Statistics of Income (SOI) Public Use File, which is a stratified random sample of U.S. taxpayers that oversamples high-income tax returns. Feenberg and Coutts (1993) describe this program in some detail. TAXSIM currently offers detailed federal tax calculators for the 1960–99 period. While it has traditionally focused on fed-

TABLE 1
PAYROLL TAX RATES AND TAXABLE EARNINGS LIMITS, 1979–99

Year	Social Security Tax Rate (OASDI)	Hospital Insurance Tax Rate (HI)	Social Security Taxable Maximum (\$)	Hospital Insurance Taxable Maximum (\$)
1979	10.16	2.10	22,900	22,900
1980	10.16	2.10	25,900	25,900
1981	10.70	2.60	29,700	29,700
1982	10.80	2.60	32,400	32,400
1983	10.80	2.60	35,700	35,700
1984	11.40	2.60	37,800	37,800
1985	11.40	2.75	39,600	39,600
1986	11.40	2.90	42,000	42,000
1987	11.40	2.90	43,800	43,800
1988	12.12	2.90	45,000	45,000
1989	12.12	2.90	48,000	48,000
1990	12.40	2.90	51,300	51,300
1991	12.40	2.90	53,400	125,000
1992	12.40	2.90	55,500	130,200
1993	12.40	2.90	57,600	135,000
1994	12.40	2.90	60,600	no maximum
1995	12.40	2.90	61,200	no maximum
1996	12.40	2.90	62,700	no maximum
1997	12.40	2.90	65,400	no maximum
1998	12.40	2.90	68,400	no maximum
1999	12.40	2.90	72,600	no maximum

Source: Authors' tabulations from the 1999 Annual Statistical Supplement to the Social Security Bulletin.

eral income tax liability, we extend its capacity to include payroll taxes as well. We focus our analysis on the 1979–99 period.

We do not consider excise taxes at either the federal or state–local level, estate taxes, or corporate income taxes, in our analysis of tax burdens. Some other studies of household tax burdens, such as the ITEP model described by Ettlenger and O’Hare (1998) or some of the models analyzed by the Congressional Budget Office, also include taxes besides income and payroll taxes. Our limited analysis avoids a number of difficult incidence issues, discussed for example in Bradford (1995) and Joint Committee on Taxation (1993), associated with taxes other than income and payroll taxes. We focus our efforts on describing two taxes that have traditionally been assumed to fall on the families that pay them, namely the individual income tax and the payroll tax (including the employer’s share of this tax).

The most recent SOI Public Use File contains tax returns for the 1995 tax year. Because we are interested in family tax liabilities under the most recent federal tax law, we “age” the information from 1995 to 1999. We do this using an algorithm described in the appendix that relies on aggregate information on tax returns as reported by the Internal Revenue Service, along with data from the National Income and Product Accounts. We also augment the data from the SOI Public Use File with data from the Current Population Survey (CPS) on families that do not file tax returns. Our non–filer imputation procedure is also described in the appendix.

Throughout our analysis, we focus on families as our basic unit of observation, and calendar years as the basic unit of time. We follow the tax code in defining “families” by excluding dependent tax filers from family units. When we stratify families according to their income, we focus on an “Adjusted AGI” measure. This is defined as Adjusted Gross Income (AGI) as reported on tax returns, plus

employer–paid Social Security and Medicare taxes, plus the portion of Social Security benefits that are excluded from AGI, plus tax exempt bond interest, plus contributions to Individual Retirement Accounts and Keoghs. Some other studies of the distribution of income or payroll tax burdens, such as Ettlenger and O’Hare (1998), use even more expansive definitions of family income that include estimates of transfer payments and other resource flows. We restrict our analysis to an income measure that can be constructed from data on tax returns. The appendix describes how we impute each family’s payroll taxes.

There are several ways to summarize the distribution of income and payroll tax liabilities for the 1979–99 period. We first describe the distribution of both types of taxes across families in different income categories in 1999. We then consider how the level of income and payroll taxes has varied over time, and also present information on the relative importance of the two taxes for families at different points in the income distribution. We finally isolate the effect of the Earned Income Tax Credit in affecting tax liabilities over the period that we study.

Income Taxes and Payroll Taxes, 1999

Table 2 presents our estimate of the distribution of income and payroll tax liabilities across families in calendar year 1999. Table 2 includes entries for the mean personal income tax and the mean payroll tax for families in different adjusted AGI categories. Our measure of the payroll tax burden combines both the employer and employee share of this tax, just as our measure of family income is defined before payment of either employer or employee payroll taxes. Table 2 also shows the fraction of families for whom the payroll tax is greater than the income tax, and for the fraction of families for whom the income tax is greater than the payroll tax,

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TABLE 2
DISTRIBUTION OF INCOME AND PAYROLL TAXES BY ADJUSTED AGI, 1999

1999 Family Adjusted AGI (000s)	Families (millions)	Mean Personal Income Tax	Mean Payroll Tax	Percent of Families with Personal Income Tax > Payroll Tax	Percent of Families with Payroll Tax > Personal Income Tax
< 10	28.83	-247	400	9.4	46.2
10–20	23.65	-217	1475	10.6	71.5
20–30	18.11	1083	2833	14.0	81.7
30–40	13.26	2538	4199	13.0	85.7
40–50	10.57	3961	5405	25.2	74.3
50–75	18.92	6267	7170	33.4	66.2
75–100	9.93	10645	9950	45.0	54.9
100–200	9.30	20750	12570	83.7	16.2
200–500	2.03	63913	14394	99.8	0.1
500–1000	0.36	181196	17873	99.9	0.0
> 1000	0.18	798317	28848	99.9	0.0
All	135.15	840.5	602.9	23.7	62.0

Notes: The aggregate number of families (column 1) is 135.15 million. Aggregate income and payroll taxes are \$839 billion and \$602.9 billion, respectively. In aggregate, 23.7 percent of families have personal income tax liabilities in excess of their payroll taxes, 62 percent have payroll taxes in excess of personal income taxes, and 14.3 percent have equal liabilities (usually zero).

again divided stratified by adjusted AGI. A substantial group of families have zero payroll and income tax liabilities, so in some adjusted AGI categories, the sum of the percent of families with payroll taxes greater than income taxes, and the percent with income taxes greater than payroll taxes, adds up to less than 100 percent.

Table 2 shows that for most families in income classes below \$100,000, the average payroll tax burden exceeds the average personal income tax burden. The disparities are particularly clear at lower income levels. For families with between \$20,000 and \$30,000 in adjusted AGI, for example, mean payroll taxes are roughly three times as great as mean income taxes. For families in lower adjusted AGI categories, mean federal income taxes are negative. This reflects the refundable portion of the Earned Income Tax Credit generating negative income tax payments. The average federal income tax burden does not approximate the average payroll tax burden until the \$75–100,000 adjusted AGI category. At higher adjusted AGI levels, income tax payments are substantially larger than payroll tax payments. This reflects both the capped base for the Social Security payroll tax, and the low rate for the Hospital Insurance payroll tax (relative to income tax rates).

Payroll taxes exceed income taxes for 62 percent of families. At income levels below \$50,000, more than three-quarters of families have payroll tax bills that exceed their income taxes. At adjusted AGI levels above \$200,000, income taxes exceed payroll taxes for virtually all families. At the lowest income levels, there are a substantial number of families with no income or payroll tax liability. Nearly half of families with adjusted AGI of less than \$10,000 have neither payroll nor income tax liabilities. These families are not classified as having payroll taxes greater than income taxes, or *vice versa*.

The results on income versus payroll taxes in Table 2 are broadly consistent with findings reported by the Congressional Budget Office (CBO). For example, CBO reports that at family income between \$40,000 and \$50,000, 78 percent of families pay combined employer and employee payroll taxes that exceed their income tax. Our estimate is 74.5 percent. At lower income levels there are greater disparities between our calculations and those by the CBO, and there are also some significant differences at higher income levels. For families with incomes between \$100,000 and \$200,000, for example, we estimate that 84 percent face income taxes greater than their pay-

roll taxes, while the CBO estimate is 66 percent.

Several factors could account for differences between our results and those in CBO (1998). One is that we use a less expansive income definition than CBO, since we do not impute any information, such as transfer payments, that is not reported on tax returns. A second possibility is different assumptions about the recent time path of various income components, particularly capital gain realizations, that represent a large share of income for the highest-income families. Any analysis of post-1995 tax distributional patterns requires making a forecast of how the income distribution has evolved since 1995 (the last year for which the SOI Public Use File is available). We describe in the appendix our algorithm for "aging" the 1995 income distribution to 1999, which differs from that used by CBO. We use more disaggregate information on the aggregate

value of income flows to "age" the 1995 income distribution to 1999 than the CBO algorithm does. Finally, our approach to identifying nonfiler families may differ from that used by the CBO. In future work, we hope to explore the source of these differences.

We have not made detailed comparisons of our findings and those from other models, such as the ITEP model described by Ettliger and O'Hare (1998). We suspect, however, that what differences arise are likely to stem from factors similar to those that may cause divergence between our results and CBO's.

Income Taxes and Payroll Taxes: The 1979-99 Experience

Table 2 provides information on the pattern of income tax and payroll tax liabilities in 1999, but it does not place these liabilities in historical context. Table 3 de-

TABLE 3
PERCENT OF FAMILIES WITH PAYROLL TAX IN EXCESS OF PERSONAL INCOME TAX

1999 Family Adjusted AGI (000s)	1979	1984	1989	1994	1999
All Families					
< 10	46.4	46.3	46.4	46.4	46.2
10-20	71.2	70.8	71.3	71.5	71.5
20-30	66.7	78.8	81.1	81.5	81.7
30-40	45.8	58.8	84.5	85.3	85.7
40-50	37.5	48.0	68.9	73.5	74.3
50-75	19.1	28.8	63.4	65.5	66.2
75-100	4.6	7.3	41.3	49.1	54.9
100-200	1.0	1.5	9.7	13.4	16.2
200-500	0.4	0.4	0.1	0.1	0.1
500-1000	0.2	0.3	0	0	0
> 1000	0.4	0.5	0	0	0
All	41.8	47.0	59.5	61.1	62.0
All Families with Positive Personal Income Tax or Payroll Tax					
< 10	83.5	83.3	83.4	83.4	83.0
10-20	86.8	86.6	86.8	87.0	87.1
20-30	69.9	82.6	84.8	85.2	85.3
30-40	46.4	59.6	85.7	86.4	86.8
40-50	37.7	48.2	69.1	73.6	74.7
50-75	19.1	28.9	63.6	65.7	66.5
75-100	4.6	7.3	41.0	49.0	54.9
100-200	1.0	1.5	9.6	13.4	16.2
200-500	0.4	0.4	0.1	0.1	0.1
500-1000	0.2	0.3	0	0	0
> 1000	0.4	0.5	0	0	0
All	48.3	54.4	68.6	70.5	71.5

Source: Authors' calculations using TAXSIM and payroll tax simulation programs for the 1979-99 period. Families are grouped according to their 1999 Adjusted AGI. Income values in the tax laws for other years are "aged" to 1999 using changes in the Consumer Price Index.

velops a longer term perspective on the relative magnitude of tax liabilities. It shows the results of applying income and payroll tax rules from five years—1979, 1984, 1989, 1994, and 1999—to the set of families whose 1999 income and payroll taxes we analyzed in Table 2. Recall that this “1999 family income distribution” was constructed by “aging” families from the 1995 SOI Public Use File and the 1995 Current Population Survey to 1999. When we apply the tax laws from other years to this set of families, we re-define the income thresholds in each year’s tax laws to correspond to 1999 price levels. We make these adjustments using price changes as reflected in the Consumer Price Index. Thus, if the Consumer Price Level for 1999 was double that for an earlier year, we would double all of the nominal magnitudes in the income tax law for the earlier year, and then apply the resulting tax code to our data set of 1999 families.

The calculations in Table 3, and in several subsequent tables, indicate what would have happened if the bracket amounts in tax codes from earlier years had been indexed for inflation but not for other changes in the economy. They assume that the U.S. economy would have evolved precisely as it did over the last twenty years despite this difference in the tax code. By holding the pre-tax distribution of family income constant, we are able to focus on the impact of tax law changes alone. Our assumption that the tax law does not affect the pretax distribution of income is an important over-simplification, however. Many studies, such as Feldstein (1995), Gruber and Saez (2000), and others surveyed in the latter study, suggest that there may be important links between the distribution of marginal tax rates and reported family income.

Table 3 shows the percentage of families for whom the payroll tax would have exceeded the personal income tax if the tax laws from various years had applied in 1999. The table shows significant

change in the relative importance of the income and the payroll tax over the 1979–99 period. The upper panel of the table reports percentages as a share of all families in various adjusted AGI ranges. If the 1979 and 1984 tax laws had applied in 1999, only 19.1 and 28.8 percent of families with adjusted AGI between \$50,000 and \$75,000 (\$1999) would have faced payroll taxes that were greater than their income tax liabilities. Under the 1999 tax law, two-thirds of the families in this group faced greater payroll taxes than income taxes. Between 1984 and 1989, the percentage of families in this income group with payroll taxes greater than income taxes rose from 28.8 to 63.4 percent, highlighting the importance of the Tax Reform Act of 1986 in affecting the relative importance of income and payroll taxes.

The last two decades have also seen some changes in the relative importance of payroll and income taxes for families at the top of the income distribution. In 1999, nearly one family in six with AGI between \$100,000 and \$200,000 paid more in payroll taxes than in income taxes. In years before the Tax Reform Act of 1986, this fraction was negligible. In 1989, less than one family in ten in this adjusted AGI category paid more in payroll than in income taxes. The increase in the number of high-income families with payroll taxes greater than income taxes thus appears to be due to both the changes in the Tax Reform Act of 1986 and the changes in the payroll tax cap in the early 1990s.

The lower panel of Table 3 presents information on only those families who paid positive income or payroll tax in each year. While restricting the sample to this group has very little effect on our results for families with income of more than \$40,000 in 1999, it has substantial effects at lower income levels. For families with 1999 adjusted AGI between \$10,000 and \$20,000, for example, 71.5 percent of all families, but 87.1 percent of families who paid some taxes, had 1999 payroll taxes in excess of

personal income taxes. In general, the share of families with payroll taxes greater than income taxes is larger when we restrict the families we are considering to those with positive tax liability of some type. We find that just over 70 percent of families with positive taxes face payroll taxes that are larger than income taxes. CBO (1998) reports an even larger value, 80 percent. In our data, the effect of conditioning on positive tax liability is similar in 1979, 1984, 1989, 1994, and 1999.

Table 3 presents information on the relative magnitude of income and payroll tax liabilities, but it does not consider the absolute magnitude of either tax liability. Tables 4 and 5 present summary information on tax levels. The tables use two different family income distributions to compare the level of payroll taxes (Table 4) and personal income taxes (Table 5) for families at different income levels. The first is the 1999 family income distribution that was used to develop the summary statistics in Tables 2 and 3. As explained above, this income distribution is based on data from 1995 income tax returns, augmented with data from the 1995 Current Population Survey, and then "aged" to 1999. The second income distribution that we consider is the 1979 family income distribution. We construct this income distribution from the 1979 SOI Public Use File, augmented with data from the 1979 Current Population Survey. Nominal magnitudes in this 1979 family income distribution are then converted to 1999 quantities using the change in the Consumer Price Index between 1979 and 1999.

We consider two income distributions to explore the robustness of our findings to shifts in the underlying characteristics of the families whose taxes we are studying. The 1979 family income distribution differs in various ways from the 1999 distribution. The share of wage income among the highest income families is lower, for example (see Feenberg and Poterba, 2000). There are differences in the

relative importance of married couples and single filers at different family income levels. The average real income level of families in 1979 is also lower than that of families in 1999, since wages and other incomes have grown faster than the price level over the intervening two decades. Tables 4 and 5 reflect this by showing lower average payroll and income tax burdens when we use the 1979 family income distribution rather than the 1999 family income distribution.

Table 4 reports information on the change in real payroll tax burdens over the 1979–99 period. The table shows that payroll taxes have increased modestly for middle-income families during this time period. The most striking change between two adjacent years in the table is that for high-income families between 1989 and 1994. This is the result of the "uncapping" of the Hospital Insurance payroll tax for years after 1993. For some high-earning families, this change more than doubled payroll taxes.

The upper and lower panels of Table 4 show similar broad trends in the average payroll tax burden for families in various adjusted AGI categories. This suggests that the changes in family structure and in family income composition between 1979 and 1999 have not significantly affected the family attributes that determine the relationship between payroll tax liability and adjusted AGI.

Table 5 is similar to Table 4, except that it reports information on income taxes. It also presents summary statistics based on the 1999 family income distribution, as well as based on the 1979 family income distribution. The table shows that average income tax burdens have declined in the last two decades across all income classes. Consider the results in the upper panel, which relates to the 1999 family income distribution. In 1999, the average family's income tax liability would have been 33 percent greater if the 1979 income tax code (with bracket break-points adjusted for

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TABLE 4
AVERAGE FAMILY PAYROLL TAX LIABILITIES, 1979–99

1999 Family Adjusted AGI (000s)	1979	1984	1989	1994	1999
1999 Family Income Distribution					
< 10	299	351	381	399	400
10–20	1147	1327	1431	1475	1475
20–30	2229	2565	2761	2833	2833
30–40	3316	3811	4099	4199	4199
40–50	4273	4909	5279	5405	5405
50–75	5441	6447	6977	7164	7170
75–100	6879	8374	9235	9771	9950
100–200	7779	9828	10970	12247	12570
200–500	6889	8952	10150	13928	14394
500–1000	6217	8170	9310	17394	17873
> 1000	6156	8075	9195	28369	28848
All	3150	3770	4120	4420	4460
1979 Family Income Distribution					
< 10	307	354	382	393	393
10–20	1450	1666	1792	1836	1836
20–30	2490	2860	3076	3150	3150
30–40	3618	4156	4468	4574	4575
40–50	4734	5444	5856	5996	5997
50–75	6052	7300	7944	8187	8205
75–100	6770	8588	9620	10418	10728
100–200	7278	9390	10588	12164	12557
200–500	7598	10048	11485	15526	16116
500–1000	6660	8780	10022	18737	19260
> 1000	5944	7820	8917	26307	26768
All	3100	3700	4040	4260	4290

Notes: All entries are reported in 1999 dollars. See text for further discussion.

TABLE 5
AVERAGE FAMILY PERSONAL INCOME TAX, INCLUDING EITC, 1979–99

1999 Family Adjusted AGI (000s)	1979	1984	1989	1994	1999
1999 Family Income Distribution					
< 10	-74	-44	-92	-204	-247
10–20	222	576	219	-84	-217
20–30	1696	1922	1484	1313	1083
30–40	3340	3487	2812	2762	2538
40–50	5016	5155	4265	4199	3961
50–75	7860	8157	6522	6514	6267
75–100	13185	13811	11006	11040	10645
100–200	26514	26758	21273	21272	20750
200–500	83853	79158	62093	66934	63913
500–1000	245638	220465	157153	192419	181196
> 1000	1111999	933132	722088	895383	798317
All	8280	8130	6340	6630	6220
1979 Family Income Distribution					
< 10	-34	5	-12	-81	-118
10–20	442	823	506	228	94
20–30	1902	2138	1768	1595	1347
30–40	3406	3594	3048	2995	2705
40–50	4955	5129	4377	4317	3921
50–75	7861	8072	6593	6495	6012
75–100	13459	13902	11710	11520	11005
100–200	26385	26656	22886	22735	22033
200–500	87080	82455	67331	73789	70412
500–1000	267559	242661	181641	223108	206967
> 1000	1003303	866633	750981	911074	775183
All	4890	5030	4160	4130	3810

All entries are reported in 1999 dollars. See text for further discussion.

changes in the Consumer Price Index) was still in force than it was with the actual 1999 tax code.

There is significant variation in the pattern of tax liabilities across income categories. For families with adjusted AGI in the \$75–100,000 range for 1999, income taxes under the 1979 law would have been 24 percent greater than they actually were. For those in the \$20–30,000 adjusted AGI class, taxes under the 1979 law would have been 57 percent greater than 1999 taxes. Taxes for families in the highest income category, with more than \$1 million in 1999 adjusted AGI, would have been 39 percent higher under 1979 rather than 1999 law. For the lowest income families (with adjusted AGI of less than \$10,000), net tax liability would have been less negative (\$-74) under the 1979 law than under the prevailing 1999 law (\$-247). The entries for the highest income families show the sharp impact of the 1986 Tax Reform Act in reducing tax burdens, and the impact of the 1993 Omnibus Budget Reconciliation Act (which raised top marginal rates) in raising tax burdens.

Table 5 shows that the most significant change in average income tax liability occurs between 1984 and 1989, the years that bracket the Tax Reform Act of 1986. The average family's income tax liability declines by 22 percent as a consequence of this reform. In evaluating this statistic, it is important to remember that this is a "no behavioral response" measure, so it does not incorporate changes in the amount of income reported, and hence the amount of tax paid, as a result of reductions in marginal tax rates. Taxpayer responses would partly offset the decline in average tax burdens shown in the table. Such offsets would be particularly important if we were disaggregating the various components of income tax liability, and considering for example the contribution of income taxes on realized capital gains. Capital gains realizations are an aspect of taxpayer behavior that appears to be particu-

larly sensitive to marginal tax rates (see Poterba (2000) for a summary of recent research).

The lower panel of Table 5 presents information on tax burdens in various years using the 1979 family income distribution rather than the 1999 income distribution. As in Table 4, the results in the upper and lower panels show the same broad trends in the effect of tax legislation on family tax burdens. There are some differences, however, that are attributable to differences in the composition of income for families in various adjusted AGI categories in 1999 and 1979. For example, for the highest income category, families with \$1 million or more in adjusted AGI, the 1979 income distribution suggests that taxes would have averaged 29 percent greater under the 1979 tax law than under the 1999 law. Data from the 1999 family income distribution suggest a 39 percent larger effect; this reflects the growing importance of wage income among these families during the last two decades. Because the 1979 family income distribution has a lower mean income than the 1999 family income distribution, the average tax burden is lower when we use the 1979 than the 1999 income distribution. Using the 1999 family income distribution, we estimate that the average family's income tax burden was \$6,220. Using the 1979 family income distribution and the 1999 tax law, we estimate an average income tax burden of \$3810. This is only 61 percent of the estimate using the 1999 family income distribution.

Table 6 combines the information in Tables 4 and 5, and shows the total payroll and income tax burden for families in various adjusted AGI categories. At the highest income levels, the entries in the table are very similar to those in Table 5, since the income tax is the primary tax on families in this income range. At lower income ranges, however, the table highlights the interplay between income and payroll tax liabilities. For families with

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TABLE 6
AVERAGE FAMILY PERSONAL INCOME AND PAYROLL TAX, 1979–99

1999 Family Adjusted AGI (000s)	1979	1984	1989	1994	1999
1999 Family Income Distribution					
< 10	225	307	289	195	153
10–20	1369	1903	1650	1391	1258
20–30	3925	4487	4245	4146	3916
30–40	6656	7298	6911	6961	6737
40–50	9289	10064	9544	9604	9366
50–75	13301	14604	13499	13678	13437
75–100	20064	22185	20241	20811	20595
100–200	34293	36586	32243	33519	33320
200–500	90742	88110	72243	80862	78307
500–1000	251855	228635	166463	209813	199069
> 1000	1118155	941207	731283	923752	827165
All	11430	11900	10460	11050	10680
1979 Family Income Distribution					
< 10	273	359	370	312	275
10–20	1892	2489	2298	2064	1930
20–30	4392	4998	4844	4745	4497
30–40	7024	7750	7516	7569	7280
40–50	9689	10573	10233	10313	9918
50–75	13913	15372	14537	14682	14217
75–100	20229	22490	21330	21938	21733
100–200	33663	36046	33474	34899	34590
200–500	94678	92503	78816	89315	86528
500–1000	274219	251441	191663	241845	226227
> 1000	1009247	874453	759898	937381	801951
All	7990	8730	8200	8390	8100

Source: Authors' calculations as described in more detail in the text.

1999 adjusted AGI below \$10,000, the table shows a decline of roughly one-third of total tax liabilities between 1979 and 1999. There is a reversal of trend during this time period, with average tax burdens rising from \$225 to \$307 (measured in 1999 dollars) between 1979 and 1984, and then declining to \$153 by 1999.

The entries in Table 6 show that for families with adjusted AGI between \$10,000 and \$200,000, using the 1999 distribution of family income, combined tax burdens in 1979 and 1999 were very similar. The table again shows an increase in tax burdens between 1979 and 1984, followed by decline in subsequent years. For the small set of families with adjusted AGI in excess of \$200,000, the table shows a decline in tax burdens between 1979 and 1999. The year with the lowest tax burden for these families is 1989, when the Tax Reform Act of 1986 had been fully phased in.

The lower panel of Table 6 repeats the calculations in the upper panel using the

1979 family income distribution rather than the 1999 family income distribution. There are some differences between the results in the two panels. The lower panel shows more evidence of rising total tax burdens between 1979 and 1999. While the increase in tax burdens from 1979 to 1999 is modest for families with adjusted AGI below \$40,000, at income levels between \$40,000 and \$200,000 a clear pattern of rising tax burdens emerges. For families with adjusted AGI between \$75,000 and \$100,000 in 1999, based on the 1979 family income distribution, combined income and payroll taxes were 7.4 percent higher in 1999 than in 1979. At income levels above \$200,000, even the data based on the 1979 family income distribution show a decline in tax liability between 1979 and 1999.

The difference between the results in the upper and lower panels of Table 6 is probably attributable to differences in the composition of income between families at

given income ranges in the two income distributions. We “age” the 1979 families to 1999 using the rate of price inflation, not the rate of real income growth. Families in a given income range based on the 1979 family income distribution represent families with a higher standing in the overall income distribution than families at the same income level based on the 1999 family income distribution. The differences may also be due to differences in demographic structure between the set of 1979 and 1999 families. In 1999, for example, there are many more single-person families than in 1979, and a higher percentage of dependents are in families without two adults. There is also a higher fraction of two earner couples amongst married joint filers. The sensitivity of findings like those in Table 6 to differences in the baseline income distribution is an issue that requires further study.

Table 7 provides further information on the changing pattern of tax liabilities. It shows the fraction of families in different strata of the 1999 income distribution that paid less taxes in 1999 than they would have paid if the 1979 tax law had still been in effect. For all families, the table shows that 62.6 percent experienced a decline in personal income tax liabilities, while only 36.4 percent experienced a decline in combined payroll and income tax liabilities. If we restrict the analysis to families that paid either payroll or income taxes, as in the upper panel of the table, the data show that 70.2 percent of families faced lower income taxes in 1999, but that only 37.5 percent faced lower income and payroll taxes. At low family income levels, most families experienced a tax increase between 1979 and 1999. We need to focus on families in income strata above \$50,000 before the probability of paying lower

TABLE 7
PERCENT OF FAMILIES WITH TAX REDUCTIONS, 1979-99

1999 Family Adjusted AGI (000s)	1999 Personal Income Tax < 1979 Personal Income Tax (%)	1999 Total Tax < 1979 Total Tax (%)
All Families		
< 10	16.0	14.8
10-20	44.9	30.1
20-30	78.1	34.5
30-40	86.2	40.2
40-50	86.4	39.0
50-75	83.7	51.4
75-100	85.8	44.8
100-200	87.4	62.5
200-500	85.6	81.6
500-1000	89.1	87.6
> 1000	93.6	93.1
All	62.6	36.4
All Families With Positive Income or Payroll Taxes		
< 10	3.8	1.0
10-20	42.5	19.6
20-30	81.4	35.4
30-40	87.4	40.6
40-50	86.8	39.2
50-75	84.0	51.6
75-100	85.9	44.8
100-200	87.5	62.5
200-500	85.6	81.6
500-1000	89.1	87.7
> 1000	93.6	93.1
All	70.2	37.5

Source: Authors' calculations using TAXSIM and payroll tax simulation programs for the 1979-99 period. Families are grouped according to their 1999 Adjusted AGI. See text for further discussion.

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combined taxes in 1999 than in 1979 rises above 50 percent. The results in Table 7 provide a stark demonstration of the importance of combining income and payroll taxes when considering recent changes in tax burdens.

The Role of the Earned Income Tax Credit

Having shown the combined income and payroll tax burden over time, we now return to explore the income tax in more detail. The average income tax burdens shown in Table 5 reflect changes in the structure of marginal income tax rates over time, changes in the level of deductions and exemptions, and changes in the Earned Income Tax Credit (EITC). Because the EITC expanded substantially during the two decades that we consider, it is informative to distinguish its effect from that of other changes in the tax code. Table 8 separates the EITC from other factors that affect personal income tax liability.

(Unlike other tax credits, the EITC is refundable. This reflects in part its historical origins as an income tax “offset” to payroll taxes (see the discussion in Liebman (1998))). Families that have a negative personal income tax liability inclusive of the EITC also have payroll tax liabilities, since the EITC is equal to a percentage of wage and/or self-employment income. At current levels, however, the EITC exceeds income and payroll tax liabilities for some low-income wage-earning families.

Because families with adjusted AGI of more than \$50,000 in 1999 were unaffected by changes in the EITC, the table focuses on families with incomes below this level. The summary statistics in Table 8 are based on the 1999 family income distribution, so the results are consistent with those in the upper panels of Tables 4 and 5.

The first panel of Table 8 shows the change in personal income tax liabilities, excluding any refunds associated with the

TABLE 8
THE IMPACT OF THE EITC ON MEAN INCOME AND PAYROLL TAX LIABILITIES, 1979–99

1999 Family Adjusted AGI (000s)	1979	1984	1989	1994	1999
Personal Income Tax, Excluding EITC					
< 10	10	36	16	14	28
10–20	495	666	504	486	466
20–30	1755	1926	1581	1552	1424
30–40	3346	3488	2816	2770	2560
40–50	5017	5155	4266	4200	3963
All	8354	8163	6426	6809	6446
EITC					
< 10	84	80	108	218	275
10–20	273	90	285	570	683
20–30	59	4	97	239	341
30–40	6	1	4	8	22
40–50	1	0	1	1	2
All	74	33	86	179	226
Payroll Tax Net of EITC					
< 10	215	272	273	181	125
10–20	874	1237	1146	905	793
20–30	2170	2561	2664	2593	2492
30–40	3311	3810	4096	4191	4177
40–50	4272	4909	5278	5403	5403
All	3080	3740	4030	4240	4230

Source: Authors' tabulations as described in the text. All calculations are based on family income distribution drawn from 1995 tax return filings and 1995 nonfilers based on Current Population Survey.

EITC. For the lowest income families, those with adjusted AGI of less than \$20,000, there is virtually no change in this measure of tax liability between 1979 and 1999. There is an increase in tax liability in the early 1980s, but this is undone by the Tax Reform Act of 1986. The middle panel of Table 8 shows the EITC for families in different adjusted AGI ranges. It demonstrates that the expansion of the EITC has been a critical factor in reducing personal income tax liabilities over the period we study. The largest change takes place between 1989 and 1994, when the average EITC for families with incomes below \$20,000 roughly doubles. There is an even larger percentage increase for the average EITC received by families with incomes in the \$20–30,000 range.

The bottom panel of Table 8 shows payroll taxes *net* of the EITC for low-income families. The results suggest that payroll taxes net of the EITC have declined for the average family with an adjusted AGI of below \$20,000, while they have increased for families with incomes above this range. The entries in the bottom panel of Table 8 can be compared with those in the upper panel of Table 4 to gauge the impact of EITC expansion as an offset to rising payroll tax burdens. For families with adjusted AGI between \$10,000 and \$20,000, for example, the data in Table 4 suggest an increase of 29 percent in real payroll taxes between 1979 and 1999. Net of the expansion of the EITC, however, there was a net decrease of 13 percent in payroll tax payments over this period.

Table 8 further underscores the need, in at least some contexts, to consider the income tax and the payroll tax in tandem. When changes in one tax instrument are designed, at least in part, to offset changes in another, it is useful to construct distribution tables that combine the two sets of taxes.

THE DISTRIBUTIONAL EFFECTS OF THE TAXPAYER RELIEF ACT OF 1997

The summary statistics in the foregoing tables do not attempt to decompose changes in tax burdens from one year to the next into components that are attributable to particular legislative reforms. Rather, they simply summarize the total tax burden, for either the income tax or the payroll tax, which results from all of the tax legislation in force in each year. Because the Taxpayer Relief Act of 1997 introduced a number of new tax credits that may substantially affect the distribution of tax burdens, and because this is the most recent substantial change in the income tax code, there is particular interest in analyzing the distributional impact of these new credits. We do this by analyzing the source of the changes in income tax liability between 1994 and 1999 that we summarized in earlier tables.

Table 9 reports on the effect of three key components of TRA97: the enactment of the Child Tax Credit, the reduction of tax rates on capital gains, and the enactment of the HOPE and Lifetime Learning Credits. The table does not present an exhaustive decomposition of the changes in tax revenue; there are other, less important, factors that also contribute to changing personal income tax liabilities between 1994 and 1999. The effect of these other factors is summarized in the last column of Table 9.

The first column in Table 9 shows the change in the average personal income tax liability for families in various adjusted AGI categories. This entry is the difference between the entries in the 1994 column, and the entries in the 1999 column, of the upper panel of Table 5. The next three columns in Table 8 show the effects of each of the three most significant components of TRA97.

The entries in Table 9 show that for high-income families, TRA97 had a substantial effect in reducing tax liabilities

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TABLE 9
DECOMPOSITION OF CHANGES IN PERSONAL INCOME TAX LIABILITY, 1994–99

1999 Family Adjusted AGI (000s)	Change in Personal Income Tax, 1994 to 1999	Effect of Child Credit	Effect of Capital Gains Tax Change	Effect of HOPE and LLC	Effect of Other Factors
< 10	-42	0	0	-1	-41
10–20	-132	-39	-2	-15	-76
20–30	-230	-147	-8	-25	-50
30–40	-224	-216	-14	-37	43
40–50	-237	-280	-24	-41	108
50–75	-247	-325	-50	-58	186
75–100	-395	-393	-137	-66	201
100–200	-521	-221	-462	-4	166
200–500	-3020	0	-2842	0	-178
500–1000	-11223	0	-10030	0	-1193
> 1000	-97062	0	-95499	0	-1563
All	-409	-159	-252	-26	28

Source: Authors' tabulations based on 1995 SOI Public Use File and nonfilers as identified in the Current Population Survey, "aged" to 1999. The total change in personal income tax in our analysis is \$55.3 billion, the total effect of Child Tax Credits is \$21.5 billion, capital gains tax changes, \$34 billion, HOPE and LLC credits, \$3.5 billion, and "other," \$3.8 billion. See text for further discussion.

through the reduction in capital gains tax rates. In evaluating these findings, however, it is important to recall our "no behavioral response" assumption. We will understate the change in taxes paid if, as is very likely, the reduction in capital gains tax rates increased gain realizations and hence taxable income.

For lower- and middle-income taxpayers, the new credits were more important than the capital gains tax changes in affecting tax burdens. For the typical taxpaying family with an adjusted AGI of between \$50,000 and \$75,000 in 1999, for example, the net effect of the HOPE and Lifetime Learning Credits was a reduction of \$58 in tax liabilities, compared to \$50 due to capital gains tax changes. The distribution of credit-eligible dependents across adjusted AGI categories implies that most of the benefits of the HOPE and LLC accrue to middle income families. The average value of the tax reduction associated with these credits was greatest for families with adjusted AGI between \$50,000 and \$100,000. At lower incomes, many families have too little income to be able to take full advantage of the tax credits.

The distributional pattern for the Child Tax Credit is similar to that for the HOPE

and LLC, but the average benefits are substantially greater. The average income tax reduction from the credit for families with adjusted AGI in the \$50–75,000 range, for example, is \$325. Since only families with dependent children can receive this credit, there are many families that do not receive any benefits from the credit, and thus many others that receive benefits substantially greater than Table 8 suggests.

Our estimate of the revenue cost of the Child Credit, \$21.5 billion, is substantially greater than the estimate of \$15.7 billion reported in the Congressional Budget Office (2000). This may reflect differences between the distribution of dependents across families that results from our imputation procedure for dependents who are eligible for the credit, and the actual distribution of such dependents. The Joint Tax Committee (1998) estimated that at 1998 income tax rates and 1998 income levels, the Child Credit would reduce income tax revenue by \$17.5 billion. Since the credit was \$400 in 1998, and \$500 in 1999, this estimate is much closer to our results than is the more recent CBO (2000) estimate.

The last column in Table 9 shows the change in average tax liability within

adjusted AGI cells that cannot be attributed to the three legislative changes that we have highlighted. There are both positive and negative entries in this "residual" column, which suggests that there are a number of other factors influencing tax liability. These include changes in the mean income of families within each AGI cell, due to differences between the rate at which tax bracket "break points" change and the rate at which various income aggregates grow. Other legislative changes can also contribute to the "residual" change in tax liability in this category. The interaction between various tax changes also contributes to this residual entry. When one provision affects a family's tax liability, it may affect the tax change associated with other tax reform provisions.

CONCLUSIONS AND FUTURE DIRECTIONS

This paper describes the changing level of income and payroll tax burdens over the last two decades, and it presents summary information on the cross-family distribution of these tax burdens. The results suggest that legislative changes have reduced average income tax liabilities relative to what they would be if pre-1980 tax laws were still in effect, but that increases in payroll taxes have largely offset these tax reductions *on average*. These findings complement the results in Burman, Gale, and Weiner (1998) on reductions in marginal income tax rates over a roughly similar period, as well as Stephenson's (1998) finding that marginal payroll tax rate changes have offset marginal income tax rate changes in the post-1981 period.

The payroll tax increase of the early 1980s, coupled with the expansion of the Earned Income Tax Credit in the mid-1980s and the early 1990s, has made the payroll tax a more significant tax than the income tax for a very substantial fraction

of U.S. families. In 1999, families needed Adjusted Gross Income in excess of \$100,000 before their expected income tax liability was greater than their expected payroll tax liability. Nearly two thirds of families in 1999 paid more in payroll taxes than they did in federal income taxes. This reflects a substantial change from two decades earlier, when this share was 42 percent.

The results in this study describe income tax payments by families, and payroll tax contributions by families and their employers. A natural next step in this line of research would involve augmenting the current tax liability calculations by including corporate income taxes, estate taxes, and excise taxes at both the federal and sub-federal level. Taking such a step would require some assumptions about the incidence of these taxes, and in particular the extent to which they are ultimately borne by the families that face legal liability for them.

Another important extension of the current project would involve linking our calculations of payroll tax liability with imputations of social insurance benefits that may be associated with such tax payments. For some taxpayers, Social Security benefits are an increasing function of their earned income. Feldstein and Samwick (1992) examine this "tax benefit linkage" and they present estimates of the distribution of marginal benefit paybacks associated with the Social Security payroll tax. Earlier studies in a similar vein include Browning (1985) and Burkhauser and Turner (1985). There is no "tax benefit linkage effect" for the hospital insurance payroll tax; all Americans over the age of 65 are eligible for Medicare, regardless of their earnings histories. Including an estimate of the present discounted value of the benefits that families at different points in the income distribution receive when they pay payroll taxes would nevertheless represent a substantial, and interesting, direction for future

work. Doing such analysis requires information on the earnings histories of the individuals who are in different current family income categories, as well as projections of future earnings and labor market behavior, such as retirement dates, for these workers. The results of such an analysis would necessarily be even more sensitive to assumptions about data construction and imputation than results like those in the current study.

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REFERENCES

- Bakija, Jon, and Joel Slemrod.
"Does Growing Inequality Reduce Tax Progressivity? Should It?" NBER Working Paper No. 7576. Cambridge, MA: National Bureau of Economic Research, 2000.
- Bradford, David F.
Distributional Analysis of Tax Policy. Washington, D.C.: American Enterprise Institute, 1995.
- Browning, Edgar K.
"The Marginal Social Security Tax on Labor." *Public Finance Quarterly* 13 No. 3 (July, 1985): 227–52.
- Burkhauser, Richard V., and John A. Turner.
"Is the Social Security Payroll Tax a Tax?" *Public Finance Quarterly* 13 No. 3 (July, 1985): 253–68.
- Burman, Leonard E., William G. Gale, and David Weiner.
"Six Tax Laws Later: How Individuals' Marginal Federal Income Tax Rates Changed Between 1980 and 1995." *National Tax Journal* 51 No. 3 (September, 1998): 637–52.
- Cronin, Julie-Anne.
"The Economic Effects and Beneficiaries of the Administration's Proposed Higher Education Tax Subsidies." *National Tax Journal* 50 No. 3 (September, 1997): 519–40.
- Dynarski, Susan.
"Hope for Whom? Financial Aid for the Middle Class and Its Impact on College Attendance." *National Tax Journal* 53 No. 3, Part 2 (September, 2000): 631–64.
- Ettlinger, Michael P., and John F. O'Hare.
"The Institute on Taxation and Economic Policy Tax Model." Washington: Citizens for Tax Justice, 1998.
- Feenberg, Daniel R., and Elisabeth Coutts.
"An Introduction to the TAXSIM Model." *Journal of Policy Analysis and Management* 12 No. 1 (Winter, 1993): 189–94.
- Feenberg, Daniel R., Andrew W. Mitrusi, and James M. Poterba.
"Distributional Effects of Adopting a National Retail Sales Tax." In *Tax Policy and the Economy*, volume 11, edited by James Poterba, 49–90. Cambridge: MIT Press, 1997.
- Feenberg, Daniel R., and James M. Poterba.
"The Income and Tax Share of Very High Income Households, 1960–1995." *American Economic Review* 90 No. 2 (May, 2000): 264–70.
- Feldstein, Martin S.
"The Effects of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform." *Journal of Political Economy* 103 No. 3 (June, 1995): 551–71.
- Feldstein, Martin, and Daniel R. Feenberg.
"The Taxation of Two-Earner Families." In *Empirical Foundations of Household Taxation*, edited by Martin Feldstein and James Poterba, 39–73. Chicago: University of Chicago Press, 1996.
- Feldstein, Martin, and Andrew Samwick.
"Social Security Rules and Marginal Tax Rates." *National Tax Journal* 45 No. 1 (March, 1992): 1–22.

- Gruber, Jonathan, and Emmanuel Saez.
 "The Elasticity of Taxable Income: Evidence and Implications." NBER Working Paper No. 7512. Cambridge, MA: National Bureau of Economic Research, 2000.
- Liebman, Jeffrey.
 "The Impact of the Earned Income Tax Credit on Incentives and Income Distribution." In *Tax Policy and the Economy*, volume 12, edited by James Poterba, 83–120. Cambridge, MIT Press, 1998.
- Lindsey, Lawrence.
 "Estimating the Behavioral Responses of Taxpayers to Changes in Tax Rates, 1982–1984: With Implications for the Revenue-Maximizing Tax Rate." *Journal of Public Economics* 33 No. 2 (July, 1987): 173–206.
- McKinnon, John D., and Karen Hube.
 "Did Stock Sales for Capital Gains Fuel Sell-Off?" *Wall Street Journal* (April 18, 2000): C1.
- Pechman, Joseph.
Who Paid the Taxes, 1966–1985? Washington, D.C.: Brookings Institution, 1985.
- Poterba, James M.
 "Taxation, Risk-Taking, and Portfolio Behavior." In *Handbook of Public Economics*, edited by Alan Auerbach and Martin Feldstein. Amsterdam: Elsevier, forthcoming.
- Stephenson, E. Frank.
 "Average Marginal Tax Rates Revisited." *Journal of Monetary Economics* 41 (1998): 389–409.
- Steuerle, C. Eugene.
The Tax Decade. Washington: Urban Institute Press, 1992.
- U.S. Congressional Budget Office.
Estimates of Federal Tax Liabilities for Individuals and Families by Income Category and Family Type for 1995 and 1999. Washington, D.C., 1998.
- U.S. Congressional Budget Office.
An Economic Analysis of the Taxpayer Relief Act of 1997. Washington, D.C., 2000.
- U.S. Congress. Joint Committee on Taxation.
Methodology and Issues in Measuring Changes in the Distribution of Tax Burdens. Washington, D.C.: U.S. Government Printing Office, 1993.
- U.S. Congress. Joint Committee on Taxation.
Summary of Revenue Provisions of H.R. 2014 ("Taxpayer Relief Act of 1997"). Committee Document JCX-40-97. Washington, D.C.: U.S. Government Printing Office, 1997a.
- U.S. Congress. Joint Committee on Taxation.
Distributional Effects of the Conference Agreement on the Revenue Reconciliation Provisions of H.R. 2014, The "Taxpayer Relief Act of 1997." Committee Document JCX-41-97. Washington, D.C.: U.S. Government Printing Office, 1997b.
- U.S. Congress. Joint Committee on Taxation.
Estimates of Federal Tax Expenditures for Fiscal Years 1999–2003. Committee Document JCS-7-98. Washington, D.C.: U.S. Government Printing Office, 1998.
- U.S. Department of Education. National Center for Education Statistics.
Digest of Education Statistics: 1995. Washington, D.C.: U.S. Department of Education, 1997.
- U.S. Department of Education. National Center for Education Statistics.
Student Financing of Undergraduate Education: 1995–96. NCES 98-076. Washington, D.C.: U.S. Department of Education, Office of Educational Research and Improvement, 1998.

Appendix: Updating the NBER TAXSIM Model

In this appendix, we first describe how we identify families that do not file federal income tax returns, and add them to each year's SOI Public Use File. We then describe our algorithm for estimating payroll taxes for each family. We next explain our imputation procedures for identifying families that are likely to claim various tax credits that were enacted as part of TRA97. Finally, we summarize how we "age" tax returns filed in one year to permit analysis of tax rules and tax rates in a different year.

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Adding Nonfilers to the SOI Public Use File

Some families have no federal personal income tax liability and do not need to file for a refund of income tax withheld, so they do not appear in the SOI Public Use File. In 1995, for example, single persons with adjusted gross income of less than \$6,400 (\$7,350 if the person were 65 years or older), and married joint filers with AGI of less than \$11,500 (\$13,000 if both taxpayers were 65 or older), were not required to file federal income tax returns. Such families may nevertheless have earnings and pay payroll taxes. To analyze the distribution of payroll tax burdens, it is essential to augment the Public Use File with information on non-filer families.

For the 1995 data set, we identify nonfiler families using data that the Census Bureau includes in the Current Population Survey (CPS) data files. Recent March CPS data sets include an imputation, based on the CPS respondent's income and probable income tax withholding, for whether or not the responding family is likely to have filed a tax return. The Census has access to the IRS master file, and it can therefore test the quality of its imputation using actual tax filing data. This imputation recognizes that many families with no income tax liability and no legal requirement to file a federal income tax return may file to obtain a refund of wage withholding. It relies on self-employment in-

come in excess of \$400 (\$1992), interest, dividends, and other types of capital income in excess of \$1,000, and wage income in excess of \$1,000, to impute "filing" as a taxpayer's status. The Census imputation, reflecting the number, incomes, ages, and demographic structure of actual filers and non-filer families, is likely to be much more accurate than imputations based solely on publicly available data sets.

The most recently available SOI Public Use File is that for the 1995 tax year. We therefore use the March 1996 CPS, which reports information that relates to the 1995 tax filing year, to identify nonfiler families for the 1995 tax year. We begin by identifying all families, whether single individuals or multi-person families, which are headed by a person over the age of 18 and which are identified as non-filers in the CPS file. We then add these families to the Public Use File, using each family's March CPS Supplemental Final Weight as the analogue to the tax model sampling weight. This procedure yields 17.9 million non-filer families in 1995. We use information reported in the CPS to construct core variables from the Public Use File, such as wages and salaries, interest and dividend income, and the family's number of dependents. We then construct each non-filer family's adjusted AGI.

Table A-1 shows the distribution of non-filer families across adjusted AGI categories in

TABLE A-1
DISTRIBUTION OF NON-FILERS, BY AGI CATEGORY, 1995

1995 AGI Category (000s)	Number of Non-filer Families (million)	Total Number of Families (Filer + Non-filer)	Percent of Families Not Filing
< 10	0.29	1.09	26.95
0-10	17.59	36.82	47.77
10-20	0.03	24.55	0.13
20-30	0.03	17.77	0.17
30-40	0.01	12.39	0.04
40-50	0	9.06	0
50-75	0	13.61	0
75-100	0	5.34	0
100-200	0	3.99	0
200-500	0	0.97	0
500-1000	0	0.17	0
> 1000	0	0.08	0
All	17.95	125.85	14.26

Source: Authors' tabulations using the 1995 Current Population Survey and the 1995 Statistics of Income datafile. Numbers of families are measured in millions.

1995. It also shows the percentage of families in each adjusted AGI class that does not file federal income tax returns. Our results suggest that roughly half of those with positive incomes of less than \$10,000 are nonfilers. The fraction is lower, roughly 25 percent, among those who have negative incomes, because negative income is often associated with activities that require filing tax returns or that produce tax benefits. Feenberg, Mitrusi, and Poterba (1997) report similar findings for 1992 non-filer families.

We also construct a non-filer augmented data file for 1979. Since the CPS does not include a non-filer imputation in 1979, we construct our own estimate of the set of families that might not file tax returns using information on wage, interest, and dividend income. We assume that any family with less than \$1,000 of wage income (measured in \$1992, for consistency with the Census Bureau imputation that underlies the 1995 non-filer imputation) and with less than \$500 (\$1992) in combined interest and dividend income did not file a tax return.

Payroll Tax Imputation: Dividing Labor Income Between Members of Married Couple

The payroll tax applies at a flat rate on earned income up to a threshold level, and there are no deductions or special definitions of income categories as there are in the income tax. The payroll tax is levied on both employees and their employers. We follow many previous studies, including Pechman (1985), in assuming that the employer share of the payroll tax is ultimately born by the employee in the form of lower wages. We therefore use the combined employer and employee tax rate as “the” payroll tax rate throughout our analysis. This also accounts for our inclusion of employer-paid payroll taxes in our measure of family adjusted AGI.

The data contained in the SOI Public Use file do not provide enough information for us to calculate payroll tax liability for all married couples. On the income tax returns of married joint filers, the wage and salary income of both spouses is aggregated. A couple with earnings

of \$100,000 would pay more in payroll taxes if the earnings were equally divided between the husband and wife than if one spouse was the only earner. (If a couple’s combined wage income is below the maximum amount of taxable earnings for the Social Security payroll tax, we would not need to know the earnings division, since all earnings would be subject to the payroll tax.) In general, however, to estimate payroll taxes we must estimate the division of labor income between members of each pair of married joint filers.

To estimate this earnings division, we construct a “synthetic match” between married couples in the SOI Public Use File and couples in the Federal Reserve Board’s Survey of Consumer Finances. One could also use the publicly available data from the CPS, as in Feldstein and Feenberg (1996) and Feenberg, Mitrusi, and Poterba (1997), to divide family earnings. However, the CPS data on earnings are top-coded, which makes it impossible to allocate earnings for some high-income families. In 1994, the CPS variable for total wage income was topcoded for one spouse in 3.7 percent of married couples, and for both spouses in 0.12 percent of couples. Combining CPS data with the Public Use File thus would undercut one of the Public Use File’s most important strengths of the SOI data, namely its detailed information on high-income families.

The Federal Reserve Board’s Survey of Consumer Finances (SCF), like the Public Use File, over-samples high-income families and thereby provides a reasonable sample for allocating the earnings of high-earning couples. The difficulties with the SCF are that it is only conducted every three years and that it is only available since 1983. However, the distribution of earnings between members of married couples is relatively stable across years. We therefore rely on the various SCF data sets, interpolated where necessary, to divide wage income for married couples.

Table A-2 presents information on the division of labor earnings based on the 1995 Survey of Consumer Finances. The table shows, for the \$1995 AGI category (*not* the adjusted AGI category) indicated in each row, the ratio

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TABLE A-2
DISTRIBUTION OF EARNINGS OF MARRIED JOINT FILERS, FILERS UNDER AGE 65, 1995

Family AGI Category (000s)	Average Earnings of Lower-Earning Spouse/ Average Earnings of Couple	
	1995 Treasury W2/1040 File	1995 Survey of Consumer Finances
< 15	8	-2
15-20	12	7
20-30	16	11
30-40	20	20
40-50	23	26
50-60	24	25
60-65	26	27
65-70	27	26
70-75	26	29
75-80	27	25
80-85	27	31
85-90	28	32
90-95	26	30
95-100	25	31
100-110	25	28
110-120	25	31
120-130	22	26
130-140	20	27
140-150	18	25
150-200	16	21
200-250	13	13
250-300	10	10
300-350	9	10
350-400	9	10
400-500	8	9
500-600	7	5
600-750	7	5
750-1000	7	4
1000-2000	6	3
> 2000	5	7

Source: Tabulations from the Treasury Masterfile and 1995 Survey of Consumer Finances. Entries can be negative if one member of a couple reports negative self-employment (Schedule C) income.

of the average earnings of the lower-earning spouse in each couple to the couple's average total earnings. Total earnings include both W-2 and Schedule C income.

The table shows a clear pattern in the share of earnings that is due to the lower-earning spouse. This share rises at low values of family AGI. At roughly \$40,000 of AGI, the average earnings share of the lower-earning spouse enters a relatively narrow range, from 20 to 25 percent, and it remains in this range until family AGI reaches roughly \$130,000. At family AGI levels above this range, the average earnings share of the lower-earning spouse declines, and it reaches relatively low levels at very high AGI ranges. This distributional pattern seems plausible, since two earner couples are likely to reach moderate to high income levels by combining wages, while secondary earners in couples with one very high earner are

not likely to seek work. Based on distributional tables that are not shown, the share of couples in which the second earner accounts for between 25 and 50 percent of the total earnings peaks at family income between \$50,000 and \$115,000. The share of married couples with a zero-earning lower income spouse is U-shaped, with relatively high values at both low and high AGI levels.

We were fortunate to be able to compare the SCF tabulations with similar tabulations based on the U.S. Treasury's income tax masterfile. This data file, which is not available to researchers outside the Treasury, merges W-2 filings with individual income tax returns (1040s). Table A-2 shows the earnings division based on the Treasury masterfile as well as the SCF, and it demonstrates that the patterns in the SCF and the Treasury masterfile are similar. This supports our use of the SCF to allocate family

labor earnings for earlier years. There are, nevertheless, some differences between the SCF and the Treasury data. There are more low-income families in the Treasury masterfile than in the SCF. Fortunately, this discrepancy only appears in an income range over which the division of wage earnings between two members of a couple does not affect the couple's total payroll tax liability.

Figures 1, 2, and 3 present more detailed information on the pattern of earnings divisions in the 1995 SCF. The first figure shows the fraction of married couples in which the lower-earning spouse earns zero, the second the fraction with the lower-earner between 1 and 25 percent of the total earnings, and the third the fraction with the lower-earner between 25 and 50 percent of total earnings. In each figure we show these earnings distributions for different income categories, and for families with "low," "middle," and "high" levels of capital income. "Low" capital income families report zero capital income, "middle" capital income families report capital income between 0 and 33 percent of the families' total income, and "high" capital income families are those for which more than 33 percent of family income comes from capital. Conditioning on the share of family income from capital income is important, because the pattern of earnings division differs across capital income groups.

We use the information in Figures 1 through 3 to apportion the wage and salary income of 1995 joint filers to the two members of the married couple. We allocate 1995 labor earnings using three probabilities: that the lower-earner reports zero earnings, that the lower-earner reports between 1 and 25 percent of total earnings, and that the lower-earner reports between 25 and 50 percent of total earnings. We also assume a uniform distribution of earnings splits within the 1-25 and 25-50 percent intervals. We follow a similar procedure using the 1983, 1986, 1989, 1992, and 1995 Surveys of Consumer Finances. For years between these surveys, we interpolate the information from survey years to develop estimates of individual earnings within married couples.

Imputations Relating to the 1997 Taxpayer Relief Act

To study the distribution of the benefits of the Child Tax Credit and of the HOPE and LLC, we need to estimate which families are eligible for each of these credits. The information in the 1995 SOI Public Use File does not permit us to make such estimates, although data in Public Use Files beginning with 1998 will include the necessary information. The Joint Committee on Taxation (1997a, 1997b) presents revenue estimates and distributional analysis that embody information available as of the time when the legislation was enacted.

With respect to the Child Tax Credit, we assume that each dependent reported on a tax return has a probability of .763 of being eligible for the credit. This probability corresponds to the number of children under the age of 17 divided by the total number of dependents claimed on tax returns. Table A-3 presents information on the distribution of under-17 dependents across 1999 adjusted AGI categories. The table shows that 51.5 percent of the under-17 dependents are in families with adjusted AGI of less than \$40,000. Only 10.5 percent of these dependents live in families with adjusted AGI of more than \$100,000. These are families that are likely to be affected by the Child Tax Credit phase-out provisions.

Our procedure for imputing potential eligibility for the HOPE credit and for the Lifetime Learning Credit involves several steps. First, we use the March 1995 Current Population Survey to impute ages of all family members in the non-filer-augmented SOI Public Use File. For tax filers who claim dependents, we know the number of dependents reported on the taxpayer's tax return, as well as the taxpayer's income. We randomly match each tax filer in the Public Use File to a family in the CPS with the same number of dependents and in the same income class. (We use broad income categories: < \$25,000, \$25-50,000, \$50-75,000, \$75-100,000, and > \$100,000.) We assign each family a number of dependents aged 17 or less, a number of dependents aged 18-24, and a number of dependents who are over the age of

Figure 1. Percentage of Couples with No Secondary Earner Wages

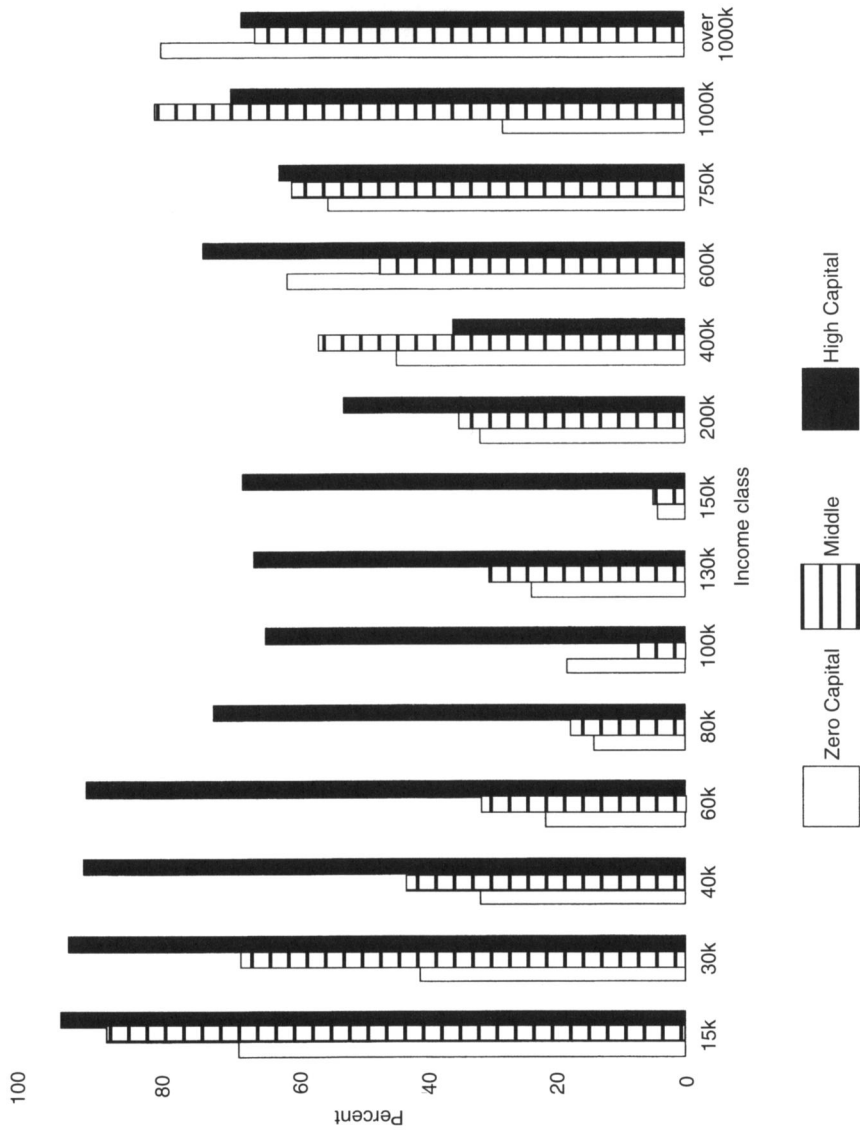


Figure 2. Percentage of Couples with Secondary Wages 1-25% of Total

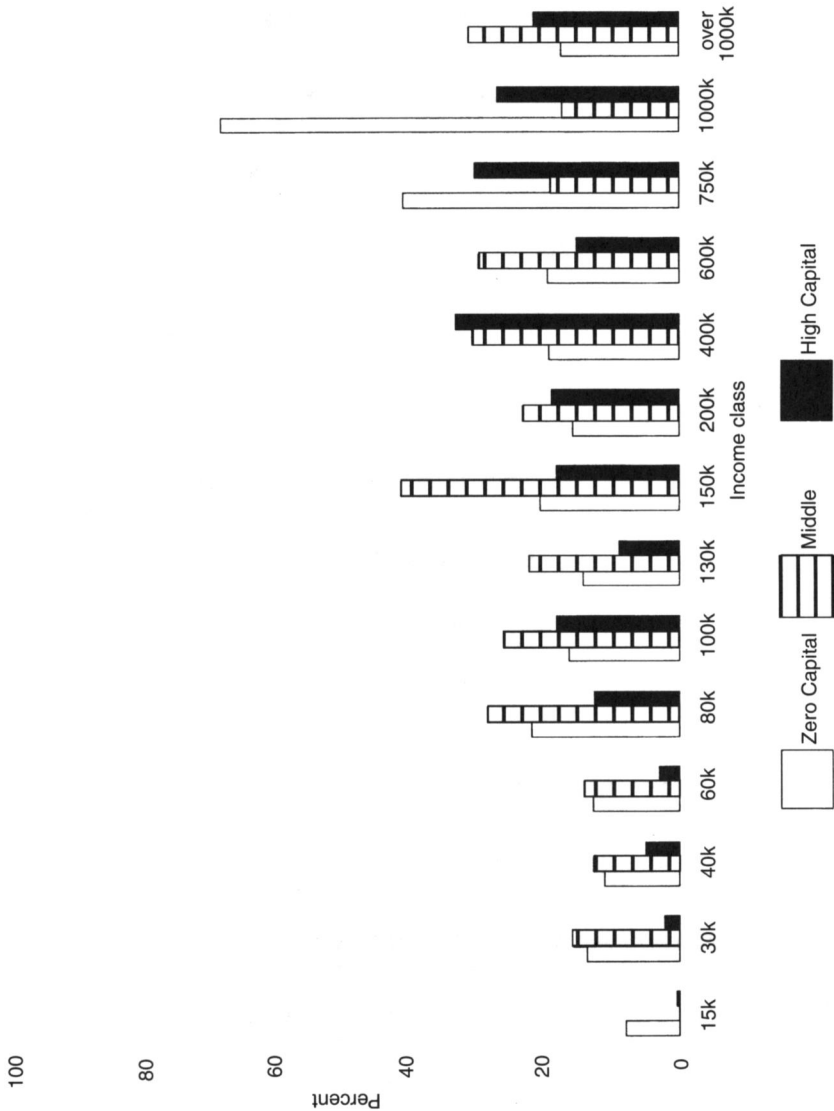


Figure 3. Percentage of Couples with Secondary Wages 26–50% of Total

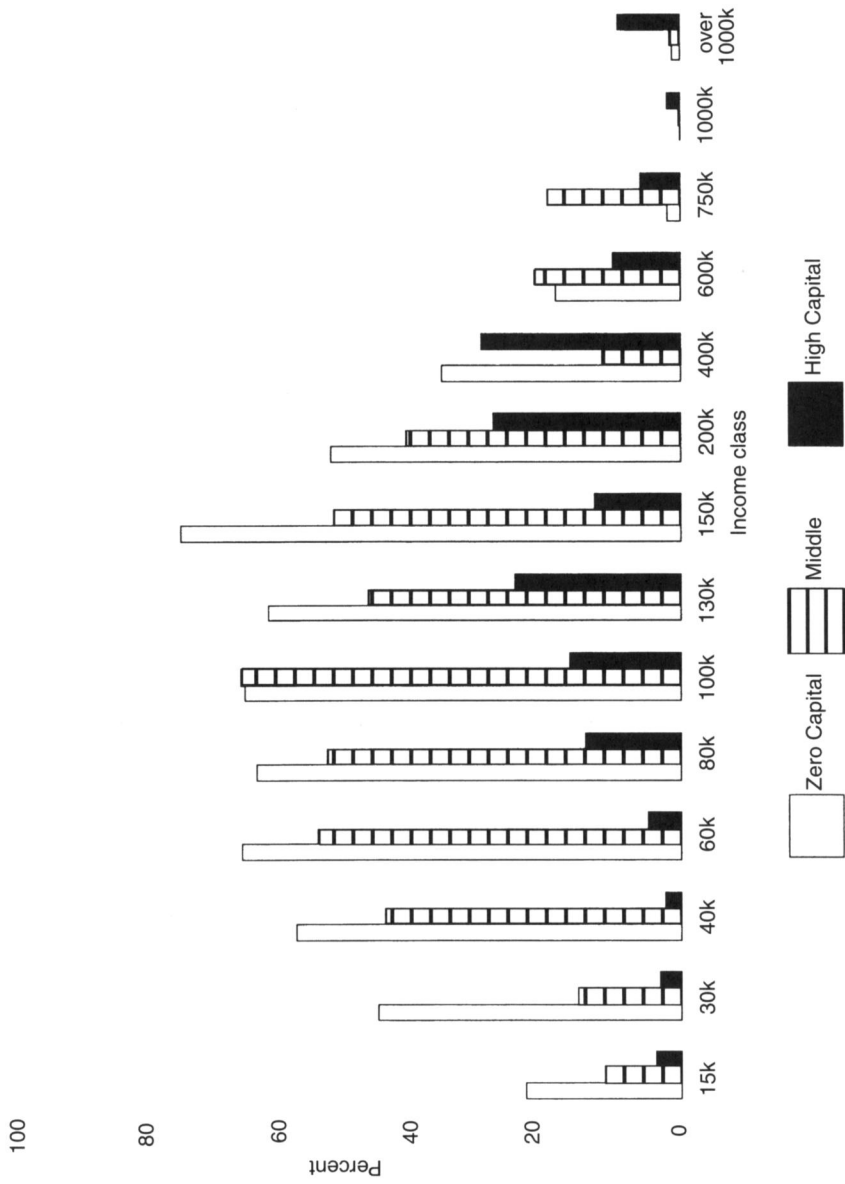


TABLE A-3
 DISTRIBUTION OF CHILD TAX CREDIT CLAIMS AND TAXABLE CAPITAL GAINS
 BY ADJUSTED AGI CATEGORIES

1999 Adjusted AGI Category (000s)	Number of Returns	Children Under 17		Children Under 17 in Families with Tax Reduction from Child Tax Credit	
		Number	Percentage	Number	Percentage
< 10	28.8	10.0	14.3	0.0	0.0
10-20	23.7	9.2	13.1	3.4	7.0
20-30	18.1	8.4	12.0	7.3	14.9
30-40	13.3	6.6	9.5	6.4	13.2
40-50	10.6	6.2	8.8	6.1	12.6
50-75	18.9	12.5	17.8	12.4	25.6
75-100	9.9	7.9	11.3	7.9	16.3
100-200	9.3	7.3	10.4	5.0	10.3
200-500	2.0	1.6	2.2	0.0	0.0
500-1000	0.4	0.2	0.4	0.0	0.0
> 1000	0.2	0.1	0.2	0.0	0.0
All	135.2	70.1	100.0	48.6	100.0

Source: Authors' tabulations using data from 1995 Treasury Individual Tax Model and 1995 Current Population Survey, "aged" to 1999. The entry for long term capital gains includes positive gains for those families with positive marginal tax rates on such gains. Number of returns and number of children are in millions.

24. We follow a similar procedure, using age and the number of persons in the CPS family, to impute the total number of individuals between the ages of 18-24, 25-29, 30-34, and > 35 for each family. This imputation yields a data file based on both tax returns (filers) and CPS records (non-filers) with information on the age structure of each family.

Next, we use data on age-specific rates of college attendance in 1995 (drawn from the U.S. Department of Education (1997) for those over 23, and from the March CPS for those under 24) to impute "college attendance status" for each person over the age of 17. Many persons over the age of 24 attend college. For the 25-29 age group, for example, the 1995 college enrollment rate was 11.2 percent. This drops to 5.7 percent for the 30-34 age group, and 2.1 percent for those over the age of 35. The U.S. Department of Education (1997) reports that in 1995, there were 14.3 million students enrolled in colleges and other institutions of higher education. By expanding the population in various age groups to 1999 levels, but assuming that the age-specific college enrollment rates remain at 1995 levels, we estimate that there would be 14.6 million students at these institutions.

Third, to determine whether someone who is attending college is eligible for the HOPE or the LLC, we assume that any 18-23-year-old who is in school is at an institution of higher learning that would qualify for the LLC or

HOPE Credit. Since HOPE is more generous than LLC, we assume that anyone who is eligible for both credits will claim the HOPE Credit. We further assume that individuals aged 18, 19, 20, and 21 who are in college have a 50 percent chance of being eligible for the HOPE Credit. This is a crude assumption designed to approximate the fraction of college students at each of these ages who are in their first or second year of post-secondary education. We assume that college students who are not eligible for the HOPE Credit receive the LLC instead.

Finally, we need to address the amount of the HOPE credit and the LLC. The U.S. Department of Education, National Center for Education Statistics (1998) reports that average tuition and fees net of grants for undergraduates attending public two- and four-year colleges in 1995-96 was \$1,641 for students who were dependents, and \$562 for students who were independent. This suggests that distinguishing between dependents and independents is potentially important for assessing the amount of HOPE and LLC tax benefits. For those attending private colleges, the average cost net of grants was \$7,259 for dependent students, and \$3,473 for independent students. These average values are net of Pell grants and other federal and state or local government grants, and they are also net of financial aid provided by the post-secondary school. Amongst those at-

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tending post-secondary institutions, 76 percent of dependent students, and 80 percent of independent students, were at public colleges and universities, while 24 percent and 20 percent, respectively, were at private institutions. We therefore assume that any dependent student who is eligible for the HOPE Credit or the LLC has a probability of .76 of being enrolled at a public institution, and .24 of being at a private institution. For independent students, we use probabilities of .80 and .20 for public and private institutions, respectively.

We assume that anyone who is eligible for the HOPE Credit and who attends a private institution claims the maximum amount of this credit (\$1,500), while anyone at a public institution claims \$1,321 if he or she is a dependent student, and \$562 if he or she is independent. (Future work might refine this analysis to recognize that the probability of attending a public versus a private institution varies with family income level.) For the Lifetime Learning Credit, we assume that students claim 20 percent of the mean net tuition for their imputed institution type (public or private) and dependency status. While any individual public college student will claim less than the maximum LLC, since the LLC is claimed on a family basis, in rare cases a family with five students who were imputed to public college enrollment could nevertheless reach the LLC maximum.

Table A-4 shows our estimates of the number of families eligible to claim the HOPE or

the Lifetime Learning Credit in 1999. We stratify these families by adjusted AGI. The table shows the number of dependent students as well as the number of independent students (persons over the age of 23, or 18–23 year olds living independently) at institutions of higher education. Approximately eighty percent of dependents who attend college are in families with adjusted AGI of less than \$100,000, while 95 percent of non-dependents attending college are in families with incomes below this threshold.

The last column of Table A-4 shows our estimate of the number of HOPE and LLC claimants whose taxes are reduced by the availability of these credits. Only a fraction of those who are eligible for the credit can claim it. For example, we estimate that there are 2.28 million college enrollees in families with adjusted AGI of between \$10,000 and \$20,000. However, only 1.27 million (56 percent) of these students benefit from the HOPE and LLC or have incomes that are above the phase-out range. The others are in families with no federal income tax liability *before* they claim the HOPE or LLC. The fraction of potentially eligible families that receives an actual tax reduction rises with income. Ninety-two percent of the college enrollees in families with adjusted AGI between \$40,000 and \$50,000, for example, experience some reduction in family tax liability as a result of these credits.

We have received preliminary data from the Internal Revenue Service on the number of

TABLE A-4
ELIGIBILITY FOR HOPE AND LIFETIME LEARNING CREDIT, BY AGI CATEGORY, 1999

1999 Adjusted AGI Category (000s)	Number of Dependent Students Attending College	Number of Independent Students Attending College	Number of HOPE and LLC Claimants
< 10	0.38	1.95	0.18
10–20	0.39	1.89	1.27
20–30	0.47	1.17	1.31
30–40	0.60	0.76	1.16
40–50	0.42	0.62	0.97
50–75	1.38	1.12	1.95
75–100	0.90	0.55	1.25
100–200	1.03	0.48	0.30
200–500	0.24	0.09	0.00
500–1000	0.03	0.01	0.00
> 1000	0.02	0.01	0.00
All	5.85	8.66	8.38

Source: Authors' calculations using 1995 Current Population Survey and 1995 Statistics of Income data, "aged" to 1999. Columns two through four are measured in millions.

families that claimed either HOPE or Lifetime Learning Credits in 1998, the first year when these credits were available. These data suggest that our imputations overstate the total number of tax returns that claim education credits, although the aggregate amount of tax reduction due to these credits is close to our estimate. In 1999, we estimate that 8.4 million families should claim HOPE or LLC, but IRS data suggest that only 4.8 million tax returns claimed one of these credits in 1998. Our estimate of the reduction in 1999 tax revenue that resulted from these credits is \$3.53 billion, while the IRS estimate for 1998 is \$3.50 billion. Further analysis of the differences between our imputations and actual claims requires data on individual tax returns for 1998 or 1999; these data will not be available for several years.

"Aging" Data From the 1995 Public Use File to 1999

Much of our analysis focuses on tax burdens in 1999. To construct a family income distribution for 1999, we "age" the non-filer-augmented SOI Public Use File for 1995. Our approach follows that in Lindsey (1987). First, we expand the total number of families in the 1995 filer and non-filer universe based on the expected increase in tax returns from 1995 to 1999. Second, to extrapolate income components and other dollar values from 1995 to 1999, we divide AGI into three components: realized capital gains, wages, and other items. We project non-gain AGI growth from 1995 to 1999 using the growth of wages and other personal

income in the national income accounts. We project realized capital gains, which have been extremely volatile in recent years, using actual realizations for 1996 and 1997 to "scale up" 1995 realizations. We project realizations for 1998 and 1999 using the fitted values of a regression equation that relates the level of aggregate realizations over the 1991-97 period to the average value of the Standard and Poor's 500 Index for the year. This simple equation yields a coefficient of 0.967 (0.027) on the stock market variable, and it generates a projected increase in realizations of 26 percent between 1997 and 1998, and 17.5 percent between 1998 and 1999. McKinnon and Hube (2000) report a taxable capital gain increase of at least 14 percent between 1998 and 1999.

"Aging" algorithms such as this one track variation in the aggregate amounts of different types of income, but they do not capture changes in the distribution of various types of income across families in different income classes. While the distribution of AGI across different income strata was relatively stable in the early 1990s, as Feenberg and Poterba (2000) report, there is some evidence in Bakija and Slemrod (2000) that income reported on tax returns became more concentrated in tax years 1996 and 1997. This raises the possibility that the foregoing algorithm for "aging" the set of filers and non-filers from 1995 to 1999 may perform poorly over this period. This issue can only be resolved with data from the 1996 through 1999 SOI Public Use Files that will not be available for several years.