Abstract – We study the efficiency and distributional effects of financing universal health-insurance coverage, using a computa-
tional general equilibrium model of the United States for 1991, with considerable disaggregation among families. Aggregate effi-
ciency losses (primarily from labor supply distortions) range from 0.2 percent to nearly 1 percent of net output. Losses are consider-
ably smaller for a “mandate-with-tax-credit” plan than for full tax
finance. All plans redistribute in favor of the poor. The mandate
with credit is much better for the highest income groups, but worse
for the lower-middle class. The elderly lose in all plans we consider.

INTRODUCTION

In 1996, an estimated 41.7 million Americans were without
health insurance (Bennefield, 1997). Among 28 industrial-
ized countries in 1995, health-care coverage was publicly
mandated for at least 99 percent of the population in all but
five (Anderson, 1997). The United States is the only country
in the group in which less than half of the population is eli-
gible for publicly mandated coverage. Although President
Clinton’s 1993 Health Security Plan proposal ultimately
failed, the goal of universal health-care coverage is still of
considerable interest.

The purpose of this paper is to expand our understanding
of the effects of a move toward universal health-care cover-
age in the United States. We do not emphasize the effects on
the health-care system itself. Instead, we focus on the way in
which the financing of care affects the efficiency with which
labor markets operate, and on the distribution of welfare
among families.

Proposals for universal health-insurance coverage fall into
two broad categories. The first category involves proposals
for a Canadian-style, single-payer system of coverage. Un-
der a system of this type, consumers would be entitled to
health insurance without direct payment, but taxes would
need to be increased to pay for the system. When we simu-
late the effects of implementing this type of proposal, we re-
fer to these as “full-tax-finance” simulations.
The second category includes proposals for some form of mandated coverage. Some of these proposals involve an "individual mandate," under which each family would be responsible for obtaining health insurance. Other proposals, including Clinton's 1993 plan, involve an "employer mandate," under which employers are required to provide coverage for their employees.

We also present simulations of a mandate-type plan. The mandate modeled here is more like an individual mandate than an employer mandate. However, we argue that the results from our mandate simulations are relevant for understanding either an individual mandate or an employer mandate. In a well-functioning labor market, employer-provided coverage is largely a substitute for wages. Thus, regardless of the way in which the mandate is imposed, a system with mandated coverage is likely to resemble a system in which each family bears the cost of its own coverage.

Moreover, our emphasis is on proposals for universal coverage. If a mandate-type proposal has the goal of achieving universal coverage, it must include some system of subsidies for the poor, regardless of whether the responsibility for obtaining coverage is focused primarily on the individual or on the employer. The subsidies must be financed by taxes.

The share of health care that is financed by taxes would be larger under either a mandate plan or a full-tax-finance plan than under the current health-care system. The increased level of taxation has implications for distribution and efficiency. The potential efficiency losses from tax-induced distortions certainly should be considered when we design a system of health-care finance.

In this paper, we incorporate health-care coverage into a computational general equilibrium (CGE) model of the U.S. economy. The model disaggregates families by income, size, composition, labor type, and age of head. The production side of the economy is based on a three-factor translog structure, in which the factors are low-skill labor, high-skill labor, and capital. In the "base-case" simulations using our model, households make an endogenous choice about whether to obtain health insurance. We choose the parameters of the model in such a way that these insurance choices are roughly in line with those made in the real economy. We then conduct experiments in which we impose health coverage on all families and finance it using versions of the two prototype systems outlined above.

Our results indicate that significant efficiency costs are created by either approach to financing universal health care. The costs can be 0.2 percent of net national product (NNP), or perhaps considerably

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1 For example, the proposals for employer mandates often involve complicated arrangements for part-time workers and small firms, and we do not deal with these issues explicitly.

2 See Ballard and Fullerton (1992) for a survey of the literature on the marginal efficiency costs of tax-financed government expenditure. In this literature, it is common to find estimates of at least 30 cents of efficiency loss per dollar of additional revenue raised. However, the efficiency losses from higher taxes have received surprisingly little attention in discussions of health-care reform. An exception is Browning and Johnson (1980), who estimate efficiency losses due to taxation of perhaps 20 cents for every dollar of health care transferred from the private to the public sector. More recently, Newhouse (1992) and Danzon (1992) have discussed the importance of the deadweight costs of taxes to the debate over health financing reforms.

3 When either of the prototype systems is implemented in our model, it is necessary to raise additional tax revenue. In the simulations reported here, the additional revenues are collected by an income tax that is imposed on both capital and labor. The labor income taxes create labor-market distortions, but taxes on capital have no first-order distortionary effects in this static, one-sector model. However, many other models have shown that capital taxes can lead to very substantial efficiency losses, either by distorting the intersectoral allocation of capital or by interfering with intertemporal consumption choices. Therefore, in this regard, our simulations may underestimate the true efficiency costs of the proposed policy changes.
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more, depending on the exact configuration considered. The overall efficiency costs appear to be a good deal lower for the “mandate-with-tax-credit” approach than they are for full tax financing. This is primarily because the amount by which distortionary taxes must be increased is so much less in the mandate-with-credit case.

Not surprisingly, the distributional consequences of the two approaches to finance are also rather different. Compared with the current system, both plans favor those at very low incomes at the expense of those at the top. But mandated coverage is much more favorable to those with high incomes, because they subsidize those below them to a smaller degree. On the other hand, mandated coverage is less favorable to those in the lower-middle range of the income distribution.

Our model also yields results for another type of distributional effect. Currently, nearly all U.S. citizens aged 65 and over receive health-insurance coverage through the Medicare system. We model reforms that do not change health-care coverage for the elderly, but we subject all groups in the population (including the elderly) to the same tax changes. Consequently, the elderly suffer losses as a result of each of the reform plans simulated here.

THE MODEL AND DATA

Much of the structure of our model is similar to that of Ballard (1988). We further disaggregate and modify that model in a number of ways, and we make use of more recent data. We discuss the data in the next section. Then, we discuss our main modeling innovations, which include the introduction of health care, the disaggregation to two labor skill types, the introduction of a three-factor translog production structure, and the disaggregation by age.4

The Family Database

Our primary data source is the March, 1992, Current Population Survey (CPS) of the U.S. Bureau of the Census. We adjust the CPS values of labor income and capital income so that our aggregates match the totals for the two types of income from the National Income and Product Accounts. Thus, the sum of pretax labor and capital income across all families in our model is equal to NNP for 1991. We also include transfer income as part of total family income for each family.

After adjusting the income data, we create family groups by taking averages of the CPS sample observations falling into particular cells.

(1) Single persons are distinguished by income decile, by gender, by whether the person is aged 65 and over, by whether the person has any labor income, and by labor skill type. (The classification by skill is discussed below.)

(2) Single-parent families are also divided by income decile, gender of household head, age of household head, labor income, and labor skill type, as well as into two size classes: two and three persons and more than three persons.

(3) Married-couple families are also divided by all of the characteristics that were used to distinguish single-parent families, as well as into three size classes: two persons (no children), three or four persons, and more than four persons. Married-couple families are also divided among groups with two earners and groups with fewer than two earners. The two-earner couples are further subdivided among four skill combinations.

4 Some of the details of model construction are omitted here because they have been discussed in Ballard (1988). More details are available on request.
Some of the family cells with no earners are also subdivided in order to single out those who are Medicaid recipients in the current system. Ultimately, we use a total of 542 family groups in the model, each of which is weighted by the share of the U.S. population that it represents.

Table 1 gives some summary information about the population represented in the model, broken down by income decile. Income is more concentrated at the top end of this distribution than in standard tables of income distribution. This results from the way in which we have constructed families, which leads to a large number of one-person families, who tend to have low incomes. (More conventional presentations of the income distribution exclude one-person families or group together unrelated individuals who share living quarters.) The bottom of Table 1 includes some information on the families that are composed only of elderly persons. The elderly account for a large share of transfer income, which includes Social Security benefits.

### TABLE 1
**SUMMARY OF INCOME DISTRIBUTION BY DECILE**

<table>
<thead>
<tr>
<th>Income Bounds ($1,000s)</th>
<th>Labor Income</th>
<th>Capital Income</th>
<th>Transfer Income</th>
<th>Total Income</th>
<th>Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5.0</td>
<td>0.3</td>
<td>0.1</td>
<td>4.1</td>
<td>0.5</td>
<td>7.2</td>
</tr>
<tr>
<td>5.0-9.0</td>
<td>0.8</td>
<td>0.4</td>
<td>13.6</td>
<td>1.7</td>
<td>7.1</td>
</tr>
<tr>
<td>9.0-14.5</td>
<td>2.2</td>
<td>1.4</td>
<td>13.6</td>
<td>2.9</td>
<td>7.8</td>
</tr>
<tr>
<td>14.5-21.0</td>
<td>4.0</td>
<td>3.0</td>
<td>12.0</td>
<td>4.4</td>
<td>8.2</td>
</tr>
<tr>
<td>21.0-28.5</td>
<td>6.1</td>
<td>4.6</td>
<td>10.7</td>
<td>6.2</td>
<td>8.8</td>
</tr>
<tr>
<td>28.5-37.2</td>
<td>8.4</td>
<td>6.7</td>
<td>10.4</td>
<td>8.2</td>
<td>9.8</td>
</tr>
<tr>
<td>37.2-48.2</td>
<td>11.3</td>
<td>8.6</td>
<td>9.5</td>
<td>10.7</td>
<td>11.0</td>
</tr>
<tr>
<td>48.2-62.8</td>
<td>15.0</td>
<td>11.6</td>
<td>8.3</td>
<td>13.9</td>
<td>12.5</td>
</tr>
<tr>
<td>62.8-88.1</td>
<td>20.5</td>
<td>15.6</td>
<td>7.5</td>
<td>18.6</td>
<td>13.7</td>
</tr>
<tr>
<td>&gt;88.1</td>
<td>31.3</td>
<td>48.0</td>
<td>10.2</td>
<td>32.8</td>
<td>13.8</td>
</tr>
</tbody>
</table>

All Elderly-Only Families

<table>
<thead>
<tr>
<th>Median Income ($1,000s)</th>
<th>Shares of Population Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.5</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>35.3</td>
</tr>
<tr>
<td></td>
<td>47.8</td>
</tr>
<tr>
<td></td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td>11.1</td>
</tr>
</tbody>
</table>

5 Some of the cells created by these procedures are empty, or nearly empty, in the CPS data set (e.g., single parents without labor income in the top income decile). We include in the model only those cells that have at least five CPS observations. Less than one percent of the U.S. population is omitted as a result of this rule.

Health Insurance and Consumer Optimization

Our most important addition to Ballard's earlier model is the introduction of health insurance. We do not attempt to model all of the complexities of the health-insurance market. Instead, we seek a simple model of demand for health insurance, but one that leads to a split of the population into insured and uninsured groups that roughly matches the actual division, and one in which the implied value of health insurance to families is captured as accurately as possible.

The approach we take may be motivated as follows. The current system includes "safety nets," such as Medicaid, other state and local programs of medical assistance, and charity care. The uninsured typically receive care when seriously ill, even if they cannot pay for it, although the quality and quantity of care is likely to be lower than that received by the insured. The amount paid by an uninsured person will depend on his income. For example, an uninsured person must...
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frequently “spend down” to a sufficiently low level of income before becoming eligible for Medicaid. Thus, reliance on the safety net may be regarded as a form of insurance. The quality of the safety net is inferior to the quality of private insurance, and the expected cost of using the safety net increases with income.

Families with low incomes will tend to rely on the safety net, because its cost is low for them, compared to the cost of private insurance. Those with higher incomes have more at risk before the safety net becomes available. Therefore, higher-income families have a stronger motive for buying private insurance coverage.

We capture these ideas formally by assuming a family utility function with consumption and leisure as arguments, where the consumption component includes health insurance. We use a constant-elasticity-of-substitution (CES) utility function, as in Ballard (1988):

$$[1] \quad U = \left[ (1 - \phi)^{1/\varepsilon} \frac{Z}{Z} + \phi^{1/\varepsilon} \frac{L}{L} \right]^{\varepsilon},$$

where $Z$ represents consumption, $L$ is leisure, and $\varepsilon$ and $\phi$ are parameters that vary by family group. We define $Z$ to include both the value of health insurance and consumption of other goods:

$$[2] \quad Z = G + (I \cdot V).$$

In equation 2, $G$ is consumption of other goods, $I$ is an indicator variable equal to 1 if the family has health insurance and 0 otherwise, and $V$ is the extra value of being insured rather than uninsured, measured in terms of goods.\(^6\) In our base-case simulations, $I$ is 1 for some families and 0 for others. In our revised-case simulations, $I$ will be 1 for all families (i.e., everyone will have health insurance). In order to simulate the welfare effects of providing insurance coverage to the uninsured, we need values for $V$ that are specific to the family groups.

We assume that insurance is chosen ($I = 1$) in the base case if:

$$[3] \quad (Z_{I=1} - Z_{I=0}) = [V + (G_{I=1} - G_{I=0})] > 0.$$

In equation 3, $(G_{I=1} - G_{I=0})$ is the expected sacrifice of consumption of other goods associated with having insurance. In simple terms, insurance is chosen if its value to the family exceeds its cost (in terms of foregone consumption).

We use equation 3 as the basis for estimating $V$. Treating $V$ as a function of family characteristics, we specify the probit function:

$$[4] \quad I^* = \gamma_0 + \gamma_1 \text{ADULTS} + \gamma_2 \text{KIDS}$$

$$+ \gamma_3 \text{NOEARN} + \gamma_4 (G_{I=1} - G_{I=0}) + \nu$$

where $\text{ADULTS}$ is the number of adults under the age of 65 in the family, $\text{KIDS}$ is the number of children, $\text{NOEARN}$ takes the value 1 if the family has no earners and 0 otherwise, and $\nu$ is a standard normal variable. The term $I^*$ is unobserved, but $I = 1$ whenever $I^* > 0$. Otherwise, $I = 0$. (Equation 4 applies for multiperson families. We estimate an analogous equation for one-person families.)

The difference in $G$ between being insured and being uninsured $(G_{I=1} - G_{I=0})$ is accounted for by the difference in expected payments for medical care. These include expected out-of-pocket payments, and they also include insurance premiums paid by the insured. We construct $G_{I=1}$ by assuming that, if a family is insured, its expected medical expenditure is equal to the actuarial value of the amount of medical care that is appropriate for a family

\(^6\) The links between health insurance, health status, and health care in the model also require some explanation. We do not disaggregate families by health status or by actual health-care expenditures. Thus, the model is best interpreted as one in which utility is evaluated ex ante before health status is known and health care is consumed. Utility depends on insurance coverage rather than on health status or health care.

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with its characteristics, adjusted for the tax subsidy for employer-provided insurance. If the family is uninsured, the expected cost of medical care is assumed to be a fixed fraction of after-tax income, but not more than the value that would be paid if the family were insured.\footnote{In the simulations reported in this paper, we assume that the expected cost of medical care for the uninsured is 11 percent of after-tax income for multiperson families and six percent for single individuals. The probit likelihood functions are maximized in the vicinity of these parameter values. The main features of our results are not very sensitive to changes in these parameters. Additional simulation results, based on other values of these parameters, are available on request.}

We estimate one probit model for multiperson families and another for one-person families, using data from the March, 1992, CPS. We exclude those families that are composed exclusively of individuals aged 65 and over. The multiperson family data set includes 34,336 observations, and the data set for one-person families has 27,982 observations. To construct the dependent variable for each of the probit equations, we classify families as insured or uninsured, on the basis of whether more than two-thirds of the family members report having private health insurance.

The results of the estimations are shown in Table 2. As expected, the coefficients for \((G_{i=1} - G_{i=0})\) are positive, and many times larger than their standard errors. According to the estimates for multiperson families, the value of insurance increases with the number of adults and with the number of children and is lower in families with no earners (holding \((G_{i=1} - G_{i=0})\) constant).\footnote{From equations 3 and 4, the value of insurance, \(\hat{V}\), can be estimated for multiperson families by \((\hat{y}_0 + \hat{y}^{\text{ADULTS}} + \hat{y}^{\text{KIDS}} + \hat{y}^{\text{NOEARN}})/\hat{y}_4\) using the estimated probit coefficients. A similar procedure is used to calculate \(\hat{V}\) for one-person families. Some illustrative estimates of \(V\) are $1,293 for a working single adult, $3,853 for a family of four with at least one earner, and $3,176 for a family of four with no earners. The \(V\)'s are important in assessing the gains from insuring the uninsured in our revised-case simulations.}

Returning to the 542 family groups, we use equation 3 and our probit results to classify the nonelderly as insured or uninsured in our base-case simulations. In our base-case simulations, 36.9 million people are classified as uninsured in 1991. (This is about 17.1 percent of the population under the age of 65.) Thus, our base-case simulations come fairly close to matching the actual number of uninsured: Based on the full CPS, the actual number of uninsured people in 1991 was estimated to be 34.7 million (Levit, Olin, and Letsch, 1992).

In the base case, we also classify 8.5 million persons as having Medicaid coverage, which we interpret as equivalent in quality to private coverage.\footnote{The details of this classification procedure are available upon request.} Nearly all individuals aged 65 and over have at least some health-insurance coverage through the Medicare program. Because we only consider reforms that leave health-care coverage for the elderly unchanged, we do not need to enter the value of insurance explicitly into the utility functions of the elderly-headed families.

Many economists believe that much of the population is "overinsured" due to the distortion induced by the tax-

<table>
<thead>
<tr>
<th>Variable</th>
<th>Multiperson Families</th>
<th>One-Person Families</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.838 (-21.3)</td>
<td>1.43 (88.5)</td>
</tr>
<tr>
<td>Adults</td>
<td>0.953 (47.5)</td>
<td>-</td>
</tr>
<tr>
<td>Children</td>
<td>0.270 (30.4)</td>
<td>-</td>
</tr>
<tr>
<td>No earnings</td>
<td>-0.283 (-8.37)</td>
<td>0.016 (-0.65)</td>
</tr>
<tr>
<td>((G_{i=1} - G_{i=0}))</td>
<td>0.00042 (69.1)</td>
<td>0.0011 (73.6)</td>
</tr>
<tr>
<td>Sample size</td>
<td>34,336</td>
<td>27,982</td>
</tr>
</tbody>
</table>

\(t\)-statistics are in parentheses.
status of employer-provided insurance (for example, see Feldstein and Friedman (1977)). Although we incorporate the tax subsidy in modeling the discrete choice of insurance, as well as in our distributional analyses, the model is not designed to measure welfare losses from inefficiently extensive coverage.

**Two Labor Types**

In the current health-care system, health-insurance coverage is strongly correlated with wage rates. Because financing reforms might affect low-wage and high-wage workers quite differently, we disaggregate the labor force. We distinguish the two types of labor (referred to as low skill and high skill) using CPS information on occupation. We classify professionals and managers as high skill and other occupations as low skill. Two-earner families are subdivided into cells for each of the four possible skill combinations.10

The most common production function in the CGE literature is the CES production function. However, the disadvantage of CES is that it constrains all of the elasticities of substitution to be the same. We want our model to reflect empirical estimates suggesting that the elasticities of substitution among capital, low-skill labor, and high-skill labor are not identical. The transcendental logarithmic (translog) production function is one of several functional forms that allow for such differences in elasticities of substitution. We employ a three-factor translog function, because the translog is the flexible functional form that has been used most often in empirical estimation.

**CALIBRATING THE BASE CASE**

To begin the calibration process, each family group is allocated its income from labor, capital, and transfers, and tax rates are set.

The actual tax/transfer system in the United States is extremely complicated. In constructing the tax-rate schedules used here, we concentrate on the features of the tax system that we believe to be most essential. These include (1) the payroll tax, (2) the personal exemptions in the federal individual income tax, (3) the marginal tax rates on taxable income in the federal individual income tax, and (4) the Earned Income Tax Credit. In addition, we adopt a simple representation of the standard deduction and the itemized deductions in the federal individual income tax. All other taxes combined (including State-and-local income taxes) are approximated by a flat seven-percent tax on income.

The details of our specification of the 1991 U.S. tax system are given in an Appendix, which is available on request. However, we provide a few illustrative examples here. In our model, a married couple with one child will face a payroll tax of 15.3 percent on the first dollar of earnings.11 Because of the personal exemptions, this household’s marginal tax rate in the federal individual income tax is zero on the first dollar of earnings, assuming that the household has no capital income. However, the household is assumed

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10 It should be noted that we do not disaggregate on the basis of whether workers are engaged in part-time or full-time work. Currently, full-time workers are much more likely to have health insurance than are part-time workers. It is possible that the current health-insurance system creates a distortion in the labor market between part-time and full-time work. Thus, if our model were to distinguish between part-time and full-time work, our simulations would probably generate smaller efficiency losses from the adoption of universal coverage.

11 We assume that the entire payroll tax is distortionary. Consequently, we are abstracting from any perceived linkages between payroll taxes and Social Security benefits. For a discussion of such linkages, see Feldstein and Samwick (1992). If we were to assume that some portion of the payroll tax is nondistortionary, our simulated efficiency costs would probably be reduced modestly. See Ballard and Goddeeris (1996a) for additional sensitivity analysis with respect to the marginal tax rates.
to face the seven percent marginal rate for other taxes on the first dollar of earnings. In addition, the household is assumed to face a subsidy rate of 17 percent in the Earned Income Tax Credit. Consequently, the first dollar of earnings for this household is taxed at a combined marginal rate of \((15.3 + 0 + 7 - 17)\) percent = 5.3 percent.12

The highest combined marginal tax rates are faced by households whose incomes are sufficient to be in the top bracket of the federal individual income tax but still low enough to be subject to the full payroll tax. These upper-middle-income households are assumed to face a marginal tax rate on earnings of 30 percent for the federal individual income tax,13 7 percent for other taxes, 15.3 percent for the payroll tax, and zero for the Earned Income Tax Credit. Thus, the combined marginal tax rate for these households is 52.3 percent. Similar calculations are made throughout the income range for every type of household, producing a piecewise-linear budget constraint.14

For workers who are insured, employer payments for health insurance are excluded from taxable income and from earnings subject to the payroll tax. Based on data from the 1987 National Medical Expenditure Survey (NMES), we assume that, for workers who are insured, 71 percent of their health-care spending is provided through insurance and, therefore, shielded from income and payroll tax.

**Insurance Status and Health-Care Spending**

In our model, health-care consumption depends on family composition and insurance status. According to the 1987 NMES, health-care consumption per insured adult under age 65 was $1,455 (Hahn and Lefkowitz, 1992). We update this to $2,129 for 1991, using the overall change in health-care expenditures per capita over the intervening period, based on Letsch et al. (1992). Insured individuals under age 19 had health-care expenditures about 62 percent as large as those of insured adults in the 1987 NMES, and we use this factor in setting health-care expenditure for children.

A number of studies have found that the uninsured use less health care than the insured. We assume that uninsured families use 64 percent as much care as insured households of similar composition (U.S. Congressional Budget Office, 1993). Spending for families with Medicaid is assumed to be equivalent to what it would be if the family were insured.15

**Labor-Supply Behavior**

Our approach to modeling labor supply, including the treatment of two-earner families, follows Ballard (1988). We set the utility-function parameters for each family, so that the base-case simulations replicate the actual labor supply and consumption, and so that the model’s responses are consistent with target values for the labor-supply elasticities. In our central case, we assume rather modest labor-supply responses to changes in wages (see reviews of the literature in Burtless (1987), Heckman (1993), and Pencavel (1986)). In the central case, uncompensated labor-supply elasticities are −0.05 for men, 0.2 for women, and 0.1 for couples.

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12 We do not directly incorporate the deductibility of State-and-local income taxes in the federal individual income tax. Our treatment of itemized deductions is described in an Appendix, which is available on request.

13 By assuming that all high-income taxpayers face a federal marginal income tax rate of 30 percent, we abstract from the fact that the actual 1991 tax code had separate rates of 28 percent and 31 percent for different groups of high-income taxpayers, and we also abstract from the “bubble” associated with the phasing out of the tax benefit from the personal exemptions.

14 The tax rates discussed in this section are expressed as percentages of earnings exclusive of the employer’s share of the payroll tax. Because the employer’s share is part of the pretax price of labor, marginal tax rates would be somewhat lower if they were expressed as a percentage of gross-of-tax earnings.
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The total-income elasticities of labor supply are -0.15 for all groups. We also perform a number of sensitivity analyses with respect to the labor-supply elasticities.

Substitution in Production

The cost function for the translog is

\[ \ln \frac{C}{Y} = \sum_{i=1}^{n} \alpha_i \ln w_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \beta_{ij} \ln w_i \ln w_j \]

where \( C \) is cost, \( Y \) is output, the \( w \)'s are the input prices, and \( \alpha \) and \( \beta \)'s are parameters. By assuming constant returns to scale, symmetry, and homogeneity, we can solve for the \( \alpha \)'s and \( \beta \)'s that are consistent with the production data, as well as with the desired combination of Allen partial elasticities of substitution.\(^{15}\)

A well-behaved production function has convex isoquants, but the translog function does not satisfy this restriction globally (Berndt and Christensen, 1973). Whether we have convexity depends on the signs of the determinants of a bordered Hessian matrix. Convexity is satisfied in all equilibria reported here.

An econometric literature has explored three-factor production schemes similar to ours (see Hamermesh (1986) for a thorough review). In much of that literature, capital and high-skill labor have been found to be more substitutable for low-skill labor than for each other. For our central-case values for the Allen partial elasticities of substitution, we use \( \sigma_{hk} = 0.4, \sigma_{hl} = 1.2, \) and \( \sigma_{lk} = 0.8, \) where \( h \) denotes high-skill labor, \( l \) is low-skill labor, and \( k \) is capital.

Model Closure: Government Budget Balance

Output is divided among health care, goods other than health care (\( G \)), and exhaustive government expenditure. To assure that aggregate demand equals output, we calibrate the model so that exhaustive government expenditure equals total tax revenue minus other government spending. Other government spending is for transfer payments, Medicaid, and the health-care expenditures of the uninsured that are not paid for by the uninsured themselves.

SIMULATION EXPERIMENTS

Once the model has been calibrated, we proceed to the simulations. Regardless of whether we are simulating a fully-tax-financed plan or a mandate-with-tax-credit plan, we impose universal health-care coverage in the same way: The level of health coverage is no longer a choice for nonelderly families. We leave health coverage for the formerly insured (and for those with Medicaid) the same as it was in the base case, and bring the level of coverage for the formerly uninsured up to that of insured families of similar size and composition. For the formerly uninsured, the value of \( Z \) in equation 2 is increased by their value of \( V \), to reflect the utility gain they receive from improved health coverage.

Under our approach to modeling universal coverage, we assume away possible effects (in either direction) on efficiency in the delivery of care, such as the potential for administrative cost savings, the potential for greater central control of aggregate expenditures, and the possibility of greater nonprice rationing. These are certainly important considerations in the choice among health-care financing systems. We abstract from these other issues in order to focus on the distributional issues and tax-related efficiency effects.

Full Tax Finance

In our experiments with a fully-tax-financed system of health insurance, families do not have to make direct pay-
ments for insurance coverage. Instead, we increase the income tax rates for all families by an amount that is sufficient to finance all health care through government. Specifically, we add the same number of percentage points to all of the income tax rates facing each of the consumer groups in the model. This added tax is treated as a flat-rate tax on all adjusted gross income. Therefore, the added tax leads to equal increases in average and marginal tax rates.

Figure 1 shows a stylized version of the budget constraint associated with the full-tax-finance plan. In the figure, AB is the original budget constraint. (For the sake of simplicity, Figure 1 is drawn as if the base case had no government programs. Thus, the figure abstracts from the many nonlinearities in our model, such as the Earned Income Tax Credit and the graduated marginal tax rates in the individual income tax.) OB is the consumer's total endowment of time. For the full-tax-finance plan, the budget constraint is given by CDB. DB is the government grant of health insurance. The slope of CD is less than the slope of AB because of the taxes that must be raised in order to finance the

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*Figure 1. The Household's Budget Constraint Under Full Tax Finance and Under the Mandate-With-Tax-Credit Plan*

---

34 Consumption taxes, such as a new value-added tax, have sometimes been suggested as a source of finance for a universal health-care system. Consumption taxation raises dynamic efficiency issues that are not captured well in a static model such as ours. However, using a broad-based consumption tax would distort labor supply in much the same way as would an increase in labor taxes.
Financing Universal Health Care in the United States

program. This budget constraint is similar to the budget constraint for a simple negative-income-tax plan. This type of plan will distort the decisions of all households, regardless of whether they were purchasing insurance before the policy change.

A Mandate with Income-Related Tax Credits

In our experiments with mandate-with-credit plans, health-insurance coverage is mandatory, and low-income families are given assistance to pay for it. This assistance comes in the form of refundable tax credits. If a family’s income, exclusive of transfers, is below the poverty line for 1991, the tax credit is equal to the full cost of coverage. If a family’s income is above the poverty level, the net amount of the tax credit is reduced. Under our central-case assumptions, the marginal tax rates are increased in the income range between one and two times the poverty level, so that the tax credits are phased out at incomes of twice the poverty level. We also explore variation in the income range over which the credit is phased out.

Figure 1 also shows a stylized version of the budget constraint for the mandate-with-credit plan. As before, the household’s budget constraint in the absence of the program is AB, and the government’s grant of health-insurance coverage is DB. When the mandate-with-credit plan is instituted, the consumer’s budget constraint is AEDB. The budget segment ED is less steep than the segment CD, because the phaseout of the credit involves very substantial increases in marginal tax rates.

The mandate-with-tax-credit approach usually requires some additional net public revenues to finance coverage for those formerly uninsured families who receive insurance in the move to universal coverage, as well as for any formerly insured families who stop working when the policy change is instituted. In order to raise the needed revenue in our model, we increase the marginal and average income tax rates on all families by the same number of percentage points. However, the amount of extra revenue that must be raised is much smaller under the mandate-with-credit plan than under full tax finance. In most cases, the budget constraint for the mandate-with-credit plan would be very slightly below AE because of the additional taxes that are necessary to finance the program. However, we have not shown separately the actual budget segment to the left of point E for the mandate-with-credit plan, because it is extremely close to the base-case budget segment, AE. For example, in the simulation using our central-case parameters, the general increase in tax rates is only 0.12 percentage points.

Under the mandate plan, the government requires that everyone get insurance, but subsidizes it for those at low incomes. Some households maximize utility by locating in the subsidized range, along the budget segment ED. The decisions of these households will clearly be distorted by the mandate-with-credit plan. However, many households will locate along the budget segment AE. These households will purchase private health insurance (as most of them already do), but they will not use the government subsidy. For households with incomes that are above the end of the phaseout, and which already had private health insurance before the mandate, the policy change does not create any new tax distortion at the margin, except for the very small increase in the overall level of taxation, as mentioned in the previous paragraph.

For either method of finance, we eliminate the tax-exempt status of employer-provided health insurance, and this broadening of the tax base creates another source of revenue for financing coverage.

Under either method of finance, family budget constraints are nonlinear. In the
base case, utility functions are calibrated so that all families with earnings are at interior optima, given their actual labor supplies and levels of nonlabor income and the implied marginal tax rates. In the revised-case simulations, however, utility may be maximized at a level of labor supply at which the marginal tax rate changes. Our simulations incorporate such “kink-point” optima.

RESULTS

Efficiency Effects

Table 3 focuses on the efficiency costs of a move to universal coverage. We use the equivalent variation (EV) to measure the change in well-being for each family group. The EV measures the dollar adjustment in lump-sum income, measured in base-case prices, that is necessary to move a family from the base-case level of utility to the level of utility that is obtained after the policy change. If the EV is positive, the family group is better off after the change, and conversely. Aggregate measures of efficiency cost are simply the negative of the sum of the EVs across family groups.

We also calculate the “Efficiency Cost of Redistribution” (ECR). The ECR is analogous to the MECR of Ballard (1988) for the nonmarginal changes represented by our policy experiments. The ECR takes the form:

\[ ECR = 100 \times \left( \frac{-\sum EV_{losers}}{\sum EV_{gainers}} - 1 \right) \]

| TABLE 3 | EFFICIENCY COSTS OF REPLACING THE CURRENT HEALTH-INSURANCE SYSTEM WITH FULL UNIVERSAL COVERAGE, FOR DIFFERENT LABOR SUPPLY ELASTICITIES |
|-----------------|-----------------|-----------------|-----------------|-----------------|
|                  | (1)             | (2)             | (3)             | (4)             |
| Tax rate increase | 7.5             | 6.5             | 7.7             | 7.8             |
| (Percentage points) |                 |                 |                 |                 |
| Efficiency cost   | $27.0           | $-14.9          | $34.6           | $39.3           |
| ($ billions)      |                 |                 |                 |                 |
| ECR               | 27.5 percent    | -14.1 percent   | 35.7 percent    | 41.3 percent    |
| Labor supply effects: |                 |                 |                 |                 |
| Insured           | 97.5            | 100.0           | 97.0            | 96.8            |
| Uninsured         | 94.0            | 100.0           | 92.1            | 94.1            |
| Mandate with Tax Credit, Phased Out at Twice Poverty Level |
| Tax rate increase | 0.12            | -0.61           | 0.17            | 0.31            |
| (Percentage points) |                 |                 |                 |                 |
| Efficiency cost   | $10.6           | $-14.9          | $11.3           | $17.4           |
| ($ billions)      |                 |                 |                 |                 |
| ECR               | 17.1 percent    | 24.3 percent    | 17.9 percent    | 27.6 percent    |
| Labor supply effects: |                 |                 |                 |                 |
| Insured           | 99.0            | 100.0           | 99.0            | 98.7            |
| Uninsured         | 90.5            | 99.9            | 88.3            | 90.1            |

(1) Central case: income elasticity for all groups = -0.15; uncompensated elasticities: men = -0.05, women = 0.2, and couples = 0.1.
(2) Uncompensated wage elasticities = 0.0; income elasticities = -0.001.
(3) Central case with income elasticities = -0.2, instead of -0.15.
(4) Central case with uncompensated wage elasticities increased by 0.05; income elasticities remain at -0.15.
Labor supply is reported as a percentage of base-case labor supply.
where the sums are over the family groups that lose and gain in the experiment being analyzed, and multiplication by 100 converts the expression to a percentage. The ECR gives a summary measure of the percent of a dollar that is lost to deadweight loss per dollar of gain to the beneficiaries.

Table 3 presents results for each of the two financing mechanisms, for several sets of assumptions. Column (1) of Table 3 involves our standard assumptions about labor supply (noted at the bottom of the table). Tax rates rise by 0.12 percentage points for the mandate with tax credit versus 7.5 percentage points for full tax finance. Under the mandate, most families choose to pay for their own health care outside the tax system, and the only reason to increase tax rates is to finance subsidies for the poor. On the other hand, under the full-tax-finance approach, all health care is financed with taxes.

Under our central-case assumptions, both methods of finance lead to efficiency losses. In other words, costs are created by the increase in labor-supply distortions, and these costs are greater than the aggregate gains from expanding health-care coverage. In absolute terms, the annual efficiency costs are $10.6 billion (in 1991 dollars) for the mandate plan, or slightly less than one-quarter of one percent of total net output. For full tax finance, the efficiency costs are $27 billion, or about three-fifths of one percent of total net output. Viewed another way, the efficiency costs are in the range of 2.8 to 7.0 percent of health-care spending by the nonelderly in the base case. These costs cannot be considered small. On the other hand, the ECR numbers are smaller than the MECRs reported by Ballard (1988). This is due in part to our use of somewhat smaller labor-supply elasticities than were used by Ballard.

The efficiency costs are a good deal higher for full tax finance than for the mandate with credit. In fact, it may seem surprising that the mandate approach does not do even better than it does, in view of the modest increases in overall marginal tax rates that accompany it. However, we must recognize that this approach increases the effective marginal tax rates very substantially for those families who are in the income range in which the tax credit phases out. For the central-case version of the mandate, with the phaseout complete at twice poverty income, about 15.7 percent of working families end up in the phaseout range. The phaseout itself adds between 20 and 38 percentage points to their marginal tax rates (with a median of 34 points). An additional 2.6 percent of working families choose to stop working at the point at which the phaseout begins.

Still, the overall efficiency cost of the mandate-with-credit plan is substantially lower than that of full tax finance. The mandate-with-credit plan does impose very large increases in marginal tax rates on nearly one-sixth of working families. However, for the other five-sixths, full tax finance requires tax-rate increases that are about 60 times as large as those that are necessary for the mandate-with-credit plan.

The labor-supply results in Table 3 are also of interest. In the full-tax-finance case, the percentage reductions in labor supply are larger for the previously uninsured than for the insured, even though the labor-supply elasticities are not assumed to vary by income or by insurance coverage. The reason is that the policy change being evaluated has two types of income effect, which work in opposite directions and which vary in relative importance across the income distribution. The tax increase has the usual adverse effect on income, which tends to increase labor supply, and largely offsets the substitution effect for those at higher incomes. However, the guarantee of health coverage effectively increases income, and this discourages labor supply. The latter effect is
relatively important at the lower end of the income distribution, where the uninsured are concentrated.

Comparing the two methods of finance in column (1), the mandate with tax credit leads to a smaller labor-supply response by those who were previously insured and a larger one by those who were previously uninsured. This is as expected, given that many of the formerly insured (those beyond the phaseout of the tax credit) face only a small—and uncompensated—increase in tax rates under the mandate. On the other hand, many of the formerly uninsured face very large marginal rate increases, which are largely compensated by the improvement in their health coverage.

We have also experimented with phasing out the tax credit over a broader range of income. If we do so, the add-on to the marginal tax rate is reduced for those with partial tax credits, but the number of families subject to the phaseout is increased. Because the aggregate subsidy for health care is increased, the required tax rate is somewhat higher as well. With this combination of effects moving in different directions, it turns out that the aggregate efficiency costs do not vary much, even when the phaseout range is expanded considerably. For example, if the phaseout range is doubled, so that tax credits are fully phased out at three times the poverty level, the efficiency cost increases only from $10.6 to $11.9 billion. In that case, about 31 percent of working families face marginal tax rate increases of between 11 and 24 percentage points due to the phaseout, and 0.7 percentage points are added to all marginal tax rates (see Sheiner (1994) for additional discussion of efficiency considerations in the choice of a phaseout range).

The other columns of Table 3 explore the relationship between the efficiency results and labor-supply elasticities. Column (2) of Table 3 shows what happens if all elasticities are close to zero. Uncompensated wage elasticities are all set to zero, and income elasticities to −0.001. In this case, the EC becomes negative, i.e., the model implies welfare gains from the move to universal coverage. This result is explained as follows: In our model, the provision of health insurance to the uninsured increases their welfare by more than the resource cost of the extra health care that they receive. When labor supply is almost completely unresponsive, the tax-induced welfare losses are much smaller than they would be under more plausible labor-supply elasticities. Therefore, in this case, the tax-induced welfare losses are outweighed by the welfare gain from moving to universal coverage. In addition, in the mandate case, a small tax-rate reduction is possible, despite the increase in insurance coverage for the uninsured. This is because of the end of the tax subsidy for insurance and because some formerly uninsured families now pay for more of their own health care.

Columns (3) and (4) of Table 3 show the results for cases in which the labor-supply elasticities vary modestly from our central case. In column (3), income elasticities are all set at −0.2, instead of −0.15 as in the central case. This increases the compensated wage elasticities by 0.05, without changing the uncompensated elasticities. In column (4), the compensated and uncompensated wage elasticities are both increased by 0.05, leaving the income elasticities unchanged. Not surprisingly, if labor-supply responsiveness is increased in either of these ways, the efficiency costs of universal coverage are higher than in the central case. As for the

17 Our utility function has strictly convex indifference curves between consumption and leisure, so that the compensated wage elasticities cannot be exactly zero.

18 This leads to the question of why these families did not choose to be insured in the base case. The answer is that the safety net is subsidized to such an extent that the extra cost (to the family) of becoming insured exceeds the extra value.
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labor-supply responses, they are larger for the insured in column (3) and for the uninsured in column (4). As these results highlight, the policy changes being evaluated are neither purely compensated nor purely uncompensated changes, so that both types of elasticity matter. In addition, the income effect of gaining coverage is particularly important for the low-income uninsured, which is why their response is largest in column (3). For further discussion of these results, see Ballard and Goddeeris (1996a).

**Distributional Effects**

Tables 4 and 5 provide some illustrative distributional results using our central-case assumptions. The tables report the welfare gains or losses as average dollar amounts per family (in 1991 dollars) and as average shares of base-case money income. While the precise numerical values should be interpreted with caution, we believe that the general patterns shown in the tables are meaningful.

Table 4 presents the results for the case of full tax finance. The leftmost columns show that, on average, the reform leads to substantial gains for the families in the lowest deciles, as a result of improved health-care coverage and reduced out-of-pocket payments. In contrast, those in the top two deciles have very significant net losses. The loss is as much as 4.2 percent of base income for the average family in the top decile.

Because different demographic groups are affected in different ways, the other columns of Table 4 display some illustrative effects for different groups. As expected, low-income nonelderly families gain and high-income nonelderly families lose. However, the pattern is rather different between one-person families and multiple-person families. Losses are suffered by one-person families as low as the sixth decile (which has a lower income limit of $28,500), while married-couple families gain through the eighth decile and single-parent families through the seventh. This happens largely because the dollar value of health-care coverage is lower for the singles, but they are assumed to pay the same additional taxes that are paid by other families with similar incomes. All of the elderly lose, because they pay higher taxes without receiving any increase in health coverage.

In Table 5, we consider the mandate with tax credit, with the phaseout range equal to poverty income. As compared with Table 4, the results are very similar for the nonelderly in the bottom decile. In deciles 2 and 3, however, the nonelderly do somewhat better under the mandate than with full tax finance. They receive the same health care in both cases but pay less for it in the mandate case. The mandate with tax credit is also much better than full tax finance for those at high incomes, as well as for all elderly, because of the smaller increase in the overall level of tax rates. To take an extreme example, Table 5 shows that nonelderly single persons in the tenth decile lose by only $928 in the mandate case, compared with losses of over $7,300 when full tax finance is used.

However, for those nonelderly persons who are affected by the phaseout of the tax credit, the welfare changes are worse in the mandate case than with full tax finance. This effect is most evident for married-couple families in the fifth through seventh deciles. In each of those deciles, the loss per family between Tables 4 and 5 is six percent or more of base-case income. Nonelderly single individuals in the fourth and fifth deciles also do considerably worse under the mandate, as do single-parent families in the fifth through seventh deciles.

Distributional results for a variety of other simulation experiments are available on request.

45
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<th>Decile</th>
<th>All Families</th>
<th>Nonelderly Singles</th>
<th>Nonelderly Couples</th>
<th>Single Parents</th>
<th>All Elderly</th>
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Average: -220, 8.8% for All Families, 13, 17.5% for Nonelderly Singles, -14, 5.4% for Nonelderly Couples, 1,034, 12.0% for Single Parents, -1,577, -3.6% for All Elderly.

Welfare gains are measured by equivalent variations in 1991 dollars and are averages within income classes. Money income is for the base case.
<table>
<thead>
<tr>
<th>Decile</th>
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<th>Nonelderly Singles</th>
<th>Nonelderly Couples</th>
<th>Single Parents</th>
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Average: -86 8.8 268 18.0 -635 3.2 616 11.3 -97 -0.2

Welfare gains are measured by equivalent variations in 1991 dollars and are averages within income classes. Money income is for the base case.
ADDITIONAL SENSITIVITY ANALYSES

Labor Supply of Medicaid Recipients

Until now, we have not incorporated one effect that deals with the labor supply of those currently covered by Medicaid. A nonworking Medicaid recipient may lose health-insurance coverage if he obtains a job that does not provide coverage. It is plausible that the potential loss of Medicaid coverage already creates a strong work disincentive and that some current Medicaid recipients would choose to work under a system of universal coverage. Research by Moffitt and Wolfe (1993) suggests that a system of universal coverage comparable to Medicaid might lead to as many as 915,000 Aid to Families with Dependent Children families leaving the welfare rolls.

In order to capture an effect of this type, we calibrate the utility functions for some of our Medicaid families, so that the equivalent variation from choosing Medicaid (rather than working) is ten percent of base-case income. As a result, it is optimal for these families to choose Medicaid in the base case if working would cause them to lose coverage. These families choose to work in the revised-case simulations, because their coverage is then guaranteed. We adjust the model in this way for 40 percent of our Medicaid families with one or two children and for 30 percent of those families with more than two children. When these assumptions are incorporated into the model, they have effects that are roughly consistent with the results of Moffitt and Wolfe (1993): Our simulations indicate that about 941,000 Medicaid recipients would join the workforce.

Compared with the central-case version of the model, this version results in a higher level of labor supply for the formerly uninsured (which here includes the Medicaid families) and a lower efficiency cost. The efficiency cost of universal coverage decreases by about $1.3 billion under either financing mechanism. In light of the paucity of evidence on the size of this positive labor-supply response, as well as the somewhat arbitrary assumptions needed to adapt the Moffitt–Wolfe results to our model, these results should only be viewed as indicating a rough order of magnitude. They suggest that the gains from improved work incentives for those on Medicaid may be appreciable, but that they are not likely to outweigh the distortions created elsewhere by the financing of universal coverage.19

Substitution between Capital and High-Skill Labor

General-equilibrium price effects in our model are usually rather modest. In the central case with full tax finance, the aggregate reduction in labor supply leads to a fall in the price of capital (relative to either labor type) of almost three percent. Under the mandate with tax credit, the aggregate labor supply reduction is smaller, but it is larger for low-skill labor. Consequently, the price of low-skill labor increases by about two percent, relative to capital and high-skill labor. We have experimented with changing the Allen partial elasticity of substitution between

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19 The distortion of the labor-supply decisions of Medicaid recipients is not the only labor-market distortion that could have an effect on our results. For example, some have suggested that the current system inefficiently inhibits job switching for those with employer-provided coverage (Madrian, 1994) and that universal coverage would eliminate this "job-lock" effect. However, the magnitude of this effect and its efficiency consequences are unclear (Holz-Eakin, 1994). Also, the Health Insurance Portability and Accountability Act of 1996 should have lessened the importance of job lock. Another potentially important labor-market effect is on retirement decisions. Gustman and Steinmeier (1994), Gruber and Madrian (1995), and Karoly and Rogowski (1994) all find that the availability of health insurance is associated with early retirement. Induced retirement would reduce the income tax base and thereby make larger tax increases necessary. Incorporation of these effects would be a valuable goal for future research.
capital and high-skill labor from 0.4 to -0.2, in order to capture "capital-skill complementarity," which is sometimes found in the econometric literature. The change has relatively little effect on the results, especially in the mandate case. When full labor tax finance is used, this change leads to a further reduction in the price of capital, and the aggregate efficiency cost falls by about $1 billion when compared with the central-case simulation.

Valuation of Insurance

In the central case, the valuation of insurance by the uninsured is taken directly from the probit estimates. We have seen that, under this formulation, the value placed on health insurance is greater than the resource cost of providing it. This fact plays an important role in explaining some of the efficiency results, as seen above. An alternative is to assume that the value of insurance for the uninsured is exactly equal to the resource cost of the extra care that they can expect to consume. Not surprisingly, this change causes the aggregate efficiency cost to increase substantially for either financing approach. The aggregate efficiency cost goes from $27.0 to $35.7 billion with full tax finance and from $10.6 to $19.3 billion under the mandate with tax credit. This change in the model has very little effect on the labor supply of the formerly insured. However, the labor supply of the formerly uninsured is higher when the value of insurance is assumed to be lower, because the move to universal coverage does not create such a large income effect. Further results are available on request.

CONCLUSIONS

Using a computational general equilibrium model of the U.S. economy and tax system, we have studied the efficiency and distributional effects of financing universal health-insurance coverage. Our results suggest that the efficiency costs associated with the distortion of labor markets are likely to be substantial, even if labor supply is only modestly elastic. For our central-case parameter values, if we replace the existing health-insurance system with a fully tax-financed plan of universal coverage, we require an increase in tax rates of 7.5 percentage points. The resulting efficiency losses amount to 0.59 percent of NNP. If we replace the existing system with mandated coverage, combined with tax credits for families with incomes less than twice the poverty level, we need an extra increase in tax rates of 0.12 percentage points, and we find efficiency losses of 0.23 percent of NNP. Because of the size of these efficiency losses, we might expect strong pressures to reduce other government expenditures, so that the move to universal health-insurance coverage would not ultimately be associated with such large tax increases.

In any case, the relative efficiency costs of different financing mechanisms are one factor that should be weighed in choosing among them. One of the interesting features of our results is the apparent superiority (on efficiency grounds) of the mandate with tax credit, as compared with full tax finance. Our results also suggest that a slow phaseout of the tax credit (so that families with income as high as three times the poverty level receive a partial credit) would have efficiency costs close to those for a more rapid phaseout.

Our results also show that the financing approach used can have important implications for the distribution of the costs and benefits of health-care reform. Both full tax finance and a mandate-with-tax-credit plan create gains for the poorest members of society. However, for the highest income groups, full tax finance leads to losses that are sometimes several times as large as the losses that they suffer under the mandate with tax credit. On the other hand, the lower-middle-income
groups fare much more poorly under the mandate with tax credit. Some of these groups suffer losses under that approach, while experiencing gains if full tax finance is used.

In our simulations, the elderly are assumed not to receive any additional health insurance, but they are assumed to bear some of the costs. Thus, the elderly lose in all of our simulations. However, their losses are much smaller under the mandate approach than with full tax finance.

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