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11 Household Wealth and Health Insurance as Protection against Medical Risks

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11.1 Introduction

Accidents, major illnesses, and other health disasters can reduce to penury people who have been economically productive all of their lives. Even the cost of relatively common illnesses can create serious problems for a family's budget. The most obvious response to the risks and uncertainties posed by the threat of poor health or other calamities is to purchase insurance. But insurance is not the only means by which individuals in an uncertain world can protect themselves against an unacceptable reduction in their future standard of living. Savings and wealth are also protection against such risks.

Precautionary savings and insurance can be viewed as alternative components in a portfolio of assets that provide for a household's future (Mayers and Smith 1983). Savings, if there is some asset that offers a safe rate of return, guarantee an improved standard of living in all future circumstances. Insurance, by contrast, is a contingent asset that provides additional wealth only in the event of misfortune. In this chapter we develop a theory of household behavior that describes the choice between health insurance and wealth as protection against the uncertainty of medical expenses, and we show that the tax subsidy associated with the current ex-

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clusion of employer-paid insurance benefits from an employee's taxable income alters the choice in favor of insurance. Before making empirical estimates of this model we review the distribution of wealth and patterns of insurance coverage in the United States as described in our data source. We then analyze household insurance purchases and household wealth, testing in particular for evidence of substitution between the two. The final section discusses the implications of our findings.

11.2 Theoretical Model of Household Savings and Insurance

A simple, two-period model can be used to describe the relationship between a household's savings and its insurance purchases. The model calls attention to precautionary motives for saving by assuming that a household decides on its savings and insurance in the first period while confronting the risk of an uncertain loss in the second period. Either type of expenditure ensures a higher level of expected consumption in the future. The model assumes that precautionary savings can be invested in a safe asset that offers a certain rate of return. It also incorporates a life-cycle perspective on saving, by assuming that all of a household's income (except for interest) is earned in the first period.

Consumption in the second period is consequently uncertain. It can be described by the following expression:

$$C_2 = S(1 + (1 - t)r) - iL. \tag{1}$$

S is the household's savings in the first period, r is the rate of interest, t is the tax rate on income, i is the coinsurance rate chosen by the household in the first period, and L is a random variable denoting its insured loss. Viewed as a model of health insurance purchases, L represents the household's medical expenses and i is the share of its medical expenses that its policy requires it to pay. For a fully insured household, $i = 0$.

Health insurance is generally purchased through employers who often pay all or part of the premium. The income earned by a household in the first period (Y) consequently consists of two types of compensation—wages (W) and health insurance benefits (equal to eP, if P is the total premium for the household's health insurance and e is the share paid by employers).

$$Y = W + eP. \tag{2}$$

Unlike the wages paid to an employee, employer-paid health insurance premiums are not subject to income or Social Security taxes. Consumption in the first period is therefore equal to the difference between the household's disposable income from wages and whatever it chooses to allocate to savings and its own share of insurance expenditures.

$$C_1 = (1 - t)W - S - (1 - e)P. \tag{3}$$

Substituting for W from equation (2) and rearranging terms,

$$C_1 = (1 - t)Y - S - (1 - et)P. \tag{4}$$

The last term in this expression, $(1 - et)P$, is the implicit cost of health insurance to the household, taking into account the tax exclusion for health insurance benefits and assuming that Y is fixed, with the incidence of the subsidy falling entirely on the household. Health insurance premiums are implicitly subsidized at a rate equal to et.

To finish specifying the relationship in the first period between consumption and expenditures on insurance, it is necessary to describe the relationship between the household's insurance premiums and the quantity of insurance it buys as measured by i. Assume that premiums are set in proportion to expected benefit payments,

$$\begin{aligned} P &= (1 + f)E[(1 - i)L] = (1 + f)(1 - i)E[L] \\ &= (1 + f)(1 - i)\bar{L}, \end{aligned} \tag{5}$$

where $E[\ ]$ is the expectation operator and $\bar{L} = E[L]$. The "loading fee," f, reflects the administrative and selling costs associated with insurance and insurance company profits. If $f=0$, then premiums are actuarially fair. For the purposes of this analysis, the acknowledged effect of health insurance on health expenditures is usefully ignored; L is not treated as a function of i. (See Arrow 1976, Phelps 1973, or Feldstein and Friedman 1977 for models that take this effect into account).

Finally, the household is assumed to maximize the expected utility of its consumption in the two periods, where

$$u[C_1, C_2] = u[C_1] + \frac{1}{1 + d}\, u\,[C_2]. \tag{6}$$

It chooses S and i to maximize $U = E[u[C_1,C_2]]$, defining two first-order conditions:

$$U_s = -u_1' + \frac{1 + (1 - t)r}{1 + d} E[u_2'] \leq 0; \tag{7}$$

$$U_i = u_1'(1 - et)(1 + f)\bar{L} - E[u_2' L] \leq 0. \tag{8}$$

In the notation employed here, the subscripts of the utility function denote the period.

At an interior solution, the first of these two equations imposes a condition similar to one that is familiar from models without uncertainty:

$$\frac{u_1'}{E[u_2']} = \frac{1 + (1 - t)r}{1 + d}. \tag{9}$$

The opportunity cost of an additional dollar of consumption in period one is $1 + (1 - t)r$ dollars in every state of the world in period two. An optimal savings plan consequently equates the marginal utility of a dollar in period one with the marginal utility of $1 + (1 - t)r$ dollars averaged over states of the world in period two. Subtracting 1 from both sides of equation (9) yields an expression in terms of the rate of return (measured in utility) from diverting a dollar of consumption in period two to period one.

$$(9') \qquad \frac{u_1' - E[u_2']}{E[u_2']} = \frac{1 + (1 - t)r}{1 + d} - 1.$$

This is equal to the discounted rate of return on savings. With a zero rate of time preference ($d = 0$) and no taxes ($t = 0$), this rate of return is the interest rate, r.

The intuition of equation (8) is more apparent after substituting for u_1' from equation (7), dividing by $E[u_2']\bar{L}$, and subtracting 1 from both sides of the equation. This yields an equation similar to equation (9').

$$(10) \qquad \frac{E[u_2'L] - E[u_2']\bar{L}}{E[u_2']L} = \frac{1 + (1 - t)r}{1 + d}(1 - et)(1 + f) - 1.$$

If premiums were actuarially fair ($f = 0$), then the denominator on the left side of equation (10) would represent the marginal cost of insurance in terms of period-two utility. That is to say, to buy a marginal increase in i would require a certain reduction in consumption in every state of the world in period two that was proportional to $\bar{L}$. The numerator of equation (10) is the expected gain in utility from spending the money on insurance rather than keeping it. The left side of equation (10) can consequently be viewed as the rate of return on insurance bought at actuarially fair rates. As in equation (9'), this rate of return is measured in expected period-two utility. Note that if the implicit subsidy were zero ($et = 0$) and premiums were actuarially fair ($f = 0$), the rate of return on insurance would equal the rate of return on first-period consumption. Without taxes and with a zero rate of time preference, this rate of return is the interest rate, r. With the tax subsidy, the rate of return on insurance is driven below the rate of interest and the rate of return on consumption.

In a single-period model of the demand for health insurance, complete insurance is optimal if it is available at actuarially fair rates (no loading fee) and does not alter expected losses (no moral hazard) (Arrow 1963; Pauly 1980). However, by calling attention to saving as an alternative to insurance, this model calls attention to another cost associated with insurance that must be ruled out if complete insurance is to be optimal, namely the opportunity cost of foregone interest. Equation (10) demonstrates that, in the absence of a tax subsidy, it is not optimal for a household to insure its medical expenses completely when the loading fee is zero, if the rate of return on precautionary savings is positive.

To see that complete insurance is not optimal, note that the numerator of the left-hand side of equation (10) is simply the covariance between L and the marginal utility of income in period two, $\text{cov}[u_2', L]$. Letting $f = 0$, equation (10) can be written as

$$\frac{\text{cov}[u_2', L]}{E[u_2']\bar{L}} = \frac{1 + (1 - t)r}{1 + d}(1 - et) - 1. \tag{11}$$

Complete insurance necessarily leads to a contradiction with this condition. Suppose that a household did fully insure. Then u_2' would not be a random variable and $\text{cov}[u_2', L]$ would be zero. However, without the subsidy ($et = 0$), the right side of equation (11) is the discounted rate of return on savings. Consequently, if the rate of return on savings is greater than zero, then the left-hand side cannot be zero. Some degree of risk, as measured by $\text{cov}[u_c^2, L] > 0$, remains. By contrast, with an implicit subsidy that is relatively large in relation to the rate of return on savings and offsets the opportunity cost of the foregone interest, it is indeed possible for the equality to hold when the left-hand side of equation (11) is zero. The subsidy may, in other words, make complete insurance optimal. Also, if insurance companies discount premiums in recognition of the time that elapses before benefits are paid, implicitly paying consumers the interest that they could have earned by saving, then all costs of insurance are eliminated and complete insurance is optimal.

We would generally expect a reduction in the relative price of insurance to lead to a substitution of insurance for savings in this model. However, the comparative statistics are ambiguous if insurance and savings are assumed to be substitutes in the sense of $U_{si} > 0$. The key consideration is the shape of the utility function and, in particular, the household's risk aversion over the range of L in the second period. Consider, for example, the effect on i and S of an exogenous increase in disposal income in the first period. In general, because of the subsequent decrease in the marginal utility of income in the first period, one would expect both savings and insurance purchases to increase. However, either type of expenditure changes the uncertain prospects confronting the household in the future and results in a higher level of expected consumption that may alter its attitudes toward risk. In particular, by assumption, an increase in savings diminishes the value of insurance and vice versa. As a consequence, additional saving could conceivably be accompanied by a cutback in insurance purchases. Or an increase in insurance coverage could make a simultaneous reduction in saving desirable.

By the same token, the income affect of an exogenous increase in the price of insurance (an increase in the loading fee, for example, or a decrease in the employer share) could conceivably result in such a significant reduction in savings and increase in risk aversion that a compensating increase in insurance purchases would result.

11.3 Empirical Model of Household Savings and Insurance

11.3.1 Data on Savings and Insurance

To investigate the empirical significance of the factors outlined in this theory of savings and insurance, we draw upon data from the 1977 National Medical Care Expenditure Survey (NMCES). NMCES provides extensive information on the benefit provisions, premiums, and financing of the health insurance held by approximately ten-thousand households that are representative of the noninstitutionalized civilian population in the United States. It also includes data on each household's 1977 federal income tax return and the specific components of its income. In conjunction with information in the survey about home ownership, we capitalize these income flows to obtain an estimate of the household's stock of wealth. Our empirical analysis focuses on wealth rather than savings.

The details of this procedure are described in the appendix at the end of this chapter. Briefly, the definition of household wealth is based on the concept of net equity; debts associated with a particular asset are deducted from its gross value. Income received as interest, dividends, rent, from nonfarm businesses (including royalties), and from estates or trusts are capitalized at different rates of return to produce an estimate of income-producing assets. Farm and home equity are derived from responses to direct questions asked in the survey. Home equity is the only non-income-producing asset that is included in the wealth estimates. The data do not permit consideration of other consumer durables that amount to about 9 percent of household wealth in the aggregate. They also exclude the cash value of life insurance and employee contributions to pensions.

Tables 11.1 and 11.2 show the resulting estimates of household wealth in the United States in 1977. The figure for mean total assets per household is \$61,499 and implies a national total of about \$4.5 trillion. According to national balance sheets (Ruggles and Ruggles 1982), household net worth in 1977 was \$5.3 trillion. This is a discrepancy of about 15 percent, much of which can be explained in terms of the exclusion of most consumer durables. Since estimates of national wealth based on household surveys tend to produce consistently lower estimates than are measured by the national aggregates (Greenwood 1983), our figures appear to be reasonable.

Moreover, these estimates are consistent with other published information. For example, homes represent 27 percent of household wealth according to the Federal Reserve's 1963 Survey of Consumer Finances (Projector and Weiss 1966) and 23 percent according to Wolff's (1980) estimates for 1969. Since the Federal Reserve's definition of wealth includes only automobiles among consumer durables and Wolff's estimates include all consumer durables, the 26 percent share of mean total assets re-

Table 11.1 **Percentage of Families with Equity in Specified Assets**

Family Characteristics	Number of Families (thousands)	All Assets	Interest Bearing	Stock	Home	Rental Property	Nonfarm Business	Farm	Estates/ Trusts
All families	73,873	79.1	52.5	15.5	58.5	8.6	9.4	4.0	2.3
Family income									
$8,000 or less	20,494	59.7	35.4	7.2	38.7	6.2	5.2	2.6	1.0
$8,001–15,000	18,583	76.0	49.0	12.6	51.4	6.5	7.4	3.9	1.8
$15,001–25,000	19,270	89.6	59.1	15.7	70.8	9.3	9.9	3.9	2.1
$25,001–50,000	12,329	94.8	68.4	27.4	78.5	11.0	13.9	5.1	4.1
Over $50,000	3,196	98.2	82.0	39.7	75.4	22.5	28.7	9.7	8.2
Age of head									
Under 35 years	23,340	65.0	44.5	8.9	37.9	3.8	7.9	2.0	1.6
35–54 years	24,462	84.0	51.5	16.1	69.3	10.0	12.4	4.6	2.9
55–64 years	11,191	88.4	59.3	21.4	69.3	9.9	11.5	6.5	2.7
65 years or older	14,880	86.3	61.7	20.6	65.0	12.8	5.5	4.3	2.2
Wealth of family									
Zero	15,424	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Less than $5,000	8,419	100.0	70.3	9.5	29.1	1.3	3.3	1.1	(0.0)*
$5,000–9,999	4,751	100.0	48.9	8.1	68.7	4.9	2.9	1.6*	0.1*
$10,000–49,999	25,444	100.0	56.0	12.2	86.6	7.9	5.5	2.7	1.5
$50,000–99,999	9,431	100.0	80.5	25.0	81.7	17.6	15.1	7.5	3.5
$100,000–199,999	5,749	100.0	79.8	44.1	75.4	19.8	33.7	13.2	8.6
$200,000–849,999	3,921	100.0	87.8	50.3	73.5	26.6	41.2	13.7	8.6
$850,000 or more	734	100.0	95.1	44.8	76.8	21.3	26.0	10.8	23.7

Source: Estimates derived from the National Medical Care Expenditure Survey, National Center for Health Services Research.

*Standard error greater than 30 percent of estimate.

Table 11.2 **Mean Total Equity per Family and Percentage Distribution**

Family Characteristics	Mean Total Equity (dollars)	Interest Bearing	Stock	Home	Rental Property	Nonfarm Business	Farm	Estates/ Trusts
All families	61,499	34.3	10.7	26.3	5.6	13.6	6.1	3.3
Family income								
$8,000 or less	17,655	21.9	5.2	47.0	5.0	8.5	10.5	1.8
$8,001–15,000	31,721	28.6	9.0	37.5	3.4	9.8	8.9	2.9
$15,001–25,000	47,237	24.4	10.7	40.1	4.2	12.0	5.8	2.8
$25,000–50,000	95,309	33.1	10.7	28.1	3.0	16.3	5.5	3.3
Over $50,000	471,307	46.4	12.8	7.3	9.4	15.3	4.7*	4.2
Age of head								
Under 35 years	27,347	38.0	2.7	24.2	6.0	19.8	6.2	3.1
35–54 years	75,504	27.9	9.2	27.8	8.1	17.3	5.3	4.4*
55–64 years	87,948	32.7	13.6	26.1	3.0	12.8	8.4	3.5
65 years or older	72,156	44.7	15.5	25.2	3.3	4.4	5.4	1.5
Wealth of family								
$1–$4,999	1,829	48.7	5.0	40.6	1.3	2.6	1.8*	(0.0)*
$5,000–9,999	7,313	28.2	2.4	62.7	3.0	2.1*	1.5	0.1*
$10,000–49,999	26,731	17.5	2.5	71.2	3.0	2.7	2.2	0.9
$50,000–99,999	70,220	25.5	4.2	45.9	6.3	9.9	6.3	1.8
$100,000–199,999	141,371	26.0	13.3	24.6	3.7	19.7	8.9	3.8
$200,000–849,999	373,859	31.8	14.9	10.5	9.7	23.3	6.8	3.1
$850,000 or more	1,187,536	66.0	13.2	3.0	2.1*	3.7*	5.6*	6.5*

Source: Estimates derived from the National Medical Care Expenditure Survey, National Center for Health Services Research.
*Standard error greater than 30 percent of estimate.

presented by mean home equity in table 11.2 is consistent with both estimates. Farms, nonfarm businesses, and rental property represent 6 percent, 14 percent, and 6 percent respectively of household wealth according to table 11.2. The Federal Reserve reports farms and nonfarm businesses as 18 percent of household wealth; Lebergott (1976), who includes all consumer durables in his wealth definition, estimates that they are 14 percent of household wealth; and Wolff puts the figure for farms, businesses, and investment real estate at 25 percent.

The data shown in tables 11.1 and 11.2 on family wealth by age are broadly consistent with life-cycle considerations. The positive relationship between income and wealth is also apparent. The probability of having a particular asset and mean equity per family increases with the age of the head up to sixty-four, and then roughly levels off or declines as families dissave in their retirement. Interest-bearing assets, the type most commonly held by families with little wealth, vary least with the age of the head. The sharpest contrasts with respect to age occur between the youngest group and those thirty-five to fifty-four. Except for interest-bearing assets, the latter age group is about twice as likely to have any particular type of wealth as the youngest group. Its average holdings exceed the youngest group's by an even greater factor.

The estimates of the number of families by wealth category that are shown in table 11.1 describe the distribution of wealth in the United States in 1977. Five thousand dollars corresponds approximately to the thirtieth percentile; $10,000 is the median. The additional categories starting at $50,000 that are shown in table 11.1 begin approximately at the seventy-fifth, ninetieth, ninety-fifth, and ninety-ninth percentiles. Also, estimates of the concentration of wealth can be derived by calculating each group's total assets from the number of families in the category and the mean per family shown in table 11.2. Such a calculation suggests that 1 percent of the families in the United States have about 20 percent of household assets and 5 percent of the families hold about 50 percent of the assets.

Table 11.3 shows the relationship between the depth or type of health insurance coverage and assets. Our expectation is that families with considerable assets, particularly financial assets that are more liquid and are most likely to be held as precautionary balances, are likely to have less comprehensive insurance coverage and vice versa. However, in making these comparisons it must be remembered that the self-employed are less likely to have group coverage and will generally have less comprehensive benefits. Yet they are by definition major holders of business assets included in household wealth. The first rows in table 11.3 show the relationship between family wealth and group versus nongroup enrollment. Nongroup enrollees have more total wealth than those with group insurance. However, the difference is concentrated almost entirely in the "other" category, which is dominated by business and farm property. In particu-

Table 11.3 **Average Wealth in 1977 of Privately Insured and Uninsured Families with Heads under Sixty-five, by Insurance Benefits**

	All Assets	Financial[a]	Home	Other[b]
All families[c]	$ 62,776	$25,472	$16,904	$20,400
Type of coverage				
Group	59,711	26,083	17,650	15,978
Nongroup	105,415	28,903	19,278	57,233
No private insurance	43,140	15,140*	6,472	21,528
Hospital benefits[d]				
Full semiprivate, generous limit	51,768	20,439	18,536	12,793
Full semiprivate, less-generous limit	70,256	29,764	16,501	23,991
Less than semiprivate	74,232	29,618	18,104	26,510
Physician office benefits[e]				
No deductible	58,793	24,303	18,579	15,910
Deductible, less than 20% coinsurance	55,155	22,331	18,805	14,019
Deductible, 20% or more coinsurance	62,946	26,713	17,274	18,959
No physician office coverage	79,970	31,841	17,464	30,665
Maximum major medical benefit				
Less than $250,000	58,962	23,089	18,085	17,787
$250,000 or more	64,422	27,208	17,845	19,369
Unlimited	65,683	29,173	17,274	19,236
No major medical	73,013	29,690	17,146	26,177
Out-of-pocket maximum				
$750 or less under major medical	60,788	21,764	18,105	20,919
Over $750 under major medical	68,289	35,955	16,966	15,368
No major medical limit, but comprehensive inpatient benefits[f]	53,040	18,215	18,742	16,083
Other privately insured	70,272	28,806	17,374	24,092
Dental coverage				
Yes	57,306	25,220	19,235	12,851
No	66,781	26,718	17,351	22,712

Source: Estimates derived from the 1977 National Medical Care Expenditure Survey, National Center for Health Services Research.

*Standard error greater than 30 percent of estimate.

[a]Includes interest-bearing assets and stock.

[b]Includes farm and nonfarm business, rental property, and estates or trusts.

[c]Excludes families with heads under sixty-five where only insurance is public. Includes those with unknown hospital or physician office benefits; dental coverage, maximum, or out-of-pocket limit not shown below.

[d]A generous limit is defined as 365 days or more of basic benefits, or $250,000 of major medical coverage for those with only major medical hospital coverage.

[e]Benefits stated in terms of a copayment or allowance per visit are converted to a coinsurance rate by assuming a cost of $20 per visit.

[f]Comprehensive inpatient benefits are defined as 120 days or more of full semiprivate basic benefits or full semiprivate major medical benefits, full coverage of a $1,000 UCR (usual, customary, reasonable) charge for surgery, and full coverage for physician inpatient visits.

lar, there is a much smaller and statistically insignificant difference between group and nongroup families with respect to financial assets. Thus, a comparison of financial assets across health insurance benefits is not greatly confounded by the different asset holdings of the nongroup self-employed; this is where a trade-off with health insurances seems most relevent.

In general, table 11.3 shows that families with less generous health insurance benefits seem to have more financial assets. Families with full semiprivate hospital benefits and a generous limit hold about $9,000 less in financial assets than families with less comprehensive coverage. Those with both a deductible and 20 percent or more coinsurance for office visits, or no coverage at all, hold more financial assets. Finally, families whose out-of-pocket expenses are limited to less than $750 by their major medical coverage or whose comprehensive inpatient benefits provide a similar safeguard against high out-of-pocket expenses have about $5,000 to $15,000 less in financial assets than families that are open to the risk of significant medical expenses. The differences for hospital benefits and out-of-pocket limits are statistically significant; the differences with respect to physician benefits are in the expected direction but are not significant.

These descriptive statistics on the wealth of families with different types of health insurance consequently suggest that families may indeed hold wealth, particularly in more liquid assets, as a substitute for more comprehensive insurance. To analyze this and other aspects of savings and insurance behavior more closely, we now present an econometric model estimated from the NMCES data.

11.3.2 Health Insurance Purchases

The theoretical model that was presented earlier calls attention to the significance of the tax subsidy associated with employer-paid premiums and the insurance company's loading fee in determining the effective price of health insurance. Both factors are closely related to whether or not a household has access to group insurance. Almost all group insurance is employment related (99 percent in the NMCES data), and the loading fees for group coverage average about 10 percent compared to 40 to 50 percent for nongroup coverage (Carroll and Arnett 1979). We treat enrollment in a group plan as exogenous and consequently divide the sample into families who did and families who did not have group coverage. For those with group coverage, the quantity of insurance is modeled as a function of the employer share, the marginal tax rate of the household head, and the size of the group (which also reduces the loading fee). For families without group coverage, we first model the decision to purchase health insurance and then the quantity purchased. Because of the peculiar benefits

and private insurance needs of the Medicare population, families headed by people sixty-five and older are excluded from the analysis.

The equations are presented in tables 11.4 to 11.6. Two different measures of insurance coverage are analyzed—premiums and hospital room and board benefits. The premium equations in tables 11.4 and 11.6 follow a modified log-linear specification, implying constant elasticities with respect to nonzero continuous variables on the right-hand side of the equation. Room and board benefits are measured as the number of days of full semiprivate coverage per disability per year. Ignoring deductibles, which were relatively uncommon (Farley and Wilensky 1983), about 75 percent of the families in the group sample and a third of those in the nongroup sample were fully insured for a semiprivate hospital room. Because 25 percent of the group sample and 70 percent of the nongroup sample had zero days of full coverage, these equations are estimated with the Tobit procedure.

Recall that the theoretically appropriate measure of the implicit subsidy rate is the product of the employer share and the marginal tax rate (*et*). Other independent variables include the age, sex, and education of the family head, race, income, and the family's public insurance coverage. Dummy variables for region and for families living outside Standard Metropolitan Statistical Areas (SMSAs) and the average expense per day among hospitals in the county account for geographic differences in health insurance benefits and the price of medical care.

Each family's expected medical expenses ($\bar{L}$ in the theoretical model) are estimated from coefficients obtained by regressing the log of total expenses for all fourteen thousand households in the NMCES household survey on the log of family size, categories of income adjusted for family size, race, and the age, sex, and activity limitations of family members. The R^2 of this equation was 0.19.

Neither total family medical expenses nor family health insurance premiums are strictly proportional to family size. In the equation used to derive expected family expenses, the elasticity with respect to family size was 1.31. This figure was significantly greater than one, implying more than proportional increases in expenditures with increasing family size. The premium for a family policy is typically about 2.5 times the premium for an identical individual policy, but does not usually vary with the number of dependents. Large families consequently enjoy lower per person insurance costs. Given these considerations, the model is not specified with premiums, income, or expected expenditures in terms of dollars per family member. Instead, family size is entered separately and, in the premium equations, the elasticity is specified as a linear function of family size rather than a constant. (This is the effect of including both family size and the log of family size in the equation.)

Table 11.4 **Health Insurance Purchased by Families with Group Coverage Headed by Persons under Sixty-five**

		Premiums[a]		Days of Full Semiprivate Benefits[b]		
		Coefficient × 10	t-statistic	Coefficient	t-statistic	Mean
Dependent variables						
LOGPREM	Log total premiums					6.66
MAXHSP	Days of full semiprivate benefits per year					198
Independent variables						
	Intercept	40.91	14.67	4.93	0.12	1
AGE	Age of head	—	—	2.41	1.20	40.4
AGESQ	*AGE* squared	—	—	−0.02	−0.65	1,786
LAGE	Log *AGE*	2.27	7.12	—	—	3.65
HEADSEX	1 = female head	−2.30	−8.22	−10.83	−1.30	0.17
FAMSIZ	Family size	−1.24	−6.99	−1.80	−0.54	3.21
LFAMSIZ	Log *FAMSIZ*	6.06	9.04	—	—	1.02
FAMINC	Family Income	—	—	−0.50D-3	−2.33	22,181
LFAMINC	Log *FAMINC*	0.42	3.19	—	—	9.74
EXPDLR	Expected family medical expenses	—	—	0.01	0.88	562
LEXPDLR	Log *EXPDLR*	0.66	2.47	—	—	6.07
EDUC1	1 = head with less than 12 years education	−0.24	−1.00	−30.02	−3.96	0.25
EDUC2	1 = head with 13–15 years education	−0.56	−2.02	−1.55	−0.18	0.16
EDUC3	1 = head with 16+ years education	−0.05	−0.20	28.47	3.51	0.20
RACE	1 = nonwhite	−0.93	−2.97	18.84	2.03	0.10
REG1	1 = lives in Northeast	−0.26	−0.86	65.93	6.75	0.22

Table 11.4 (continued)

		Premiums[a]		Days of Full Semiprivate Benefits[b]		
		Coefficient × 10	t-statistic	Coefficient	t-statistic	Mean
REG2	1 = lives in North Central	0.89	3.06	66.63	7.19	0.31
REG3	1 = lives in South	−0.72	−2.34	−14.10	−1.43	0.29
NONSMSA	1 = not SMSA	−0.54	−2.10	3.88	0.49	0.27
GRPSIZ	Group size	—	—	0.10D-2	10.92	19,664
GRPSIZSQ	*GRPSIZ* squared	—	—	−0.20D-8	−7.32	5,380D6
LGRPSIZ	Log *GRPSIZ*	0.29	8.28	—	—	6.70
EMPMTR	Employer share × marginal tax rate	4.06	5.65	92.05	4.04	0.23
HSPCOST	Ave. expense per day in county hospitals	—	—	0.25	3.32	166.6
LHSPCOST	Log *HSPCOST*	1.02	2.36	—	—	5.08
PUBPCT	Percent of family publicly insured	−2.56	−5.54	—	—	0.06
PUBREF	1 = person with private benefit is publicly insured	—	—	−26.38	−1.59	0.03
Statistics						
Number of observations		5,411		4,508		
R- squared		0.20		—		
Prob(*F*)		0.0001		—		
Chi-square				455.3		

Note: D(integer) denotes figures to be multiplied by the indicated power of ten.

[a]Omitted category is a white family headed by a male with twelve years of education living in an SMSA in the West.

[b]Tobit estimates. Omitted category is a white family headed by a male with twelve years of education and no public insurance, living in an SMSA in the West.

Looking first at the equations in table 11.4 that represent families with group insurance, the price effects of the implicit tax subsidy and group size are clear. Group size is positive and highly significant in all three equations. The subsidy rate, *EMPMTR,* has a positive and significant effect on premiums and the number of fully insured hospital days. A family that spent the average amount on premiums ($987) with no employer contribution and was subject to the average tax rate, 31 percent, would spend another $132 if the employer were to pay the entire premium. The elasticity of premiums with respect to the subsidy is .09 at the mean; the elasticity for the number of fully insured hospital days is about .11.

Although income is positive and significant in the premium equation with an elasticity of .04, it is negatively related to the number of fully insured hospital days. The higher premium expenditures of high-income families apparently go towards other types of benefits. Age, too, has a significant effect on premiums but not on hospital benefits. The same pattern seems to apply to families with higher expected medical expenses; they have significantly more expensive coverage but not more comprehensive hospital benifits.

The premiums of families headed by women are about 20 percent lower than the premiums of families headed by men, but such families do not have significantly less comprehensive hospital coverage. Nonwhites have lower premiums, too, but are more likely to have full semiprivate coverage than whites.

Education seems to figure significantly only in the comprehensiveness of a family's hospital benefits. Families headed by someone without a high school degree have fewer days of complete coverage. Families headed by college graduates tend to be insured for more days of complete coverage. These patterns are not apparent in the premium equations.

Finally, there are significant geographic differences in health insurance purchases. The higher the local price of hospital care, the higher are premiums and the greater a family's semiprivate hospital benefits. Thus, there appears to be a mutually reinforcing relationship between medical care prices and more comprehensive health insurance that may, as Feldstein (1977) has warned, contribute to the escalation of health care costs. Other geographic differences include the higher level of premiums in North Central states and lower premiums in the South and outside of SMSAs. This may partly be a reflection of general cost-of-living differences. However, full semiprivate benefits are also less extensive in the South than in the Northeast and in North Central states.

For families not enrolled in a group plan, the major decision is whether or not to purchase health insurance on a nongroup basis. We show both OLS and Probit estimates in table 11.5, partly to note that there is little difference in the results. As with the premium expenditures of group enrollees, the sex of the family head, income, education, race, and the family's expected medical expenses are all associated with the decision to buy

Table 11.5 **Decision to Purchase Private Health Insurance among Families without Group Coverage Headed by Persons under Sixty-five**

		OLS[a]		Probit[a]			
		Coefficient	t-statistic	Coefficient	t-statistic	Marginal Effect[b]	Mean
Dependent variables							
1 = private coverage							0.346
Independent variables							
	Intercept	0.293	2.67	−0.751	−1.68	—	1
AGE	Age of head	−0.002	−0.45	0.009	0.44	0.003	40.7
AGESQ	*AGE* squared	0.100D-3	1.66	0.900D-4	0.39	0.300D-4	1850
HEADSEX	1 = female head	0.047	2.29	0.085	1.11	0.029	0.37
FAMSIZ	Family size	−0.032	−3.75	−0.168	−5.01	−0.057	2.76
FAMINC	Family income	0.300D-5	4.89	0.700D-5	3.03	0.200D-5	12,819
EXPDLR	Expected family medical expenses	0.200D-3	4.98	0.800D-3	5.49	0.300D-3	437
EDUC1	1 = head with less than 12 years education	−0.111	−5.28	−0.417	−5.36	−0.140	0.41
EDUC2	1 = head with 13–15 years education	−0.038	−1.29	0.019	0.17	0.006	0.12

EDUC3	1 = head with 16+ years education	0.060	1.82	0.202	1.60	0.068	0.09
REG1	1 = lives in Northeast	0.223	7.82	0.647	5.73	0.218	0.19
REG2	1 = lives in North Central	0.192	6.90	0.673	5.93	0.226	0.21
REG3	1 = lives in South	0.096	3.53	0.384	3.63	0.129	0.35
RACE	1 = nonwhite	−0.084	−3.34	−0.400	−4.25	−0.134	0.18
NONSMSA	1 = not SMSA	0.001	0.06	−0.004	−0.05	−0.001	0.32
HSPCOST	Ave. expense per day in county hospitals	−0.900D-4	−0.36	−0.184D-3	−0.19	−0.600D-4	165.9
PUBPCT	Percent of family publicly insured	−0.387	−18.08	−1.636	−16.67	−0.551	0.37
Statistics							
Number of observations			1991		1991		
R- squared			0.31		—		
Prob (*F*)			.0001		—		
Chi-square			—		774.2		

Note: D(integer) denotes figures to be multiplied by the indicated power of ten.

[a]Omitted category is a white family headed by a male with twelve years of education, living in an SMSA in the West.

[b]The marginal effect of X_i on the probability of private insurance is $f(X_iB)B$ where f is the normal density function. Here f is evaluated at the means of X and equals .3367.

Table 11.6 **Health Insurance Purchased by Families with Nongroup Coverage Headed by Persons under Sixty-five**

		Premiums[a]		Days of Full Semiprivate Benefits[b]		
		Coefficient × 10	t-statistic	Coefficient	t-statistic	Mean
Dependent variables						
LOGPREM	Log total premiums					5.83
MAXHSP	Days of full semiprivate benefits per year					52.8
Independent variables						
	Intercept	50.84	5.48	452.42	2.32	1
AGE	Age of head	—	—	−23.47	−2.51	45.7
AGESQ	*AGE* squared	—	—	0.24	2.17	2,280
LAGE	Log *AGE*	3.25	3.00	—	—	3.76
HEADSEX	1 = female head	−0.06	−0.08	17.46	0.56	0.31
FAMSIZ	Family size	0.09	0.13	13.74	0.94	2.62
LFAMSIZ	Log *FAMSIZ*	3.07	1.50	—	—	0.80
FAMINC	Family income	—	—	0.10D-3	0.13	18,175
LFAMINC	Log *FAMINC*	0.12	0.43	—	—	9.28
EXPDLR	Expected family medical expenses	—	—	0.01	0.20	460
LEXPDLR	*Log EXPDLR*	0.06	0.08	—	—	5.86
EDUC1	1 = head with less than 12 years education	−0.37	−0.49	−12.46	−0.36	0.31
EDUC2	1 = head with 13–15 years education	0.86	0.84	−11.21	−0.27	0.12

EDUC3	1 = head with 16+ years education	1.33	1.37	75.45	1.98	0.14
RACE	1 = nonwhite	−2.28	−1.90	55.98	1.06	0.08
REG1	1 = lives in Northeast	−1.20	−1.13	45.02	1.07	0.25
REG2	1 = lives in North Central	1.08	0.99	−104.33	−2.32	0.27
REG3	1 = lives in South	−1.50	−1.37	−156.62	−3.39	0.33
NONSMSA	1 = not SMSA	−1.64	−1.96	−62.76	−1.78	0.35
HSPCOST	Ave. expense per day in county hospitals	—	—	0.03	0.09	161.0
LHSPCOST	Log *HSPCOST*	−1.41	−0.94	—	—	5.04
PUBPCT	Percent of family publicly insured	−6.67	−4.93	—	—	0.11
PUBREF	1 = person with private benefit is publicly insured	—	—	−288.82	−3.56	0.09
Statistics						
Number of observations		671		511		
R- squared		0.14		—		
Prob(*F*)		.0001		—		
Chi-square		—		89.2		

Note: D(integer) denotes figures to be multiplied by the indicated power of ten.

[a]Omitted category is a white family headed by a male with twelve years of education living in an SMSA in the West.

[b]Tobit estimates. Omitted category is a white family headed by a male with twelve years of education and no public insurance, living in an SMSA in the West.

health insurance. Holding the family's total income and expected expenses constant, family size has a negative effect. This may be an indicator of the budgetary effect of stretching the same income over more people. Regional differences that roughly parallel the likelihood of comprehensive hospital coverage also emerge with respect to nongroup enrollment. Lastly, and not surprisingly, enrollment in public insurance programs drastically reduces the likelihood of private coverage.

With respect to the amount of insurance that a family purchases on a nongroup basis, there appear to be few consistent or significant behavioral relationships. Private insurance purchases are reduced by the availability of public insurance, and premiums again appear to be somewhat less in nonmetropolitan areas. Age is positively related to premium expenditures, but, from a joint test on *AGE* and *AGESQ,* is not significant in explaining semiprivate hospital benefits. This relationship may well reflect the higher rates that older persons are required to pay.

11.3.3 Household Wealth

Two types of assets are analyzed in the econometric model of household wealth described in table 11.7. First, all wealth (including home equity, stock, interest-bearing assets, farm and nonfarm businesses, rental property, and estates and trusts) are considered. A second equation examines only financial wealth (stock and interest-bearing assets). These more liquid assets are more likely to be held as a precaution against unexpected expenses. Both equations are estimated in a modified log-linear form, using the Tobit procedure. Families with zero wealth are arbitrarily assigned a value of zero for the dependent variable, corresponding to one dollar of wealth.

The equations are premised on the precautionary and life-cycle motives for savings that are assumed in the theory presented earlier. Like other empirical models of household assets that are derived from the life-cycle theory (Kotlikoff 1979; Feldstein and Pellechio 1979; Blinder, Gordon, and Wise 1981), the explanatory variables include age of the household head, family size, and marital status to account for the family's place in the life cycle, its retirement needs, and unforeseeable changes in family composition. As in the health insurance premium equations, family size is entered in both a log and linear form. The model also accounts for racial, educational, and regional differences in savings behavior. A cost-of-living index, derived by fitting 1977 figures available from the Bureau of Labor Statistics for a limited number of cities to secondary data available for all counties and SMSAs, is used to control for variations in the real value of asset holdings.

Recall that each household's wealth is defined from components of its income. The resulting tautological relationship between wealth and total family income makes the latter an inappropriate variable for measuring

Table 11.7 **Wealth of Families Headed by Persons under Sixty-five**

		Total Assets[a]		Financial Assets[a]		
		Coefficient	t-statistic	Coefficient	t-statistic	Mean
Dependent variables						
LASSET	Log total assets					7.81
LOGFIN	Log financial assets					4.56
Independent variables						
	Intercept	−6.60	−1.22	−47.40	−5.18	1
LAGE	Log *AGE*	5.63	30.04	5.74	18.51	3.65
HEADSEX	1 = female head	−1.17	−6.19	−1.10	−3.44	0.22
FAMSIZ	Family size	−0.29	−2.87	−0.37	−2.06	3.09
LFAMSIZ	Log *FAMSIZ*	1.72	5.22	0.03	0.05	0.97
NONVINC	Noninvestment income	0.40D-4	8.07	0.60D-4	6.61	16,646
LNONVINC	Log of *NONVINC*	−0.21	−4.80	−0.21	−2.96	9.23
EDUC1	1 = head with less than 12 years education	−1.29	−9.53	−1.95	−8.40	0.30
EDUC2	1 = head with 13–15 years education	0.40	2.46	0.58	2.15	0.15
EDUC3	1 = head with 16+ years education	0.77	4.93	2.27	8.92	0.17
MARST1	1 = married head	1.16	5.28	0.83	2.25	0.66
MARST2	1 = divorced, widowed, separated head	−0.49	−2.29	−2.37	−6.49	0.18
RACE	1 = nonwhite	−2.82	−15.96	−4.64	−14.36	0.13
REG1	1 = lives in Northeast	−0.27	−1.58	0.06	0.22	0.21
REG2	1 = lives in North Central	0.54	3.42	0.57	2.17	0.28
REG3	1 = lives in South	0.13	0.71	−0.30	−0.96	0.31
NONSMSA	1 = not SMSA	−0.10	−0.77	−0.55	−2.59	0.30

Table 11.7 (continued)

		Total Assets[a]		Financial Assets[a]		
		Coefficient	t-statistic	Coefficient	t-statistic	Mean
LCSTLIV	1 = log of cost-of-living index	−1.38	−1.18	6.84	3.48	4.58
SELFEM	1 = self-employed	2.07	10.32	0.72	2.18	0.09
GROUP	1 = group	0.17	0.72	0.45	1.16	0.75
LGRPSIZ	Log *GRPSIZ*	0.04	1.59	0.08	2.09	4.98
EMPPCT	Employer share of premiums	0.02	0.12	−0.65	−2.12	0.53
PUBPCT	Percent of family publicly insured	−3.24	−15.96	−3.10	−8.71	0.14
Statistics						
Number of observations		6,948		6,948		
Chi-square		3,372		1,718		

Note: D(integer) denotes figures to be multiplied by the indicated power of ten.

[a]Tobit estimates. Omitted category is a white family headed by a single, wage-earning male with twelve years of education without group coverage, living in an SMSA in the West.

the effect of income on asset holdings. Accordingly, only noninvestment income is considered. This variable largely corresponds to labor income, but also includes government transfers and pensions. Like the effects of family size, the income elasticity is assumed to be linear in income rather than a constant.

In addition to these variables, the precautionary savings theory suggests that the price of insurance—an alternative to holding precautionary balances—should also enter the wealth equations. That is, the significance of group enrollment and group size (as proxies for the loading fee) and the health insurance subsidy rate provides a test for substitution between wealth and health insurance in hedging against the risk of illness. If households do trade off between the two, then these variables that alter the price of insurance and have a demonstrably positive effect on insurance purchases will have a negative effect on wealth holdings.

Because the marginal tax rate increases with total family income and the latter is used to define family wealth, the tax rate is positively correlated with the error term in the wealth equations. Because its coefficient is consequently biased, the employer share is entered alone and our estimate of the effect of the subsidy is obtained from the elasticity with respect to the employer share.

The equations are estimated for all families headed by individuals under age sixty-five. Initially, because nongroup enrollment is correlated with self-employment and with several categories of business assets included in household wealth, we also estimated the equations for a sample restricted to group enrollees. The differences in the two sets of equations proved to be negligible, and we show only the equations for the entire sample.

Table 11.7 appears to be a reasonable model of household wealth, in terms of the signs and significance of the variables and the fit of the equations. There is also evidence, in the negative and significant sign on the employer's share of premiums, that households do indeed hold financial assets as a substitute for health insurance. The elasticity of financial assets with respect to the employer share is $-.34$. Negative and significant coefficients for group enrollment and group size would provide stronger support for the substitution hypothesis. However, these variables generally have the wrong sign, and group size is positive and significant in the financial assets equation.

Other findings worth noting include the great effect of age on asset holdings, as predicted by the life-cycle hypothesis for families who have not reached retirement. A 1 percent increase in the age of the family head is associated with almost a 6 percent increase in total wealth or financial assets. Also in keeping with the life-cycle hypothesis, more wealth is accumulated by families with married partners. The widowed, divorced, and separated hold less wealth, probably because they have less incentive and less income to save.

The generally positive effects of family size on total wealth can also be explained in terms of the life cycle, and in terms of the desirability of home ownership and the bequest motives among families with children. Note, however, that total asset holdings start to decline with increases in family size beyond about six members. After a certain point, the budgetary constraints imposed by having a larger family apparently outweigh the incentive to save. Financial assets decline in general with increased family size, holding marital status constant.

The income elasticity for total wealth evaluated at the mean is about .46. However, the elasticity increases by about .04 for every $1,000 increase in a family's noninvestment income. The elasticity for financial wealth is .79 at the mean and increases by .06 for every $1,000 increase in income. Because some families with very little noninvestment income have a lot of investment income and a lot of assets, the relationship between family wealth and noninvestment income less than about $4,000 to $5,000 is negative.

Finally, there are important sociodemographic factors in family wealth patterns. Holding other considerations constant, nonwhites have substantially less total or financial wealth per family than whites. Families headed by females have about 65 percent less total or financial wealth. The education of the family head also bears a strong positive relationship to wealth holdings.

11.4 Summary and Conclusions

Our two-period theoretical model demonstrates that savings and health insurance both serve as protection against medical risks. Within such a model, the expected rate of return (measured in utility) to be gained by diverting a dollar from savings to present consumption is the after-tax interest rate. The expected rate of return on insurance purchased at actuarially fair rates is also equal to the rate of interest. Given the subsidy implicit in the exclusion of health insurance benefits from an employee's taxable income, we have shown that the expected rate of return on an actuarially fair policy is driven below the rate of interest and the return on savings. We also demonstrate that complete insurance is not optimal, even at actuarially fair rates, if it is possible to earn a certain, positive rate of return on savings.

To estimate an empirical model of the behavior described by this theory, variables describing each household's wealth were constructed from detailed income components reported in a nationally representative household survey. Capitalizing these income flows and utilizing data on home and farm equity that are also available from the survey produce estimates of the wealth of U.S. households that are consistent with other sources. In a preliminary test for a trade-off between health insurance and wealth in

household portfolios, these data on assets are compared among households with different types of insurance coverage. Even such gross comparisons suggest that there is a negative relationship between the level of insurance and holdings of relatively liquid assets. This relationship cannot be explained by the connection between self-employment, the lack of group coverage among the self-employed, and the less comprehensive insurance benefits available to nongroup enrollees.

The econometric model of household wealth and insurance purchases also suggests that precautionary balances are held in lieu of health insurance. The estimates imply that the group insurance premiums of a family whose premiums are paid entirely by employers and a family that pays all of its premiums differ by 12 percent. At the same time, the family with more insurance holds 48 percent less in financial assets. The findings on the substitution question are mixed, however, since group size also reduces the price of insurance but has a positive correlation with financial wealth.

The empirical model of insurance purchases does confirm, at any rate, that the tax subsidy encourages an increase in the quantity of health insurance. This effect is apparent with respect to premiums and the comprehensiveness of hospital benefits. Income, the family's expected medical expenses, and medical care prices also have a positive effect on the quantity of insurance. Among families not enrolled in health insurance groups, income and expected expenses mainly affect whether a family has any insurance at all. This decision seems to be the main issue for such families, rather than the quantity of insurance to purchase.

In addition to the findings with respect to the effect of employer-paid insurance benefits, the econometric estimates shed light on other aspects of household behavior in accumulating wealth. The elasticity of wealth with respect to noninvestment income appears to increase by four to six percentage points with every $1,000 increase in income. Family size is associated with greater holdings of wealth, but only up to a point. In general, the effects of age, family size, and marital status testify to the significance of life-cycle considerations. And the disparity in the wealth of families headed by educated white males compared to others is very evident.

In contrast to savings accumulated by a household for its use in any future circumstances, the wealth offered in the future by health insurance is contingent on future circumstances. From our estimates of the relative effect of the tax subsidy on premiums and financial assets, it is possible to make inferences about the value to households of this contingent asset in terms of its certain equivalent. Consider a family with median total assets for families headed by a person under sixty-five in 1977, in the range of $10,000–15,000. The average health insurance premiums of such a family were about $900, with employers paying about 60 percent and an implicit

tax subsidy of $200. The average marginal tax rate was 27 percent, the average subsidy rate was 18 percent, average financial assets were $1,900, average total income was $17,400, and average noninvestment income was $17,000. Simultaneously compensating such a family for the $200 loss of income, elimination of the tax subsidy would reduce its expenditures on health insurance by $63. Its holdings of financial assets would increase by $933 to a total of $2,833. In sum, the contingent wealth represented by a marginal expenditure of $63 on health insurance is equivalent to holding about fifteen times that amount in tangible assets.

The subsidy implicit in the exclusion of employer-paid premiums from taxable income has a number of effects. It represents a loss in government revenues amounting to about $31 billion in 1983 (Taylor and Wilensky 1983). In this paper we have demonstrated that it encourages employees to choose more comprehensive health insurance. This in turn contributes to increased spending on health care. We have also called attention to the fact that spending more on health insurance necessarily means spending less on something else. In particular, we have argued, and evidence exists in our empirical findings, that precautionary savings may be one of the close substitutes for insurance where the reduction occurs.

Appendix

The National Medical Care Expenditure Survey

The National Medical Care Expenditure Survey (NMCES) provides detailed national estimates of personal and family characteristics, the use of health services, health expenditures, and health insurance for the civilian noninstitutionalized population in 1977. The survey was funded and undertaken by the National Center for Health Services Research with the cosponsorship of the National Center for Health Statistics, two agencies in the U.S. Department of Health and Human Services. NMCES consists of several different surveys—the main household survey and other follow-up surveys that complement the household data collection. In the household survey, data were obtained for a nationally representative sample of approximately fourteen thousand households (representing approximately forty thousand people) who were interviewed six times over an eighteen-month period during 1977–78. The complex, clustered sampling design of the household survey is described in Cohen and Kalsbeek (1981), and the survey instruments are described in Bonham and Corder (1981). All regressions and descriptive statics are estimated with weights that produce national estimates and account for the nonrandom sampling design of the survey and differential nonresponse.

The estimates of household wealth that are presented are derived from two types of information collected in the household survey. First, income-producing assets of each household are inferred by capitalizing various types of income derived from such assets. This part of a household's wealth is calculated from detailed components of each person's income that were reported, including the amount of interest, dividends, farm income, nonfarm business income, rental income, income from estates and trusts, and royalties.

Second, each household was asked a series of questions concerned with home ownership. These questions provide the only information on non-income-producing assets owned by a household that are included in the wealth estimates, namely home equity. Homeowners were asked the present value of the property and the amount remaining on the mortgage(s). Where applicable, the value of the property and mortgage were reported for the entire farm or multiunit dwelling owned by the homeowners who resided there.

The data on health insurance premiums and benefits are drawn from one of the follow-up surveys, the Health Insurance/Employer Survey (HIES). This was a survey of the employers, unions, insurance companies, and other organizations that were identified by NMCES households as the source of their private health insurance coverage. It was designed to verify the coverage reported in the household survey and to obtain information on benefit provisions, premiums, and premium payments by employers, employees, and others. A copy of the policy or certificate describing the benefits offered through each respondent was requested and subsequently abstracted onto forms suitable for computer analysis. Because of nonresponse in this additional phase of data collection, national estimates derived from the HIES survey are based on a sample of approximately 10,000 households and 24,000 individuals. This is the sample that underlies the data analyzed here. However, because premium data were often obtained when information about the policy was not, different weights are used to analyze benefits and premiums. About 9,100 households have benefit data. (See Cohen and Farley 1984 for a more detailed description of the Health Insurance/Employer Survey.)

In the data on family insurance benefits that are presented here, a family is characterized by the benefits of the head. Except, however, the benefits of a family member with group insurance were selected over the non-group benefits of a head without any group benefits.

Definition and Estimation of Household Wealth

The estimates of household wealth are based on the concept of net equity or net worth. To the extent possible, wealth is measured in these terms. Debts associated with a particular asset are either explicitly or implicitly deducted from its gross value.

Because of limitations of the data source, not all types of wealth are included. Most significantly, consumer durables (except for homes) are not considered. Both Wolff (1980) and Lebergott (1976) estimate that these other consumer durables represent about 9 percent of household wealth. Also excluded are equity in life insurance and annuities, and household contributions to pension funds. The measurement of household wealth also ignores debts that were not secured by one of the assets included in the definition. Thus, home mortgages are included, but automobile loans or installment credit are not.

Income-Producing Assets

Wealth in income-producing assets is estimated by capitalizing the specific types of income shown in table 11.A.1. A similar technique has been employed by Lebergott (1976), Wolff (1980), and Greenwood (1983) to estimate household wealth. As shown in table 11.A.1, different rates of return are applied to each type of income. A single figure is used for all households with a particular type of income—an apparently reasonable assumption according to Greenwood. She reports that rates of return do not appear to vary substantially or systematically by income class.

Ninety-eight of the 1,284 households that reported income or losses from a nonfarm business reported losses, and about 130 reported losses on rental property out of 1,242 with income or losses. An analysis of families reporting business losses in the 1967 Survey of Economic Opportunity suggested that their business equity followed a distribution similar to those with positive income; households in the NMCES survey with negative business income are consequently assigned the mean for households with positive income. In the Survey of Economic Opportunity, the mean equity in rental property of families with rental losses was about 1.5 times the mean for families with positive income, and such families in the NMCES survey are assigned a value equal to 1.5 times the comparable figure from NMCES.

As noted earlier, households that lived on farms or in multiunit dwellings were asked about their equity in the entire property. Equity thus reported for families with farm income or losses is categorized as farm equity. This is the primary basis for estimating farm equity. However, if a household was not able to report its equity in a farm, then its farm equity is capitalized from its farm income at a rate of 6.57 percent (Evans and Simunek 1978, p. 28). If a family did not report any rental income but lived in and owned a multiunit dwelling, then equity in the property not assigned to home equity (see below) was categorized as wealth in rental property.

Home Equity

The home equity of families that owned and lived in multiunit dwellings is defined as the net worth of the particular housing unit that they occu-

Table 11.A.1 Estimation of Income-Producing Assets

Type of Income	Rate of Return on Equity (capitalizing ratio)	Source
1. Interest	5.48%	Interest as a percentage of time and savings deposits in Federal Reserve member banks in 1977 (*Annual Statistical Digest* 1978, p. 307)
2. Dividends	4.56	Average dividend-price ratio for common stock in 1977 (*Annual Statistical Digest* 1978, p. 94)
3. Estates/trusts	4.56	Assumes rate of return comparable to stocks.
4. Nonfarm business and royalties	13.51	Aggregate proprietor's income received by households as a percentage of noncorporate, nonfarm equity in 1977 (Ruggles and Ruggles 1982, pp. 33 and 43)
5. Rental income	14.87	The average rate of return on equity in rental property reported by households in the 1967 Survey of Economic Opportunity was 15.55 percent. This figure was adjusted by the difference between the average rate of increase in household rental income and increase in gross assets in residential structures reported by Ruggles and Ruggles (1982) for the period 1969–77. This difference was −4.3 percent.

pied. If its value was not reported, then the value was calculated in equal proportion to the number of units in the dwelling. Homeowners who were not able to estimate the current market value of their property were asked its purchase price and year. For 587 such households, the value of the property was inflated from the Bureau of Labor Statistics' Consumer Price Index for home purchases and depreciated at a rate of 1.5 percent per year. The latter figure is the 1970–77 average annual rate of depreciation on the assets held by households in residential structures, calculated from Ruggles and Ruggles (1982, pp. 42–43).

Among the 10,045 households in the HIES sample, 945 did not respond to any of the questions concerning home ownership that were asked in the final round of the household survey. The weights utilized in the analysis of household wealth are adjusted to account for these nonrespondents by the age of the household head, income, family size, and location in an SMSA, allowing national estimates to be made from the remaining 9,100 households with data on home ownership. Among the 5,742 homeowners in the remaining sample, 799 households are imputed a value for home equity from partial information on the property's current value or mortgage, income, family size, location, and the age of the household head.

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Comment

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The chapter by Farley and Wilensky makes a contribution, but it is a different contribution than the authors think they have made. And the chapter contains some important theoretical and empirical problems. The most startling statement in the theoretical section is on page 326: "in the ab-

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sence of a tax subsidy, it is not optimal for a household to insure its medical expenses completely when the loading fee is zero, if the rate of return on precautionary savings is positive." This statement appears to overturn a basic result of Arrow (1963), who showed that if moral hazard was zero—an assumption Farley and Wilensky also make—a risk-averse consumer facing no loading charge would fully insure. (For generalizations of Arrow 1963, see Arrow 1973a, 1973b.)

The authors argue that Arrow ignored precautionary savings and therefore reached a different conclusion, but closer inspection reveals that the authors have made a strange assumption. If an individual saves in period one, he receives the after-tax rate of interest in period two; but if he buys a health insurance policy in period one that pays off in period two, the health insurer earns no interest. But insurers do, of course, earn interest on reserves. Thus, actuarially fair insurance in this context must extend to insurers passing on to consumers any interest that those reserves earn.

If we assume, for simplicity, that insurers earn the same after-tax rate of interest as consumers, then the right-hand side of equation (5) and the first term on the right-hand side of equation (8) should be divided by $1 + r(1 - t)$, a term that then comes into the first term of the denominator of the right-hand side of equations (10) and (11), canceling the same term in the numerator. Making this revision in equation (11), the authors reach Arrow's result: if d is equal to or exceeds zero (neutral or positive time preference), the subsidized consumer will fully insure. He would like to more than fully insure (given that et is positive), but as long as more than 100 percent reimbursement of costs is not permitted, the left-hand side of equation (11) cannot be negative; thus, he fully insures.

With this change of assumptions the inferred substitution between financial assets and health insurance, if there is no loading, vanishes. The presumed substitution of precautionary savings for insurance derives from the asymmetry in interest rates earned by the consumer (greater than zero) and the insurer (zero). Thus, insurance in this model has a price analogous to a loading (namely, foregone interest), and it is not surprising that under these conditions full insurance is generally not optimal. In actuality, the insurer may well be able to earn a higher return than the individual consumer, thereby favoring insurance, not precautionary saving.

Indeed, one can ask: Given that et is on the order of 0.2 if typical values are used, and given that f for hospital insurance is on the order of 0.1 or less in a standard group plan, why doesn't equation (10) imply full hospital insurance in all group plans? The authors tell us that 75 percent of those insured by group plans do in fact have full insurance (or a deductible, but the latter category is said to be "uncommon").

Why do not the other 25+ percent have full insurance? The explanation, I think, lies in heterogeneity. Those who have less than average probability of hospitalization face effectively higher loadings than 0.1. Why

such higher loadings do not lead to a demand for deductibles rather than coinsurance is not clear, although it may well have to do with moral hazard.

If the authors' theory, when corrected to allow the insurer to earn interest, does not (without positive loading fees) yield a prediction of precautionary saving as a substitute for insurance, what about the empirical results in their table 11.7 that appear to support such a prediction? The authors find a negative and highly significant relationship between the employer share of family premiums and the log of a family's financial assets. This they take as evidence in support of their thesis that the two assets are substitutes.

Unfortunately, this evidence is marred by an econometric problem. As the authors note (p. 345), one explanatory variable, the marginal tax rate, is positively correlated with the error term. They go on to say, "Because [the coefficient of the marginal tax rate] is consequently biased, the employer share is entered alone and our estimate of the effect of the subsidy is obtained from the elasticity with respect to the employer share." But the coefficient of the employer share is inconsistent if the marginal tax rate and employer share are positively correlated, which theory would predict. In a simple two-variable model

$$Y = a + bX + cf + e, \tag{1}$$

where X is the marginal tax rate and f is the employer share, it can be shown that plim $\hat{c} = c\,(D - m_{Xf}\,m_{Xe})/D)$, where D is the determinant of the asymptotic moment matrix $(m_{XX}m_{ff} - m_{Xf}m_{Xf})$ and m_{Xf} and m_{Xe} are the population moments toward which the sample moments tend asymptotically. (This assumes f is independent of e.) Because all the terms in the parentheses are positive, the entire expression may be positive or negative; hence, the negative sign on the employer's share in table 11.7 could be a statistical artifact.

Of course, the actual positive loading on insurance would make these two assets substitutes, so a negative relationship between insurance and financial assets is not surprising. But detecting the relationship does seem surprising because of the small amounts involved, the noise in the asset data, and the difficulty of portfolio adjustment for the fifth of the sample with zero assets. The authors have reestimated this equation omitting the marginal tax rate, and the employer's share is still negative and significant. On the other hand, access to group insurance is not significant and group size is marginally significant with the wrong sign. I take this as weak evidence in support of the substitution hypothesis, but for most of the nonaged population the amounts of probable out-of-pocket medical care expenditure is small relative to wealth.

What then is the chapter's contribution? I read it as presenting, in tables 11.4 through 11.6, estimates of the demand for insurance that are probably more reliable than any in the literature. The only remotely compara-

ble study is Phelps (1973, 1976), and the present paper uses a larger, more recent sample and studies more measures of insurance.

The result on demand for insurance that I found most noteworthy was the positive sign on the average expense per day in county hospitals in table 11.4. (I assume the authors mean the average for all general hospitals in a county and not the average in hospitals operated by a county.) The authors note that this evidence is consistent with Feldstein's discussion of a vicious circle of more hospital insurance leading to higher hospital prices which leads to more hospital insurance.

I confess to some skepticism about this conclusion. Previous econometric evidence is certainly mixed. The authors' result with premiums as a dependent variable could be a reflection of cost-of-living differences (although the estimated coefficient seems large for that interpretation), especially if the hospital price index is a proxy for all medical input prices. There is also a higher demand (in group policies) for full semiprivate room benefits as hospital expense rise, which would not be explained by cost-of-living differences. But full semiprivate room benefits tend to be found in Blue Cross policies, and Blue Cross has quite different market shares across states. I would like to see the authors take account of the tax subsidies that Blue Cross receives; it may be that a tax subsidy leads to a high Blue Cross market share that leads to widespread full semiprivate coverage. Specifically, would the coefficient on hospital cost remain significant if subsidies to Blue Cross were accounted for? My reasons for raising this issue are that the vicious circle hypothesis is of some significance, evidence from other studies is sketchy, and Marquis and Phelps (1982) find the opposite result using a different approach.

Another result of some note in table 11.4 is the significance of the age variable. Although a number of interpretations of this result are possible, one is that older workers tend to have more complete coverage, indicating that group insurance should not be considered exogenous with respect to medical conditions.

In sum, the theoretical case that health insurance and financial assets are substitutes is true—almost by definition—but the empirical case that health insurance exerts an important influence on the makeup of families' asset portfolios is not one that I find compelling.

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