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On the Consumption Insurance Effects of Long-term Care
Insurance in Japan: Evidence from Micro Household Data

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On the Consumption Insurance Effects of Long-term Care Insurance in Japan: Evidence from Micro Household Data[*] [**]

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Abstract: Using micro-level household data in the 2001 *Comprehensive Survey of the Living Conditions of the People on Health and Welfare* as compiled by the Japanese Ministry of Health, Labor and Welfare, this paper examines how having a household member in need of long-term nursing care can result in welfare losses measured in terms of consumption. In doing so, the study evaluates the role of the public long-term care insurance scheme implemented in Japan in April 2000. The results indicate that when households included a disabled family member, household consumption net of long-term care costs did not decrease as much as before the introduction of long-term care insurance. When compared with the surveys conducted in 1995 and 1998, the adverse effects on consumption net of long-term care costs have became much weaker. These findings suggest that the introduction of social insurance in 2000 helped to reduce the welfare loss associated with having a disabled family member.

JEL classification numbers: E21, I18

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1. Introduction

Employing a micro-level household dataset compiled by the Ministry of Health, Labor and Welfare, this paper examines how the state of having a household member who needs long-term nursing care could result in welfare losses measured in terms of consumption, and evaluates the role of the public long-term care (hereafter, LTC) insurance that was implemented in Japan in April 2000.

This paper attempts to measure the welfare loss that a household would suffer from having a disabled or bedridden household member in terms of the effects on household consumption. There are two basic channels whereby a household member in need of long-term nursing care could affect household consumption: (1) a decline in permanent income because of the sacrifice of earning opportunities in order to take care of the disabled, and (2) a decrease in household consumption net of LTC costs as a result of expenditure on the uninsured costs associated with having a disabled member.

The first channel works as follows. A person who cares for a disabled family member at home may sacrifice a job opportunity. For example, a person who lives with a bedridden parent may give up a position which may then force workers to move to a different location or shorten their working hours. In any case, the long-term losses in earning opportunities could certainly decrease permanent household income. The decline in permanent income in turn lowers household consumption. The second channel is that without an appropriate insurance instrument, household members are forced to sacrifice items of consumption (on goods or services) or withdraw their savings to pay uninsured LTC costs.

The above framework has a similar spirit to the literature on consumption insurance that examines the effect of adverse health shocks on consumption. Based on the Panel Study of Income Dynamics, Cochrane (1991) found that a loss of work hours because of health problems reduced food consumption. If a household head became absent at the workplace for more than 100 days (the probability of this event was 7.2% in the sample), consumption declined between 11% and 14%. From the 1975–1985 panel data on families in rural areas in India, Townsend (1994) found that the percentage in the year when an adult male was sick had no impact on consumption. Gertler and Gruber (2002) examined panel data conducted in Indonesia and found that the impairment of the activities of daily living (ADL) led to a significant economic loss. The impairment of

basic ADL (2% in the sample) decreased consumption by 59%. The problem of intermediate ADL (24% in the sample) decreased consumption by 14%. Gertler, Levine and Moretti (2001) used a different dataset on Indonesian households, but obtained a similar result. Dercon and Krishnan (2000) regarded individual nutritional status (weight divided by squared height) as a proxy for consumption, and explored rural Ethiopian household data. They did not find that nutrition was affected by unpredictable losses of working days. On the other hand, Wagstaff (2005) used the same index as an indicator of health status. Using panel data on Vietnamese households, Wagstaff (2005) found that a decrease in the average nutritional status of household members by one standard deviation reduced food consumption by 1.2% and non-food consumption by 2.9%.[1]

Our empirical investigation takes into consideration the introduction of the public LTC insurance scheme in April 2000.[2] The Japanese Government introduced this system in compensation for the lack of private insurance.[3] The public LTC insurance

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[1] Most studies on consumption insurance have used household data in developing countries. Chetty and Looney (forthcoming) caution that the welfare consequences of consumption smoothing may be different between developing and developed countries. Using panel data on households in Indonesia and the United States, they found that Indonesian households used costly methods to smooth consumption. Even when households smooth consumption with limited financial instruments in developing countries, households may still suffer from adverse shocks, and the provision of social insurance may help to improve welfare substantially. As an alternative approach, using US micro-level data (the National Long-Term Care Survey), Sloan, Hoerger, and Picone (1996) examined the effects of LTC needs on non-housing wealth rather than consumption and found negative, though less significant, wealth impacts.

[2] See Campbell and Ikegami (2002) and Mitchell, Piggott and Shimizutani (2004) for a detailed explanation of Japanese LTC insurance. Geraedts, Heller and Harrington (2000) carefully document the German social insurance approach to LTC services.

[3] Several studies, including Pauly (1990), Cutler (1993), and Cochrane (1995), have provided a number of explanations for why private insurance fails to cover the risk of LTC [see Norton (2000) for a more detailed review). For example, in respect to the supply-side, it is extremely difficult to calculate expenses of long-term nursing care accurately. It is also difficult to forecast future technical innovation properly in medical technology. In regard to the demand side, it is difficult for individuals to evaluate their own risk of the need for LTC. Individuals who underestimate this necessity have less incentive to buy insurance. They may also substitute the informal care provided by household members for the purchase of insurance. When the demand for insurance is not strong for those reasons, a private insurance company would not offer any plan at a reasonable price. Mellor (2001), Finkelstein, McGarry and Sufi (2005) and Brown and

scheme aims to provide disabled family members with financial assistance as follows. To start with, enrollees in the public LTC insurance scheme are all residents aged 40 years or more. Each municipal government is responsible for operating the public LTC insurance scheme in its own territory. To obtain benefits, a person has to be examined concerning the status of disability by an expert committee. The government sets the categorization procedure based on various kinds of information. When a person is certified as being in need of LTC services, an independent care manager develops a service plan for him/her.

The introduction of the public LTC insurance scheme changed the way that LTC services are delivered and financed in Japan.[4] As these services had hitherto been financed by municipal governments' general budgets, the supply of services tended to be limited.[5] The public LTC insurance scheme covers long-term nursing care both at home and in nursing care facilities. Under the public LTC insurance scheme, the services are provided through a quasi-market mechanism. Once a person is certified as needing LTC services, he/she can purchase the necessary services with the help of the LTC insurance and can freely choose a provider. Because profit-making organizations are permitted to enter homecare markets, the number of LTC service providers has dramatically expanded.

Finkelstein (forthcoming) empirically tested some of these theoretical implications.

[4] The coinsurance rule in public LTC insurance is that a beneficiary pays 10 percent of total costs. One-half of the entire insurance benefits is financed with insurance premiums. The premiums paid by those aged 65 years and over are, in principle, withheld from public pension benefits, while persons aged under 65 years pay premiums along with their health insurance. The premiums of employees are proportional to their earnings. The premiums for persons other than employees are divided into proportional and fixed parts: the former is partly related to income and partly to asset holdings. At the aggregate level, the remaining half-share of benefits is financed with subsidies from national, prefectural, and municipal governments.

[5] Municipal governments (major or ordinance-designated cities, ordinary cities, towns, or villages) offered their own long-term nursing assistance for the disabled elderly even before the central government introduced LTC insurance in 2000. Accordingly, there were substantial regional differences in the extent to which a municipal government provided long-term nursing assistance: some municipal governments offered generous assistance for the disabled, while others local governments did not. It at first appears that we could exploit this information to identify the institutional effects on consumption insurance. As described later, however, the inability to access any detailed information concerning examinees' places of residence for privacy reasons prevented us from exploiting regional differences in public assistance availability.

Thus, the extent to which the public LTC insurance scheme can absorb the household risk associated with severely disabled family members, who to a great extent had not been sufficiently insured prior to its introduction, should be subject to a rigorous empirical study. To the best of our knowledge, there are few studies that empirically examine the possible effects of public LTC insurance, although several countries have already introduced similar schemes.[6] Our paper attempts to offer a rigorous empirical assessment of the public LTC insurance scheme introduced in Japan. Such empirical evidence may then be informative for other countries considering this kind of social insurance.

As a result of our focus on the effects on household consumption as a welfare measure, we can evaluate the impact of the introduction of this type of social insurance more precisely. For example, social insurance is expected to absorb the risk of LTC needs. On the other hand, as the public LTC insurance scheme does not provide income support, the loss of earnings opportunity may not be covered. Hence, the public LTC insurance scheme differs sharply from other social insurance programs designed to insure income risks directly.[7] To highlight this aspect of the public LTC insurance scheme, we carefully separate the effects of having severely disabled members on household permanent income from the effect on household consumption. In our empirical framework, if the social insurance scheme absorbs the risk of LTC needs, its effect on consumption is not statistically significant after controlling for permanent income.[8] If the effect on consumption is significant before the introduction of the public LTC insurance scheme, but insignificant afterwards, then social insurance is found to cover an important risk not covered by the private sector.

The dataset we use is the micro-level data in the *Comprehensive Survey of the Living Conditions of the People on Health and Welfare* (*Kokumin Seikatsu Kiso Chosa* in Japanese) (hereafter Survey of Living Conditions or SLC), which is a nationally

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[6] Gupta and Li (2004) simulated the optimal plan of purchasing long-term care insurance.

[7] Bloemen and Stancanelli (2005) and Gruber (1997) assessed the consumption insurance effects of unemployment insurance.

[8] Wagstaff (2005) found that a health shock had a negative effect on non-medical consumption, even among households that purchased health insurance, and conjectured that health insurance did not effectively tackle income losses. However, he did not take into consideration the possible impact of a health condition on permanent income.

representative household survey. The SLC contains detailed information about LTC needs and economic status every three years. As the public LTC insurance scheme was introduced in April 2000, we use the datasets gathered before and after this event (1998 and 2001). In addition, we compare the estimation results based on the 1998 and 2001 SLC with those derived from the 1995 SLC reported in Iwamoto, Kohara and Saito (hereafter IKS, 2001).

The remainder of this paper is organized as follows. Section 2 describes our dataset, while Section 3 reports the estimation results and discusses the implications. Section 4 offers some concluding remarks.

2. Data Descriptions and Basic Statistics

2-1 Data Characteristics

We use the household micro-level data of *the Comprehensive Survey of the Living Conditions of the People on Health and Welfare* compiled by the Ministry of Health, Labor, and Welfare, and recognized as one of the most comprehensive government-sponsored collections of household micro-level data. The SLC conducts a large-scale survey every three years, when more than 30,000 households usually provide information concerning household income and consumption together with details of the health conditions of household members. For estimation purposes, we employ the surveys conducted in 1998 and 2001. In addition, the estimation results based on these surveys are compared with those based on the 1995 survey, which is reported in IKS. (2001).

The SLC is well suited to the purposes of our empirical investigation. First, this large-scale household survey reports on several important dimensions of household characteristics, including family structure, job status, income, financial assets, real estate and health conditions of every family member. In regard to severe health conditions, the SLC surveys in detail whether a family member needs LTC as a result of a physical disability, and if so, what kind of care is provided for the disabled member. Second, given that it is a large-scale household survey, we can include a reasonable number of households with a member in need of LTC in our sample, even though the probability of having a severely disabled family member is extremely low in the overall population. In this regard, unlike micro-level datasets that survey only those households

with disabled members, a dataset constructed from the SLC allows us to explore differences in household behavior between families with disabled members and those without. Third, the 1998 and 2001 surveys are conveniently timed for the purpose of evaluating the possible welfare impacts of the public LTC insurance scheme introduced in April 2000.

For privacy reasons, we were not permitted to have access to any detailed information concerning the location of the respondent's residence. We could obtain, however, the prefecture where the surveyed household resided, and the population class of the city/town/village of residence (150,000 persons or more, between 50,000 and 150,000, and 50,000 or less). Consequently, we cannot exploit the substantial differences in the availability of social services among municipal governments observed before the introduction of the public LTC insurance scheme in 2000.

Both the 1998 and 2001 SLC identified a particular family member residing at home as a member in need of LTC, when he/she required nursing assistance in the following six activities of daily living (ADL): (1) washing face and teeth, (2) changing clothes, (3) eating, (4) discharging, (5) bathing, and (6) walking. Thus, the degree of need for LTC may be measured in terms of how many activities required nursing assistance. In addition, the 1998 SLC classified the state of a bedridden member according to a level from 'occasionally' through 'sometimes' and 'most of the time' to 'completely.' In addition, the 2001 SLC compiles the degree of need of LTC that is authorized under the public LTC insurance scheme law where an independent examiner judges the state of nursing care required ranging from Level 1 (the lightest) through to Level 5 (the most serious) by visiting each applicant for a public LTC insurance scheme payout. Under this classification, a member classified as Level 5 is almost equivalent to a bedridden member.

We construct two kinds of dummy variables concerning the state of disability. One dummy variable takes a value of one if a family member older than 40 years needs help with at least four activities, zero otherwise. Using the 1995 SLC, which basically follows the same definitions as the 1998 and 2001 SLC, IKS (2001) classify a member in need of LTC as one who needs nursing assistance in four activities or more. The other dummy variable takes a value of one if he/she is bedridden, zero otherwise. We define a bedridden member as one assigned to either of the two severe states.

The SLC reports the annual household income of the previous year, the monthly expenditure on household consumption in May of the surveyed year, and the health condition of family members as at the first Thursday in June of the surveyed year. For example, the 2001 SLC reports annual income in 2000, monthly consumption expenditure in May 2001, and the health conditions of family members as at June 7, 2001.

One potential problem associated with the timing of the survey is that each household reports its income not in the surveyed year, but in the previous year. To deal with this issue, we construct a dummy variable for currently bedridden members for each household, and a dummy variable for *having had bedridden members for more than one year*. However, it is not possible to make such a control in constructing dummy variables of having disabled members in need of at least four activities (a definition of which is described below). In this regard, our estimation potentially fails to capture the effects of disabled members on household income. Nevertheless, this aspect does not affect the estimation results because there is no substantial difference in the estimation results using currently bedridden members and that one year before.[9] For this reason, we report the estimation results based on the current state of disabled family members.

The SLC identifies a particular family member who is institutionalized, such as at a nursing facility.[10] However, neither of the SLCs reports the health condition of institutionalized family members. We construct a dummy variable for the presence of family members who are in nursing facilities in order to capture the close similarity between being nursed at home and being institutionalized.

As discussed in the introduction, we evaluate the welfare impact of having a family member in need of LTC in terms of the loss in household consumption. When a disability shock hits a family member, extra expenses incurred in caring for the disabled member may be financed from household savings or may be compensated for by giving

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[9] More precisely, because of the smaller sample in the latter construction, point estimates of the dummy variables associated with disabled members become less significant because of larger standard errors.

[10] The SLC also identifies family members who are hospitalized for a long period of time but does not record their ages. It is thus impossible to construct a dummy variable for the presence of hospitalized elderly members.

up other consumption expenses. Some family members, in particular the spouse of a household head, may quit his/her current high-income job and switch to another job with a lower commitment, thereby sacrificing lifetime income and allocating time to the care of the disabled member at home. The combined effects of these compensating activities are eventually reflected in changes in household consumption net of LTC costs. The SLC also reports any uninsured expenses on LTC including extra clothes, beds, caring tools, charged care service, and uninsured medical expenses. We thus use household consumption net of expenditure on LTC costs as a household welfare measure.

We now make several remarks on the use of consumption as a welfare measure in the context of the LTC. First, consumption expenditures reflect the consumption service available from market activities, but not from home production. For example, as a result of having a disabled member, a family may eat more often at home than away from home, and may reduce expenditure on consumption. A decrease in food consumption for this reason may not necessarily be interpreted as decrease in welfare. Second, as a result of allocating more time to LTC at home, a family may reduce time-consuming consumption activities such as travel and sports. Once again, such a decline in consumption may not exactly capture the increase in disutility associated with giving up leisure time.

2-2 Basic Statistics

We use the sample of households whose household head (more precisely, the highest income earner in the household) is an employee. A major reason for this sample selection is that we are primarily interested in the case where healthier (and maybe younger) household members support an elderly member in need of nursing care.[11] We also exclude as outliers those whose household income (consumption) is four standard deviations from the mean. As a consequence, the number of observations is 15,262 for the 1998 SLC, and 15,542 for the 2001 SLC.

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[11] Our investigation may underestimate the welfare impacts of having a disabled member because our sample excludes the much more serious case where the household head becomes in need of nursing care.

Table 1 and Table 2 report the basic statistics for our sample comprising the 1998 and 2001 SLC. In regard to the 1998 SLC, the number of households with members in need of nursing care for at least four disability activities is 215 observations (1.41%), while the number of households with bedridden members is 77 observations (0.50%). As for the 2001 SLC, the number of households with members in need of nursing care for at least four disability activities is 419 observations (2.70%) Based on the authorized degree of LTC required under the law governing the public LTC insurance scheme, the number of households with members in need of nursing care is 85 observations (0.55%) for Level 5 (equivalent to a bedridden state).

Given the differences in the share of families with disabled members between the 1998 and 2001 surveys, it may be difficult to compare directly estimations from the 1998 survey with those from the 2001 survey. One possible reason is that in response to the introduction of the public LTC insurance scheme in 2000, greater recognition may have been given to the situation of disabled members within households, and consequently the 2001 survey may have recognized disabled members much more broadly than the 1998 survey.

Even in comparison with the 1995 and 1998 surveys, the former reports a smaller share of households with disabled members than the latter. More concretely, the share of household members with four or more disability activities is only 0.81% in the 1995 SLC, but 1.41% in the 1998 SLC. The share of households with bedridden members is 0.38% in the 1995, but 0.50% in the 1998 SLC. More general recognition might have been paid to the state of the disabled even before the public LTC insurance scheme was implemented in 2000, or the number of members in need of nursing care might have indeed increased with population aging in Japan.

In both the 1998 SLC and the 2001 SLC, the share of a family in which an adult child supports his/her disabled parents is the largest among households with disabled members. For example, in the 1998 SLC (the 2001 SLC), the proportion of households in which a spouse's bedridden parent is supported is 35.4% (36.3%), the proportion of households in which a head's bedridden parent is supported is 17.2% (24.3%), and the proportion of households in which a bedridden spouse is supported is 30.2% (27.2%). The number of households that have disabled members at nursing facilities is 46 (0.30%) in the 1998 SLC, and 93 (0.60%) in the 2001 SLC. According to IKS (2001),

on the other hand, 72 such households make up 0.47% of the entire sample in the 1995 SLC.

Table 2 compares the averages of representative household characteristics such as income and consumption net of LTC costs in households with disabled members and in those without. According to this table, the average income (or consumption) of the former is not necessarily inferior to the latter. As far as the average level is concerned, there is no direct evidence for an adverse impact of having a disabled member in terms of household income and consumption. However, note that in families with disabled members, the age of the household head is more than 10 years older than in families without a disabled member. This finding appears reasonable in that parents of household heads and their spouses are more likely to need LTC when they get older. The numbers of household members and workers are larger in families with disabled members than in those without them. Household consumption may be heavily influenced by these household characteristics. Section 3 explores in detail how the presence of a disabled member could have welfare impacts after controlling for other possible effects of household characteristics on income and consumption.

3. Statistical Specification and Estimation Results

3-1 Statistical Specification

Because we have cross-sectional data at particular points of time (1998 and 2001) and not panel data, we cannot estimate a structural form based on dynamic optimization, rather only a reduced-form specification to evaluate the impact of having disabled members within a family.

We construct a two-stage specification for this purpose. First, we estimate household income as a function of household characteristics assuming fixed effects, including a dummy variable associated with disabled members, and use predicted household income as a proxy for the permanent income of a household in the second stage. This first-stage estimation allows us to identify the impact of disabled members on household permanent income. In the second-stage estimation, we specify household consumption net of uninsured expenditures on LTC as a function of household characteristics, including the household permanent income predicted by the first stage estimation, and a dummy variable for the presence of disabled members. For the

second-stage estimation, we add as explanatory variables several factors specific to the consumption decision.

There are two channels, indirect and direct, through which the state of having disabled members could yield welfare impacts in terms of consumption net of nursing care costs. By an indirect channel, a disabled state may reduce household permanent income, thereby lowering consumption. By the direct channel, on the other hand, given permanent income, consumption may decline through the state of a household having disabled members.

Our two-stage procedure is suitable for classifying the role of insuring risks caused by having disabled members. As described, the LTC insurance scheme provides in-kind benefits for both home care and institutional care, but does not provide any cash benefit for care provided by family members. As it is not an income support program, it does not compensate for income losses because of a problem with disability. Therefore, the LTC insurance scheme does not help mitigate a substantial decline in permanent income in the first stage, but is intended to offset a decrease in consumption in the second stage.

In the first-stage estimation, the household income function is specified as:

$$\ln y_i = \sum_{j=1}^{J} \alpha_j x_{1ij} + \beta d_i, \tag{1}$$

where y_i and x_{1ij} denote the total income and characteristics of household i.

A set of variables of household characteristics $\{x_{1ij}\}$ includes the number of household members (in logarithms), the age of the household head and its square, the sex of the household head, whether the household head is married or single, the number of children relative to the number of household members, the number of parents relative to the number of household members, the number of income earners, the scale of the firm in which the household head is employed, and a dummy variable for households residing in a city. In addition, we include a dummy variable for the presence of disabled members in nursing facilities so as to consider the similarity between nursing the disabled member at home and outside the home. As mentioned earlier, although the timing of the recording of a health condition differs from the timing of the recording of household income, such differences in recorded timing do not substantially affect the

estimation results. In addition, d_i is a dummy variable indicating the presence of disabled members within household i. Thus, a coefficient on d_i (β) represents the (possibly negative) effect of the state of having disabled members on permanent income.

In the second-stage estimation, the household consumption function is specified as:

$$\ln c_i = \gamma(\ln y_i)^e + \sum_{j=1}^{J} \lambda_j x_{2ij} + \mu d_i,\tag{2}$$

where $(\ln y_i)^e$ is the household income predicted in the first-stage estimation, while c_i denotes household consumption net of nursing care costs.

Unlike the first-stage estimation, the SLC records the monthly household consumption of May of 1998 or 2001, and there is no significant difference in the timing of recording health conditions (in the early June) and household consumption. A set of household characteristics adds a dummy variable of children attending a college and living separately, and a dummy variable associated with home ownership in order to control for possible impacts on consumption behavior.

In equation (2), the coefficient on d_i (μ) represents the direct effect of disabled members on household consumption. A possible dynamic effect, such as adjustment costs or habit formation, may be captured by the coefficient on the proxy for permanent income (γ) being less than one.

Throughout the two-stage estimation procedure, we assert that the state of having disabled members is completely exogenous. Although we regress a dummy variable of disabled members on every possible household characteristic to explore endogenous nature, we cannot find any systematic pattern in determining the state of having disabled members.[12] Thus, the above identification assumption can be justified as far as our dataset is concerned.

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[12] The only exception to this is that the probability of having disabled members tends to be higher in households with more rooms and/or a larger ground area. This indicates that physical capacity is an important determinant in nursing disabled members at home.

3-2 Estimation Results

Tables 3 and 4 report the estimation results of the income and consumption functions based on equations (1) and (2) using the 1998 and 2001 SLC datasets for both the case with household members with at least four disability activities and the case with household members bedridden for at least one year.

Before discussing the effects of the presence of disabled members, we briefly explore the effects of other household characteristics on the estimation results based on the 1998 and 2001 SLC datasets. Most of the estimated coefficients appear to be quite reasonable. Household income increases with age, but at a diminishing rate, while it increases with the number of household members, but decreases with the number of children. Both households with male and married heads and those working for larger firms or residing in larger cities tend to earn higher incomes.

On the other hand, household consumption largely reflects household income. In addition, consumption is influenced by student-related expenditure. A significantly positive coefficient on the dummy variable for home ownership indicates that houses that are owned may serve as a proxy for net household wealth. One point to be noted is that the estimated coefficient on the dummy variable for disabled members in nursing facilities is significantly negative in the 1998 estimation; that is, household consumption declines by about 20% in the presence of disabled members in nursing facilities. A similar effect is absent from the 2001 survey. We will discuss this part of the estimation results later.

In regard to the effects of the presence of disabled members, we first discuss the estimation results using the 1998 SLC. As documented in Table 3, in terms of household income functions, the state of having disabled members yields negative impacts on household income, although the estimates are slightly insignificant (the *p*-value is 11.7% for the estimation based on members with four or more disability activities, and 10.5% for that based on bedridden members). More concretely, the state of having members with problems in at least four ADLs reduces household income by 5.5%, while the presence of bedridden members lowers household income by 9.0%. On the other hand, the state of having disabled members has a significantly negative effect on household consumption. That is, the state of having members with problems in at

least four ADLs reduces household consumption by 9.2%, while the presence of bedridden members lowers household consumption by 7.7%.

The estimated marginal propensity to consume out of permanent income, as captured by γ, is slightly less than 50% in both cases (45.8% and 46.1%). As suggested earlier, an estimated γ less than one may be a consequence of slow consumption adjustment because of habit formation. Thus, as a result of the combined effect through both indirect and direct channels, household consumption would decline by 11.7% for households with members with problems in at least four ADLs, and by 11.8% for households with bedridden members.

One caveat concerning the estimated welfare impacts of LTC is that it only considers the case where disabled members are cared for at home and does not take into consideration any cost associated with institutional services. As indicated, household consumption declines by about 20% in the presence of disabled members in nursing facilities. In this regard, the estimated welfare impact implied by the 1998 estimation may be underestimated to some extent.

The estimation results of the 2001 SLC contrast with those of the 1998 SLC in that the state of having disabled members has a significantly negative impact only on household income. As shown in Table 4, and in the case of members with at least four disability activities, the state of having a disabled member results in a 22.5% decrease in household income, while the state of having bedridden members reduces household income by 15.3%. Another difference from the 1998 estimation is that the presence of a family member who is institutionalized has no impact on household consumption.

On the other hand, the state of having members with at least four disability activities has little direct impact on household consumption. Consequently, the state of having disabled members reduces household consumption only through the indirect channel. Unlike the 1998 estimation, the coefficient on the dummy variable for disabled members in nursing facilities is not significant. The absence of negative effects on consumption in the second stage estimation may be interpreted as supportive evidence for the direct effects of the public LTC insurance scheme introduced in April 2000. In addition, one possible interpretation of the insignificant effect of institutionalized household members is that the public insurance system may even reduce the potential burden on those who would have even nursed disabled members outside the home.

Given that the coefficient on predicted household income is estimated to be less than 50%, the state of having disabled members reduces household consumption by the order of half of the estimated impact on household income. More precisely, the state with household members with at least four disability activities reduces household income by 22.5%, while the marginal propensity to consume out of predicted household income is 41.8%. Accordingly, household consumption decreases by 9.4% as a result of the indirect effect. Similarly, in the presence of bedridden members, household consumption decreases by 6.4% as a result of the indirect effect.

3-3 Discussion

As discussed, the state of a household having disabled members has a significantly negative impact on household welfare in terms of a decrease in household consumption in both the 1998 SLC and the 2001 SLC, but the pattern differs between the two datasets. In the 1998 SLC, the state of having a disabled member has negative impacts on both income and consumption. In the 2001 SLC, on the other hand, the state of having disabled members has negative impacts on income, but not on consumption. As the introduction of the public LTC insurance scheme was a nationwide policy change, a well-designed control group was not available. Although we cannot preclude the possibility that the time series change in other factors may lead to a different consumption insurance effect, the most significant change in the environment surrounding a person who needs an LTC was the most likely to cause the difference.

According to IKS (2001), who employed almost the same methodology with the 1995 SLC, the state of having disabled members has significantly negative impacts on both household income and consumption.[13] More concretely, as shown in Table A-1, households with members with at least four disability activities significantly reduces household income by 11.5% and household consumption by 24.3%, while the state of having bedridden members reduces household income by 15.3% and household

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[13] There are a few minor differences in the construction of explanatory variables. First, in the 1995 dataset, the dummy for a disabled member was set at one if the member had been in care for more than six months. Unfortunately, the information about the duration of this status is not available in the 2001 dataset. Second, the dummy for a bedridden member was set at one if the member had been bedridden for more than six months. Third, the dummy for a college student was set at one regardless of whether or not they lived separately from the household.

consumption by 33.8%. Given that the marginal propensity to consume out of predicted household income is estimated to be 23.1% or 23.0% (much smaller than in the 1998 and 2001 data), household consumption should decline by either 27.0% or 37.3% as a result of the combined effect through the indirect and direct channels.

These results jointly demonstrate that the introduction of the public LTC insurance scheme in 2000 has substantially mitigated the risk faced by a household with a severely disabled member. First, we find that after controlling for the effect of household income, the state of having disabled members still has a significantly negative impact on household consumption in both 1995 and 1998, but little effect on household consumption in 2001. That is, the public LTC insurance scheme, which was specifically designed to mitigate consumption risk, indeed helps to absorb the risk of LTC needs that appear at the level of household consumption.

Second, the overall impact of the state of having disabled members on household welfare measured in terms of consumption has weakened significantly over time. As mentioned, in the case of members with at least four disability activities, household consumption decreases by 27.0% as a result of both the indirect and direct channels in the year 1995. On the other hand, household consumption decreases by 11.7% through the indirect and direct channels in 1998, and by 9.4% and by only the indirect channel in 2001. In the case of bedridden members, the combined effects are –37.3% in 1995, –11.8% in 1998, and –6.4% in 2001. The pattern in diminished welfare impacts of the state of having disabled members can be justified by the introduction of the public LTC insurance scheme law in 2000. In addition, it is consistent with the fact that municipal governments put the public LTC system into effect by implementing its provisions before 2000.

Third, the estimation results imply that the public LTC insurance scheme reduces the risk faced by a household that has institutionalized a disabled member in a nursing facility. According to the 1998 analysis, having disabled members outside the home should cost substantially more; that is, household consumption should decrease by about 20% when there are family members in nursing facilities. Based on the 1995 survey reported by IKS (2001), household consumption decreases slightly and insignificantly. However, such an adverse effect on household consumption is absent from the 2001 estimation results. One possible interpretation of the difference among

the three sets of results is that the public insurance system may even mitigate the potential burden of those with institutionalized disabled members. Under the prepublic LTC insurance scheme era, the provision of institutional nursing services was part of the social welfare program, and fees for nursing facilities depended on the income level of the user's household. For middle-income earners who had institutionalized their parents in nursing facilities, the out-of-pocket payments were burdensome. As the public LTC insurance scheme pays 90% of total costs, this then helps to reduce the financial burden of middle-income households.

4. Concluding Remarks

The literature on consumption insurance has successfully revealed which kinds of risks are not absorbed well by informal, private or social insurance. Our paper aimed to connect this approach to a public policy issue, by comparing the consumption insurance effects given a fundamental change in the social insurance scheme. Employing the micro-level household data in the 1998 and 2001 SLC compiled by the Japanese Ministry of Health, Labor and Welfare, this paper has examined how the state of having a household member who needs LTC results in welfare losses measured in terms of consumption, and evaluates the role of the public LTC insurance scheme introduced in April 2000.

Our findings are summarized as follows. First, in the 1998 SLC, the state of having disabled members has a negative impact on both income and consumption. In the 2001 SLC, on the other hand, the state of having a disabled member has a negative impact on income, but not on consumption. Second, the combination of indirect and direct impacts of LTC needs on household consumption has become weaker over time. Third, even the burden borne by a household with a disabled family member outside the home in 2001 is reduced to some extent.

These findings jointly demonstrate that the social insurance approach to financing LTC costs in Japan has helped reduce the welfare loss associated with having a disabled family member. That is, the public LTC insurance scheme successfully absorbs the risk of expenses for a disabled member not covered by the private insurance market. Consequently, even when households have a disabled family member, the household consumption net of LTC costs does not decrease as much as before the introduction of the public LTC insurance scheme.

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Table 1: Descriptive Statistics of Major Variables

Panel A: 1998 SLC

	Total Sample Number: 15262			
	Average	Standard Deviation	Minimum	Maximum
log of family consumption	12.4259	0.5117	9.2103	14.4935
log of family disposable income	6.2683	0.6427	1.3863	7.7717
log of the number of family members	1.0491	0.5325	0	2.3026
the age of a household head	48.2905	13.2591	18	95
a dummy of a male head	0.8736	0.3323	0	1
a dummy of a married head	0.7861	0.4101	0	1
the number of children relative to the number of household members	0.1797	0.2217	0	1
a dummy of students living separately	0.0298	0.1701	0	1
the number of parents relative to the number of household members	0.0397	0.1081	0	0.6667
a dummy of persons in nursing facilities	0.0030	0.0548	0	1
a dummy of firm scale (medium)	0.1947	0.3960	0	1
a dummy of firm scale (large)	0.2696	0.4437	0	1
a dummy of firm scale (government office)	0.0302	0.1712	0	1
a dummy of homeownership	0.6666	0.4714	0	1
a dummy of city scale (metropolitan)	0.1909	0.3930	0	1
a dummy of city scale (large)	0.3156	0.4648	0	1
a dummy of city scale (medium)	0.2197	0.4141	0	1
a dummy of city scale (small)	0.0589	0.2355	0	1
the number of workers	1.6958	0.8486	1	7
a dummy of household members with at least four disabled acitivities	0.0141	0.1179	0	1
a dummy of bedridden household members	0.0050	0.0709	0	1

Panel B: 2001SLC

	Total Sample Number: 15542			
	Average	Standard Deviation	Minimum	Maximum
log of family consumption	12.4003	0.5337	9.2103	14.3808
log of family disposable income	6.1899	0.7028	0	7.7511
log of the number of family members	1.0840	0.5343	0	2.4849
the age of a household head	49.7730	13.8367	18	101
a dummy of a male head	0.8714	0.3347	0	1
a dummy of a married head	0.7766	0.4165	0	1
the number of children relative to the number of household members	0.1795	0.2219	0	1
a dummy of students living separately	0.0370	0.1888	0	1
the number of parents relative to the number of household members	0.0589	0.1298	0	0.7500
a dummy of persons in nursing facilities	0.0060	0.0771	0	1
a dummy of firm scale (medium)	0.1793	0.3836	0	1
a dummy of firm scale (large)	0.1457	0.3529	0	1
a dummy of firm scale (government office)	0.1052	0.3068	0	1
a dummy of homeownership	0.7627	0.4254	0	1
a dummy of city scale (metropolitan)	0.1375	0.3444	0	1
a dummy of city scale (large)	0.2718	0.4449	0	1
a dummy of city scale (medium)	0.2133	0.4096	0	1
a dummy of city scale (small)	0.0892	0.2851	0	1
the number of workers	1.8234	0.9077	1	7
a dummy of household members with at least four disabled acitivities	0.0270	0.1620	0	1
a dummy of bedridden household members	0.0055	0.0738	0	1

Table 2: Long Term Care Needs and Family Characteristics

Panel A: 1998 SLC

(total observations: 15262)	household members with at least four disabled activities				bedridden household members			
	without the disabled		with the disabled		without the disabaled		with disabled	
	Mean	(Standard Deviation)	Mean	(Standard Deviation)	Mean	(Standard Deviation)	Mean	(Standard Deviation)
(1) monthly household consumption (yen)	284384.3	(167656.9)	348093	(163677.3)	284851.5	(167549.4)	370129.9	(188634.2)
(2) monthly expenditure on LTC (yen)	174.3	(3829.1)	47641.86	(81134.7)	654.4	(10972.7)	38026.0	(47541.1)
(1) - (2)	284210.0	(167559.5)	300451.2	(144381.0)	284197.1	(167186.2)	332103.9	(176377.0)
annual household income (ten thousand yen)	625.9	(347.3)	753.5	(375.0)	627.0	(347.5)	772.8	(407.9)
the age of a household head	48.1479	(13.1955)	58.2698	(13.9060)	48.2321	(13.2234)	59.8182	(15.2279)
the number of household members	3.2170	(1.4880)	4.6558	(1.4985)	3.2288	(1.4930)	4.8961	(1.5268)
the number of children	0.7760	(1.0137)	0.7535	(1.0411)	0.7756	(1.0138)	0.8052	(1.0642)
the number of workers	1.6927	(0.8473)	1.9116	(0.9103)	1.6940	(0.8475)	2.0519	(0.9719)
a dummy of homeownership	0.6633	(0.4726)	0.9023	(0.2976)	0.6653	(0.4719)	0.9221	(0.2698)
a dummy of a male head	0.8724	(0.3337)	0.9581	(0.2007)	0.8732	(0.3327)	0.9481	(0.2234)
a dummy of a married head	0.7843	(0.4113)	0.9070	(0.2911)	0.7856	(0.4104)	0.8701	(0.3384)
a dummy of two-generation family	0.1293	(0.3355)	0.6279	(0.4845)	0.1338	(0.3404)	0.6364	(0.4842)
the number of children relative to the number of household members	0.0294	(0.1690)	0.0558	(0.2301)	0.0299	(0.1703)	0.0130	(0.1140)
a dummy of students living separately	0.0027	(0.0515)	0.0279	(0.1651)	0.0028	(0.0525)	0.0519	(0.2234)
a dummy of firm scale (medium)	0.3271	(0.4692)	0.2651	(0.4424)	0.1950	(0.3962)	0.1299	(0.3384)
a dummy of firm scale (large)	0.2704	(0.4442)	0.2140	(0.4111)	0.2696	(0.4438)	0.2597	(0.4414)
a dummy of firm scale (government office)	0.0169	(0.1288)	0.0279	(0.1651)	0.0303	(0.1714)	0.0130	(0.1140)
a dummy of city scale (metropolitan)	0.1911	(0.3932)	0.1721	(0.3783)	0.1910	(0.3931)	0.1688	(0.3771)
a dummy of city scale (large)	0.3166	(0.4652)	0.2465	(0.4320)	0.3161	(0.4650)	0.2208	(0.4175)
a dummy of city scale (medium)	0.2204	(0.4145)	0.1721	(0.3783)	0.2199	(0.4142)	0.1818	(0.3882)
a dummy of city scale (small)	0.0586	(0.2349)	0.0791	(0.2705)	0.0589	(0.2354)	0.0649	(0.2480)

Panel B: 2001SLC

(Total Sample Number: 15542)	household members with at least four disabled activities				bedridden household members			
	without the disabled		with the disabled		without the disabaled		with disabled	
	Mean	(Standard Deviation)	Mean	(Standard Deviation)	Mean	(Standard Deviation)	Mean	(Standard Deviation)
(1) monthly household consumption (yen)	278131.3	(158930.2)	336563.2	(194060.4)	279404.2	(160062.7)	334705.9	(184355.9)
(2) monthly expenditure on LTC (yen)	533.8	(6125.5)	22357.3	(38718.0)	1019.3	(9208.8)	19835.9	(23797.6)
(1) - (2)	277597.5	(158708.1)	314205.9	(188657.7)	278384.9	(159534.4)	314870.0	(183684.6)
annual household income (ten thousand yen)	594.1	(346.5)	610.0	(352.3)	594.0	(346.2)	685.3	(404.9)
the age of a household head	49.4958	(13.7602)	59.7780	(12.8535)	49.7171	(13.8229)	59.9412	(12.5938)
the number of household members	3.3191	(1.5452)	4.6516	(1.5676)	3.3478	(1.5583)	4.6588	(1.4764)
the number of children	0.7957	(1.0363)	0.6969	(1.0266)	0.7938	(1.0367)	0.6471	(0.9220)
the number of workers	1.8162	(0.9037)	2.0859	(1.0082)	1.8217	(0.9068)	2.1412	(1.0136)
a dummy of homeownership	0.7571	(0.4288)	0.9642	(0.1860)	0.7616	(0.4261)	0.9647	(0.1856)
a dummy of a male head	0.8698	(0.3365)	0.9308	(0.2541)	0.8711	(0.3351)	0.9294	(0.2577)
a dummy of a married head	0.7743	(0.4180)	0.8592	(0.3482)	0.7758	(0.4170)	0.9176	(0.2765)
a dummy of two-generation family	0.1832	(0.3868)	0.7399	(0.4392)	0.1953	(0.3965)	0.7176	(0.4528)
the number of children relative to the number of household members	0.0365	(0.1875)	0.0549	(0.2280)	0.0369	(0.1885)	0.0588	(0.2367)
a dummy of students living separately	0.0047	(0.0684)	0.0525	(0.2233)	0.0058	(0.0761)	0.0353	(0.1856)
a dummy of firm scale (medium)	0.1803	(0.3844)	0.1456	(0.3531)	0.1794	(0.3837)	0.1647	(0.3731)
a dummy of firm scale (large)	0.1481	(0.3552)	0.0621	(0.2415)	0.1463	(0.3535)	0.0353	(0.1856)
a dummy of firm scale (government office)	0.1058	(0.3076)	0.0835	(0.2770)	0.1051	(0.3066)	0.1294	(0.3376)
a dummy of city scale (metropolitan)	0.1397	(0.3467)	0.0573	(0.2327)	0.1379	(0.3448)	0.0588	(0.2367)
a dummy of city scale (large)	0.2730	(0.4455)	0.2267	(0.4192)	0.2720	(0.4450)	0.2353	(0.4267)
a dummy of city scale (medium)	0.2142	(0.4103)	0.1790	(0.3838)	0.2134	(0.4097)	0.1882	(0.3932)
a dummy of city scale (small)	0.0889	(0.2847)	0.1002	(0.3007)	0.0893	(0.2852)	0.0824	(0.2765)

Table 3: Estimation Results of the 1998 SLC

Panel A: with household members with at least four disabled activities

Dependent Variable: log of disposable household income			*Dependent Variable: log of household consumption net of LTC expenditures*		
a dummy of disabled household members	-0.0553		**a dummy of disabled household members**	-0.0916	***
	(0.0353)			(0.0357)	
log of the number of household members	0.3405	***	**the predicted Income**	0.4577	***
	(0.0206)			(0.0297)	
the age of a household head	0.0285	***	log of the number of household members	0.0741	***
	(0.0021)			(0.0215)	
a dummy of a male head	0.2866	***	the age of a household head	0.0025	***
	(0.0196)			(0.0004)	
a dummy of a married head	0.1291	***	a dummy of a male head	-0.0705	***
	(0.0196)			(0.0174)	
the number of children relative to the number of household members	-0.3290	***	a dummy of a married head	0.1065	***
	(0.0348)			(0.0160)	
the number of parents relative to the number of household members	0.1198	***	the number of children relative to the number of household members	0.1845	***
	(0.0459)			(0.0321)	
a dummy of persons in nursing facilities	-0.0454		a dummy of students living separately	0.3422	***
	(0.0802)			(0.0199)	
a dummy of firm scale (medium)	0.1623	***	the number of parents relative to the number of household members	-0.0541	
	(0.0107)			(0.0399)	
a dummy of firm scale (large)	0.3661	***	a dummy of persons in nursing facilities	-0.1964	**
	(0.0093)			(0.0957)	
a dummy of firm scale (government office)	-0.2664	***	a dummy of firm scale (medium)	-0.0133	
	(0.0298)			(0.0111)	
a dummy of city scale (metropolitan)	0.0243		a dummy of firm scale (large)	-0.0500	***
	(0.0159)			(0.0146)	
a dummy of city scale (large)	0.0427	***	a dummy of firm scale (government office)	0.0759	***
	(0.0120)			(0.0230)	
a dummy of city scale (medium)	0.0198	+	a dummy of homeownership	0.0405	***
	(0.0123)			(0.0093)	
a dummy of city scale (small)	-0.0095		a dummy of city scale (metropolitan)	0.1728	***
	(0.0201)			(0.0118)	
the squared age of a household head	-0.0002	***	a dummy of city scale (large)	0.1128	***
	(0.0000)			(0.0105)	
the number of workers	0.1131	***	a dummy of city scale (medium)	0.0851	***
	(0.0065)			(0.0109)	
constant term	4.0709	***	a dummy of city scale (small)	0.0085	
	(0.0683)			(0.0173)	
			constant term	9.1946	***
				(0.1498)	
R-squared	0.4184		F-statistics (all the coefficients = 0)	332.28	***
F-statistics (all the coefficieints = 0)	165.13	***			

Panel B: with bedridden household members

Dependent Variable: log of disposable household income

a dummy of disabled household members	-0.0898	
	(0.0553)	
log of the number of household members	0.3401	***
	(0.0206)	
the age of a household head	0.0285	***
	(0.0021)	
a dummy of a male head	0.2866	***
	(0.0196)	
a dummy of a married head	0.1290	***
	(0.0196)	
the number of children relative to the number of household members	-0.3284	***
	(0.0347)	
the number of parents relative to the number of household members	0.1179	***
	(0.0457)	
a dummy of persons in nursing facilities	-0.0425	
	(0.0797)	
a dummy of firm scale (medium)	0.1624	***
	(0.0107)	
a dummy of firm scale (large)	0.3663	***
	(0.0093)	
a dummy of firm scale (government)	-0.2663	***
	(0.0298)	
a dummy of city scale (metropolitan)	0.0243	
	(0.0159)	
a dummy of city scale (large)	0.0426	***
	(0.0120)	
a dummy of city scale (medium)	0.0199	+
	(0.0123)	
a dummy of city scale (small)	-0.0096	
	(0.0201)	
the squared age of a household head	-0.0002	***
	(0.0000)	
the number of workers	0.1133	***
	(0.0065)	
constant term	4.0709	***
	(0.0683)	
R-squared	0.4184	
F-statistics (all the coefficieints = 0)	165.13	***

Dependent Variable: log of household consumption net of LTC expenditures

a dummy of disabled household members	-0.0766	
	(0.0612)	
the predicted Income	0.4610	***
	(0.0298)	
log of the number of household members	0.0714	***
	(0.0216)	
the age of a household head	0.0025	***
	(0.0004)	
a dummy of a male head	-0.0716	***
	(0.0175)	
a dummy of a married head	0.1061	***
	(0.0160)	
the number of children relative to the number of household members	0.1875	***
	(0.0321)	
a dummy of students living separately	0.3417	***
	(0.0200)	
the number of parents relative to the number of household members	-0.0634	+
	(0.0398)	
a dummy of persons in nursing facilities	-0.1984	**
	(0.0953)	
a dummy of firm scale (medium)	-0.0138	
	(0.0111)	
a dummy of firm scale (large)	-0.0511	***
	(0.0146)	
a dummy of firm scale (government)	0.0772	***
	(0.0230)	
a dummy of homeownership	0.0409	***
	(0.0093)	
a dummy of city scale (metropolitan)	0.1723	***
	(0.0118)	
a dummy of city scale (large)	0.1124	***
	(0.0105)	
a dummy of city scale (medium)	0.0852	***
	(0.0109)	
a dummy of city scale (small)	0.0083	
	(0.0173)	
constant term	9.1801	***
	(0.1500)	
F-statistics (all the coefficients = 0)	331.69	***

Notes
1. The number of observations is 15,262.
2. *, **, *** indicates 10%, 5%, and 1% significance levels respectively.
3. The number in a parenthesis is a robust standard error.

Table 4: Estimation Results of the 2001 SLC

Panel A: with household members with at least four disabled activities

Dependent Variable: log of disposable household income			*Dependent Variable: log of household consumption net of LTC expenditures*		
a dummy of disabled household members	-0.2248	***	**a dummy of disabled household members**	0.0295	
	(0.0326)			(0.0283)	
log of the number of household members	0.2645	***	**the predicted Income**	0.4181	***
	(0.0225)			(0.0273)	
the age of a household head	0.0320	***	log of the number of household members	0.1072	***
	(0.0023)			(0.0197)	
a dummy of a male head	0.2782	***	the age of a household head	0.0015	***
	(0.0221)			(0.0005)	
a dummy of a married head	0.1858	***	a dummy of a male head	-0.0543	***
	(0.0203)			(0.0177)	
the number of children relative to the number of household members	-0.1796	***	a dummy of a married head	0.0983	***
	(0.0409)			(0.0161)	
the number of parents relative to the number of household members	0.1993	***	the number of children relative to the number of household members	0.1436	***
	(0.0470)			(0.0307)	
a dummy of persons in nursing facilities	0.0759		a dummy of students living separately	0.3384	***
	(0.0701)			(0.0195)	
a dummy of firm scale (medium)	0.1829	***	the number of parents relative to the number of household members	0.0518	
	(0.0120)			(0.0362)	
a dummy of firm scale (large)	0.3476	***	a dummy of persons in nursing facilities	0.0187	
	(0.0129)			(0.0531)	
a dummy of firm scale (government office)	0.5050	***	a dummy of firm scale (medium)	-0.0230	**
	(0.0133)			(0.0116)	
a dummy of city scale (metropolitan)	0.0058		a dummy of firm scale (large)	-0.0388	***
	(0.0190)			(0.0153)	
a dummy of city scale (large)	0.0523	***	a dummy of firm scale (government office)	-0.0714	***
	(0.0129)			(0.0189)	
a dummy of city scale (medium)	0.0383	***	a dummy of homeownership	0.0795	***
	(0.0136)			(0.0107)	
a dummy of city scale (small)	-0.0068		a dummy of city scale (metropolitan)	0.1966	***
	(0.0180)			(0.0128)	
the squared age of a household head	-0.0002	***	a dummy of city scale (large)	0.1077	***
	(0.0000)			(0.0105)	
the number of workers	0.1194	***	a dummy of city scale (medium)	0.0625	***
	(0.0070)			(0.0112)	
constant term	3.7613	***	a dummy of city scale (small)	0.0296	**
	(0.0710)			(0.0145)	
			constant term	9.4321	***
				(0.1311)	
R-squared	0.3609		F-statistics (all the coefficients = 0)	318.24	***
F-statistics (all the coefficieints = 0)	124.35	***			

Panel B: with bedridden household members

Dependent Variable: log of disposable household income

a dummy of disabled household members	-0.1526	***
	(0.0546)	
log of the number of household members	0.2556	***
	(0.0225)	
the age of a household head	0.0325	***
	(0.0023)	
a dummy of a male head	0.2782	***
	(0.0221)	
a dummy of a married head	0.1863	***
	(0.0204)	
the number of children relative to the number of household members	-0.1677	***
	(0.0410)	
the number of parents relative to the number of household members	0.1651	***
	(0.0468)	
a dummy of persons in nursing facilities	0.0466	
	(0.0698)	
a dummy of firm scale (medium)	0.1835	***
	(0.0120)	
a dummy of firm scale (large)	0.3492	***
	(0.0129)	
a dummy of firm scale (government)	0.5060	***
	(0.0133)	
a dummy of city scale (metropolitan)	0.0064	
	(0.0190)	
a dummy of city scale (large)	0.0516	***
	(0.0129)	
a dummy of city scale (medium)	0.0388	***
	(0.0136)	
a dummy of city scale (small)	-0.0064	
	(0.0181)	
the squared age of a household head	-0.0002	***
	(0.0000)	
the number of workers	0.1217	***
	(0.0070)	
constant term	3.7513	***
	(0.0712)	
R-squared	0.3588	
F-statistics (all the coefficieints = 0)	123.55	***

Dependent Variable: log of household consumption net of LTC expenditures

a dummy of disabled household members	0.0450	
	(0.0418)	
the predicted Income	0.4169	***
	(0.0268)	
log of the number of household members	0.1080	***
	(0.0195)	
the age of a household head	0.0016	***
	(0.0004)	
a dummy of a male head	-0.0538	***
	(0.0176)	
a dummy of a married head	0.0982	***
	(0.0161)	
the number of children relative to the number of household members	0.1427	***
	(0.0305)	
a dummy of students living separately	0.3383	***
	(0.0195)	
the number of parents relative to the number of household members	0.0546	
	(0.0358)	
a dummy of persons in nursing facilities	0.0211	
	(0.0535)	
a dummy of firm scale (medium)	-0.0229	**
	(0.0116)	
a dummy of firm scale (large)	-0.0386	***
	(0.0152)	
a dummy of firm scale (government)	-0.0711	***
	(0.0188)	
a dummy of homeownership	0.0800	***
	(0.0107)	
a dummy of city scale (metropolitan)	0.1967	***
	(0.0128)	
a dummy of city scale (large)	0.1078	***
	(0.0105)	
a dummy of city scale (medium)	0.0625	***
	(0.0112)	
a dummy of city scale (small)	0.0296	**
	(0.0145)	
constant term	9.4371	***
	(0.1294)	
F-statistics (all the coefficients = 0)	317.67	***

Notes
1. The number of observations is 15542.
2. *, **, *** indicates 10%, 5%, and 1% significance levels respectively.
3. The number in a parenthesis is a robust standard error.

Table A-1: Estimation Results of the 1995 SLC (Iwamoto, Kohara, and Satio, 2001)

Panel A: with household members with at least four disabled activities

Dependent Variable: log of disposable household income

dummy of disabled household members	-0.1149	***
	(0.0424)	
log of the number of household members	0.1937	***
	(0.0187)	
the age of a household head	0.0442	***
	(0.0019)	
dummy of a male head	0.2627	***
	(0.0155)	
dummy of a married head	0.1207	***
	(0.0161)	
the number of children relative to the number of household members	-0.0949	***
	(0.0339)	
the number of parents relative to the number of household members	-0.4260	***
	(0.0480)	
dummy of firm scale (medium)	0.2126	***
	(0.0099)	
dummy of firm scale (large)	0.4058	***
	(0.0093)	
the squared age of a household head	-0.0004	***
	(0.0000)	
the number of workers	0.2701	***
	(0.0053)	
constant term	3.8045	***
	(0.0655)	
R-squared	0.4723	
F-statistics (all the coefficieints = 0)	244.01	***

Dependent Variable: log of household consumption net of LTC expenditures

dummy of disabled household members	-0.2429	***
	(0.0460)	
the predicted Income	0.2311	***
	(0.0178)	
log of the number of household members	0.2320	***
	(0.0200)	
the age of a household head	0.0038	***
	(0.0004)	
dummy of a male head	-0.0355	**
	(0.0175)	
dummy of a married head	0.1358	***
	(0.0171)	
the number of children relative to the number of household members	-0.0750	**
	(0.0348)	
a dummy of students	0.1549	***
	(0.0113)	
the number of parents relative to the number of household members	-0.0197	
	(0.0490)	
dummy of persons in nursing facilities	-0.0121	
	(0.0592)	
dummy of firm scale (medium)	0.0387	***
	(0.0115)	
dummy of firm scale (large)	0.0574	***
	(0.0125)	
constant term	1.1933	***
	(0.0883)	
F-statistics (all the coefficieints = 0)	372.67	***

Panel B: with bedridden household members

Dependent Variable: log of disposable household income

dummy of disabled household members	-0.1534	**
	(0.0613)	
log of the number of household members	0.1940	***
	(0.0187)	
the age of a household head	0.0443	***
	(0.0019)	
dummy of a male head	0.2670	***
	(0.0155)	
dummy of a married head	0.1208	***
	(0.0161)	
the number of children relative to the number of household members	-0.0961	***
	(0.0339)	
the number of parents relative to the number of household members	-0.4326	***
	(0.0478)	
dummy of firm scale (medium)	0.2125	***
	(0.0099)	
dummy of firm scale (large)	0.4056	***
	(0.0093)	
the squared age of a household head	-0.0004	***
	(0.0000)	
the number of workers	0.2700	***
	(0.0099)	
constant term	3.7694	***
	(0.0668)	
R-squared	0.4703	
F-statistics (all the coefficieints = 0)	243.97	***

Dependent Variable: log of household consumption net of LTC expenditures

dummy of disabled household members	-0.2280	***
	(0.0665)	
the predicted Income	0.2299	***
	(0.0178)	
log of the number of household members	0.2332	***
	(0.0200)	
the age of a household head	0.0039	***
	(0.0004)	
dummy of a male head	-0.0349	**
	(0.0175)	
dummy of a married head	0.1354	***
	(0.0171)	
the number of children relative to the number of household members	-0.0777	**
	(0.0348)	
a dummy of students	0.1545	***
	(0.0113)	
the number of parents relative to the number of household members	-0.0204	
	(0.0488)	
dummy of persons in nursing facilities	-0.0206	
	(0.0592)	
dummy of firm scale (medium)	0.0385	***
	(0.0115)	
dummy of firm scale (large)	0.0579	***
	(0.0125)	
constant term	1.1996	***
	(0.0883)	
F-statistics (all the coefficieints = 0)	373.11	***

Notes
1. The number of observations is 15,325.
2. *, **, *** indicates 10%, 5%, and 1% significance levels respectively.