Generational Accounts and Lifetime Tax Rates, 1900–1991

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Introduction

Generational accounting is a new method for determining how government deficits, taxes, transfer payments, and other expenditures affect the distribution of income and wealth among different generations. The technique is still being developed, and a number of the assumptions used to estimate the accounts are controversial.

Auerbach, Gokhale, and Kotlikoff (1991), Kotlikoff (1992), and Office of Management and Budget (1992) explain the basic concept and present some illustrative results. This article updates the baseline generational accounts reported in the 1993 federal budget and estimates the effects of several new alternative policies. It also extends the analysis for the first time to lifetime net tax rates—the taxes that a generation pays, less the Social Security and other transfer benefits that it receives, as a percentage of income over its entire lifetime.

The new analysis reveals the following:

- The lifetime net tax rates paid by Americans in the baby boom and successive generations will likely be much higher than the rates paid by those born earlier.
- The net tax rates paid by future generations will be substantially higher than those paid by the baby boom and other current generations, unless policy actions are taken now to mitigate the increase.
- The generational imbalance between newly born and future Americans could be largely eliminated either by imposing a cap on mandatory spending (excluding Social Security) from 1993 through 2004 or by instituting an appropriate surtax. Both policies would significantly raise the net taxes paid by current Americans, but the increase for the newly born would be considerably more under a surtax.

I. The Nature of Generational Accounts

The federal budget normally measures receipts and outlays for one year at a time and reports these estimates for only a few years into the future. Generational accounts, in contrast, look ahead many decades, classifying taxes paid and transfers received—such as Social Security, Medicare, and food stamps—according to the generation that pays or receives the money. For an existing

generation, taxes and transfers are estimated year by year over members' remaining lifespan. These amounts are then summarized in terms of one number, the present value of the generation's entire annual series of average future tax payments net of transfers received. For future generations, the accounts are based on the proposition that the government's bills will have to be paid either by them or by those now living. The calculations determine how much future Americans will have to pay on average to the government, above the amount they will receive in transfers, if total government spending is not reduced from its projected path and if those now living pay no more than anticipated.

Defined more precisely, generational accounts measure, as of a particular base year, the present value of the average future taxes that a member of each generation is estimated to pay minus the present value of the average future transfers that he or she is estimated to receive. This difference is called the "net payment" in the following discussion. A generation is defined as all males or females born in a given year.

Generational accounts can be used for two types of comparison. First, they allow us to compare the lifetime net payments by future generations, by the generation just born, and by different generations born in the past. Lifetime net payments by generations born in the past are based on estimates of actual taxes paid and transfer payments received through 1991, as well as on projections of taxes to be paid and transfer payments to be received in the future.

Second, generational accounts can be used to compare the effects of actual or proposed policy changes on the remaining lifetime net payments of currently living and future generations. Such comparisons can be made equally well for policies that change the totals of receipts or expenditures and for those that change the composition of the budget without affecting the deficit.

It should be noted that, as now constructed, generational accounts have a number of limitations. First, they include the taxes and transfers of all levels of government—federal, state, and local—and thus do not show the separate effect of the federal budget as a whole. However, the difference in the accounts due to a federal government policy *change* can be analyzed alone.

Second, generational accounts reflect only taxes paid and transfers received. They do not impute to particular generations the value of the government's purchases of goods and services for education, highways, national defense, and so on. Thus, the full net benefit or burden that any generation receives from government fiscal policy as a whole is not totally captured. Still, the accounts can reveal the effects of a policy change that affects only taxes and transfers. In the future, it may be feasible to impute the value of certain types of government purchases to specific generations.

Third, generational accounting does not, as yet, incorporate any policy feedback on the economy's growth and interest rates. Feedback effects can be significant, but because they generally occur slowly, their impact on the discounted values used in the accounts may be small. Moreover, there is reason to believe that they would reinforce the conclusions derived here. For example, policies that decrease current generations' net payments while increasing the burden on future generations are likely to reduce investment over time. This in turn will lower real wage growth and raise real interest rates, which on balance will harm future generations in absolute terms.

Finally, generational accounting divides people born in the same year into only two categories, males and females, with each designated a "generation." This is an important distinction, since the sexes differ significantly in such characteristics as lifetime earnings and longevity. However, the method does not reveal differences with respect to other characteristics, such as income levels or race, nor does it show the wide diversity among individuals within any particular grouping.

Thus, the results presented here should be viewed as experimental and illustrative. They are limited by the availability and quality of the data, especially for earlier years. In addition, they are necessarily based on a number of simplifying assumptions (about which reasonable people may disagree) concerning the pattern of future taxes and spending, mortality and birth rates, the interest rate used for discounting future taxes and transfers to derive present values, and so forth. The absolute amounts of the generational accounts are sensitive to all of these assumptions.

Nevertheless, like the 75-year projections issued each year by the Social Security trustees, the accounts can be illuminating when considered in light of their assumptions. Moreover, the most fundamental result—that future generations' average net payment will be relatively much larger than that of the generation just born—holds for a wide range of reasonable changes in the assumptions.

II. Remaining Net Payments by Existing Generations

Tables 1 and 2 show the generational accounts as of calendar year 1991 for every fifth generation of

TABLE 1

Generational Accounts for Males: Present Value of Taxes and Transfers as of 1991 (thousands of dollars)

Generation's Age in 1991	Net Payment	Taxes Paid: Labor Income Taxes	Taxes Paid: Capital Income Taxes	Taxes Paid: Payroll Taxes	Taxes Paid: Excise Taxes	Transfers Received: Social Security	Transfers Received: Health	Transfers Received: Welfare
0	78.9	29.2	10.1	31.8	28.2	6.1	11.0	3.3
5	99.7	37.5	12.9	41.0	33.3	7.7	13.1	4.2
10	125.0	47.8	16.5	52.3	38.7	9.2	15.7	5.4
15	157.2	61.1	21.2	67.1	44.6	10.7	19.2	6.9
20	187.1	73.5	26.5	81.3	48.3	11.8	22.2	8.4
25	204.0	80.4	33.1	89.5	49.1	14.6	24.3	9.0
30	205.5	80.4	39.9	89.8	48.5	18.0	26.4	8.6
35	198.8	77.6	46.8	87.0	47.8	22.6	29.7	8.0
40	180.1	71.0	52.3	79.9	46.9	28.5	34.1	7.3
45	145.1	59.8	55.4	67.6	44.5	35.9	39.6	6.6
50	97.2	45.8	55.3	52.0	40.7	45.2	45.4	6.0
55	38.9	30.2	52.2	34.5	36.2	57.1	51.8	5.3
60	−23.0	16.2	46.4	18.6	30.8	72.4	58.1	4.6
65	−74.0	5.7	39.0	6.6	25.6	82.3	64.6	3.9
70	−80.7	2.4	30.9	2.7	20.4	75.5	58.2	3.4
75	−75.5	1.1	23.6	1.3	15.5	63.3	50.9	2.8
80	−61.1	0.6	18.0	0.7	11.0	47.9	41.5	1.9
85	−47.2	0.2	15.0	0.3	7.6	36.4	33.1	0.9
90	−3.5	0.0	7.1	0.0	1.7	6.5	5.8	[a]
Future generations	166.5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Percentage Difference in Net Payment							
Future generations and age zero	111.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

a. $0.05 thousand or less.
SOURCE: Office of Management and Budget (1992).

males and females alive in that year. The first column, "Net Payment," is the difference between the present value of taxes that a member of each generation will pay, on average, over his or her remaining lifetime and the present value of transfers that he or she will receive. The other columns show the average present values of several different taxes and transfers. All federal, state, and local taxes and transfers are included in these calculations. Federal spending and receipts are based on the baseline calculations in the Office of Management and Budget's *Mid-Session Review of the 1993 Budget*.

The present value of future taxes to be paid by young and middle-aged generations far exceeds the present value of the future transfers they will receive. For males age 40 in 1991, for example, the present value of future taxes is $180,100 more than the present value of future transfers. The amounts are large because these generations are close to their peak taxpaying years. For newborn males, on the other hand, the present value of the net payment is much smaller, $78,900, because they will pay very little in taxes for a number of years.

Older generations, who are largely retired, will receive more Social Security, Medicare, and other future benefits than they will pay in future taxes. That is, they have negative net payments. Females have smaller net payments than males, mainly because they earn less and thus pay less income and Social Security taxes.

TABLE 2

Generational Accounts for Females: Present Value of Taxes and Transfers as of 1991 (thousands of dollars)

Generation's Age in 1991	Net Payment	Taxes Paid: Labor Income Taxes	Taxes Paid: Capital Income Taxes	Taxes Paid: Payroll Taxes	Taxes Paid: Excise Taxes	Transfers Received: Social Security	Transfers Received: Health	Transfers Received: Welfare
0	39.5	15.1	3.7	16.5	27.3	5.8	9.6	7.7
5	48.7	19.4	4.8	21.2	32.0	7.3	11.5	9.9
10	59.4	24.7	6.1	27.0	36.8	8.7	14.0	12.5
15	72.4	31.4	7.9	34.6	41.8	10.0	17.3	16.0
20	84.0	37.1	9.8	41.3	45.0	11.1	20.0	18.2
25	86.4	38.5	12.3	42.9	46.1	13.7	23.2	16.5
30	81.1	36.2	15.5	40.5	46.1	17.0	26.9	13.4
35	71.9	33.3	19.1	37.4	46.1	21.3	32.1	10.7
40	55.3	29.0	22.3	32.7	45.2	26.9	38.8	8.2
45	29.5	23.1	24.8	26.2	43.2	34.2	47.4	6.1
50	−2.2	16.7	26.1	19.0	39.5	43.5	55.4	4.6
55	−39.5	10.8	26.0	12.3	35.2	55.6	64.4	3.7
60	−80.8	5.6	24.4	6.4	30.3	71.4	73.1	3.1
65	−112.5	2.0	21.7	2.3	25.3	80.3	80.8	2.7
70	−110.6	0.8	18.0	0.9	20.6	74.2	74.4	2.4
75	−100.6	0.4	13.8	0.4	15.8	63.0	65.8	2.1
80	−83.3	0.2	9.3	0.2	11.6	49.5	53.3	1.7
85	−65.6	0.1	4.7	0.1	8.9	36.8	41.1	1.4
90	−9.8	0.0	0.5	0.0	1.6	5.6	6.0	0.2
Future generations	83.4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
		Percentage Difference in Net Payment						
Future generations and age zero	111.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

SOURCE: Office of Management and Budget (1992).

Since the figures in these tables show the *remaining* lifetime net payments of particular generations, they do not include the taxes paid or transfers received in the past. This must be kept in mind when considering the net payments of those now alive. The portion of a generation's remaining lifetime net payment depends on whether we are talking about 10-, 40-, or 65-year-olds. The fact that 40-year-old males can expect to pay more in the future than they receive, in present-value terms, while the reverse is true for 65-year-old males, does not necessarily mean that federal, state, and local governments are treating the 40-year-olds unfairly. Because 65-year-old men paid considerable taxes when younger, and these are not reflected in their remaining lifetime net payments, direct comparisons are impossible. The lifetime net payments of different generations can be compared only by using lifetime net tax rates, discussed below.

Estimates of future net payments by generation are affected by the amount of taxes, transfers, and other government expenditures assumed year by year in the baseline projection. These assumptions can differ widely. As explained in the appendix, the methods of projection generally seek to maintain current policy in some sense. However, current policy can be interpreted in several ways, especially for expenditures such as defense. Furthermore, long-term Medicare and Medicaid projections assume that, eventually, policy actions or other forces will hold spending growth to the overall rate of economic expansion (adjusted for shifts in the age and sex composition of the

TABLE 3

Percentage Difference in Net Payments between Future Generations and Age Zero

	Productivity Growth Rate		
Interest Rate	0.25	0.75	1.25
3.0	117	89	65
6.0	138	111	87
9.0	228	193	162

SOURCE: Office of Management and Budget (1992).

population), even if the growth rate is quite rapid for the next few decades.[1]

III. Net Payments by Future Generations

Future generations—those born in 1992 and later—will be required to make a 111 percent larger net payment to the government, on average, than those born in 1991. The average net payments of $166,500 by future males and $83,400 by future females are calculated assuming that the male-to-female net payment ratio is the same for future generations as for those born in 1991. The calculations also assume that all future Americans of a particular sex will make the same average net payment over their lifetimes after adjustments are made for economic growth.

A growth adjustment is needed to compensate for the fact that future generations will pay more in taxes, net of transfers received, simply because their incomes will be higher. To properly assess future generations' net payment relative to that of the newly born, it is necessary to calculate the net payment they will make above and beyond the amount due to economic growth. Generational accounts assume that all future generations will pay the same net amount apart from this growth adjustment. The net amount is the number shown in tables 1 and 2 for all future generations of the same sex.

A generational imbalance, as defined above, is calculated in such a way that the generations now alive, including the newly born, do not pay any more taxes (or receive any less transfers) than projected in the baseline. This assumption is an analytical device for determining the size of the nation's fiscal imbalance; it is not meant to suggest that future generations will in fact close the gap all by themselves. Any actual policy change is almost certain to bear in some degree on current generations as well as on those yet to be born. If such a policy change is made, the percentage difference in net payments between the newly born and future generations would be less than shown in tables 1 and 2. Policy changes of this kind are discussed below.

The size of the imbalance between future generations and the newly born is sensitive to assumptions about both the interest rate used for discounting and the growth rate of the economy. Table 3 shows the percentage differential under interest rates of 3.0, 6.0, and 9.0 percent and productivity growth rates of 0.25, 0.75, and 1.25 percent. Although the difference ranges from 65 percent to 228 percent, our basic conclusion, that future generations' net payment will be much larger than that of those just born, still holds in every case.

The generational imbalance also depends on the policy assumption that all future generations of the same sex will have the same net payment (after adjusting for growth). But suppose that the future generations born between 1992 and 2001 pay only the same amount as those born in 1991. Because these future generations pay less than previously assumed, those born after 2001 will have a net payment that is 186 percent larger, rather than 111 percent larger, than that facing the 1991 generation. The greater the number of future generations who pay no more than current newborns, the larger will be the net payment required of generations who are born still later.

Change in the Imbalance between 1990 and 1991

The estimated 111 percent imbalance in 1991 between newborns and future generations can be compared with the estimated 79 percent imbalance in 1990 reported in the fiscal year 1993 budget. The difference primarily reflects lower baseline receipts projected for 1993–2004. Based on last year's projections, the estimated 1991 imbalance would be 81 percent. A second factor is that another generation, the one born in 1991, does not have to make the higher lifetime net payments required of future generations.

■ **1** A pure extrapolation of recent trends, in contrast, implies that health care costs will eventually bankrupt the government.

TABLE 4

Change in Generational Accounts Due to Alternative Policies as of 1991 (thousands of dollars)

Generation's Age in 1991	Males		Females	
	Mandatory Cap	Surtax	Mandatory Cap	Surtax
0	6.4	16.1	5.4	7.5
5	7.7	19.2	6.6	8.9
10	9.1	22.4	7.9	10.4
15	10.5	25.3	9.3	11.4
20	11.1	26.1	10.4	11.6
25	11.8	25.5	11.8	11.1
30	12.6	24.0	13.5	10.4
35	14.0	21.8	15.9	9.4
40	15.9	18.8	18.7	8.2
45	18.2	15.1	22.0	6.8
50	20.7	11.2	25.6	5.3
55	23.0	7.6	29.2	4.0
60	23.2	4.9	30.3	2.8
65	20.0	3.1	27.4	1.9
70	15.6	2.0	22.7	1.2
75	11.0	1.2	16.9	0.6
80	6.6	0.7	10.2	0.2
85	2.5	0.3	3.6	a
90	0.0	0.0	0.0	0.0
Future generations	−71.3	−57.2	−33.2	−29.3
Percentage Difference in Net Payment				
Future generations and age zero	11.7	15.1	11.7	15.1

a. $0.05 thousand or less.
SOURCES: Office of Management and Budget (1992) and authors' calculations.

IV. Illustrative Policy Changes

Table 4 compares two alternative policies aimed at rectifying the fiscal imbalance between the generation just born and future generations. Both would remove the imbalance to about the same degree, but their distributive effects among different generations vary tremendously.

The first of these policies is a cap on all mandatory spending programs except Social Security and deposit insurance. From 1993 to 2004, the savings from the cap would be calculated for each mandatory program with beneficiaries as the difference between 1) baseline spending and 2) spending limited to the growth in the number of beneficiaries plus the inflation rate (with a little additional growth allowed in the first two years for transition). Medicare and Medicaid are the largest mandatory programs, and they produce most of the total savings. For these two programs, spending would be limited to the amount determined by the cap. For all other mandatory programs (except Social Security and deposit insurance), the required savings would be spread across the board as a proportionate reduction in spending. Employing the economic assumptions used for the 1993 *Mid-Session Review* (and extended to the years after 1997), the consolidated budget is projected to be balanced under the cap in 2004.[2] Thereafter, the spending growth rates for mandatory programs would be the same as in the baseline calculations. However, because the level of mandatory spending in 2004 would be lower than under the baseline, applying these same growth rates would produce permanently lower levels of subsequent spending.

The cap on mandatory spending would largely eliminate the imbalance in net payments between future generations and those just born. Future generations would pay an average of 12 percent more, instead of 111 percent more. The net payment by future males would be $71,300 less than under the baseline, on average, and the net payment by future females would be $33,200 less.

All existing generations would face a larger net payment. In terms of age, the biggest increase would be for people who are now around 55 to 60. This is because the cap would mainly reduce transfer payments for health care, especially Medicare, which is received almost totally by the elderly. The increase in net payments would be higher for females than males at almost every age, because females live longer, and the cap would primarily reduce transfers to the elderly.

The second policy is a surtax on the federal individual income tax. From 1993 to 2004, the amount of the surtax would equal the spending reduction required by the mandatory cap. After 2004, the surtax would increase at the same rate as other taxes generally do.

The surtax would reduce the generational imbalance by almost as much as the mandatory cap. Future generations would pay 15 percent more on average than those just born, compared to 12 percent under the cap and 111 percent under the baseline. The average future male would pay $57,200 less, and the average future female would pay $29,300 less. All existing generations would pay more.

The distributional effect of the surtax would be quite different from that of the mandatory cap, however. The surtax would bear much

2 The budget would not necessarily be balanced in all later years. Generational balance over a period taken as a whole is consistent with some years of deficit, and the illustrative policies do not entirely eliminate the imbalance.

TABLE 5

Lifetime Net Tax Rates, Gross Tax Rates, and Transfer Rates (percent)

	Males			Females			Average of Males and Females		
Generation's Year of Birth	Net Tax Rates	Gross Tax Rates	Transfer Rates	Net Tax Rates	Gross Tax Rates	Transfer Rates	Net Tax Rates	Gross Tax Rates	Transfer Rates
1900	17.8	19.6	1.8	35.3	43.9	8.7	21.5	24.8	3.3
1910	21.8	24.6	2.8	35.7	49.6	13.9	24.7	29.8	5.2
1920	24.2	27.7	3.5	34.0	50.4	16.5	26.3	32.5	6.2
1930	26.4	30.5	4.1	34.4	52.8	18.5	28.1	35.3	7.2
1940	28.2	33.0	4.8	32.7	50.6	17.9	29.3	37.3	8.0
1950	30.6	36.8	6.2	30.6	46.9	16.3	30.6	39.9	9.3
1960	32.3	39.6	7.2	31.5	47.9	16.4	32.1	42.3	10.2
1970	33.6	41.7	8.1	32.5	50.3	17.8	33.2	44.5	11.3
1980	34.1	42.4	8.3	33.1	51.6	18.5	33.8	45.5	11.7
1990	33.9	42.7	8.7	32.9	52.0	19.1	33.6	45.7	12.2
1991	33.9	42.7	8.8	32.8	52.0	19.2	33.5	45.8	12.2
Future generations	71.5	n.a.	n.a.	69.3	n.a.	n.a.	71.1	n.a.	n.a.

SOURCE: Office of Management and Budget (1992).

more on the relatively young; the cap, on the relatively old. For example, a 65-year-old male would pay $3,100 more under the surtax than under the baseline, but $20,000 more under the cap; in contrast, a 20-year-old male would pay $26,100 more under the surtax but $11,100 more under the cap. This is because the surtax is paid disproportionately by younger people earning income, whereas the cap disproportionately reduces transfer payments to the elderly.

The second distributional difference is between males and females. The surtax bears more on males; the cap, on females. This is primarily due to the fact that males tend to have higher incomes and pay more income taxes, whereas females tend to live longer and receive more health care transfers.

The two policies also have different distributional effects between existing and future generations. The reduction in net payments by future generations is less under the surtax: $14,000 less for males, on average, and $4,000 less for females. This is partly because a larger imbalance remains between future generations and those just born, 15 percent compared to 12 percent. The improvement for future generations is less under the surtax because older generations do not pay as much more.

V. Historical Lifetime Tax Rates

The analysis so far has been prospective, considering only the present value of future taxes and transfers as of 1991 for existing generations and those yet to be born. A prospective analysis can compare policy changes, and it can compare the lifetime fiscal burdens on the newly born and future generations, since their entire lifetimes are yet to come. However, it cannot compare the lifetime fiscal burden of one existing generation with that of another existing generation born in a different year—or with future generations—because part of any living generation's taxes and transfers occurred in the past and thus are not taken into account.

A comparison of one existing generation with another must be based on their entire lifetime taxes and transfers. Table 5 shows the results in terms of lifetime net tax rates for different generations born since 1900 and for future generations. The lifetime net tax rate of a generation is defined as the present value of its lifetime net taxes (taxes less transfers) divided by the present value of its lifetime income. The present values are calculated as of the generation's year of birth, so that each cohort can be compared from the standpoint of when it was born. The lifetime net taxes are the

same as the generational account for a generation in the year of its birth. (As shown in table 1, the lifetime net taxes of males born in 1991 are $78,900.) Since lifetime taxes, transfers, and income have trended upward and have fluctuated to some extent, it is more appropriate to compare the relative fiscal burden on different generations in terms of lifetime net tax rates than in terms of absolute amounts.

Lifetime net tax rates are calculated from historical data on taxes, transfers, and income up to 1991 and from projections of future data as described in the previous sections. Historical data, however, are not available in the same detail as the figures for recent years underlying our projections, and in some cases they are not available at all. The appendix summarizes the methods used to construct the historical series.

Lifetime calculations also introduce a number of conceptual issues. For example, how should lifetime income be measured? Lifetime income is defined as a present value, like lifetime taxes and transfers. Therefore, the present-value calculations should include all income that increases a generation's resources: labor earnings, inherited wealth, and capital gains over and above the normal return to saving. The normal return to saving is not itself included in income, because that would be double counting. Saving and earning a normal rate of return do not increase the present value of a household's resources. Data do not exist on the share of each generation's income stemming from inherited wealth or supernormal capital gains, so labor earnings are used to represent income.[3]

The lifetime net tax rate for males in the base case exhibits a strong upward trend, rising from 17.8 percent in 1990 to about 34 percent in 1970 and succeeding years. The lifetime net tax rate for females exhibits a quite different pattern. It started much higher than for males, at 35.3 percent, declined irregularly for half a century, and rose slightly thereafter. Since 1950, the net tax rate has been about the same for both sexes.

The pattern of the female net tax rate is an artifact of women's increasing labor force participation and the method used to attribute labor earnings and taxes within a family. Labor earnings are attributed to the person who receives them; some taxes, including excises, are attributed equally to husband and wife. The lower female earnings thus contribute to a higher female tax rate, especially in the early decades of the century. At the same time, the rise in female labor force participation over time has caused their earnings to increase faster than male earnings, without directly increasing those taxes that are attributed equally to husband and wife. This has offset the general increase in taxes that contributed to the rising net tax rates observed in the series for males.

This pattern emphasizes a conceptual question in calculating the generational accounts. How should income, taxes, and transfers be attributed within a family? Excise taxes could alternatively have been attributed in proportion to labor earnings, or labor earnings could have been attributed equally between husband and wife. Table 5 displays one answer to this question by including lifetime net tax rates for males and females combined, calculated as a weighted average of the net tax rate for each sex. Note that the average net tax rises significantly over most of this century, increasing from 21.5 percent for the generation born in 1900, to 32.1 percent for the generation born in 1960, to about 33 percent for the generations born since 1970. This trend reflects the growing fiscal role of government. The average net tax rate for future generations is 71.1 percent, which is the same percentage difference relative to people newly born in 1991 as that shown in tables 1 and 2. The male and female net tax rates are virtually identical for future generations.

Table 5 also breaks down the net tax rates between gross tax rates and transfer rates. To calculate the latter, the present value of a generation's lifetime taxes (or transfers) is divided by the present value of its lifetime income. This breakdown reveals the expanded role of government transfer payments during the past century. The lifetime transfer rate for males and females taken together nearly *quadrupled* between the generations born in 1900 and those born in 1991, starting at 3.3 percent and rising each decade to a rate of 12.2 percent. The increase was more rapid, in both relative and absolute terms, for the generations born before World War II than afterward.

Because of the growth in the transfer rate, the gross tax rate has not leveled off in the past two decades to the same extent as the net tax rate. The gross tax rate for males and females combined nearly doubled between the generations born in 1900 and 1991, starting at 24.8 percent and increasing each decade to a rate of 45.8 percent. A generation's lifetime taxes pay for the government's purchases of goods and services as well as for public transfers to its own members and other generations.

■ **3** The error due to this omission is relatively small in the aggregate, given that labor income has long accounted for three-fourths of all income and that only part of the remaining income from capital should be included. However, the errors for different generations could vary, depending on trends and fluctuations in asset values and bequest behavior.

TABLE 6

Lifetime Net Tax Rates (percent)

Generation's Year of Birth	Males			Females			Average of Males and Females		
	Baseline	Mandatory Cap	Surtax	Baseline	Mandatory Cap	Surtax	Baseline	Mandatory Cap	Surtax
1900	17.8	17.8	17.8	35.3	35.3	35.3	21.5	21.5	21.5
1910	21.8	21.8	21.8	35.7	35.9	35.7	24.7	24.7	24.7
1920	24.2	24.4	24.3	34.0	34.8	34.0	26.3	26.6	26.3
1930	26.4	26.8	26.4	34.4	36.5	34.5	28.1	28.9	28.2
1940	28.2	28.9	28.5	32.7	35.2	33.2	29.3	30.4	29.7
1950	30.6	31.5	31.6	30.6	32.9	31.5	30.6	31.9	31.6
1960	32.3	33.6	34.6	31.5	34.2	33.5	32.1	33.8	34.2
1970	33.6	35.3	37.6	32.5	35.7	35.9	33.2	35.4	37.1
1980	34.1	36.5	39.9	33.1	37.0	38.2	33.8	36.6	39.3
1990	33.9	36.6	40.7	32.9	37.4	39.0	33.6	36.9	40.2
1991	33.9	36.6	40.8	32.8	37.3	39.1	33.5	36.9	40.2
Future generations	71.5	40.9	47.0	69.3	41.7	45.0	71.1	41.3	46.5

SOURCE: Office of Management and Budget (1992).

The breakdown further shows that the similarity between males and females in lifetime net tax rates masks very different gross tax and transfer rates. Each rate is much higher for females, reflecting such factors as their lower lifetime income and greater longevity (as well as the attribution assumptions for taxes and income within the family).

Table 6 shows how policy changes designed to rectify the generational imbalance would affect the lifetime net tax rates of different generations. For future generations, the cap on mandatory spending reduces the average lifetime net tax rate on males and females together from 71.1 percent to 41.3 percent, while the surtax reduces it to 46.5 percent.

For existing generations, the effect of policy changes on lifetime net tax rates increases as the generation's age declines, and for the very youngest cohort, born in 1991, the change is quite significant. Under the mandatory cap, this generation's lifetime net tax rate increases by 2.7 percentage points for males. For females, who will live longer, the increase is 4.5 percentage points. A surtax would raise the burden on the youngest group still more: an increase over the baseline of 6.9 percentage points for males and 6.3 percentage points for females. For older generations, the increase in the lifetime net tax rate is smaller, primarily because the absolute effects of the policy change are discounted over more years in order to calculate the present value as of the generation's year of birth. In the case of the surtax, the absolute effects are also smaller for older generations, because they have fewer remaining years of labor earnings.

The burden that remains on the older generations is greater under the mandatory cap than under the surtax, as previously explained, because Medicare benefits are relatively high and income taxes relatively low during their remaining years. Since females live longer than males, the increase in their lifetime net tax rate under the mandatory cap is greater than for males at every age. On the other hand, because males have higher labor earnings, the surtax generally hits them harder than it does females.

Appendix—Construction of the Generational Accounts

Present-Value Constraint

Generational accounting is based on the present-value budget constraint of the government sector. In simple terms, this constraint says that the government must ultimately pay for its purchases of goods and services either with resources it obtains from current and future generations or with its current assets (net of debt). If current

generations pay less in taxes (net of transfers received) to finance government purchases, future generations will have to pay more. For example, suppose that, through borrowing, payments for the government's bills were repeatedly shifted to future generations by each successive current generation. Then this debt would grow, with interest. Eventually, the interest would exceed the lifetime income of future generations, resulting in default.

More precisely, the government's present-value constraint means that, at any point in time, the present value of the government's future purchases of goods and services cannot exceed the sum of three items: 1) the present value of future taxes to be paid (net of transfers received) by existing generations (that is, the sum of their generational accounts multiplied by the number of people in each generation), 2) the present value of taxes to be paid (net of transfers received) by future generations, and 3) the value of government assets that yield income, less the government debt. Generational accounting estimates the present value of the government's purchases of goods and services plus amounts 1 and 3. Amount 2, the present value of taxes to be paid by all future generations (net of transfers received), is calculated as the present value of future government purchases minus amounts 1 and 3.

The generational accounts for future generations are derived from the aggregate amount 2. For all but one of the policy experiments discussed here, different net payments (after adjusting for economic growth) are not estimated for different future generations. Rather, the aggregate present-value net payment by future generations is divided on an even basis among all future generations so that the average net payment by the members of each keeps pace with the economy's productivity growth. Thus, as shown in tables 1 and 2, one single (growth-adjusted) average figure stands as the generational account for all future generations of a given sex. Because the generational account is calculated indirectly from the above aggregates, it can be shown only as a single number and cannot be divided among specific taxes and transfers.

Underlying Calculations

Calculating the generational accounts is a three-step process. The first step entails projecting each currently living generation's average taxes and transfers for each future year in which at least some of its members will be alive. The second step converts these projected values into an actuarial present value, using assumptions for the discount rate and the probability that the generation's members will be alive in each of the future years. The sum of these present values, with transfers subtracted from taxes, is the generational account, or net payment, for existing generations shown in the first column of tables 1 and 2. The third step estimates the other terms of the present-value constraint (explained in the previous section) so as to derive the average net payment by future generations. The calculations are based on projections to the year 2200.

Projection of taxes and transfers. The projection of average future taxes and transfers begins with the national totals of all federal, state, and local taxes and transfers as reported in the National Income and Product Accounts (NIPAs) for calendar year 1991. (All years in this article are calendar years unless otherwise stated.) Employee retirement and veterans' benefits paid by the government are considered a form of employee compensation and are classified as the purchase of a service rather than as a transfer payment.

The base-year NIPA totals are distributed to all existing generations, as defined by age and sex, based on the corresponding distributions in cross-section survey data. These surveys include the Survey of Income and Program Participation and the Current Population Survey, both by the Bureau of the Census, and the Survey of Consumer Expenditures by the Bureau of Labor Statistics. Those taxes that are not directly paid by individuals and so do not appear in these surveys, such as the corporate income tax, are allocated. Because generational accounting attributes taxes and transfers to individuals, household taxes and transfers are attributed to household members. No special imputations are made to children, but the cross-section surveys impute some consumption to them; thus, the taxes on that consumption are attributed to children. The attribution rules affect the values of the baseline accounts, but are not likely to alter the generational implications of policy changes.

The distribution of average future taxes and transfers by age and sex is assumed to equal the base-year average amounts after adjustments for growth and projected policy. In the case of federal taxes and transfers for 1993–2004, the amounts correspond to the current service estimates of taxes and transfers in the *Mid-Session Review of the 1993 Budget* (July 1992), extended beyond 1997 and updated for the actual fiscal year 1992 results. In the case of state and local taxes and transfers for 1993–2004, the amounts are based on the GDP assumptions in the *Mid-Session Review* as well as on the assumption that the ratios of

state and local tax and transfer aggregates to GDP remain constant at 1991 levels. After 2004, the average taxes and transfers by age and sex are assumed, with two exceptions, to increase at the assumed rate of productivity growth. Productivity (both labor and multifactor) is assumed to increase by 0.75 percent a year, which is close to the average annual rate of multifactor productivity growth since 1970.

Social Security and health care transfers are the two exceptions. Projected Social Security transfers and payroll tax receipts after 2004 are based on special calculations made by the Social Security Administration assuming a productivity growth rate of 0.75 percent. Projected Medicare and Medicaid transfers from 2005 through 2030 are calculated from the growth rates in the Health Care Financing Administration's middle-scenario estimates published in 1991.[4] After 2030, health care transfers are assumed to stabilize as a percentage of GDP apart from the effect of changes in the composition of the population by age and sex. Medicare receipts are assumed to grow at 0.75 percent a year.

Assumptions for present value. The appropriate discount rate for calculating the present value of future amounts depends on whether these amounts are known with certainty. Future government receipts and expenditures are risky, which suggests that they should be discounted by a rate higher than the real rate of interest on government securities. On the other hand, government receipts and expenditures appear to be less volatile than the real return on capital, which suggests that they should be discounted by a rate lower than that. The baseline calculations assume a 6 percent real discount rate, which is intermediate between the roughly 2 percent average real return available in recent years on short-term Treasury securities and the roughly 10 percent real return available on capital.

The present values of future average taxes and transfers are also discounted for mortality probabilities in order to derive actuarial present values. The demographic probabilities through 2066 are those embedded in the Social Security trustees' intermediate projection in 1992 (alternative II) of the population by age and sex. The fertility, mortality, and immigration probabilities in 2066 were used for later years. Immigration is treated as equivalent to a change in mortality.

Other projections. Federal purchases of goods and services through 2004, like federal taxes and transfers, are from the latest *Mid-Session Review* extended beyond 1997 and updated for the actual fiscal year 1992 results. State and local purchases through 2004 are kept at the same ratio to GDP as in 1991. Federal, state, and local purchases after 2004 are divided between 1) those made on behalf of specific age groups—the young, middle-aged, and elderly—such as educational expenditures, and 2) those that are more nearly pure public goods, such as defense and public safety. Purchases per person in each of the three age groups, and purchases of public goods per capita, all increase at the assumed rate of productivity growth.

The economic value of the government assets that yield income, less the government debt, is estimated to be the cumulative amount of the NIPA deficit since 1900 converted to constant dollars by the GDP deflator.

The average growth-adjusted net payment to be made by future generations is determined using the aggregate present value of the net payment (as derived through the present-value budget constraint), the assumed productivity growth, and the projected size of future generations. The size of future generations is estimated using the Social Security alternative II projection through 2066 and the demographic assumptions for 2066 for later years.

Historical lifetime net tax rates. Lifetime net tax rates for generations born between 1900 and 1991 are calculated by dividing the generational account of each generation at birth by its human wealth—the present value at birth of its future labor earnings. Calculating a generation's human wealth requires knowing its average labor earnings in each future year. The average labor earnings received by particular generations in particular years are determined by distributing aggregate labor income by age and sex using cross-section distributions of labor income found in cross-section survey data. The lifetime generational accounts for generations born between 1900 and 1991 are based on actual taxes and transfers between 1900 and 1991 and on projected taxes and transfers in the years thereafter.

Aggregate labor earnings, taxes, and transfers were obtained from the NIPAs for 1929 and later years. Pre-1929 aggregate labor earnings are from *Historical Statistics of the United States, Colonial Times to 1970.* Pre-1929 taxes and transfers are from the 1982 Census of Governments, *Historical Statistics on Government Finances and Employment.* Various cross-section surveys are used to distribute aggregate labor earnings, taxes, and transfers by age and sex. Cross-section surveys prior to the early 1960s were not available for this study, so surveys from years after 1960 are used for earlier years. The Current Population Surveys are used for labor earnings and taxes on labor earnings in 1964 and later years, and the 1964 survey is used for earlier years.

4 This scenario is discussed in Sonnefeld et al. (1991).

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