National Health Insurance and Precautionary Savings: Evidence from Taiwan

Shin-Yi Chou
Department of Humanities and Social Sciences
New Jersey Institute of Technology and
National Bureau of Economic Research

Jin-Tan Liu
Department of Economics
National Taiwan University

James K. Hammitt
Department of Health Policy and Management
and Center for Risk Analysis
Harvard School of Public Health

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Corresponding author: James K. Hammitt, Harvard School of Public Health, 718 Huntington Ave., Boston, MA 02115-5924. Tel: 617 432 4030, Fax: 617 432 0190, E-mail: jkh@hsph.harvard.edu

Abstract

By reducing uncertainty about future medical expenses, comprehensive health insurance can reduce households' precautionary savings. We examine this effect using Taiwan micro-data spanning the 1995 introduction of National Health Insurance. The effects of National Health Insurance are identified using employment-based variation in prior insurance coverage. Replacement of the household's prior insurance coverage with National Health Insurance is exogenous to the household, so our estimates are not subject to selection bias. Compared with the most-generous of the preceding insurance programs, National Health Insurance reduced savings by an average of 6.9% with the largest effects for households with the smallest savings.

Keywords: national health insurance, precautionary savings, prudence
JEL: D1, H4, I1

I. Introduction

The possibility of economic adversity leads households to save more and consume less than they would otherwise. Because health expenditures can be large relative to income, persist and generally increase with age, they make a significant contribution to a household's uncertainty about its future economic circumstances.[1] The introduction of comprehensive health insurance, by reducing uncertainty about the magnitude of future out-of-pocket health expenditures, can substantially reduce the demand for precautionary savings and so increase current consumption. We investigate this effect by studying the 1995 introduction of National Health Insurance (NHI) in Taiwan.

Numerous theoretical studies have examined the precautionary-savings motive under uncertain future income (see, e.g., Leland, 1968; Sandmo, 1970; Drèze and Modigliani, 1972; Skinner, 1988; Zeldes, 1989a; 1989b; Kimball, 1990; Caballero, 1990; 1991; Deaton, 1991). Most empirical studies have focused on uncertain future income and provide mixed evidence of precautionary savings. There have been few empirical studies testing the impact of social health insurance on saving behavior.

We use a natural experiment created by a series of legal changes to examine the effect of NHI on household saving and consumption behaviors. There is virtually no private health insurance in Taiwan. Before the implementation of NHI, employment had been the only way to obtain health insurance. A majority of the working population had almost complete coverage under Labor Insurance or Government Employees' Insurance. Two major differences between these government-sponsored policies enable us to exploit the variation with respect to the uncertain health expenditures to identify the pure effect of NHI on savings. First, government employees were the only workers who continue to have health-insurance coverage after retirement. Second, parents, spouses, and children of government employees were the only family members who had extended health-insurance

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[1] In the US, total health-care spending was equivalent to 16% of disposable personal income in 1997 (Bureau of Economic Analysis data). In Taiwan, medical care and health expenses were roughly 7.6% of household disposable income in 1998 (Survey of Family Income and Expenditure data). Feenberg and Skinner (1994) have shown that medical expenses are persistent, so that modest annual health costs can gradually deplete a family's resources.

coverage under their household heads' insurance policies. As a result, the introduction of complete coverage under NHI had a smaller effect on the government-employed than on other households.

We estimate the effect of NHI on precautionary savings using a "difference-in-differences" approach. We compare the change in savings for a treatment group (non-government employed households) with the change in savings for a control group (government employed households). The change in savings for the control group accounts for any systematic structural change while the experimental group's change reflects both the systematic structural change and the impact of the policy intervention.

Our data are from the Survey of Family Income and Expenditure, a nationally representative survey that collects detailed information on household income and consumption expenditures as well as demographic and employment status for each household member.[2] The characteristics of health-insurance programs in Taiwan and these data allow us to improve previous studies in three aspects. First, our estimates are not subject to selection bias, since National Health Insurance covers everyone and was inaugurated by the government in Taiwan. Second, NHI is not an asset-based, means-tested program. Thus, the empirical analysis offers a direct test of the impact of NHI on precautionary savings, without an additional negative effect arising from means testing. Third, we are able to exploit variation across different insurance policies before the implementation of NHI to identify the pure effect of NHI on saving and consumption behaviors.

Our empirical results support the premise that the precautionary motive is an important determinant of household saving and consumption behaviors. We find that government provision of universal health insurance can cause a considerable reduction in private savings: Compared with the preceding Labor Insurance, implementation of the National Health Insurance lowers average savings by 6.9% and raises average consumption expenditures by 2.4%. The effect on saving is strongest for households with the smallest savings, which is consistent with the hypothesis that prudence (the sensitivity of precautionary savings to risk) declines with wealth (Kimball, 1990).

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[2] For detailed information about the data, see Deaton (1994a,b).

The paper proceeds as follows. Section 2 provides some background on health insurance in Taiwan and a brief review of the related literature. Section 3 outlines a theoretical framework. Section 4 presents the data. Section 5 discusses the empirical strategy and empirical specification. Section 6 reports the estimation results and Section 7 concludes.

II. Background

A. National Health Insurance in Taiwan

Taiwan inaugurated NHI in March 1995. Since implementation, NHI has increased the insured fraction of the population from 57% in 1994 to 97% in 1998. Prior to implementation, there were three major health-insurance programs – Labor Insurance, Government Employees' Insurance, and Farmer Health insurance, but virtually no private health insurance in Taiwan. An individual could obtain health insurance only through one of these government-sponsored health plans, which were tied to a person's employment status.[3] Although most of the working population was covered by these three programs, almost half the total population was uninsured because only Government Employee's Insurance offered coverage to the worker's children, spouse, and parents. In 1992, 37% of the population was covered under Labor Insurance, 8.2% under Government Employees' Insurance, and 8.2% under Farmer Health Insurance (Peabody et al., 1995). The 47% of the population who were not covered were mostly children, the elderly, and housewives.

Labor Insurance was implemented in 1950 and initially designed to cover industrial workers employed in public or private factories. Under the 1970 Labor Insurance Statute, employers of journalistic, cultural, and nonprofit organizations, and cooperative enterprises with five or more employees were required to insure all workers between the ages of 15 and 60 years. In 1988, Labor Health Insurance was extended to cover government employees who were not legally entitled to join civil servants' insurance and to private-school teachers and employees. Members of an occupational union who had no definite employer or who were self-employed were also insured under the program. The premium

[3] Since 1990, the government provided health insurance for low-income households, but this program covered less than 1% of the population.

for Labor Insurance was 6–8% of monthly-insured salary, 80% of which was paid by the employer and 20% by the worker. Labor Health Insurance did not provide coverage of workers' or employees' family members.

As implemented in 1958, Government Employees' Insurance initially provided coverage only for government employees. Spouses became covered under the Health Insurance for Government Employees' Dependents program in 1982. Parents and children of government employees became eligible in 1989 and 1992, respectively. Coverage was also extended to retired government employees in 1965, though it was not compulsory. The premium rate was 3–5% of the government employee's salary, of which 35% was paid by the employee and 65% by the government.

The Farmer Health Insurance program, established in 1985, covered all farmers. In 1989, coverage was extended to almost all family members of agriculture households. We exclude agriculture households from our sample, since the major form of their savings is in non-liquid assets such as land. In order to eliminate potential impacts of Farmer Health Insurance on female labor supply, we also limit our study period to years beginning with 1991.

In contrast to previous insurance programs, NHI covers all members of the population. The premium payable by the insured and his or her dependents depends on the insured payroll-related amount and the premium rate of the insured. The maximum premium rate is 6%, which is shared by the employee, employer, and government.[4]

Before the implementation of NHI, all the social insurance programs provided similar benefits, including outpatient visits, inpatient care and prescription drugs. Approximately 85% of hospitals and 70% of clinics contracted with the social insurance programs in 1994. Two years later, after the implementation of NHI, the proportion of contracted institutions increased to about 96.5% of hospitals and 89.5% of clinics. NHI coverage also extends to severe illnesses and home health care (Cheng and Chiang, 1997). For outpatient visits, the out-of-pocket expenditure ranges from NT$80 to NT$150. For hospitalization, the co-payment ranges from 5% to 30% for both acute and chronic care,

[4] In 1996, the premium payable ranged from 2% to 5% of total household income.

depending on the hospital length of stay. In the case of major illness and injury, no co-payment is required.

Table 1 summarizes the differences among Government Employees' Insurance, Labor Insurance and National Health Insurance. The diverse health-insurance programs provide an opportunity to study the effect of health insurance on precautionary savings against unexpected health expenditures. The implementation of National Health Insurance reduces the risk of catastrophic health expenditures and consequently weakens the precautionary-saving motive. We expect that NHI had a smaller impact on government-employed households' precautionary savings since their prior coverage was more generous than that of other households, and so NHI had less effect in reducing uncertainty about medical expenditures.

By exploiting the variation in uncertainty with respect to health expenditures before the implementation of NHI, we are able to identify the effect of national health insurance on households' precautionary-saving motives. Note that the variation is created by a series of laws implemented at the national level and does not arise from differences in household behaviors. This natural experiment allows us to study precautionary saving without selection bias, as discussed in the next section.

B. Related Literature

The theoretical condition under which an increase in uninsurable risk leads to more precautionary saving was first derived by Leland (1968) and further analyzed by Sandmo (1970) and Drèze and Modigliani (1972). Kimball (1990) defined the concept of "prudence" and showed that a prudent individual will engage in precautionary savings. The theory of precautionary saving was further sharpened by numerous recent studies (Skinner, 1988; Kotlikoff, 1989; Zeldes, 1989a; 1989b; Caballero, 1990; 1991; Deaton, 1991; Hubbard, Skinner, and Zeldes, 1994a; 1994b; 1995).[5]

Most empirical studies emphasize income uncertainty and provide mixed evidence of precautionary saving. Using subjective or objective risk measures, Skinner (1988), Guiso et al. (1992), and Dynan (1993) found no support for the precautionary motive, while other studies found more support for the precautionary view (Carroll and Samwick,

[5] See Deaton (1992) and Browning and Lusardi (1996) for reviews of this literature.

1998; Kazarosian 1997). Zeldes (1989a) confirmed the importance of precautionary-saving motives using numerical simulation.

Several studies have considered the effects of health and other types of insurance on savings. Palumbo (1999) used a dynamic structural model to estimate household consumption decisions during retirement and concluded that uncertain out-of-pocket medical expenses represent an important motive for precautionary saving among the elderly. Based on simulation results, Kotlikoff (1989) showed that savings for self-payment exceed those under actuarially fair insurance, while savings are smallest for Medicaid. Recent theoretical work by Hubbard et al. (1995) suggested that means and asset-tested social insurance programs create a significant disincentive for saving. Powers (1996) and Gruber and Yelowitz (1999) confirmed this prediction by showing a strong positive association between social insurance eligibility and consumption expenditures. Kantor and Fishback (1996) examined the impact of the introduction of insurance against workplace accident and found that the presence of workers' compensation led to a 25% reduction in the savings of working households. Engen and Gruber (forthcoming) examined the effect of unemployment insurance programs on wealth holdings and found that increasing the generosity of unemployment insurance by one-half lowers savings by 14%.

Farley and Wilensky (1985) used the 1977 National Medical Care Expenditure Survey and found that families with more insurance hold less wealth in financial assets. Starr-McCluer (1996) used data from the 1989 Survey of Consumer Finances to examine the relationship between insurance and wealth, and found a positive effect of health-insurance coverage on wealth holdings, even after controlling for the potential selection effect.

The mixed empirical findings leave open the question of the effect of health insurance on saving behavior. Our study offers several advantages in examining the impact of health insurance on precautionary saving. First, the National Health Insurance introduced in Taiwan in 1995 represents an exogenous factor; therefore, we do not confront the selection problems which are likely to cause estimation biases in most

previous studies.[6] For example, in examining the impact of income uncertainty on precautionary saving, Skinner (1988) used occupational dummies to classify households in different risk categories and did not find any significant correlation between earnings uncertainty and precautionary saving. These proxies for risk are almost inevitably correlated with observable or unobservable attributes which are correlated with saving behavior as well. A similar concern casts doubt on Starr-McCluer's (1996) finding that health insurance is positively associated with wealth holdings. Those individuals who are highly risk averse are more likely to both purchase private health insurance and accumulate wealth for self-insurance. As a result, it is difficult to distinguish the effect of health insurance per se.

Second, the NHI in Taiwan is not means-tested. Thus our study offers a direct test of how saving is affected by the reduction of health expenditure uncertainty. As argued by Hubbard et al. (1995), asset-based, means-tested social insurance usually has two effects on saving. Insurance reduces the risk of unexpected medical expenditures and weakens the precautionary-saving motive. In addition, some households will spend-down their wealth in order to become eligible for means-tested social health insurance, such as Medicaid. Consequently, it is difficult to distinguish whether a low saving rate is attributable to the reduction of precautionary saving or the effect of the means test.

Third, as described in the previous section, we can exploit the variation with respect to prior health insurance to identify the pure effect of NHI on households' precautionary savings. It is usually difficult to obtain data sets that detail type of health-insurance coverage together with information about consumption and saving. We are able to identify the health-insurance policies through the household heads' employment status.

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[6] There is a potential selection effect if, prior to NHI, workers' choices between government and private-sector jobs were significantly affected by differences in insurance coverage. This effect would bias downward our estimates of the effect of NHI on precautionary savings, if households that chose private sector jobs are less concerned about uncertain future health expenditures than are households that chose government jobs. In principle, one could account for the possible endogeneity of household head's employment status due to joint job and health insurance decisions by estimating employment status using instrumental variables. We do not pursue this because of a lack of suitable instruments in our cross-sectional data. In addition, because the survey does not provide

Furthermore, there is usually little or no variation in the benefits households expect to receive, if the benefits of social insurance programs are set by the government. Various types of health-insurance programs provided by the government in Taiwan before NHI enable us to exploit the variation across employment status.

III. Conceptual Framework

The implementation of NHI reduces a household's uncertainty about future health expenditures. If households are prudent, the reduction in risk will decrease savings and increase consumption (Kimball, 1990). There is, in addition, a potential income effect. Although NHI is offered at actuarially fair rates (i.e., the premium equals the expected medical expense), employees of government, publicly and privately owned enterprises or institutions, and of certain other employers bear only 30%-40% of the premium. Unless there are compensating wage reductions, NHI increases expected income net of medical expenses for these households. This income effect will increase both consumption and savings. It can be distinguished from the risk effect which also increases consumption, but decreases savings. We expect the income effect to be trivial as the premium is only a few percent of household expenditures.

To understand how uncertain health expenditures can influence savings, we consider a stochastic life-cycle model, following Blanchard and Fischer (1989) and Deaton (1992). The household is assumed to be uncertain about future medical expenditures. In each period the household incurs out-of-pocket health expenditures M_t. In period t, after observing M_t, the household chooses consumption C_t and future consumption $\{C_{t+1},\ldots,C_{T-1}\}$ to maximize the expected value of its additively time-separable von Neumann-Morgenstern utility

$$E\left[\sum_{t=s}^{T-1}(1+\rho)^{-(t-s)}U(C_t)\mid I_s\right] \tag{1}$$

where ρ is the household's rate of time preference. The notation $E(\cdot\mid I_s)$ denotes an expectation conditional on information at time s. We assume medical care expenditures *per*

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information on job tenure, we do not know when the household makes its employment decision.

se do not enter the utility function. For simplicity, we also assume the household's lifespan, *T-1*, is certain.[7]

The budget constraint is given by

$$A_{t+1} = A_t(1+r) + Y_t - M_t - C_t, \tag{2}$$

$$M_t, A_t \geq 0, \forall t.$$

A_t is financial wealth at the beginning of period *t*, *r* is the deterministic real rate of return, and Y_t is labor income. Savings can be defined as the first difference of assets ($= A_{t+1} - A_t$) or, equivalently, as income minus consumption ($= rA_t + Y_t - M_t - C_t$). Finally, we assume households must have non-negative net worth in all periods.

Such dynamic decision problems under uncertainty yield no closed-form solution for optimal consumption except under specific utility functions. For simplicity, we assume that the utility function exhibits constant absolute risk aversion (and thus constant absolute prudence), following Kimball and Mankiw (1989), Caballero (1990) and Weil (1990). We further simplify by assuming the discount rate, ρ, and interest rate, *r*, are both equal to zero. Thus, at time zero, the household maximizes

$$E\left[\sum_{t=0}^{T-1}(-\tfrac{1}{\alpha})\exp(-\alpha C_t) \mid I_0\right] \tag{3}$$

subject to

$$A_{t+1} = A_t + Y_t - M_t - C_t$$

and

$$M_t = M_{t-1} + \varepsilon_t, \varepsilon_t \sim N(0, \sigma^2).$$

Health care expenditure is modeled as a random walk, with normally distributed error term. The degree of absolute risk aversion and the degree of absolute prudence (Kimball, 1990) are both constant and equal to α.

The optimal consumption levels as of time zero can be solved as

[7] Several studies (eg. Skinner, 1985 and Hubbard, Skinner and Zeldes, 1994a, 1995) incorporate lifespan uncertainty to examine its role in explaining the slow rate of dissaving among the elderly.

$$C_t = \frac{1}{T-t} A_t + (Y_t - M_t) - \frac{\alpha(T-t-1)\sigma^2}{4} \tag{4}$$

and optimal consumption satisfies

$$C_{t+1} = C_t + \frac{\alpha\sigma^2}{2} + \varepsilon_t . \tag{5}$$

Equation (4) implies that increases in either uncertainty about future health care expenditures (σ^2) or the degree of absolute prudence (α) will yield smaller consumption and greater precautionary savings (= $Y_t - M_t - C_t$). Equation (5) shows the effect of uncertain health expenditures on the slope of the consumption path. Higher risk about future health care expenditures (σ^2) or higher absolute prudence (α) leads the household to defer consumption and results in a steeper consumption path.

In the context of this study, the implementation of NHI reduces the risk of unexpected medical expenditures, and thus discourage household's precautionary savings. If the household's precautionary-saving motive is strong, the NHI will have a positive welfare effect in terms of consumption smoothing.[8]

In our empirical work, we test the assumption of constant absolute prudence imposed above. Kimball (1990) suggests that, like risk aversion, prudence is likely to decline with wealth. Decreasing absolute prudence implies that the precautionary-saving motive decreases with wealth. People who have amassed considerable assets will be less sensitive to risk.

The welfare implication of decreasing absolute prudence is important. It implies that lower-income people will be more sensitive to the risk reductions, that is, NHI will have a larger impact on their precautionary savings and consumption. In terms of consumption smoothing, the welfare gain from NHI is larger for lower-income households.

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[8] Another potential welfare gain is through the labor market response. Unlike Government Employees' Insurance and Labor Insurance, the National Health Insurance program is not linked to employment status. As a result, workers may choose to work fewer hours or to change jobs. Increasing flexibility in job choice expands the opportunity set and improves welfare. Moreover, if NHI leads to an increase in maternity leave time, the long-run consequences on child development may be beneficial to society. The health and productivity of the workforce may also improve either through greater investment in health care or through a reduction in labor-force participation of marginal workers.

IV. Data and Sample

A. Data

The data are from the Survey of Family Income and Expenditure (SFIE) conducted each year since 1976 by the Directorate-General of Budget, Accounting and Statistics (DGBAS), Taiwan. The SFIE is a large, nationally representative household survey. We restrict our sample to the period 1991 through 1998 for two reasons. First, we want to exclude the impacts of other health-insurance policies prior to 1990. Second, we use more recent data to limit the impact of technology diffusion on growing medical-care expenditures.

The survey contains information on demographic characteristics, economic status, and industrial sector of employment for each member of the sampled households. It also includes information on household income and consumption. Household income includes employee compensation, entrepreneurial, property, and transfer income for all household members. Total consumption expenditures include both durable and nondurable goods. For the household head and spouse, the survey provides information on individual wage rates and incomes. The 1991-1995 surveys include information on estimated value of the household's assets including residential property, other real estate, business equity, vehicles, machinery, and equipment. However, these questions were omitted from the 1996-1998 surveys. All samples are drawn each year, so we cannot track individual households longitudinally. About 13,000 to 16,000 households are surveyed and approximately 52,000 to 68,000 civilians aged 15 and above are interviewed each year from 1991 to 1998.

B. Sample

Our sample is restricted to households headed by a 20 to 65 year old married person who was employed by the public or private sectors or self-employed.[9] Agricultural families were excluded from the sample. Also deleted were households whose data on net

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[9] The public sector includes two types of employees: government and public enterprise. If employees of a public enterprise are not civil servants, their spouses, children and parents were not covered by government health insurance. We exclude this small proportion of employees.

saving was missing or who had negative net saving.[10] These restrictions result in a sample of 67,484, of which 59,856 household heads (88.7%) were non-government employees and 7,628 (11.3%) were government employees.

V. Empirical Strategy

A. Difference-in-Differences Estimation

To estimate the effect of National Health Insurance on households' precautionary savings, our strategy is to compare the change in savings for non-government employed households before and after implementation of NHI with the corresponding change for government employed households (who received similar insurance packages before and after NHI). The comparison can be expressed as:

$$\Delta^{\text{NHI}} = (Y_{\text{N-g}}^{\text{After NHI}} - Y_{\text{N-g}}^{\text{Before NHI}}) - (Y_{\text{G}}^{\text{After NHI}} - Y_{\text{G}}^{\text{Before NHI}}) \qquad (5)$$

where Δ^{NHI} represents the effect of NHI, and $Y_{\text{N-g}}$ and Y_{G} denote the savings or consumption for the non-government and government employed households before and after NHI, respectively. Equation (5) is the so-called "difference-in-differences" estimator.[11] As described in Section 2, the NHI is expected to have a larger impact on the saving and consumption behaviors of non-government employed households than on government employed households.

The "difference-in-differences" estimator can be expressed within a regression framework. We pool the 1991 – 1998 samples of non-government and government employed households and estimate the following regression:

$$Y_h = \alpha + \gamma_1 NHI_h + \gamma_2 NG_h + \gamma_3 NHI_h NG_h + \varepsilon_h, \qquad (6)$$

where h indexes households, Y_h is the saving or consumption observed for household h, *NHI* is an indicator variable for implementation of National Health Insurance, *NG* is an indicator variable for the non-government employed households, and ε is a random error term. Based on the estimates of Eq. (6), the "difference-in-differences" estimator in Eq. (5)

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[10] Ten percent of households have negative or zero net savings. These were excluded because we analyze the logarithm of savings.

[11] Similar "difference-in-differences" estimators have been used widely, for example, by Gruber (1994) and Hamermesh and Trejo (2000).

can be expressed as: $\Delta^{\text{NHI}} = [(\gamma_1 + \gamma_2 + \gamma_3) - \gamma_2] - [\gamma_1 - 0] = \gamma_3$. The coefficient γ_3 measures the difference-in-differences defined in Eq. (5).

The regression framework also allows us to control for other variables that affect saving and consumption. We estimate the following regression:

$$Y_{hjt} = \alpha + \gamma_1 NHI_{hjt} + \gamma_2 NG_{hjt} + \gamma_3 NHI_{hjt} NG_{hjt} + \beta_1 X_{hjt} + \beta_2 \delta_j + \beta_3 \tau_t + \varepsilon_{hjt}, \qquad (7)$$

where j indexes region and t indexes years. X is a vector of observable characteristics, δ_j is a fixed regional effect and τ_t is a fixed year effect. The coefficients of these control variables are assumed to be constant across years.

B. Dependent and Explanatory Variables

We specify two dependent variables: (1) household savings, defined as the difference between total household disposable income and household consumption expenditures (excluding expenditures on durable goods such as family furniture, furnishings and household equipment); and (2) household consumption expenditures (excluding expenditures on durable goods). The all-items Consumer Price Index (CPI) is used to convert all money figures to 1991 NT dollars.[12]

The mean and distribution of household savings by household head employment status are presented in Table 2. For non-government employed households, the average annual household saving is NT$268,652, which is the difference between average annual household income NT$935,758 and annual household consumption expenditures NT$667,105. The average savings, income and consumption expenditures are higher for the government-employed households. The distributions of savings and consumption are right-skewed for both groups of households. We use robust regression techniques to account for this feature.

X_{hjt} is a vector of demographic and economic characteristics of the household: the head's education (6 category dummies), age, age squared, gender, spousal education dummies, number of children under age 18, number of children over age 18 and number of elderly parents or grandparents. Table 3 presents summary statistics for the explanatory variables by household head employment status. Government-employed household heads

[12] The average exchange rate was US$1 = 25.75 New Taiwanese dollars (NT$) in 1991.

were older, better educated, and had slightly fewer children under age 18, more older children, and fewer elderly parents living in the household. Only 21% of non-government employed household heads received at least some college education, in contrast with 63% of government employed household heads.[13]

C. Marginal Effect of Dummy Variable on Logged Dependent Variable

We employ ordinary least square (OLS) to estimate the model and White's method to correct the estimate of the variance-covariance matrix for potential heteroscedasticity (White, 1980). As discussed by Manning (1998), if the residuals are non-normal or heteroscedastic, the marginal effect of the explanatory variables on the logged dependent variable is unbiased, but the marginal effect on the untransformed dependent variable is biased. We follow Manning et al. (1987) and use the "smearing" method to retransform the dependent variable to calculate the marginal effect of national health insurance on precautionary savings. Specifically, the marginal effect of NHI can be expressed as $E(Y \mid NHI = 1) - E(Y \mid NHI = 0)$. The general form of the retransformation for a loglinear model is given by $E(Y) = \phi \exp(\mathrm{X}\beta)$, where the so-called smearing factor $\phi = E[\exp(\varepsilon)]$. The estimate of the smearing factor is the sample average of the exponentiated least-squares residuals. Finally, the standard errors of the marginal effects are obtained by bootstrapping.

D. Quantile Regression

In addition to examining how savings on average are affected by NHI, we investigate how the effect of NHI differs across households with different levels of saving. Precautionary savings depend on the risk of future medical expenses and the household's degree of absolute prudence (Eq. 4). Kimball (1990) suggests that absolute prudence declines with wealth. Unless this decline is offset by a sufficiently large increase in risk of future medical expenses with wealth, households at the bottom of the saving distribution will be more sensitive to the introduction of NHI than will households at the top of the

[13] One reason that government employees are better educated is that Taiwan has a Civil Servant Certification Exam (much like the U.S. Foreign Service exam or the Postal Service Exam, but more comprehensive). The higher education of government employees' wives may reflect assortative mating.

distribution. If so, this implies that the welfare gain, in terms of consumption smoothing, is larger for households in the bottom part of the savings distribution.

A natural and relatively simple way to explore differences across the distribution of household saving is through the use of quantile regressions (Buchinsky, 1994). Quantile regression can be used to estimate the marginal effect of an explanatory variable at a distinct point of the conditional distribution of the dependent variable.

Specifically, the estimated coefficient vector $\hat{\beta}$ minimizes:

$$\theta \sum_{\{h:Y_h \geq X_h\beta\}} \left|Y_h - X_h\beta\right| + (1-\theta) \sum_{\{h:Y_h < X_h\beta\}} \left|Y_h - X_h\beta\right| \tag{8}$$

where Y_h is the dependent variable, X_h is a vector of explanatory variables including observable characteristics, fixed regional effects and fixed year effects, and θ is the quantile to be estimated. The coefficient vector β depends on the quantile being estimated.[14]

VI. Empirical Results

A. Difference-in-Differences Estimates

Table 4 reports difference-in-differences estimates of the effect of National Health Insurance on households' savings and consumption expenditures. The first panel compares the change in households' savings for non-government employed households (which receive better insurance coverage after NHI) to the change for government employed households. There was a 1.7% increase in the household savings of non-government employed households after the implementation of NHI, compared with a 10.6% increase in the household savings of government employed households. The increase in the household savings for both government and non-government households after the implementation of NHI might be attributed to general economic growth that had the same effect on all households. Because the government-employed households have almost identical insurance coverage before and after NHI, we assume that the growth of 10.6% for government-employed households measures the impact of general economic growth. Thus, taking the difference between the two figures (1.7% and 10.6%), the difference-in-

differences estimate implies that the NHI significantly reduced non-government-employed households' savings by 8.9%.

The second panel of Table 4 reports the results for consumption. Both government and non-government households experienced a substantial increase in consumption expenditures after the implementation of NHI. The difference-in-differences estimate implies that the NHI increases households' consumption expenditures by 4.6%.

Taken together, these results are consistent with the theoretical prediction that the NHI reduces the households' precautionary savings and increases consumption expenditures. The NHI has a smaller impact on the saving and consumption behaviors of government employed households which have comparable insurance coverage before the NHI. In contrast, the non-government employed households reduce their precautionary saving in response to increases in the health insurance benefits. By exploiting the variation in the uncertainty of health expenditures before the implementation of NHI, we are able to eliminate the spurious economic shocks and identify the effect of NHI on precautionary savings.

The difference between the effects of NHI on savings and on consumption (a decrease in savings and increase in consumption) confirm that the effects are due to a reduction in risk, not an increase in expected income net of medical expenses. NHI may also affect households' income structure. For example, women may reduce their working hours or labor force participation, because NHI benefits are not linked to their employment status.[15]

B. Results with Control Variables

Table 5 reports the difference-in-differences estimates from alternative specifications that successively add control variables. For comparison, the row labeled (1) reproduces the estimates from Table 4 that do not control for household characteristics,

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[14] Estimates were calculated using the sqreg procedure of STATA Version 6.

[15] Chou and Staiger (2001) found that the availability of spousal health insurance in Taiwan decreased labor force participation by 4% among married women. Their results are based on the availability of National Health Insurance in 1995 and the expansion of Government Employee Insurance to spouses in 1982 in Taiwan. Other studies that provide empirical evidence on the effects of health insurance on labor supply are reviewed by Gruber (2000).

region and year effects. We also report the marginal effects adjusted by the smearing estimator. Specification (2) adds regional and year dummies to the baseline model, and specification (3) includes household characteristics. Full estimated results on the control variables for specification (3) are reported in Table A1 in the Appendix.

Overall, the results are similar across specifications, which suggests that the difference-in-differences approach performs well in accounting for general economic shocks that are correlated with changes in the demographic, regional and time characteristics. Because our dependent variables are in log terms, we retransform the estimated coefficients and present the marginal effects in untransformed terms. The marginal effects are smaller than the coefficients but are still statistically significant at the 1% level, except that the marginal effect on saving is not statistically significant in the baseline model. Based on specification (3), the results imply that the NHI significantly reduced household savings by 6.9% and increased consumption expenditures by 2.4%.[16]

C. Quantile Regression Results

To test the effect of NHI on savings across the household-saving distribution, we estimate quantile regressions on households' savings (Table 6). Without controlling for other observable characteristics, NHI has the largest negative impact (–0.197) on the first (lowest) decile. The effects decrease for higher quantiles, with the ninth decile having a point estimate of –0.056. In all cases the estimated coefficients are statistically significant at the 5% level.

Accounting for regional and year effects in specification (2) enhances the estimated negative impacts of NHI on savings for the lower quantiles. With the full specification, quantile estimates show the same pattern as the estimates from the baseline model. That is, NHI has the largest negative impacts on savings at the bottom quantile, and the effects tend to become smaller the higher the quantile.

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[16] We also estimate the same model on a sample of single households. The results (not reported) show that NHI decreased precautionary savings by 3.7% and increased consumption by 0.2%. The effects are smaller than those for the full sample and are not statistically significant. They suggest that non-government employees place more weight on health insurance coverage for their family members than on the extension of coverage to their retirement.

To investigate how the degree of prudence varies across income levels, we compare the absolute change in savings with the absolute change in risk of medical expenses by income quantile (Eq. (4)). First, we predict out-of-pocket medical expenses as a function of household characteristics and NHI. The results, shown in Table A2, suggest that out-of-pocket medical expenditures increase after implementation of NHI, perhaps because of growth in demand for, or costs of, medical care, or increased expenditures on home health care, nursing home care, rehabilitation, and chronic disease care which are not covered under NHI. The NHI has the largest impact on the out-of-pocket medical expenditures for the lowest income quantile.

Second, we use the coefficients from Table A2 to predict average medical expenses and the variance of residuals (σ^2 in Eq. (4)) before and after NHI. The results, shown in Table A3, indicate that uncertainty about medical expenditures was greater before NHI. Households in the top income quantile have the largest uncertainty with regard to the out-of-pocket medical expenditures. The variances of the residuals drop drastically after implementation of NHI, indicating the NHI reduces uncertainty about out-of-pocket health expenditures. Risk of out-of-pocket expenditures, measured by the variance of the residuals, decreases the most for the top income quantile.

Third, we can estimate a number that is proportional to the degree of absolute prudence by dividing the change in savings (NT$)[17] by the change in risk of medical expenses (NT$ squared). As shown in Table A3, the degree of absolute prudence declines with income.

D. Robustness Test – Number of Dependents

The value of the National Health Insurance benefit increases with the number of children and the number of non-employed parents. To account for such variation, we estimate equation (7) by family structure to investigate how variation across families in the value of insurance coverage affects the estimates.

Table 7 presents the results by family composition. Dependents include children who are less than 18 years old and elderly parents who are not employed. Under the

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[17] The change in savings is estimated from a regression with savings (NT$) as the dependent variable. Results are available from the authors.

assumption that additional dependents increase the value that a family places on health insurance, the negative effect of NHI on savings and consumption should be enhanced by additional dependents. The effect of NHI is significant in families with more than three dependents. These households reduce savings by 12.6% and increase consumption expenditures by 5.4%. In contrast, the effect of NHI coverage in families with no dependents is essentially zero. This suggests that the effect of NHI depends on the value of health insurance to the family.

We also estimate quantile regressions on this sub-sample (results not shown). The previous findings that the NHI has the largest proportional impact on the bottom quantile and that the effects tend to decrease to the top quantile are confirmed. For households with more than one dependent, quantile estimates show the same pattern.

E. Robustness Test – Composition of Employment Status

Our results thus far neglect issues of mating and husband-wife joint job decisions. In order to obtain health insurance for all household members, one of the couple may choose to work in the government sector. Thus, using only the household head's employment status to define control and treatment groups may lead to biased results. We define three treatment groups based on the husband-wife joint employment status to test the importance of this problem. The control group includes households where the head (or both head and spouse) work in the public sector.

The results are reported in Table 8. Non-government employed households with spouses who were not in the labor force or were unemployed significantly reduce their savings by 13.4% and increase their consumption by 3.3%. Non-government employed households with spouses working in the private sectors also have significant responses in reducing their savings (7.8%) and increasing their consumption (3.8%). However, NHI has no effect on savings or consumption for households with at least one household member working in the public sectors.[18] These results suggest it is important to consider the effect of government policy on joint decisions regarding family labor supply and consumption in future research.

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[18] If we also include these households — where either spouse works in the public sector — in the control group, we obtain larger and more significant coefficients for the first two treatment groups.

VII. Conclusion

The introduction of social health insurance can substantially reduce uncertainty about out-of-pocket health expenditures, and thus reduce households' precautionary-saving motive. Examination of the effect of National Health Insurance on Taiwan households' saving and consumption behaviors suggests that households significantly reduced their savings, increased their consumption, and reduced their saving rates when the comprehensive health insurance became available. These results are robust to a variety of specifications. Furthermore, our results suggest that the effect of NHI is most pronounced in families with dependents, who presumably place greater value on health insurance than do families without dependents.

Contrary to Starr-McCluer's (1996) finding that health insurance is positively related to wealth, our study offers a more direct test of the impact of health insurance on savings that is not subject to selection bias. By exploiting the fact that government and non-government employed households received different insurance packages before NHI, our approach controls for idiosyncratic shocks and identifies the effects of NHI on households' savings and consumption.

Our empirical results are consistent with recent studies that have found that coverage by other social programs, such as disability insurance (Kantor and Fishback, 1996), unemployment insurance (Engen and Gruber, forthcoming) and Medicaid (Gruber and Yelowitz, 2000), are negatively associated with savings. Unlike these studies, we examine health insurance, which is more likely to affect precautionary savings throughout the population.

Moreover, we find that NHI has a larger impact on precautionary savings for households at the bottom of the savings distribution than for those at the top. This result supports the assumption of decreasing absolute prudence and is consistent with the theoretical argument of Kimball (1990) and the empirical result of Guiso et al. (1992). It further suggests that NHI yields a larger welfare improvement, through consumption smoothing, for households with smaller savings.

Our evidence supports the contention that precautionary motives are an important determinant of savings. This study provides some explanation for consumption puzzles mentioned by Zeldes (1989b): the excess sensitivity of consumption to anticipated income

fluctuations (people “save too much”) and the steep consumption path in the presence of a low or negative real interest rate (people “consume too little”). Financial risk and the level of health expenditure affect saving and consumption decisions, as suggested by Kotlikoff (1989), Palumbo (1999) and Hubbard, Skinner, and Zeldes (1995). Our findings suggest that the introduction and expansion of social health insurance will contribute significantly to the decline in private saving. Moreover, even if eligibility for the insurance policy is not means tested, it may still have a larger impact on households at the bottom than the top of the savings distribution.

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Table A3: Change in Risk, Change in Savings and Absolute Prudence by Income Quantile

Income Quantile	(1) Risk of Medical Expenditures (00,000,000 NT$) Before NHI	(2) After NHI	(3) Change in Risk (NT$) =(2)-(1)	(4) Change in Savings (NT$)	(5) Absolute Prudence =(4)/(3)
<=0.25	12.07939	12.07696	-243,208	-17,580	0.072
>0.25 & <= 0.5	12.16430	12.16136	-294,093	-11,833	0.040
> 0.5 & <= 0.9	16.75128	16.73938	-1,190,816	-36,949	0.031
>0.9	32.47289	32.43136	-4,153,094	-59,791	0.014

Table 2: Distribution of Savings, Income, and Expenditures by Household Head Employment Status

	Savings[a]		Total Household Disposable Income[b]		Total Household Expenditures[c]	
	Non-government Employed Household	Government Employed Household	Non-government Employed Household	Government Employed Household	Non-government Employed Household	Government Employed Household
Mean	268,652	387,356	935,758	1,145,065	667,105	757,709
Standard Deviation	(303,435)	(372,073)	(522,345)	(548,210)	(334,608)	(330,434)
10th percentile	38,657	77,298	469,214	607,153	343,569	414,824
25th percentile	91,934	161,630	604,796	787,956	442,628	532,480
50th percentile	191,001	307,402	813,853	1,056,040	591,640	698,611
75th percentile	351,639	516,501	1,124,168	1,389,586	805,621	915,159
90th percentile	572,014	762,809	1,538,017	1,755,072	1,075,407	1,159,373
Number of observations	59856	7628	59856	7628	59856	7628

Notes: All values are in NT dollars. The 1991 exchange rate is US$1 = 25.75NT$.

[a] Savings are defined as the difference between total household income and expenditures.

[b] Total household income includes employee compensation, entrepreneurial income, imputed rent income, current transfer receipts and other miscellaneous receipts.

[c] Total household expenditures include nonconsumption expenditures and consumption expenditures. Nonconsumption expenditures include interest and transfer expenditures. Consumption expenditures are for food, beverage, tobacco, rent, fuel, household operations, medical care and sanitation, transport and communication, recreation, education and culture, and other miscellaneous expenditures. We exclude expenditures on furniture and family facilities.

Table 3: Sample Statistics

	Non-government-employed household		Government-employed household	
	Mean	Standard Deviation	Mean	Standard Deviation
Characteristics of Houeshold Head				
Junior high school	0.197	0.398	0.046	0.210
Senior high school	0.294	0.456	0.238	0.426
Community college	0.113	0.317	0.263	0.440
University	0.086	0.281	0.306	0.461
Graduate school	0.013	0.115	0.069	0.254
Male	0.947	0.224	0.915	0.279
Age	41.698	9.041	43.514	9.865
$Age^2(00)$	18.204	7.956	19.908	8.939
Characteristics of Family Members				
Spouse education dummies				
Junior high school	0.199	0.399	0.122	0.327
Senior high school	0.299	0.458	0.339	0.473
Community college	0.077	0.267	0.171	0.377
University	0.051	0.220	0.165	0.371
Graduate school	0.004	0.064	0.016	0.127
# of children under age 18	1.632	1.179	1.377	1.082
# of children over age 18	0.422	0.840	0.451	0.833
# of parents or grandparents	0.293	0.636	0.230	0.563
Other variables				
Regional dummies				
North	0.489	0.500	0.486	0.500
Middle	0.210	0.407	0.182	0.386
South	0.276	0.447	0.281	0.450
Sample size	59856		7628	

Table 4: Difference-in-Differences Estimates of the Impact of National Health Insurance on Savings and Consumption

	Log(savings)	
	Non-government Employed Household	Government Employed Household
(1) Before NHI (1991-1994)	11.995	12.441
	(1.122)	(0.979)
	[34046]	[4381]
(2) After NHI (1995-1998)	12.012	12.548
	(1.179)	(1.005)
	[25810]	[3247]
(3) Difference (=(2)-(1))	0.017	0.106
	(0.010)	(0.023)
(4) Difference-in-differences (=Non-g. (3) - Gov. (3))	-0.089	
	(0.025)	

	Log(consumption)	
	Non-government Employed Household	Government Employed Household
(1) Before NHI (1991-1994)	13.191	13.361
	(0.437)	(0.401)
	[34046]	[4381]
(2) After NHI (1995-1998)	13.457	13.581
	(0.427)	(0.380)
	[25810]	[3247]
(3) Difference (=(2)-(1))	0.266	0.220
	(0.004)	(0.006)
(4) Difference-in-differences (=Non-g. (3) - Gov. (3))	0.046	
	(0.010)	

Notes: Cells contain mean log savings, consumption and saving rates for the group identified. Standard errors are given in parentheses; sample sizes are given in square brackets.

Table 5: Regression on Savings and Consumption
(Estimated coefficient of NHI (post 1995) * Non-government employment status)

	Log(savings)	Log(consumption)
(1) Baseline model		
	-0.089 [a]	0.046 [a]
	(0.025)	(0.010)
	[-0.027]	[0.044] [a]
(2) Specification (1) + regional and year dummies		
	-0.095 [a]	0.034 [a]
	(0.025)	(0.009)
	[-0.033]	[0.032] [a]
(3) Specification (2) + household's characteristics		
	-0.120 [a]	0.027 [a]
	(0.023)	(0.008)
	[-0.069] [a]	[0.024] [a]
Sample size	67484	67484

Notes: Heteroskedasticity-robust standard errors are given in parentheses; marginal effects are given in square brackets.

[a] Statistically significant at the 1% level.

Table 6: Quantile Regression on Savings

	Quantile				
	0.1	0.25	0.5	0.75	0.9
(1) Baseline model					
Log(savings)	-0.197 [a]	-0.094 [a]	-0.076 [b]	-0.060 [b]	-0.056 [b]
	(0.055)	(0.034)	(0.031)	(0.027)	(0.024)
(2) Specification (1) + regional and year dummies					
Log(savings)	-0.183 [a]	-0.114 [a]	-0.089 [a]	-0.056 [b]	-0.071 [a]
	(0.051)	(0.042)	(0.026)	(0.024)	(0.027)
(3) Specification (2) + household's characteristics					
Log(savings)	-0.212 [a]	-0.110 [a]	-0.098 [a]	-0.094 [a]	-0.072 [a]
	(0.055)	(0.040)	(0.024)	(0.020)	(0.023)

Notes: Bootstrapped standard errors for quantile regressions are given in parentheses.

[a] Statistically significant at the 1% level.

[b] Statistically significant at the 5% level.

Table 7: Regression on Savings and Consumption by Familiy Composition
(Estimated coefficient of NHI (post 1995) * Non-government employment status)

	No dependents	One or Two dependents	At least three dependents
Log(savings)	-0.091 [c]	-0.100 [a]	-0.184 [a]
	(0.048)	(0.030)	(0.052)
	[-0.042]	[-0.043]	[-0.126] [a]
Log(consumption)	0.028	0.011	0.056 [a]
	(0.017)	(0.010)	(0.015)
	[0.021]	[0.011]	[0.054] [a]
Sample size	13916	33685	19883

Notes: Dependents include non-employed parents and children <=18.

Coefficients are estimated under specification (3).

Heteroskedasticity-robust standard errors are given in parentheses; marginal effects are given in square brackets.

[a] Statistically significant at the 1% level.

[b] Statistically significant at the 5% level.

[c] Statistically significant at the 10% level.

Table 8: Regression on Savings and Consumption by Employment Status
(Estimated coefficient of NHI (post 1995) * Non-government employment status)

Employment status			
Household head	Work in the private sector	Work in the private sector	Work in the private or public sector
Spouse	Not in the labor force or unemployed	Work in the private sector	Work in the public or private sector (i.e. Work in different sectors)
Log(savings)	-0.216 [a]	-0.116 [a]	-0.064 [c]
	(0.033)	(0.031)	(0.037)
	[-0.134] [a]	[-0.078] [a]	[-0.047]
Log(consumption)	0.037 [a]	0.042 [a]	0.016
	(0.011)	(0.011)	(0.013)
	[0.033] [a]	[0.038] [a]	[0.011]
Sample size			
Treatment group	19842	37765	5812
Control group	4065	4065	4065

Notes:
Control group includes both household heads and their spouses work in the public sector or only household heads work in the public sector.
Coefficients are estimated under specification (3).
Heteroskedasticity-robust standard errors are given in parentheses; marginal effects are given in square brackets.

[a] Statistically significant at the 1% level.

[b] Statistically significant at the 5% level.

[c] Statistically significant at the 10% level.

Table A1: Estimates of National Health Insurance on Savings, Consumption, and Saving Rates

	Log(savings)		Log(consumption)	
	Coefficient	Standard Error	Coefficient	Standard Error
NHI (post 1995)*Non-government employment status	-0.120 [a]	(0.023)	0.027 [a]	(0.008)
Non-government employment status	-0.130 [a]	(0.016)	0.031 [a]	(0.005)
NHI (post 1995)	0.229 [a]	(0.025)	0.247 [a]	(0.008)
Characteristics of Houeshold Head				
Junior high school	0.059 [a]	(0.014)	0.079 [a]	(0.004)
Senior high school	0.156 [a]	(0.014)	0.184 [a]	(0.004)
Community college	0.345 [a]	(0.018)	0.296 [a]	(0.006)
University	0.505 [a]	(0.020)	0.388 [a]	(0.007)
Graduate school	0.583 [a]	(0.032)	0.467 [a]	(0.011)
Male	0.202 [a]	(0.020)	0.102 [a]	(0.007)
Age	-0.016 [a]	(0.004)	0.029 [a]	(0.001)
Age^2(00)	0.000 [a]	(0.000)	0.000 [a]	(0.000)
Characteristics of Family Members				
Spouse education dummies				
Junior high school	0.011	(0.014)	0.054 [a]	(0.004)
Senior high school	0.092 [a]	(0.014)	0.149 [a]	(0.004)
Community college	0.342 [a]	(0.020)	0.289 [a]	(0.006)
University	0.507 [a]	(0.023)	0.357 [a]	(0.008)
Graduate school	0.694 [a]	(0.052)	0.475 [a]	(0.020)
# of children under age 18	-0.089 [a]	(0.005)	0.066 [a]	(0.001)
# of children over age 18	0.232 [a]	(0.006)	0.209 [a]	(0.002)
# of parents or grandparents	0.187 [a]	(0.007)	0.083 [a]	(0.002)
Other variables				
Regional dummies				
North	0.082 [a]	(0.026)	0.113 [a]	(0.009)
Middle	0.109 [a]	(0.027)	-0.057 [a]	(0.009)
South	0.029	(0.027)	-0.013	(0.009)
Constant	11.721 [a]	(0.094)	11.800 [a]	(0.031)
Sample size	67484		67484	
F(28, 67455)	412.42		1944.09	
Adjusted R^2	0.14		0.45	

Notes: Standard errors are in parentheses. Control variables also include year dummies which are not reported here.

[a] Statistically significant at the 1% level.

Table A2: Regression on Out-of-Pocket Medical Expenditures by Income Quantile

	<= 0.25		>0.25 & <=0.5		>0.5 & <= 0.9		> 0.9	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
NHI (post 1995)*Non-government employment status	0.480	(0.297)	0.181	(0.221)	0.810 [a]	(0.136)	1.592 [a]	(0.412)
Non-government employment status	-0.123	(0.087)	-0.112	(0.089)	-0.560 [a]	(0.078)	-1.243 [a]	(0.337)
NHI (post 1995)	2.605 [a]	(0.308)	2.629 [a]	(0.226)	2.137 [a]	(0.156)	0.841 [c]	(0.484)
Characteristics of Household Head								
Junior high school	-0.139 [b]	(0.067)	0.042	(0.075)	-0.038	(0.090)	0.280	(0.372)
Senior high school	-0.238 [a]	(0.078)	0.000	(0.075)	-0.071	(0.084)	0.355	(0.349)
Community college	-0.556 [a]	(0.117)	-0.119	(0.102)	0.081	(0.100)	0.636	(0.386)
University	-0.167	(0.283)	-0.249 [c]	(0.142)	-0.167	(0.116)	0.729 [b]	(0.359)
Graduate school	-0.529	(0.919)	-0.509	(0.521)	0.107	(0.202)	1.375 [a]	(0.435)
Male	-0.684 [a]	(0.114)	-0.856 [a]	(0.214)	-0.373 [b]	(0.164)	-1.882 [b]	(0.794)
Age	-0.167 [a]	(0.024)	-0.183 [a]	(0.027)	-0.237 [a]	(0.027)	-0.267 [b]	(0.106)
Age^2(00)	0.002 [a]	(0.000)	0.002 [a]	(0.000)	0.003 [a]	(0.000)	0.003 [a]	(0.001)
Characteristics of Family Members								
Spouse education dummies								
Junior high school	-0.029	(0.073)	-0.049	(0.075)	-0.038	(0.075)	-0.512 [c]	(0.309)
Senior high school	-0.037	(0.082)	-0.027	(0.079)	0.096	(0.078)	-0.593 [b]	(0.301)
Community college	-0.171	(0.206)	-0.168	(0.137)	-0.031	(0.105)	-0.410	(0.350)
University	-0.447 [c]	(0.271)	-0.483 [a]	(0.186)	-0.114	(0.136)	-0.754 [b]	(0.375)
Graduate school	-2.481 [a]	(0.509)	-1.042 [c]	(0.554)	-0.483	(0.349)	-0.912	(0.594)
# of children under age 18	0.202 [a]	(0.024)	0.272 [a]	(0.026)	0.405 [a]	(0.027)	0.494 [a]	(0.078)
# of children over age 18	-0.069	(0.048)	-0.016	(0.052)	0.241 [a]	(0.047)	0.480 [a]	(0.111)
# of parents or grandparents	0.948 [a]	(0.050)	1.021 [a]	(0.053)	1.363 [a]	(0.060)	2.122 [a]	(0.188)
Total household income	0.000 [a]	(0.000)	0.000 [a]	(0.000)	0.000 [a]	(0.000)	0.000 [a]	(0.000)
Constant	4.275 [a]	(0.600)	4.713 [a]	(0.637)	5.626 [a]	(0.618)	11.154 [a]	(2.798)
Sample size	16871		16871		26993		6749	
Adjusted R^2	0.2512		0.2493		0.1809		0.1071	

Notes: The dependent variable is the out-of-pocket medical expenses (0,000 NT$). Standard errors are in parentheses.
Control variables also include year and regional dummies which are not reported here.

[a] Statistically significant at the 1% level.

[b] Statistically significant at the 5% level.

[c] Statistically significant at the 10% level.

Table 1: Comparison of Health Insurance Programs in Taiwan

	Government Employee Insurance	Labor Insurance	National Health Insurance
Year of implementation	1958	1950	1995
General Provision	maternity benefit injury and sickness benefit disability benefit unemployment benefit old-age benefit death benefit	maternity benefit injury and sickness benefit medical-care benefit disability benefit unemployment benefit old-age benefit death benefit	maternity benefit injury and sickness benefit
Insured Persons	government employees (civil servants)	workers above 15 years and below 60 years of age	six categories (see notes)
Dependents of the insured			
Spouse	1982	No	1995
Parents	1989	No	1995
Children	1992	No	1995
Retired employees	1985	No	---

Notes: The insured of NHI are classifed into the following six categories: 1. Civil servants; employees of publicly or privately owned enterprises or institutions; employees employed by particular employers; employers or self-employed owners of business; independently practicing professionals and technicians.
2. Members of an occupational union; seamen serving on foreign vessels. 3. Members of the Farmers Association, the Irrigation Association and the Fishers Association. 4. Dependents of voluntary military officers, noncommissioned officers or servicemen. 5. Members of a household of low-income families.
6. Veterans. (National Health Insurance Act, Chapter II, Article 8)