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YALE UNIVERSITY

P.O. Box 208269
New Haven, CT 06520-8269
http://www.econ.yale.edu/~egcenter/

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HEALTH AND LABOR FORCE PARTICIPATION OF THE ELDERLY IN TAIWAN

Cem Mete
Yale University

T. Paul Schultz
Yale University

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Abstract

Estimates are reported of the consequences of health on participation in the labor force of elderly men and women in Taiwan from 1989 to 1996. Three survey indicators of individual health are examined, and two are estimated by instrumental variables (IV), using as instruments parent longevity, birthplace, and childhood conditions. IV estimates of health's effect on participation are in most cases significant and always positive, and about twice the magnitude of the ordinary least squares estimates, and the hypothesis that health is exogenous and measured without error is rejected. Implementation in 1995 of a National Health Insurance (NHI) shifted to the state the growing cost of elderly health care, and reduced the incentive for elderly to work to receive employer-provided health insurance. But this change in health care financing does not appear to have contributed to a reduction in elderly participation rates in 1996.

Keywords: Labor Force Participation, Elderly, Health Status, National Health Insurance, Taiwan

JEL Classification: J22, J26, I10, I18

1. Introduction

Economic performance of low-income countries may be affected by their system of health care. But there is no consensus regarding the optimum level of public health spending, or the efficiency and equity of various schemes for financing public and private health care. On one hand, excessive government spending on health care in poor countries could divert resources from promising investment opportunities and thus translate into slower economic growth. Some countries have used public health subsidies with restraint at early stages of economic development, but at later stages public expenditure on health increase as a share of GDP — often with the goal of universal coverage of health care.[1] Reviewing the health care experiences of "successful" East Asian countries -- Japan, Korea, Singapore and Taiwan -- Gertler (1998) notes that these countries achieved universal coverage of health care only after they had reached relatively high levels of income, were largely urbanized, and most workers were in the formal sector. Gertler cautions against early implementation of universal coverage because the resulting health subsidies encourage over use of health care (i.e. moral hazard) and inefficient allocation of health goods and services. If cost inflation of medical curative care is partly borne by the private consumer, this may also deter the adoption of new medical technology until it is cost effective.

On the other hand, labor productivity and labor supply may positively respond to health improvements, creating economic gains to compensate for health subsidies. Schultz and Tansel (1997) emphasize the positive effect of health status on worker earnings due to increased productivity and decreased sickness-related absences from work. Strauss and Thomas (1998) maintain that the labor market consequences of poor health are likely to

[1] Newhouse (1993) discusses the evolution of the debate on universal coverage in United States. Campbell and Ikegami (1998) focus on universal coverage by comparing the health systems of Japan and U.S. The Asian experience is summarized in Gertler (1998).

be more serious for the poor, who are more likely to suffer from severe health problems and to be working in jobs for which physical strength has a high payoff.[2]

The provision of universal health care coverage may contribute to a healthier population through the use of more health care, and allocate more care to poorer segments of the population whose labor productivity might be more responsive to the provision of more health inputs. Conversely, such a national health policy might reduce labor force participation and thereby erode the government's tax base and even reduce national income. Although the extension of health care coverage by a National Health Insurance (NHI) scheme might raise productive capacity through improvements in overall health, entitlement to the program would redistribute wealth toward those who were not currently working, reducing the motivation to work and to engage in precautionary savings to pay for unpredictable medical care for themselves and their families. This latter tendency would be stronger if the elderly worked in sectors which provided health insurance only to current employees, as was the case in much of Taiwan's economy in the 1980s. A growing literature comparing high income countries concludes that social security arrangements contribute to earlier retirement by taxing heavily the value of wages among the elderly, after adjustment for their loss of social security wealth if the individual works beyond the age when pensions can be initiated (Krueger and Pischke, 1992; Gruber and Wise, 1999; Coile and Gruber, 2000; National Research Council, 2001; Chou and Staiger, 2001). Thus, national health care programs may similarly allow the elderly to retire at an earlier age than they would otherwise, even when these programs contribute to improving the health and productive capacity of the elderly. But the direction and magnitude of the net effect of a National Health Insurance scheme on national income and welfare remains to be assessed. In the United States Medicare and Social Security are phased in approximately together, from age 59 to 65, providing only a short interval when

[2] It is also plausible that improved health status would improve the school performance of children (Rosso and Marek, 1996). The improved school performance would be partly because of the less severe impact of sickness on the family budget. Higher educational attainment and/or better quality of education would, in turn, have a positive influence on economic growth in the long run.

pensions are available but medical insurance is not covered. In Taiwan, in contrast, retirement pensions are relatively smaller and rarer, and medical insurance for elderly nonworkers and dependents of workers was very limited until the NHI program was introduced in 1995.

In this paper we assess among elderly men and women how their health status affects their labor force participation, and whether the national expansion in health insurance in 1995 encouraged earlier retirement and hence lower labor force participation in 1996. We also seek to assess the effect on labor force participation of self reported health limitations and health status, recognizing that these health variables may be measured with error and may be endogenously affected by coordinated household behavior. Many problems remain to be resolved in this form of analysis, including the development of more satisfactory methods for dealing with the endogeneity of household composition, the choice of living arrangements among the elderly, and their marital status.

2. Literature review

Analyses of labor force participation typically assume the demand of individuals for leisure (not working in the labor force) and market consumption goods depends on the wage they are offered in the labor force, their income without working in the labor force, and other factors including exogenous health conditions (Killingsworth, 1983). Although this labor supply framework has been extended to study the household's coordination of the labor supply of all family members, it is not commonly employed to analyze labor force participation among the elderly in low-income countries. When it has been used to study the retirement decision in contemporary high income countries, administrative and tax provisions of the pension system exercise important empirical effects on the life cycle timing of retirement (Gruber and Wise, 1999). In less developed countries such as Taiwan, which have smaller and fewer pensions, the retirement decision may be more readily understood in terms of the standard labor supply framework, including non-earned income, wealth, market wage offers, family support systems, and the

evolving health status of the elderly. We first review two papers that use data from Taiwan: one focuses on the predictors of health status and the other one investigates the determinants of labor force participation. A brief look at "other empirical evidence" follows.

Using data from the 1989 and 1993 Surveys of Health and Living Status (SHLS) of the Middle Aged and Elderly in Taiwan, Zimmer et al. (1998) find that educational attainment is associated with reduced likelihood of developing a health functional limitation in 1993, conditional on having no health limitation in 1989. For those who were limited in their health functioning in 1989, however, higher education had little influence on their functional health transitions. It is difficult to interpret these findings, however, since social networks, health behavior, and self-assessed health status are all treated as exogenous variables.

The effect of national health insurance (NHI) on female labor force participation in Taiwan is investigated by Chou and Staiger (2001) based on the Family Income and Expenditure Survey, and they find the availability of insurance for non-workers (enabled by universal coverage) was associated with a 4 percentage point decline in married female labor force participation. The authors conclude that countries considering universal health insurance should anticipate similar declines in labor force participation. Even though there is theoretical justification for this outcome, the findings cannot be readily generalized, because the analysis focuses on a selected sample: married women of ages 20 to 65, whose husbands are paid employees in the public or private sectors (women from agricultural families, as well as women whose husbands are self-employed or an employer are excluded), and the women must be a household head or married to a household head. Because the FIES do not have direct questions on health insurance status for each individual, Chou and Staiger distinguish between government employees' wives (who already had access to health insurance) and others — which may be a rough approximation to who had access to health insurance prior to the implementation of NHI. The exclusion of males and the elderly from the analysis also deserves reconsideration. Nonetheless, it is likely that the impact of NHI on

labor force participation would a priori be most substantial among married women and the elderly, and our analysis of the elderly based on the SHLS allows for a further examination of the labor force participation effects of NHI in combination with detailed measures of health status.

We conclude this section by citing related evidence from United States. Even though there is no universal health insurance in the U.S., the studies investigating the relationship between social security benefits and retirement behavior are relevant to this study (Gustman and Steinmeier, 1994). This line of research, in general, has reached the conclusion that the level of social security benefits has a significant effect on the timing of retirement (Krueger and Pischke 1992 ; Gruber and Wise, 1999; Coile and Gruber 2000). One possible limitation of this literature on the effect of social security benefits on labor supply is relevant to our efforts to infer the effect of NHI on labor supply: the cross sectional estimation may be biased if unobserved individual heterogeneity which affects labor supply is also related to which persons benefit most from the NHI insurance coverage. Without controlling for individual heterogeneity, the changes in labor supply associated with the introduction in NHI may be due to other compositional changes occurring in the population or heterogeneity in the response to the treatment of insurance coverage.

3. Health System in Taiwan and its Reform

As a result of the sharp reduction in fertility and increase in life span, the share of elderly in the population of Taiwan is increasing: 8.7 percent of the population were aged 60 and over in 1987, and the estimate for year 2020 is 21 percent (Chang and Hermalin, 1989). The implementation of the National Health Insurance (NHI) from March 1995 is believed to have an especially large impact on the elderly both because (i) eligibility for most health insurance programs prior to 1995 was dependent on employment status; and (ii) the elderly face high medical expenditures (Republic of China – Taiwan 1997 Yearbook).

Prior to March 1995, 59 percent of the Taiwan's population had health insurance under 13 public health plans. The three main insurance categories were Labor Insurance, Government Employee Insurance, and Farmers Insurance. Private health insurance serves a negligible fraction of the Taiwan population. NHI subsumed and extended the existing insurance schemes, but the old schemes were not abolished, for they continue to provide special benefits for extraordinary financial cases, e.g. the Labor Insurance program offers some benefits to workers under age 60 and the Farmers Insurance provides some special benefits to registered/working farmers (Department of Health, 1992; Republic of China – Taiwan Yearbooks 1997 and 2000).

The beneficiaries of NHI, after paying their premium and obtaining NHI cards, are entitled to receive medical services including outpatient service, inpatient care, Chinese medicine, dental care, childbirth, physical therapy, preventive health care, home care, rehabilitation for chronic mental illness, etc. Although enrollment in NHI is compulsory, program coverage increased but was not immediately universal. At the end of 1998, 96 percent of the population participated in the program (up from around 90 percent during the latter half of 1995). By 1996 about 93 percent of medical institutions nationwide were participating in NHI. People aged 70 or older, as well as members of low-income households (as defined by the Social Support Law) pay no premium. Between 70 and 95 percent of hospitalization fees are also paid by the NHI program. Thus, NHI covered by 1996 the medical expenditures of a large proportion of the population who had no health insurance before 1995 (Republic of China – Taiwan 2000 Yearbook).

4. Labor force participation, health status and health expenditures over time

Figures 1, 2a and 2b depict health status and labor force participation by age and sex in Taiwan. The data come from the 1989 and 1996 Surveys of Health and Living Status (SHLS) of the Middle Aged and Elderly

in Taiwan.[3] Figure 1 is based on an activities of daily living (ADL) index (using seven activities) ranging from 0 (cannot perform any of the seven activities listed) to 100 (no functional limitations).[4] Comparison of ADL indexes for 1989 and 1996 suggest that improvements in health among both men and women age 70 and older may be emerging even in this short span of seven years. There are significant differences between males and females, with females reporting more functional limitations. This finding is in line with the U.S. literature (Smith and Kington 1997, Verbrugge 1989).[5]

Elderly males in Taiwan are less likely to work in 1996, compared to 1989, as shown in Figure 2a.[6] The reduction seems to occur mostly through a reduction in part-time work. Among females the percentage working also declined from 1989 to 1996, but those working full-time increased at all ages, implying the propensity to engage in part-time work has also declined for women (Figure 2b). The patterns of labor force participation by sex are depicted in Table 1, using data from the Family Income and Expenditure Survey (FIES, various years). The FIES are not necessarily representative of the same population as the SHLS, but the FIES are useful both because of their larger sample size and because these surveys were conducted following a relatively consistent methodology since 1976 to develop price indexes and construct the national income accounts. The FIES also provide information on private discretionary expenditures on health, health insurance premiums paid by private households, and public subsidies for health insurance used by households. However, the questionnaires eliciting

[3] In 1996, in addition to following-up the elderly interviewed in 1989, a new panel of individuals aged 50 to 66 was also surveyed, and as a result a representative sample of elderly aged 60 and more exist both for 1989 and 1996.

[4] Section 6 provides more information on the construction of this index.

[5] Sex differences in self reported indicators of morbidity are generally attributed to: (i) biological differences by sex, (ii) differences between males and females in perceiving and reporting health problems, (iii) differences in contacts with the health care system, which increases information and diagnosis of health conditions, and (iv) differential in mortality by sex, leading to a selection bias in the health status of survivors.

[6] In U.S., the spike in age pattern of retirement has been documented by a number of studies (Hurd 1990, Rust and Phelan 1997). The Taiwan data, however, do not show a sudden increase in retirement at a specific age, probably because pensions for the elderly replace only a small fraction of the wage received by most workers before retirement, and pensions are not conditional on receiving no earnings as they are in many OECD countries.

whether a worker is employed part-time or full-time appear to have changed in the FIES after 1995 introducing a possible discontinuity in the measurement of part time workers as reported in Table 1.

The labor force participation rate for males between the ages of 25 to 59 has declined gradually in Taiwan, at least from 1980, not unlike other countries experiencing substantial economic development (Durand, 1975; Gruber and Wise, 1999). Among men age 60 to 69 participation rates first rise until 1988 and then begin to decline. Male participation rates for those age 70-74 rise until 1993, and then stabilize, while there is no clear trend in the participation rates among males over 74, but it is notable that participation remains about a quarter in these advanced ages, much higher than in the OECD high income countries. The proportion of each age group working part time is reported in parentheses beneath the overall participation rates, and these part-time rates tend to increase through 1995, encompassing most of the period of our panel survey analysis. These data suggest that the increase in part-time jobs by the elderly may help to explain the rise until the early 1990s in the overall labor force participation rates among males in Taiwan.

Among females, the secular trend is for participation in the labor force to increase gradually in many parts of the world (Durand, 1975; Schultz, 1990), and it is evident in Taiwan for women age 25 to 49 from 1976 to 1996. But in Taiwan there is in addition a large shift of female participation from work in agricultural self employment and as an unpaid family worker to wage employment at the beginning of this period (Levenson, 1997; Schultz, 1999a). For females age 50-59 the participation rate peaks in 1994 at 45 percent and has nearly recovered this level again by 1999. Among older women the secular trend of increasing participation is evident until the early 1990s, after which the participation rates stabilize and in some cases fall slightly.

Table 2 reports the share of household total expenditures spent on discretionary health goods and services from the Family Income and Expenditure Survey (FIES), which decreased from 5.6 percent in 1992, to 3.2 percent in 1995 and 1996, possibly because the National Health Insurance (NHI) was extended to all persons in

March 1995.[7] When health insurance premiums are included in the household's health expenditure share after 1992, this share of all private health expenditures declined from 5.04 percent in 1994, to 3.69 in 1996.[8]

5. A Heuristic Framework for Studying Labor Supply and Health of the Elderly

An individual's single period utility function depends on leisure, l, consumption, C, of market goods after paying for health care, and health status, H:

$$U = U(l, C, H),$$

subject to a constraint in which time can be allocated either to market labor, L , or leisure, l :

$$T = L + l,$$

and consumption depends on market labor supply, market wage W, and nonearned income inclusive of pensions that are not conditional on work or retirement, V, minus the relative price of health care P_H , which may be reduced or redistributed by a government subsidy, S_H :

$$C = WL + V - (P_H - S_H),$$

where all elements are expressed in real terms by dividing them by the price of consumption goods other than health.

The issue is how health status of the elderly and national health insurance affect the labor supply of the elderly. The market wage offer an individual receives depends on the individual's education, age, sex, health status, and other things:

$$W = W(E, A, H, e_l), \qquad (1)$$

[7] These estimates are prepared by the authors from the Family Income and Expenditure Survey (FIES) files, representing the Taiwan area of the Republic of China, collected by the Directorate General of Budget, Accounting and Statistics, Executive Yuan.

[8] A public insurance subsidy for health services consumed appears to be attributed to household's in the FIES, based on the number of outpatient visits and days of inpatient (hospital) care reported by household members in the previous year. Including this public subsidy one obtains the last series of public and private expenditures on health care as a fraction of household total expenditures (and subsidies). The total share of household resources used for health, including this public subsidy for health insurance coverage, increased from 9.02 percent in 1993 to 12.04 percent in 1999 (Table 2).

and labor supply could also be affected by the wage or implicitly by these same variables, plus nonearned income and the relative price of health care, P_H, after the government subsidy, S_H:

$$L = L\ (W,\ E,\ A,\ H,\ V,(P_H - S_H),\ e_2\ ) = L_{rf}(\ E,\ A,\ H,\ V,(P_H - S_H),\ e_1\ ,\ e_2\ ) \qquad (2)$$

where the errors of measurement, functional form, and omitted variables are denoted by the e's, and the second expression represents a reduced form in which the wage (unobserved in our data) has been solved out. Some studies of the impact of health status on labor supply assume that health status is exogenous in equation (2), which implies that the errors in the wage and labor supply equations are uncorrelated with the error in equation (3) determining health status (Schoenbaum, 1995):

$$H = H\ (\ E,\ A,\ V,\ P_H - S_H\ ,\ Z,\ \ e_3\ )\ . \qquad (3)$$

Because we anticipate that the errors affecting health status across elderly individuals could be related to those errors affecting wages and labor supply, we need an exclusion restriction if we are to identify the estimated effect of endogenous health status on labor supply in equation (2), or some variable(s) Z which are assumed to influence health, but not to affect directly wages or labor supply. We will assume that information regarding the individual's parents' longevity and ethnic origin, residential location of the individual at age 12, and proxies for regional nutritional variation at birthplace are valid instrumental variables Z, which help to predict health status, but are not otherwise correlated with the error in the labor force participation equation. In other words, the identification restriction implied by the choice of Z allows one to estimate without bias the labor supply equation (2). The use of such an instrumental variable method should also correct for the attenuation bias due to health being measured with error, which is likely to otherwise underestimate the effect of health status on labor supply (Schoenbaum, 1995). With self reported survey

evaluations of an individual's health status, this problem of measurement error may be particularly serious.

6. The Available Data

Our analysis is based on the first three waves of the SHLS of the Middle Aged and Elderly in Taiwan (collected for years 1989, 1993 and 1996), conducted by the Taiwan Provincial Institute of Family Planning and the Population Studies Center of the University of Michigan. The Round 1 survey sample included 4049 individuals aged 60 or over. These individuals were then contacted again in 1993 and in 1996. In 1993, 3449 individuals were alive, and 92 percent of these persons were successfully re-interviewed. In 1996, about 90 percent of the 2968 survivors were re-interviewed. In addition to re-interviewing the panel sample, the 1996 survey also included a new sample of individuals, aged 50 to 66. The sample of the elderly is nationally representative: all elderly, including the institutionalized, are sampled.[9] The health section of the questionnaire is particularly comprehensive, providing us with a variety of variables to measure health status. The main limitation of the surveys is that little information is collected on wages, incomes, assets, and response rates are low on the single income question. As a consequence, we initially estimate a reduced form type of specification of labor force participation (2) in which we do not attempt to distinguish how poor health affects differentially worker productivity, wages, wealth, and labor supply or effort, and rather estimate labor force participation as a function of health status, where we then proceed to assume adult health status is influenced by the longevity and other characteristics of the parents and family, as well as the location when he or she was a child.

With the exception of health status proxies, the variables in our labor force participation model are relatively straightforward. The measurement of health status, however, deserves some explanation. Survey variables commonly used to measure health status include (1) subjective self-evaluation of how well the individual feels at the time of the survey, (2) a health index based on the daily functions which the individual is limited in performing, (3) height and weight, (4) self-reported specific health problems or illnesses, (5) clinically confirmed

[9] As described by the survey documentation, in Taiwan elderly (whether institutionalized or not) are covered in the "household register". The surveys adopted sampling designs that were a probability sample of all individuals in the age

incidence of specific diseases or health conditions, and (6) number of days of work lost due to illness in a prior reference period. The alternative ways of measuring health have their distinctive strengths and shortcomings, and the preferred measure may depend on the research objective. The relationship between these alternative health measures is also of interest. To the extent that data exist on more than one measure, it may be useful to replicate the analysis using the alternative measures to examine the robustness of the results. We examine health status measures (1), (2) and (4).[10]

A serious problem with relying on self reported health measures to investigate labor market behavior is that those who have a preference to retire early or enjoy leisure may overstate their health problems that might limit their capacity to work, and those who have a preference to stay in the labor force may understate these health problems (Dwyer and Mitchell 1999, Bound 1991). In this case, one would expect a stronger inverse association between self-reported health and labor force participation than would be estimated if an objective measures of health status were available to relate to labor force participation. Studies of U.S. data tend to support this hypothesis of a self reporting bias, notably among those applying for disability insurance, but there is less agreement on the magnitude of the bias (Dwyer and Mitchell, 1999). The number of days of work lost due to illness may also produce misleading results because individuals have some discretion as to whether to work (Bartel and Taubman 1979; Schultz and Tansel, 1997). The problem with using self-reported specific illnesses involves the inability of most persons to self-diagnose their illnesses, and those who use medical care facilities tend to be richer, better educated, and possibly better insured, other things equal. Those reporting a specific illness are therefore a self selected sample of those who were diagnosed (or better informed) and had the illness, not a random sample of the ill. What is more, recent evidence using data from Canada suggests there could be significant discrepancies between medical records and self reports (Baker, Stabile and Deri 2001). Infrequent specific diseases and illnesses

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groups of interest in the household register.

[10] In our SHLS data non reporting of anthropometric information is substantial for (3), and (5) is reported also for a limited

also require large samples to observe a sufficient number of each type of illness to analyze.

Our preferred measure of health status is an index based on Activities of Daily Living (ADL)[11], but we also report models that use self-evaluated health (SEH) status and specific problems and illnesses. The self-assessment of health question provides five categories: poor, not so good, average, good, excellent. The specific illness indicators are constructed using questions on high blood pressure, diabetes, heart disease, stroke, respiratory problems, arthritis or rheumatism, ulcer, liver problem, cataract, glaucoma, kidney disease, anemia, bone disease/fracture, prostate trouble (for males), seeing problems, and hearing problems.

The ADL index is constructed as the sum of the capacities of the individual to do the following seven activities: squat, raise both hands over the head, grasp or turn objects with fingers, lift or carry something weighing 11-12 Kg, walk up two or three flights of stairs, bath oneself, and walk for 200-300 meters. In order to capture the severity of each separate activity limitations, value 0 denotes no problem in doing it, 1 some difficulty, 2 very difficult to do, and 3 if entirely unable to do the activity. After adding these codes for each activity, we convert this sum to a $0 - 100$ scale, 100 indicating the worst health status observed in the data.[12] The more objective multiple dimensions of ADL questions are thought to provide a less subjective indicator of health status and ones

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number of respondents, perhaps only those whose diagnosis was clinically confirmed.

[11] A daily activity health index may be of limited use in signaling the health status of younger individuals (most observations may be close to the best health). But for the elderly, as the earlier figures suggest, ADLs may be a good proxy for the health status (Stewart and Ware, 1992; Strauss, et al. 1995).

[12] This procedure does not weigh certain activities more heavily than others. Zimmer et al. (1998), using the 1989 SHLS, argue that a few well-selected activities can be used as a proxy for a detailed battery of functional tasks. Following their choices, we also experimented with an alternative index, this time focusing only on walk up two or three flights of stairs, bathing, walk for 200-300 meters. At the least, focusing on fewer activities has the advantage of resulting in a slightly larger sample size for estimation. This new index also takes into account the severity of the functional limitations, and is scaled to vary between 0 and 100. The estimation resulted in almost identical estimates for both ADL indices, and consequently the remainder of the paper uses the index based on seven activities rather than three. Note also that the 1989 wave of the survey included an additional category named "never did it before." In few cases this category was chosen more than 20 times: for the question "Doing heavy work in or around the house" it was chosen 262 times, as a result this question is not used. The only other question where this issue is likely to be problematic is "Lifting and carrying something as heavy as 25 pounds," where 110 individuals revealed they did not do it before. These cases are treated as missing (an ADL index without that question produces similar results). Finally, in some cases there are minor differences in the wording of activities in different surveys. For example, in the 1989 and 1993 surveys we have "climbing 2-3 flights of stairs" and "reaching up over your head", while the 1996 survey uses "walk up two or three flights of stairs" and "raise both hands over your head."

that can be partly validated by the interviewer. Such ADL indexes are well replicated at the individual level over time, and have been systematically validated by clinical examinations (Stewart and Ware, 1992). To describe improvements in health status or in physical functioning in Activities of Daily Living as an increase in the health index, we subtract this number from 100. Thus, an ADL index of 0 (100) indicates the worst (best) health status observed in the data. The health status indicator is also scaled from 0 (poor) to 4 (excellent).

The descriptive statistics for our health proxies are reported in Appendix Tables A-1, A-2 and A-3. Table A-1 reports for elderly men and women the mean values for all health variables that are used in our analyses. In 12 out of 15 of the specific morbidities for which men and women can be compared (i.e., prostate troubles are male specific), women over age 60 report the illness or health problem more often than do men.

Table A-2 reports the mean value of the ADL index for each self-assessed health category, separately for each gender. Females not only report more functional limitations than men (as shown in Table A-1, index 85.5 < 93.2), but also they report more functional disabilities than do men within each of the self assessed health status categories.

To summarize the relationship between specific illnesses and the functional limitations, the ADL index and self-evaluated health are regressed against all 16 specific illness outcomes. The OLS coefficients estimated on the specific illness indicators are reported in Table A-3, where all statistically significant ($P < .05$) coefficients are negative. The first two columns report results for the ADL index, separately for men and women. The number of statistically significant estimates is 12 for males and 9 for females, but in only four cases are the estimates more significant for men than women: diabetes, heart disease, stroke, and bronchitis and respiratory problems. The last two columns report results for self evaluated health and this time we have 15 statistically significant estimates for men and 14 for women. In 11 cases the estimates for males are more significant than those for females (these 11 include four illnesses highlighted by the ADL index regressions mentioned above).

Table A-4 reports the means of the survey variables for the pooled sample of all three rounds of the SHLS, and for the three variables associated with the region of current residence and of birth. The working hypothesis is that the indicators of parent longevity, father's schooling, city/town/village residence at age 12, and vegetable and protein (pork) consumption per capita in the region of birth, are all conditions which are relevant to childhood nutrition and health care that should affect adult health status among the elderly, but do not directly affect current labor force participation, except through the respondent's own education, age, etc.

7. Empirical analysis

The objective of this analysis is to investigate the determinants of labor force participation of the elderly, paying special attention to the influence of health status on labor force participation and the possible impact of the implementation of National Health Insurance starting from early 1995. First, the estimation of health status indicators are reported, followed by labor force participation. Then, instrumental variable estimates are investigated where the family origin and status variables are expected to affect health status and thereby influence labor force participation. Finally, estimates of the effect of the National Health Insurance program are obtained.

7.1. Health status

Health status determinants are estimated for males and females in Tables 3 and 4 using first the ADL index of health as the dependent variable, and then the Self Evaluated Health (SEH) indicator with its five categories of improvement. The explanatory variables include age, age squared, marital status, own schooling attainment, ethnicity, household possessions index (proxy for wealth), a regional unemployment rate[13] (by gender), year

[13] The unemployment rate data are drawn from the Yearbook of Manpower Statistics Taiwan Area, Republic of China (1989, 1993 and 1996). Appendix table A – 5 presents these data (by gender and 21 regions).

dummies, father's schooling (the Taiwanese surveys did not inquire about mother's schooling), a dummy variable to indicate birth in Taiwan (versus in Mainland China), farm/town/city residence at age 12, dummy variables that indicate if the mother and father died before age 60, average vegetable consumption per capita (kg) and average pork consumption per capita (kg) in 1967 in the region of birth.[14]

According to the ADL index, health declines for older males and females (within the sample 60 or over), whereas the SEH indicator declines until about age 85 for males and until 75 for females, controlling for the other variables in the regression. Being married is not associated with significant differences in either measure of health for either gender, in contrast to some studies in United States (Feinstein, 1993). Own schooling is related to monotonic improvements in ADLs for women (in the SEH model 1-6 years of schooling ranks below literacy), but with a significant improvement for men only for those with 7 or more years of schooling, consistent with some analyses of mortality and health (Strauss, et al. 1995; Kitigawa and Hauser, 1973). Similarly, the index derived from household possessions, which is the survey's only proxy for wealth, is related to improvements in ADL measures of health for men and women, just as a growing number of studies document that wealth is related in high income countries to improved survival among the elderly. The SEH indicator of health is also reported to increase with own schooling and household wealth (Hurd and McFadden, 1999; Attanasio and Hoynes, 2000; Attanasio and Emmerson, 2001).[15] The relationship between the unemployment rate and health status is not well-

[14] The data come from Taiwan Agricultural Products Wholesale Market Yearbook, 1967 Edition, Department of Agriculture and Forestry, Provincial Government of Taiwan. We would like to use the relative food prices in the region of birth, at the time of birth or shortly thereafter. But, the earliest food data (by region) that we could find related to consumption patterns in 1967. Thus, we must assume that food consumption variations across regions were related to relative price patterns which tended to be persistent over time and hence relevant for the elderly surveyed in 1989 when they were young children. For those born in mainland China, the lack of consumption series is compounded into the ethnic origin variable, so the consumption data only distinguish among health outcomes for those born in Taiwan.

[15] In an alternative specification, wealth effect is allowed to vary by age (not reported). Both for males and females, these models present evidence of diminishing wealth effects by age, although the overall wealth effect does not disappear until after age 82 for males and 86 for females (based on models using ADL index—for self assessed health models the threshold ages are well over 90). We also experimented with interacting own schooling variables with age, but this exercise did not produce as clear evidence. For males when the interaction variables are included in the model with ADL index, an F test of joint significance of the age/schooling interaction variables resulted in a *p*-value of 0.44. When the dependent variable is self evaluated health, however, being literate or having 1-6 years of schooling (as opposed to being illiterate or having attend school for 7 or more

understood (Chen, Wittgensten and Mckeon 1996, Novo, Hammarstrom and Janlert 2001), and our findings do not offer robust evidence as well: higher unemployment rate is associated with poor health for males and good health for females. Father's schooling leads to a rise in ADL health index, or an improvement in health free of functional limitations, with the patterns being stronger for females than males. Residing at age 12 in a small town is less healthy than on a farm or in a city for both genders. If a female respondent's mother died before age 60, she tends to have worse health, according to the ADL or SEH indicators, however her father's early death is associated with fewer health problems. The parent's longevity is surprisingly not associated with the ADLs of the males (in contrast with the reported pattern in the United States, e.g., Smith and Kington, 1997), though it is for male SEH with respect to their mother's longevity. The nutritional indicators at birthplace are only significant in the case of vegetable consumption being associated with improved male health according to either indicator, and in the case of hog consumption being associated with improved female health according to ADLs. The identifying variables in Tables 3 and 4 are jointly significant in all four cases at better than 0.02 percent level. Although there is general consistency between the more objective ADL index and the more subjective SEH indicator of health, it is our belief that the ADL based measure is less "culturally conditioned" (Johannsson, 1991), and therefore the more reliable indicator of objective health status across a society and possibly over time.

7.2. Labor force participation

The dependent variable is an ordered categorical variable which distinguishes between full-time and part-time workers and those not working in the market labor force. The determinants of the labor force categories is estimated by maximum likelihood methods by fitting an ordered probit model (Madalla, 1983). The explanatory

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years) has beneficial effects on health as a male ages (*p*-value for the joint significance of interaction variables being 0.03). For females, the model with ADL index suggests that schooling (monotonically) translate into better health as an individual gets older (*p*-value for the joint significance of interaction variables is 0.05). But this time, the model with self evaluated health results in imprecise parameter estimates (*p*-value 0.85).

variables are alternative indicators of health status, age, married, own schooling, a household wealth index,[16] ethnicity, plus regional unemployment rate (by gender), and year dummies, and the threshold parameters for part-time and full-time work. Separate models for men and women are estimated. None of the significant parameters reported here would change if a probit were fit to participation in both full time and part time work (i.e. all work), though we prefer retaining the plausible distinction which is available in the survey data. This is a parsimonious specification which could be generalized to a multinomial probit, but at the

cost of nearly doubling the parameters estimated, which would be a limitation given the modest size of four sample.

Three alternative specifications are reported for men and women in Tables 5 and 6: (i) a model excluding any indicator of health status as an explanatory variable, (ii) one that includes health status (either ADL index of SEH indicator) as if it were exogenous and measured without error, and (iii) one that treats either of the health status variables as an endogenous explanatory variable which may also be measured with random error. The last column (in both tables) presents marginal effects evaluated at sample means for full-time and in brackets part-time labor force participation. An instrumental variable two-stage conditional maximum likelihood (2SCML) model of Rivers and Vuong (1988) is estimated in which health status is endogenous, and the models of health status reported in the previous section serve as the first-stage equations. The inclusion of residuals from the first stage equation provides a specification test for the null hypothesis that the health status variables are exogenous, and the coefficients on the predicted health status variable are the estimates of causal effects of health on labor force participation.

First, it should be noted that both health indicators are positively associated with labor force participation, whether treated as exogenous or endogenous, for both genders, though the estimate of the effect of SEH on labor force participation is not statistically significant for women when treated as endogenous. However, for both men

[16] Household possessions index is formed by the summation of the indicators for the availability of telephone, color television set, refrigerator, washing machine, VCR, stereo, and air conditioner.

and women, the specification test indicates that the exogeneity of either health status variable can be rejected, leading to our preference for the 2SCML instrumental variable (IV) estimates in the last two columns.

The IV impact of the ADL index on labor force participation is simulated by age and sex, evaluating model predictions at sample means allowing health status to vary. We consider the mean values of ADLs for health status (93.2 for males and 85.5 for females) as well as an ADL index of 100, which corresponds to no functional limitations or perfect health. At age 65, the full time labor force participation for males would increase from 69 to 78 percent with an increase in their ADL index from 93.2 to 100. The overall male labor force participation (including part-time work) increases from 77 to 85 percent as a result of this magnitude of improvement in ADLs. For women age 65 an ADL increase from 85.5 to 100 is associated with a near doubling of their full time labor force participation from 25 to 45 percent, whereas their overall labor force participation (including part time work) would increase from 35 to 57 percent. The differences in labor force participation rates due to this large improvement in ADLs become smaller among the eldest of the elderly, but the total effect on labor force size remain substantial, at least for men, beyond age 70 in Taiwan.

In all specifications labor force participation declines with age within the sample range for both men and women, and is higher for married than single persons. Own schooling tends to reduce participation among men, significantly for those with 7 or more years of schooling, if health status is controlled, whereas for women, being literate or with 7 or years of schooling is associated with a greater likelihood of participating in the labor force than being illiterate or with only 1-6 years of schooling. The regional level of unemployment deters male labor force participation, but is unexpectedly related to greater female labor force participation.[17]

With reference to the overall impact of the introduction in the National Health Insurance in early 1995, it

[17] The "displaced worker effect" could explain this trend, where husbands are unemployed, their wives are more likely to work. This seems to be a plausible explanation, for when the female unemployment rates are replaced by male unemployment rates and the female labor force participation models are rerun, in all specifications the estimated unemployment rate coefficients are positive and statistically significant at 5 percent level.

may be noted that female labor force participation (including part time work) among this elderly sample may have increased by about 1.1 percentage point in 1993 compared with 1989 (the omitted category), but decreased 1.5 percent in 1996 compared with 1989, based on the preferred endogenous ADL index specification (the reported numbers are obtained by adding the marginal effects for full-time and part-time work, which are presented in the last column of Table 6). A 2.6 percentage point decline for elderly women's participation from 1993 to 1996 would therefore have occurred in this time interval when NHI was introduced. For elderly males the participation rate is 3.9 percent lower in 1993 than 1989, whereas in 1996 the rate is 3.6 percent lower than in 1989, implying a 0.3 percent rise from 1993 to 1996 (the marginal effects are listed in Table 5, separately for full-time and part-time work). But this three year change in labor force participation rates could be explained by other developments than the introduction of NHI, and we will return to a more satisfactory estimate of the labor supply effects due to the expansion of the national health insurance coverage in the next section.

The labor force participation equations are re-estimated in Table 7 replacing the two overall indicators of health status with the 16 specific forms of morbidity or disease type. There are insufficient instrumental variables in our survey describing life cycle conditions and parental longevity to identify all of these forms of morbidity simultaneously as endogenous determinants of labor force participation. We report therefore only ordered probit models in which the specific morbidities are assumed to be exogenous and measured without error. Despite their collinearity, of the 16 morbidity indicators, 7 remain individually significantly associated at the 5 percent level with a reduction in male labor force participation, and for women five out of 15 morbidities are individually statistically significant in their partial association with labor force participation. It may be noted that all of the statistically significant partial associations are inverse as expected, with the largest coefficients associated with glaucoma and hearing difficulties for women, stroke and heart disease for men, and diabetes for both sexes, etc.

7.3. National Health Insurance

To estimate with more precision the impact of National Health Insurance on labor force participation of the elderly, we make the distinction between individuals who already had benefits similar to those provided by the NHI in 1993, and those who were covered by insurance only after the implementation of NHI in 1995. The approach is similar to that used by Chou and Staiger (2001) who focus on a sample of younger married women age 20-65 whose husbands are wage earners. No information on health insurance was collected in the 1989 round of our SHLS survey, but in 1993 and 1996 questions were answered about health insurance. We assume that those who did not have health insurance in 1993, as well as the workers and their dependents covered by Laborer, Farmer, Fisherman and Private insurances benefited from the expansion of NHI in March 1995. Government, military, and veteran workers and retirees in these three categories of employment, and their spouses, probably received expansions in their insurance in 1982 and thereafter, and they may therefore have not materially gained benefits with the start of NHI in 1995. For example, Laborer and Farmer Insurance schemes covered only workers, not retirees or dependents before the start of NHI.

Before moving to multivariate analysis, it is instructive to construct difference-in-difference estimates (Table 8). Males who benefited from the introduction of NHI (as defined in the previous paragraph) are more likely to be working relative to the others, both in 1993 and in 1996 (the single differences, D, are statistically significant at 5 percent level). For males the difference in differences (DD) estimate is large and in the expected direction (suggesting a 1.9 percentage points decline in full time work, 9.9 percentage points overall decline when part time work is also included), but not statistically significant at 10 percent level. For females, neither in 1993 nor in 1996 do we detect significant differences in labor force participation patterns between those who "benefited from the introduction of NHI" and others. The DD estimates are negligible (signaling a 0.4 percentage points *increase* in full time work and a 0.2 percentage points decline in labor force participation when part time work is also

considered), and not statistically significant at 10 percent level for females.

Table 9 provides the ordered probit estimates of the effect of NHI on labor force participation for this group eligible to benefit: the participation model without the health index is reported first, followed by the specification with the ADL index treated as endogenous (Appendix Table A-6 reports the descriptive statistics on this reduced sample of individuals observed in 1993 and 1996.). The critical estimate in this table is that of the first coefficient reported on the interaction between the year (1996) and NHI beneficiary group. For males, when both full time and part time work is considered, the impact of the NHI on the NHI beneficiary group's labor force participation appears to be sizable (a 3.9 percent decline in labor force participation, considering the marginal effects for both full-time and part-time work for the endogenous ADL index specification, as reported in Table 9), but the estimated coefficient is not statistically significantly different from zero. For females, the coefficient on the interaction term is unexpectedly positive (suggesting a 1.6 percent increase in labor force participation — 1.0 due to full-time participation and 0.6 to part-time participation — marginal effects being listed in Table 9), but this time too, the estimate is not statistically significant. We conclude from our analysis, those most likely to gain health insurance coverage for themselves and their dependents from the expansion of NHI did not change their likelihood of labor force participation in 1996. But a cautionary note is also in order. Only eight percent (186 observations) of this elderly female sample is working and 26 percent (744 observations) of the male sample is working, which underscores the need for a larger survey and a better method for inferring who is eligible to benefit from the National Health Insurance program. We are doubtful that the expansion of the coverage by NHI to the elderly was a large factor in reducing the size of the labor force, whereas the program may have had an important effect in equalizing the economic burden of health care among this elderly population in Taiwan.

8. Conclusions

Poor health status among the elderly, as summarized by an activities of daily living (ADL) index and a Self Evaluation Health (SEH) indicator reported in a Taiwan Survey of Health from 1989 to 1996, are associated with reduced participation in the labor force for both elderly men and women. These health effects on labor supply and on the postponement of retirement of individuals age 60 and over are substantial in this rapidly growing middle income country. The econometric specification tests reject the exogeneity of these health status indicators, and a set of characteristics of the respondents residence at age 12 and at birth as well as parents provide a basis for identifying the endogenous effects of health status on current labor force participation in part time or full time work. The IV estimates of the endogenous effect of health are larger than the estimates assuming health is exogenous, with the exception of women with the self evaluation indicator for which the IV coefficient is not significant. Both men and women reduce their labor force participation when the household's wealth proxy is higher, and both are more likely to work if they are married and younger. The respondent's own schooling, at least 7 years or more, is associated with lower participation for the male and higher participation for the female, suggesting that women's labor supply responds positively to their wage opportunities as proxied by their education, compared with men whose labor supply decreases with their wage opportunities in these elderly years.

The establishment of a National Health Insurance (NHI) program in Taiwan in March 1995 raises the prospect that by offering health insurance to the population, whether they are currently working in the labor force or not, could reduce the incentive to work, particularly among secondary workers who are not likely to be covered in their health care expenditures unless they themselves are working. One might expect this health insurance subsidy to be particularly valuable to the poor and to most Taiwan elderly who could not obtain private health insurance before 1995. Economic theory would lead us to expect that the NHI could have contributed to a

reduction in labor supply, particularly among secondary workers, such as women. The analysis reported here did not find a statistically significant response, and indeed the direction of the response among those most likely to benefit from NIH was to increase labor force participation for women by 1.6 percentage points and to decrease participation for men by four percentage points, although both estimates are not statistically significant. The four percent decline in labor force participation by a selected sample of married women age 20 to 65 reported by Chou and Staiger (2001) using another source of survey data is a challenge to replicate here. We suspect that a change in the questionnaire in their survey between 1994 and 1995 may have been responsible for the decline reported of part time workers after 1995. But it is also possible that NHI contributed to the sudden decline in part-time work which was noted after 1994 in Table 1. To distinguish between these explanations may require additional data or a different way to interpret the various survey and administrative information.

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Table 1. Proportion of age and sex group working in the labor force for selected years, 1976 to 1996, according to the Family Income and Expenditure Survey[a]

Sex and Age (proportion part time)	1976	1980	1984	1988	1992	1993	1994	1995	1996	1997	1998	1999
Men												
25-49	.98 (.000)	.98 (.001)	.97 (.005)	.97 (.004)	.96 (.005)	.96 (.005)	.96 (.005)	.96 (.008)	.95 (.009)	.95 (.008)	.95 (.012)	.94 (.011)
50-59	.91 (.002)	.93 (.023)	.90 (.052)	.90 (.041)	.89 (.016)	.88 (.020)	.88 (.019)	.86 (.023)	.85 (.015)	.86 (.020)	.85 (.022)	.85 (.027)
60-64	.70 (.007)	.73 (.043)	.75 (.158)	.76 (.208)	.72 (.152)	.72 (.147)	.71 (.121)	.68 (.111)	.65 (.050)	.66 (.051)	.60 (.040)	.64 (.043)
65-69	.53 *	.52 (.125)	.54 (.258)	.60 (.274)	.57 (.331)	.58 (.402)	.59 (.413)	.55 (.371)	.53 (.227)	.51 (.198)	.50 (.175)	.48 (.155)
70-74	.31 (.019)	.33 (.119)	.31 (.224)	.37 (.288)	.44 (.425)	.45 (.458)	.41 (.476)	.44 (.536)	.42 (.217)	.41 (.243)	.41 (.245)	.45 (.264)
75 or more	.13 (.056)	.21 (.143)	.11 (.157)	.21 (.262)	.24 (.430)	.25 (.503)	.23 (.509)	.25 (.552)	.25 (.150)	.26 (.162)	.26 (.176)	.28 (.198)
Female												
25-49	.44 (.003)	.49 (.009)	.53 (.042)	.58 (.040)	.61 (.028)	.63 (.031)	.64 (.028)	.64 (.031)	.66 (.022)	.65 (.019)	.65 (.020)	.67 (.018)
50-59	.35 *	.41 (.009)	.40 (.036)	.42 (.053)	.44 (.039)	.43 (.048)	.45 (.047)	.43 (.047)	.42 (.024)	.40 (.021)	.41 (.022)	.44 (.022)
60-64	.18 *	.31 (.005)	.25 (.025)	.28 (.108)	.32 (.043)	.30 (.084)	.32 (.082)	.31 (.096)	.27 (.027)	.27 (.022)	.24 (.031)	.26 (.030)
65-69	.11 *	.13 (.013)	.13 (.061)	.16 (.125)	.23 (.148)	.20 (.102)	.21 (.083)	.19 (.097)	.16 (.023)	.16 (.017)	.16 (.026)	.14 (.027)
70-74	.029 *	.065 (.040)	.029 (.067)	.073 (.237)	.12 (.069)	.12 (.134)	.11 (.169)	.11 (.221)	.10 (.023)	.10 (.020)	.084 (.035)	.095 (.021)
75 or more	.031 *	.036 *	.006 (.333)	.021 (.231)	.036 (.115)	.043 (.152)	.043 (.176)	.035 (.192)	.023 (.004)	.031 (.008)	.035 (.011)	.044 (.011)

[a] Labor force equal to persons working in a full-time or part-time job from 1976 to 1995, and reporting occupation and industry. Part-time reported from 1996 to 1999 in new questionnaire sequence (25), possibly related to sharp decline in part-time share after 1995.

* No part-time workers reported in marked cells.

Table 2. Percent of household total expenditures on health care.[*]

	1976	1980	1984	1988	1992	1993	1994	1995	1996	1997	1998	1999
Discretionary health expenditures	2.09	4.31	5.08	5.48	5.60	4.08	4.27	3.23	3.24	3.27	3.13	3.19
Expenditures plus health insurance premium	n.a.	n.a.	n.a.	n.a.	n.a.	4.79	5.04	3.57	3.69	3.78	3.74	3.98
Expenditures, insurance premium and National Health Insurance	n.a.	n.a.	n.a.	n.a.	n.a.	9.02	9.86	11.41	10.99	10.98	11.52	12.04

[*] Imputed share of National Health Insurance outlays. Data come from Family Income and Expenditure Surveys, various years.
n.a. health insurance premium not reported before 1993.

Table 3. Males. Determinants of health status. (|t|-ratios calculated using Huber-White **variance estimator)**

OLS estimates	**ADL Index**		**Self Evaluated Health**	
Independent Variables	**Coefficient**	**|t|-ratio**	**Coefficient**	**|t|-ratio**
Age	2.20	2.69	-.051	1.18
Age squared / 100	-1.93	3.36	.027	0.89
Marital status (1 married)	-.417	0.75	-.049	1.31
Illiterate[a]	-----	-----	-----	-----
Literate	-.190	0.20	-.055	0.92
1-6 years of schooling	.418	0.66	.011	0.25
7 years of more schooling	1.48	1.92	.214	4.05
Fuchien[a]	-----	-----	-----	-----
Hakka	-1.22	1.70	-.016	0.33
Mainlander	-3.31	4.11	-.135	1.29
Other	-5.87	2.80	-.549	3.53
Household possessions index	.611	4.16	.105	9.99
Regional unemployment rate (by gender)	-.832	1.93	-.055	1.71
Year 1993 dummy	.588	1.07	.035	0.93
Year 1996 dummy	1.66	1.97	-.159	2.75
Father's schooling Illiterate[a]	-----	-----	-----	-----
Missing	-.558	0.66	.016	0.27
Literate	1.25	2.19	.009	0.23
Attended school	.946	1.49	.070	1.43
Birth place (1 if born in Taiwan)	-3.18	4.00	-.271	2.61
Residence at age 12 Farm[a]	-----	-----	-----	-----
Town	-1.20	1.88	-.100	2.44
City	-.257	0.47	.122	3.00
Mother died before age 60	.248	0.48	-.073	1.99
Father died before age 60	.146	0.33	-.003	0.09
Average vegetable consumption per capita (kg) in 1967, at the region of birth	.097	2.67	.007	2.50
Average hog consumption per capita (kg) in 1967, at the region of birth	.051	0.84	-.005	1.16
Constant	24.5	0.88	4.09	2.58
F-test (*p*-value): Joint significance of the identifier variables (bold above)	.0001		.0000	
Overall significance (*p*-value)	.0000		.0000	
R-squared	.08		.08	
Number of observations	5080		5080	

Table 4. Females. Determinants of health status. (|t|-ratios calculated using Huber-White variance estimator)

OLS estimates	ADL Index		Self Evaluated Health	
Independent Variables	**Coefficient**	**|t|-ratio**	**Coefficient**	**|t|-ratio**
Age	2.22	2.22	-.161	3.37
Age squared / 100	-2.15	3.09	.107	3.30
Marital status (1 married)	-.276	0.43	.011	0.30
Illiterate[a]	-----	-----	-----	-----
Literate	3.15	2.71	.273	3.97
1-6 years of schooling	4.08	5.48	.140	3.04
7 years of more schooling	6.71	6.58	.472	5.81
Fuchien[a]	-----	-----	-----	-----
Hakka	-.146	0.16	.054	1.11
Mainlander	1.92	0.64	-.018	0.11
Other	.367	0.18	-.256	2.11
Household possessions index	.615	2.78	.065	5.38
Regional unemployment rate (by gender)	1.73	3.70	.041	1.47
Year 1993 dummy	.782	1.05	.086	2.06
Year 1996 dummy	-.668	0.70	-.199	4.04
Father's schooling Illiterate[a]	-----	-----	-----	-----
Missing	.592	0.59	-.061	1.15
Literate	2.73	3.45	.148	3.24
Attended school	1.77	1.93	.083	1.40
Birth place (1 if born in Taiwan)	3.35	1.07	-.047	0.29
Residence at age 12 Farm[a]	-----	-----	-----	-----
Town	-2.11	2.45	-.099	2.12
City	.286	0.35	.003	0.06
Mother died before age 60	-1.83	2.34	-.103	2.41
Father died before age 60	1.20	1.78	.060	1.60
Average vegetable consumption per capita (kg) in 1967, at the region of birth	.071	1.42	-.002	0.70
Average hog consumption per capita (kg) in 1967, at the region of birth	.110	1.69	.005	1.26
Constant	15.7	0.44	7.54	4.26
F-test (*p*-value): Joint significance of the identifier variables (bold above)	.0001		.0016	
Overall significance (*p*-value)	.0000		.0000	
R-squared	.13		.07	
Number of observations	3736		3736	

Table 5. Males. Labor force participation models (not-working, part-time work and full-time work). Ordered Probit Estimates. (|t|-ratios, calculated using Huber-White variance estimator, in parentheses)

Labor Force Participation Models Independent variables	Basic Equation	Health indicators ADL index	 SHE	Health indicators as endogenous variables ADL index	 SEH	Marginal effects: endogenous ADL index specification[a]
ADL Index		.036 (10.45)				
Self Evaluation of Health			.217 (12.3)			
Estimated ADL Index				.049 (2.62)		.013 [.003]
Estimated Self Evaluation of Health					.661 (3.23)	
ADL Index Residual				.036 (10.44)		
Self Evaluation of Health Residual					.214 (12.09)	
Age	-.206 (3.23)	-.241 (3.64)	-.213 (3.31)	-.270 (3.45)	-.190 (2.94)	-.074 [-.016]
Age squared / 100	.095 (2.13)	.125 (2.70)	.101 (2.23)	.151 (2.55)	.089 (1.98)	.041 [.009]
Marital status (1 married)	.232 (4.67)	.261 (5.14)	.251 (5.00)	.266 (5.18)	.275 (5.33)	.073 [.015]
Illiterate[b]	-----	-----	-----	-----	-----	
Literate	.009 (.13)	.005 (.07)	.028 (.37)	.004 (.06)	.048 (.63)	.001 [.000]
1-6 years of schooling	-.026 (.50)	-.039 (.74)	-.025 (.48)	-.048 (.88)	-.036 (.69)	-.013 [-.003]
7 years of more schooling	-.056 (.92)	-.118 (1.90)	-.112 (1.81)	-.146 (1.99)	-.232 (2.82)	-.040 [-.008]
Fuchien[b]	-----	-----	-----	-----	-----	
Hakka	.097 (1.79)	.127 (2.27)	.108 (1.98)	.137 (2.36)	.117 (2.14)	.038 [.008]
Mainlander	-.011 (.23)	.001 (.03)	-.040 (.82)	.002 (.04)	-.096 (1.75)	.001 [.000]
Other	-.156 (1.03)	-.009 (.06)	-.041 (.27)	.065 (.35)	.201 (1.07)	.018 [.004]
Household possessions index	-.037 (2.81)	-.054 (4.10)	-.060 (4.48)	-.062 (3.65)	-.107 (4.23)	-.017 [-.004]
Regional unemployment rate (by gender)	-.087 (2.20)	-.073 (1.78)	-.080 (1.99)	-.061 (1.68)	-.067 (1.66)	-.017 [-.004]
Year 1993 dummy	-.094 (2.04)	-.108 (2.30)	-.099 (2.12)	-.116 (2.40)	-.117 (2.48)	-.032 [-.007]
Year 1996 dummy	-.058 (.77)	-.084 (1.08)	-.020 (.27)	-.107 (1.26)	-.063 (.74)	-.030 [-.006]
Threshold 1 (part-time)	-9.43 (4.15)	-6.99 (2.97)	-9.16 (4.02)	-6.59 (2.73)	-7.30 (3.02)	
Threshold 2 (full-time)	-9.19 (4.04)	-6.74 (2.86)	-8.91 (3.89)	-6.33 (2.63)	-7.04 (2.91)	
Number of observations	5080	5080	5080	5080	5080	
Chi squared (13, 14, 14,15, 15) in order *p*-value **Log Likelihood**	554.09 0.0000 -3785.95	613.85 0.0000 -3642.00	677.06 0.0000 -3711.97	615.64 0.0000 -3641.76	679.06 0.0000 -3709.68	

[a] Marginal effects of the variables evaluated at the sample mean on full-time labor force participation, and on part time participation in brackets.

[b] Omitted category.

Table 6. Females. Labor force participation models (not-working, part-time work and full-time work). Ordered Probit Estimates. (|t|-ratios, calculated using Huber-White variance estimator, in parentheses)

Labor Force Participation odels Independent variables	Basic Equation	Health Indicators ADL index	 SEH	Health Indicators as Endogenous Variables ADL index	 SEH	Marginal Effects: Endogenous ADL Index Specification[a]
ADL Index		.022 (7.48)				
Self Evaluation of Health			.197 (6.78)			
Estimated ADL Index				.041 (2.49)		.003 [.002]
Estimated Self Evaluation Of Health					.078 (.24)	
ADL Index Residual				.022 (7.43)		
Self Evaluation of Health Residual					.198 (6.85)	
Age	-.178 (1.45)	-.170 (1.29)	-.150 (1.22)	-.211 (1.56)	-.171 (1.27)	-.016 [-.010]
Age squared / 100	.078 (.90)	.080 (.86)	.059 (.68)	.120 (1.22)	.073 (.77)	.009 [.006]
Marital status (1 married)	.135 (2.17)	.139 (2.18)	.133 (2.11)	.142 (2.24)	.135 (2.15)	.011 [.007]
Illiterate[b]	-----	-----	-----	-----	-----	
Literate	.294 (2.78)	.253 (2.35)	.244 (2.30)	.182 (1.55)	.279 (2.01)	.014 [.009]
1-6 years of schooling	.086 (1.09)	.031 (.39)	.052 (.65)	-.059 (.55)	.073 (.78)	-.004 [-.003]
7 years of more schooling	.374 (2.96)	.278 (2.16)	.279 (2.15)	.133 (.78)	.343 (1.69)	.010 [.006]
Fuchien[b]	-----	-----	-----	-----	-----	
Hakka	-.062 (.76)	-.095 (1.15)	-.077 (.94)	-.110 (1.31)	-.066 (.76)	-.008 [-.005]
Mainlander	-.379 (3.05)	-.361 (2.82)	-.388 (3.06)	-.357 (2.79)	-.381 (2.95)	-.027 [-.017]
Other	.211 (1.07)	.213 (1.06)	.293 (1.51)	.210 (1.05)	.258 (1.17)	.016 [.010]
Household possessions index	-.111 (5.35)	-.126 (5.87)	-.125 (5.90)	-.137 (5.78)	-.117 (3.79)	-.010 [-.006]
Regional unemployment rate (by gender)	.083 (1.79)	.071 (1.47)	.078 (1.65)	.043 (.77)	.082 (1.67)	.003 [.002]
Year 1993 dummy	.114 (1.58)	.103 (1.40)	.092 (1.26)	.088 (1.17)	.102 (1.30)	.007 [.004]
Year 1996 dummy	-.120 (1.23)	-.129 (1.26)	-.089 (.90)	-.119 (1.16)	-.111 (.93)	-.009 [-.006]
Threshold 1 (part-time)	-7.48 (1.75)	-4.90 (1.07)	-6.17 (1.43)	-4.33 (.94)	-7.11 (1.42)	
Threshold 2 (full-time)	-7.20 (1.68)	-4.61 (1.01)	-5.90 (1.36)	-4.05 (.87)	-6.83 (1.37)	
Number of observations	3736	3736	3736	3736	3736	
Chi squared (13, 14, 14,15, 15) in order *p*-value **Log Likelihood**	210.21 0.0000 -1316.93	222.65 0.0000 -1274.68	228.77 0.0000 -1294.44	223.32 0.0000 -1274.09	229.32 0.0000 -1294.38	

[a] Marginal effects of the variables evaluated at the sample mean on full-time labor force participation, and on part time participation in brackets.

[b] Omitted category.

Table 7. Labor force participation (not-working, part-time work and full-time work) and specific diseases. Ordered Probit Estimates. (|t|-ratios calculated using Huber-White variance estimator)

Labor Force Participation Models Independent variables	Males		Females		Marginal Effects[a] Males		Marginal Effects[a] Females	
	Coefficient	|t|-ratio	Coefficient	|t|-ratio	Full Time	Part Time	Full Time	Part Time
High Blood Pressure	-.119	2.55	-.091	1.29	-.035	-.006	-.008	-.005
Diabetes	-.185	2.37	-.207	1.99	-.054	-.010	-.017	-.010
Heart Disease	-.273	4.98	-.105	1.35	-.079	-.015	-.009	-.005
Stroke	-.728	5.99	-.288	1.39	-.212	-.039	-.024	-.014
Bronchitis, Pneumonia, or Other Respiratory Ailment	-.019	0.38	-.019	0.20	-.006	-.001	-.002	-.001
Arthritis or Rheumatism	-.022	0.47	-.138	2.06	-.007	-.001	-.011	-.007
Gastric Ulcer or Stomach Ailment	-.129	2.52	-.081	0.98	-.038	-.007	-.007	-.004
Liver or Gall Bladder Disease	-.099	1.20	-.218	1.40	-.029	-.005	-.018	-.011
Cataract	-.104	1.84	-.271	3.31	-.030	-.006	-.022	-.013
Glaucoma	-.032	0.21	-.970	2.36	-.009	-.002	-.080	-.048
Kidney Disease	-.160	1.78	-.044	0.38	-.047	-.009	-.004	-.002
Anemia	-.027	0.34	-.124	1.37	-.008	-.002	-.010	-.006
Bone Diseases/Fracture	-.002	0.03	-.007	0.09	-.001	.000	-.001	-.000
Prostate Trouble	-.148	2.05	-----	-----	-.043	-.008	-----	-----
Seeing Difficulties	-.123	1.99	-.054	0.73	-.036	-.007	-.004	-.003
Hearing Difficulties	-.085	1.27	-.336	2.54	-.025	-.005	-.027	-.016
Age	-.191	3.00	-.159	1.27	-.056	-.010	-.013	-.008
Age Squared / 100	.086	1.92	.067	0.76	.025	.005	.006	.003
Marital Status (1 Married)	.243	4.84	.150	2.38	.071	.013	.012	.007
Illiterate[b]	-----	-----	-----	-----	-----	-----	-----	-----
Literate	.016	0.21	.241	2.29	.004	.001	.020	.012
1-6 Years of Schooling	-.029	0.54	.037	0.45	-.008	-.002	.003	.002
7 Years of More Schooling	-.072	1.14	.287	2.23	-.021	-.004	.024	.014
Fuchien[b]	-----	-----	-----	-----	-----	-----	-----	-----
Hakka	.103	1.87	-.090	1.09	.030	.006	-.007	-.004
Mainlander	.020	0.40	-.329	2.60	.006	.001	-.027	-.016
Other	-.182	1.19	.259	1.33	-.053	-.010	.021	.013
Household Possessions Index	-.045	3.40	-.113	5.33	-.013	-.002	-.009	-.006
Regional Unemployment rate	-.085	2.09	.121	2.51	-.025	-.005	.010	.006
Year 1993 Dummy	-.075	1.58	.127	1.64	-.022	-.004	.010	.006
Year 1996 Dummy	-.047	0.61	-.152	1.50	-.014	-.003	-.012	-.007
Threshold 1 (part-time)	-9.08	4.00	-6.95	1.58				
Threshold 2 (full-time)	-8.83	3.89	-6.67	1.52				
Number of Observations	5080		3736					
Chi Squared (29, 28) in order	695.29		237.10					
p-value	0.0000		0.0000					
Log Likelihood	-3703.29		-1280.61					

[a] Marginal effects of the variables evaluated at the sample mean on full-time and part-time labor force participation. [b] Omitted category.

Table 8. Differences between labor force participation rates between the individuals who were eligible for supplemental NHI benefits and others and over time. [a]

	1993 differences in labor force participation (Eligible for supplemental NHI benefits after 1995 – others) Single Differences (D)		1996 Differences in Labor Force Participation (Eligible for supplemental NHI benefits after 1995 – others) Single Differences (D)		1996 – 1993 Difference in Differences Double Differences (DD)	
	Male	Female	Male	Female	Male	Female
Work	.176 (7.56)	.029 (1.41)	.077 (3.33)	.027 (1.54)	-.099 (1.37)	-.002 (1.01)
Full-time work	.078 (3.77)	.015 (.915)	.059 (2.71)	.019 (1.28)	-.019 (1.36)	.004 (.543)

[a] |t|-ratios, based on probit models to fit the contingency table for labor force participation, in parentheses.

Table 9. The impact of National Health Insurance program on labor force participation (not-working, part-time work and full-time work). Ordered Probit Estimates. |t|-ratios calculated using Huber-White variance estimator. Marginal effects for full-time work (in brackets) and part-time work (parenthesis) are reported for the interaction term.

Labor Force Participation	**Males**		**Females**		**Endogenous ADL Index Males**		**Endogenous ADL Index Females**	
Independent Variables	**Coefficient**	**|t|-ratio**	**Coefficient**	**|t|-ratio**	**Coefficient**	**|t|-ratio**	**Coefficient**	**|t|-ratio**
Interaction term between year 1996 dummy and Eligible for supplemental NHI benefits after 1995	-.179 [-.045] (-.010)	1.57	.067 [.006] (.003)	0.29	-.136 [-.031] (-.008)	1.16	.164 [.010] (.006)	0.69
Eligible for supplemental NHI benefits after 1995	.630	7.33	.229	1.60	.604	6.94	.153	1.03
Estimated ADL Index	----	----	----	----	.018	0.85	.040	1.80
ADL Index Residual	----	----	----	----	.034	7.14	.025	5.78
Age	-.127	1.01	-.272	1.29	-.112	0.79	-.286	1.26
Age squared / 100	.039	0.46	.141	0.97	.028	0.28	.167	1.06
Marital status (1 married)	.266	3.79	.153	1.78	.303	4.20	.193	2.11
Illiterate[a]	-----	-----	-----	-----	-----	-----	-----	-----
Literate	-.017	0.16	.142	0.92	-.026	0.24	.009	0.05
1-6 years of schooling	-.003	0.05	.078	0.71	-.008	0.11	-.092	0.59
7 years of more schooling	-.050	0.56	.384	2.16	-.087	0.87	.182	0.80
Fuchien[a]	-----	-----	-----	-----	-----	-----	-----	-----
Hakka	.055	0.75	-.098	0.88	.100	1.30	-.131	1.15
Mainlander	.292	3.75	-.154	0.93	.295	3.64	-.204	1.16
Other	-.439	1.93	-.186	0.59	-.438	1.68	-.147	0.45
Household possessions index	-.037	2.03	-.114	3.92	-.044	2.19	-.137	4.08
Regional unemployment rate (by gender)	-.111	1.84	.116	1.55	-.101	1.64	.085	1.09
Year 1996 dummy	.183	1.38	-.292	1.34	.159	1.17	-.348	1.55
Threshold 1 (part-time)	-6.03	1.32	-10.83	1.42	-3.80	0.82	-7.25	0.86
Threshold 2 (full-time)	-5.80	1.27	-10.60	1.39	-3.56	0.77	-6.99	0.83
Number of observations	2906		2196		2906		2196	
Chi squared (14,14,16,16) in order	264.47		98.25		305.75		108.94	
p-value	0.0000		0.0000		0.0000		0.0000	
Log Likelihood	-1916.05		-672.62		-1844.48		-646.23	

Appendix

Table A – 1. Means And Standard Deviations Of The Health Indicators.*

	Males		Females	
	Mean	Std. Dev.	Mean	Std. Dev
Diseases				
High blood pressure	.260		.323	
Diabetes	.076		.132	
Heart disease	.180		.262	
Stroke	.050		.034	
Bronchitis, pneumonia, or other respiratory ailment	.182		.133	
Arthritis or rheumatism	.219		.345	
Gastric ulcer or stomach ailment	.177		.192	
Liver or gall bladder disease	.061		.047	
Cataract	.167		.275	
Glaucoma	.020		.029	
Kidney disease	.056		.085	
Anemia	.064		.150	
Bone diseases/fracture	.129		.207	
Prostate trouble	.089		-----	
Seeing difficulties	.133		.287	
Hearing difficulties	.099		.100	
ADL index	93.2	15.3	85.5	19.7
Self-evaluated health	2.44	1.10	2.00	1.04
Number of observations	5080		3736	

* For a binary dummy variable with a mean of m, the standard deviation is (m(1-m))exp 1/2.

Table A – 2. The Relationship Between The ADL Index And Self Evaluated Health Status.

	Males ADL index		**Females ADL index**	
Self-Evaluation Of Health Status	**Mean**	**Frequency (%)**	**Mean**	**Frequency (%)**
Poor	56.8	186 (3.6)	53.8	208 (5.6)
Not so good	85.6	826 (16.3)	77.5	1037 (27.7)
Average	94.2	1756 (34.5)	89.3	1415 (37.9)
Good	97.2	1223 (24.1)	93.3	704 (18.9)
Excellent	99.1	1089 (21.5)	96.8	372 (9.9)
Total	93.2	5080	85.5	3736

Table A – 3. The relationship between the ADL index, self-evaluated health and specific diseases. (|t|-ratios, calculated using Huber-White variance estimator, in parentheses)

OLS estimates	ADL index		Self-evaluated health	
Specific conditions	**Males**	**Females**	**Males**	**Females**
	-.504	-.841	-.170	-.148
High blood pressure	(1.10)	(1.30)	(5.24)	(4.38)
	-4.06	-2.58	-.383	-.299
Diabetes	(5.56)	(2.95)	(7.39)	(6.52)
	-2.44	-1.26	-.382	-.242
Heart disease	(4.67)	(1.81)	(10.3)	(6.62)
	-23.4	-23.1	-.732	-.693
Stroke	(25.9)	(14.27)	(11.5)	(8.18)
Bronchitis, Pneumonia, Or	-4.00	-2.26	-.462	-.245
Other Respiratory Ailment	(7.92)	(2.58)	(12.9)	(5.32)
	-2.26	-3.30	-.221	-.193
Arthritis Or Rheumatism	(4.76)	(5.28)	(6.58)	(5.88)
Gastric Ulcer Or	.308	.043	-.283	-.226
Stomach Ailment	(.60)	(.06)	(7.82)	(5.68)
Liver Or	1.36	1.53	-.278	-.176
Gall Bladder Disease	(1.66)	(1.09)	(4.80)	(2.40)
	-1.47	-2.14	-.073	-.116
Cataract	(2.79)	(3.16)	(1.96)	(3.26)
	.577	-1.07	-.004	-.086
Glaucoma	(.42)	(.61)	(.04)	(.93)
	-1.67	-4.12	-.275	-.343
Kidney Disease	(1.96)	(3.80)	(4.55)	(6.02)
	-2.16	-1.50	-.381	-.297
Anemia	(2.71)	(1.80)	(6.73)	(6.78)
	-3.06	-5.07	-.185	-.171
Bone Diseases/Fracture	(5.31)	(6.92)	(4.52)	(4.44)
	-1.85	-----	-.167	-----
Prostate trouble	(2.72)		(3.46)	
	-6.54	-8.88	-.533	-.395
Seeing difficulties	(11.13)	(13.2)	(12.8)	(11.2)
	-5.37	-10.1	-.345	-.218
Hearing difficulties	(8.25)	(10.2)	(7.47)	(4.21)
	98.7	94.4	3.01	2.60
Constant	(338)	(190)	(145)	(99.6)
R-Square	.22	.20	.25	.21
Number of observations	5080	3736	5080	3736

Table A – 4. Means and standard deviations of the variables examined in the models investigating the determinants of health status and labor force participation of the elderly.[*]

Variables	Males		Females	
	Mean	Std. Dev.	Mean	Std. Dev.
Labor force participation				
Full-time	.247		.061	
Part-time	.076		.037	
Not-working	.677		.902	
Age	69.8	6.09	70.9	6.28
Married	.758		.522	
Own schooling				
Illiterate	.199		.651	
Literate	.102		.069	
1-6 years of schooling	.409		.213	
7 years of more schooling	.290		.067	
Ethnicity				
Fuchien	.516		.726	
Hakka	.141		.168	
Mainlander	.330		.089	
Other	.013		.018	
Household possessions index	4.81	1.63	4.82	1.46
Father's schooling				
Illiterate	.463		.535	
Missing	.077		.114	
Literate	.292		.223	
Attended school	.169		.128	
Mother died before age 60	.222		.192	
Father died before age 60	.314		.279	
Year 1989	.413		.399	
Year 1993	.325		.329	
Year 1996	.262		.272	
Born in Taiwan	.653		.906	
Residence at age 12				
Farm	.610		.593	
Town	.155		.174	
City	.235		.233	
Average Vegetable Consumption Per Capita (Kg) In 1967, At The Region Of Birth	87.0	5.77	86.8	6.80
Average Hog Consumption Per Capita (Kg) In 1967, At The Region Of Birth	33.8	4.02	33.7	4.71
Regional Unemployment Rate	1.84	.774	1.87	.693
Number Of Observations	5080		3736	

[*] For a binary dummy variable with a mean of m, the standard deviation is (m(1-m))exp 1/2.

Table A – 5. Unemployment Rates And Food Consumption By Region.

	1989 Male Unemp. Rate	1993 Male Unemp. Rate	1996 Male Unemp. Rate	1989 Female Unemp. Rate	1993 Female Unemp. Rate	1996 Female Unemp. Rate	1967 Vegetable cons. (kg) per capita	1967 Hog cons. (kg) per capita
Taipei Municipality	1.71	1.65	3.09	1.77	1.96	2.66	84.1	38.7
Keelung city	3.28	3.06	3.92	4.37	3.92	3.28	84.1*	29.4
Hsinchu city	2.23	1.19	1.91	2.03	1.76	1.75	88.5	38.7*
Taichung city	2.05	1.70	2.99	1.92	2.24	2.68	78.0	33.0**
Chiayi city	2.32	2.19	2.22	2.11	2.06	1.57	84.6	34.2*
Tainan city	2.48	1.77	3.86	2.59	1.53	3.12	79.5	34.2
Kaohsiung Municipality	1.66	1.24	3.03	2.02	1.83	3.15	84.6	26.8
Ilan Hsien	1.78	1.52	3.39	1.58	2.57	3.01	88.5*	21.1*
Taipei Hsien	1.50	1.37	2.83	1.47	1.43	2.30	84.1*	38.7*
Taoyuan Hsien	1.17	1.23	1.94	1.17	1.45	2.35	88.5*	38.7*
Miaoli Hsien	1.34	1.22	2.26	1.49	1.69	2.46	88.5*	38.7*
Taichung Hsien	0.83	0.99	2.65	0.99	1.51	2.28	78.0	33.0**
Changhwa Hsien	0.98	1.01	2.12	0.86	1.12	2.08	95.4	33.0**
Nantou Hsien	1.72	1.52	2.54	1.20	1.29	2.67	95.8	33.0**
Yunlin Hsien	1.05	0.85	1.89	0.72	1.15	1.82	90.3	33.0**
Chiayi Hsien	1.38	0.86	2.26	0.73	0.72	1.99	84.6	34.2*
Tainan Hsien	1.93	1.50	2.21	1.35	1.27	2.18	79.5	34.2
Kaohsiung Hsien	1.78	1.34	3.41	1.95	1.77	1.99	84.6	26.8
Pingtung Hsien	1.24	1.10	2.80	1.40	1.21	2.36	101	33.7
Taitung Hsien	2.06	1.67	3.30	2.34	1.34	3.60	81.0	20.8
Hualien Hsien	2.08	1.32	3.88	1.83	1.80	2.65	100	57.9

[a] The unemployment rate data come from the Yearbooks of Manpower Statistics Taiwan Area, Republic of China (1989, 1993 and 1996). The regional grouping used in these surveys is identical to that of the Survey of Health and Living Status of the Middle Aged and Elderly in Taiwan. The vegetable and hog consumption data come from the Taiwan Agricultural Products Wholesale Market Yearbook (1967), which employs a different grouping with some commonalities. In some cases this later reference provides food consumption data for a broader region, and in some other cases data exist for a town that is located in one of our regional categories. The cases where there is not a perfect match among region names are marked with "*". Also, the vegetable and hog consumption data were not necessarily reported for the same regions, and so in some cases there is a match for vegetable consumption but not for hog consumption and vice versa. For five of the 21 regions (marked with **), there is no data on hog consumption: average hog consumption per capita of all cities/town listed in the Taiwan Agricultural Products Wholesale Market Yearbook (1967), 33 kg, is assigned to these cases.

Table A – 6. Means of the variables examined in the model investigating the impact of National Health Insurance program on labor force participation: data come from the 1993 and 1996 waves of the survey. For continuous variables, standard deviations are reported in parentheses beneath the means.

Variables	Males	Females
Labor force participation		
Full-time	.194	.052
Part-time	.062	.028
Not-working	.744	.920
Age	71.6 (5.42)	72.6 (5.68)
Married	.763	.514
Illiterate	.192	.639
Literate	.097	.070
1-6 years of schooling	.418	.222
7 years of more schooling	.293	.069
Fuchien	.514	.725
Hakka	.146	.170
Mainlander	.328	.088
Other	.012	.017
Household possessions index	4.84 (1.60)	4.83 (1.44)
Regional unemployment rate	2.01 (.860)	2.01 (.638)
Year 1993	.568	.559
Year 1996	.432	.441
Eligible for supplemental NHI benefits after 1995	.618	.786
Interaction term: Year 1996 * Eligible for supplemental NHI benefits after 1995	.268	.344
Number of observations	2906	2196

Figure 1. ADL Index of Health: by age, gender and year

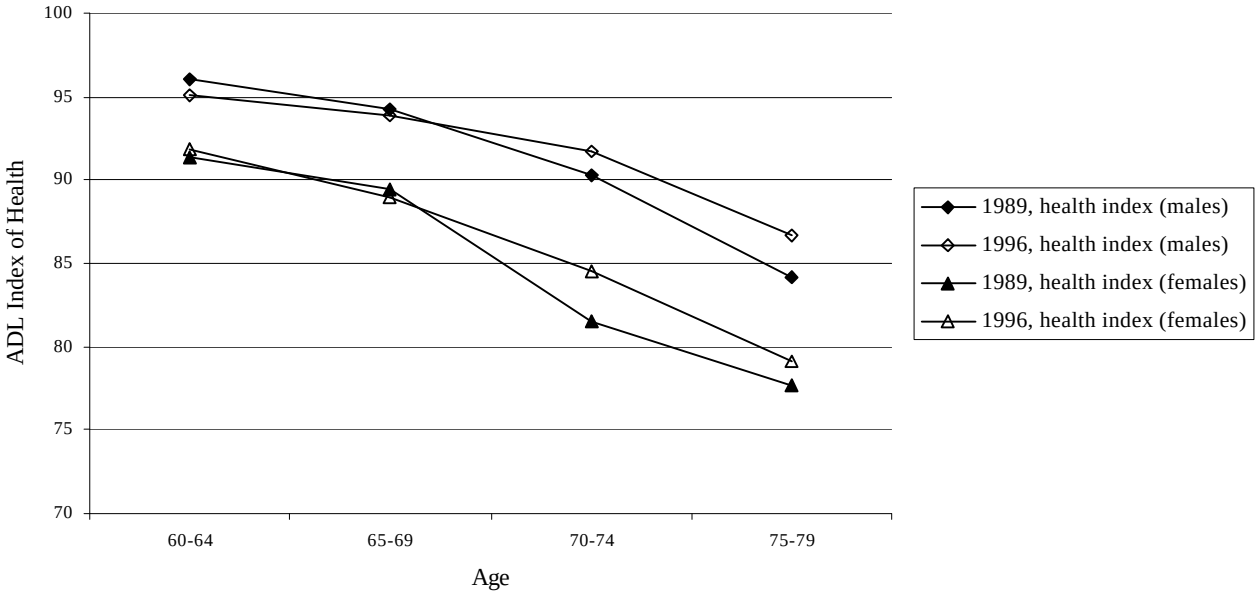

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Figure 2a. Labor force participation of males
by age, full/part time and year

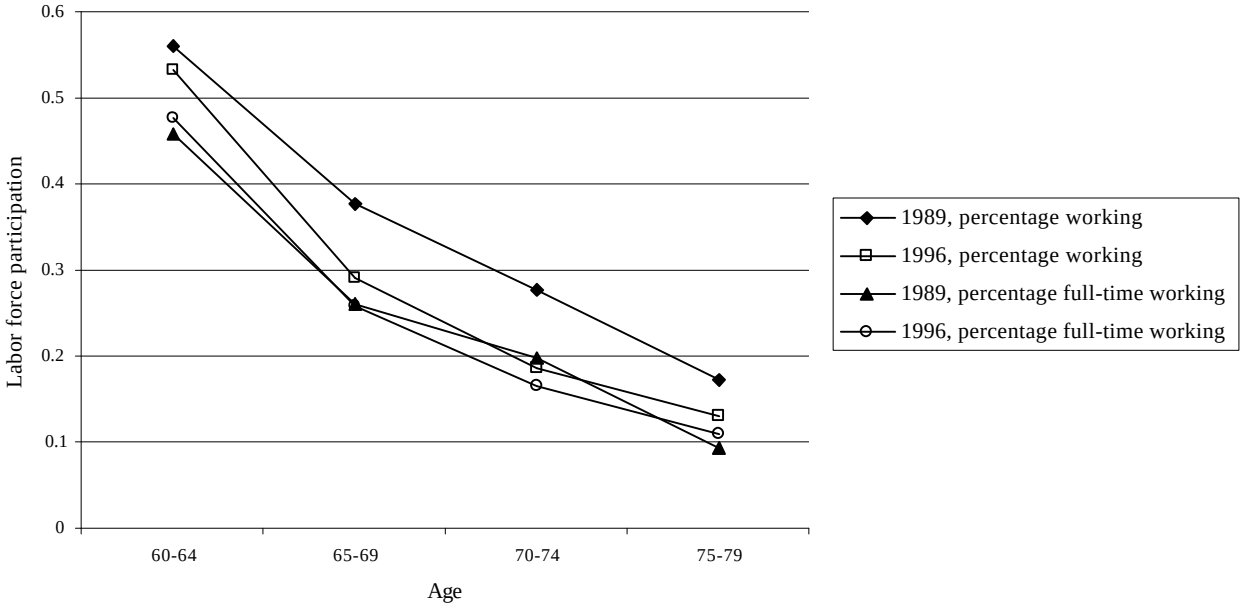

Figure 2b. Labor force participation of females
by age, full/part time and year