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Studies on the Effect of Public Pensions on the Labor Supply

By

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Abstract

This chapter conducts a brief survey of the studies of the effect of public pension on the labor supply of older people. Many empirical analysis on the effect of public pension on the labor supply were done between the mid 1970's to mid 1980's in the US. and the U. K., in which the retirement inducement effect of public pension was commonly confirmed by different types of models and by different data sets. Since the end of the 1970's, when the problems raised by the aging population started to attract social concern, same kind of empirical analysis were begun in Japan. These empirical analysis by the mid 1980's in Japan confirmed that there was a significantly negative relation between the public pension benefit and the labor supply of the older people in Japan, which were the same results as American and British researchers had found in the U. S. and the U. K. The empirical results from these analysis however, included both the simultaneity bias and the sample selectivity bias. In the late 1980's, the analysis which were exempt from the two types of bias was made and confirmed the negative effect of the public pension on the labor supply behavior of older people in Japan without introducing the problems of bias.

Key Words

labor supply, market wage, micro data, older people, probit function, public pension, retirement inducement effect, simultaneity bias, sample selectivity bias

Introduction

In the past decades, public pension systems in the major advanced countries have developed substantially. With the development of the pension system itself, the effect of pensions on various economic agents, including pension beneficiaries themselves has attracted the attention of public policy makers. One of the most important effects is that of public pension benefits on the labor supply behavior of pension-eligible older people.

The studies on the effects of public pensions on the labor supply of older people began in the 1950's in the United States and blossomed throughout the 1970's and 1980's. This chapter conducts a brief survey of these studies in the U.S., United Kingdom and Japan.

In one of the pioneering studies, Long (1958) used time-series data from the U.S., and concluded that there was no proof that public pensions (social security in the U.S.)

affected the labor supply. On the other hand, Pechman, Aaron and Taussing (1968) using international cross-section data showed that the degree of development of the social security system had a negative effect on the labor supply of older people. However, neither time-series data nor international cross-sectional data were adequate to control for the effect of other factors, and thus the pure effect of public pensions on labor supply was not able to be identified.

More detailed cross-sectional data and a sophisticated framework of economic analysis were necessary for rigorous discussion, and in fact the analysis moved in that direction. Pioneering studies which influenced the advancement of the analysis of the effect of social security in the U.S. on the labor supply were done in the late 1960's and the early 1970's. There were studies done on the effect of a "negative income tax" on the labor supply. The major early contributions were collected by Cain and Watts (1973), followed by Ashenfelter and Heckman (1974) and Masters and Garfinkel (1977).

These studies on the negative income tax have a couple of common features. First, they used conventional neo-classical theory and estimated the linear reduced form labor supply functions. The prototype for this analytical framework was established by Mincer (1962), and was followed by various empirical studies using aggregate cross-sectional data in the 1960's, of which Bowen and Finegan (1969) became the final benchmark.

Secondly, the studies on the negative income tax estimated labor supply functions using such household-based or individual-based microeconomic data as the SEO (Survey on Economic Opportunities). The creation of theoretically ideal micro data and their use started with the negative income tax studies.

The accumulation of empirical studies on labor supply using both aggregate data on the one hand and introducing micro data on the other, enabled the studies on the negative income tax to be conducted at a more rigorous level than previous studies.

Studies on the Effect of Social Security on the Labor Supply in the U.S.

Important technical methods of empirical analysis of the effect of social programs on the labor supply increased and were widely shared by labor economists. Taking advantage of this circumstance, many studies on the effect of social security as a form of social program on the labor supply were done between the mid-1970's to mid-1980's in the U.S.

One of the earliest works was Boskin (1977), which estimated the retirement probability function of older people by using the PSID (Panel Study of Income Dynamics). The estimated results showed that the amount of social security benefit certainly increased the probability of retirement among older people.

Quinn (1977) estimated the labor supply function of older people by using the RHS (Retirement History Survey). His estimation includes the pension eligibility variable as an independent variable instead of the pension benefit itself in order to avoid simultaneity bias. Because the pension benefit from social security is accompanied by an earnings test which reduces the benefit level according to the level of earnings of the pensioner, the pension benefit is not able to be treated as an independent variable. On the other hand, the variable that identifies the eligibility of each person to collect social security pension benefits is, however, completely independent from the labor supply decision of that person. Therefore the pension eligibility variable is better as an

independent variable exempt from simultaneity bias. The most important contribution of Quinn (1977) was that he confirmed that pension eligibility itself reduced the probability of labor force participation among older people.

On the opposite side of the Atlantic, Zabalza, Pissarides and Barton (1980) analyzed the effect of the British public pension system on the labor supply. They estimated labor supply functions using micro data compiled by the Office of Population Censuses and Surveys. They found that pension benefits and an earnings test had the same negative effect on labor supply probability as their American colleague had found in the U.S.

One of the most comprehensive studies of the relation between pensions and the labor supply of older people was done by Fields and Mitchell (1984). They estimated four different types of mathematical models which analyzed the effect of both private and public pensions on the labor supply, using the LRHS (Longitudinal Retirement History Survey) of the U.S. Social Security Administration and the BAS (Benefit Amounts Survey) of the U.S. Department of Labor. They found that such monetary variables as social security or company pensions had far larger impact on the retirement decisions of older people than such nonmonetary variables as health conditions. And the retirement inducement effect of pensions was widely confirmed by different types of models and by different data sets.

Ward (1984) used the same LRHS and calculated differences in lifetime social security pension wealth according to the timing of retirement. He found that pension wealth fell if the pension-eligible person retired after age 62, when he/she became able to receive a reduced early benefit, and drastically decreased if the person retired after age 65 when he/she became eligible to collect a full pension. The major factor that reduced pension wealth when retirement was delayed was the earnings test which reduced the benefit if the pension-eligible worker continued to work.

In addition to social security, i.e. public pensions, the importance of company pensions has been growing in recent decades. Lazear (1982) did the most fundamental theoretical work on the relation between company pensions and retirement, and showed that company pensions could be an important instrument for human resource management for encouraging older workers to retire early. Kotlikoff and Wise (1985) used a detailed calculation of how the net wealth of the company pensions varied according to the length of each tenure, and showed that the company pension schemes played an important role in determining the timing of retirement from the firm.

Studies on the Effect of the Public Pension System on the Labor Supply in Japan

Since the end of the 1970's, when the problems raised by the aging population started to attract social concern in Japan, Shimada (1979) and Arizawa (1979) pointed out the necessity for empirical studies of the effects of the public pension system on the labor supply of older people. Seike (1980) estimated the labor supply function of male family heads using the NIES (National Income and Expenditure Survey) and found that the amount of public pension reduced the labor supply of male family heads aged 60 years old and over.

The NIES at that time, however, had limited information on individual characteristics for explanatory variables, and the estimated sample comprised only the working population for which working hours, and not work choice, was included. In this sense,

Seike (1980) should be regarded as a preliminary analysis on the issue.

More substantial analysis on the effect of pension on the labor supply of older people in Japan had to wait until the Ministry of Labor compiled the first ESSE (Employment Status Survey on the Elderly) in 1980. Motokawa and Mori (1981) estimated a logit function with discrete participation choice as the dependent variable. The estimated results of their logit function showed that the amount of pension benefit (both public and private pensions) reduced the labor force participation probability. This was the first rigid confirmation of the effect of pension benefits on individual participation decisions using micro data in Japan.

Using the same ESSE data set as Motokawa and Mori (1981), Shimono and Tachibanaki (1984) estimated a logit function with the amount of public pension benefit and the amount of private pension benefit. They confirmed that the amount of the public pension benefit had a significantly negative effect on the labor supply probability of older people in Japan.

The same data set was used by Mikami (1983) for her cross-tabulation analysis on the labor supply of older women. She found that the sub-sample with higher pension benefits had a significantly lower rate of labor force participation than the one with lower pension benefits, although the average pension benefit for female workers was still low compared to their male counterparts in 1980.

Seike (1986) estimated a probit function of the labor supply of older people by using different cross-sectional data, and compared the effect of the public pension system on the labor supply among different years. He used the NLS (National Living Survey) by the Ministry of Welfare for the years of 1978, 1981 and 1984, and found that the magnitude of the effect of the public pension system on labor supply increased from 1978 to 1981 and stabilized between 1981 and 1984. The study suggested that the effect of the public pension system stabilized after a rapid increase in both the number of public pension beneficiaries and the average benefit level.

These empirical analyses in the mid-1980's confirmed that there was a significantly negative relation between public pension benefits and the labor supply of older people in Japan. These were the same results as American and British researchers had found in the U.S. and the U.K. The analyses however, included two types of bias, simultaneity bias and sample selectivity bias.

As noted earlier in the discussion of Quinn (1977), simultaneity bias is produced because public pensions have an earnings test. The amount of public pension benefit is reduced if the pension-eligible person is still working and generating earnings. If the pension-eligible worker has earnings that exceed the upper limit of the earnings test scheme, he/she forgoes the entire benefit.

And even if earnings are below the upper limit, the basic pension benefit is reduced depending on the level of earnings. That means the amount of labor supply and the amount of pension benefit are by definition mutually dependent. A pension-eligible person does not work because he/she can receive a higher pension benefit, and at the same time, he/she can receive a higher pension benefit because he/she does not work. The pension benefit can be both a cause and a result of the labor supply of a pension-eligible person.

Thus there is a relation of simultaneous determination between the amount of public pension benefit and the labor supply of the pension-eligible worker. The amount of the public pension benefit can therefore not be an independent variable for the labor

supply function. The estimated parameter of the public pension benefit in the labor supply function shows that both the amount of public pension benefit reduces the labor supply and the amount of labor supply reduces the public pension benefit.

This is the simultaneity bias of the estimated parameter that is caused by using the amount of public pension benefit as an explanatory variable. The analyses reviewed above were not exempt from that bias.

The other bias is the sample selectivity bias of the wage variable which is included in the labor supply function. The market wage offered to each individual is one of the most essential explanatory variables for choosing labor force participation. Each individual may determine whether he/she would work or not depending upon the level of market wage offered as well as upon other variables.

However, the market wage offered to an individual who chooses not to work can not be observed. Therefore the market wage for the non-working sample should be imputed using such individual human capital characteristics as sex, age, and educational attainment. The market wage function that imputes the wage for the non-working sample can be estimated only by using the actual market wage of the working sample. The labor force participation decision is made by comparison of the reservation wage of an individual and the market wage offered to him/her. If the latter is larger than the former, he/she would participate in the labor force. Therefore the market wage is estimated by the working sample, whose market wages are larger than their reservation wages by definition. The above mentioned research in Japan is not exempt from this bias.

Estimation of Labor Force Participation and Market Wage Functions

In order to overcome the above two biases, we needed to use more sophisticated data and estimation methods. For the simultaneity bias, the Employment Status Survey of the Elderly in 1983 gave us a solution. This survey included a question that asked whether the individual was eligible for collecting a public pension benefit. Because this questionnaire was asking about pure eligibility regardless of the actual collection of the pension benefit, those who were not collecting the benefit because of their earnings level were identified as part of the pension-eligible sample as well as those who were actually collecting the benefit. Therefore, the pension eligibility dummy variable created from this question could be independent from the labor supply behavior of the individual.

For the sample selectivity bias, the estimation technique that was developed by Heckman (1979) was a solution. By including the inverse of Mill's ratio generated from the probit labor force participation function in the market wage function, the parameters of an independent variable which explains the market wage can be exempt from the bias.

Seike (1989) estimated the labor supply and the market wage functions for males aged 60 to 69 in 1983 without simultaneity bias and sample selectivity bias by using the above technique. Table 1 shows the result of the labor supply function in the form of a probit participation function.

The specification of the probit function and the expected sign of the parameter of each variable (in parentheses) are:

$$\text{prob(work/not-work)} = f\ (\underset{(-)}{\text{AGE}},\ \underset{(-)}{\text{HEALTH}},\ \underset{(+)}{\text{HIGHSCHL}},\ \underset{(+)}{\text{COLLEGE}},\ \underset{(-)}{\text{PENELG}},\ \underset{(-)}{\text{NONPEN}},\ \underset{(-)}{\text{MANDRET}},\ \underset{(+)}{\text{TOKYOMET}})$$

As shown in Table 1, all coefficients are statistically significant and all parameter signs are consistent with those predicted.

PENELG, which represents the eligibility for a public pension, is negative and highly statistically significant. Since PENELG is completely independent of the labor supply decision, the result confirms the negative effect of a public pension on the participation decision without introducing the problem of simultaneity bias. The magnitude of the parameter ∂prob/∂var of PENELG implies that eligibility for a public pension reduces the participation probability by 15 percent.

Table 1 also shows the impact of other variables on labor supply. The negative coefficients of the age variable (AGE), and the health limitations variable (HEALTH), which are the two most significant, and the mandatory retirement variable (MANDRET) can be attributed to the increasing preference for leisure time and the reduction in market wage. Coefficients of the education variables (HIGHSCHL, COLLEGE) and the variable for residence in the Tokyo metropolitan area (TOKYOMET) show a positive effect on the labor supply because they increase the

Table 1. Empirical Results of the Participation Function
(Probit Estimation)

Coefficients of the Participation Function		
Variable	Coefficient	∂Prob/∂Var
ONE	4.14156 (11.348)	
AGE	−0.047458 (−8.378)	−0.017092
HEALTH	−0.919626 (26.861)	−0.331203
HIGHSCHL	0.10164 (2.745)	0.036605
COLLEGE	0.242146 (2.616)	0.087208
PENELG	−0.424072 (−11.429)	−0.152729
NONPEN	−0.000619 (−4.386)	−0.000223
MANDRET	−0.49258 (−13.103)	−0.177402
TOKYOMET	0.156467 (3.688)	0.056351
Sample size	7,014	
Log likelihood	−3,859.3	

Note: Asymptotic t-values are in parentheses.
Source: Seike (1989)

market wage of older people.

Table 2 shows the results of the market wage function using lambda which corrects for sample selectivity bias. The specification of the wage function and the expected sign of the parameter of each variable (in parentheses) are:

$$\ln(Wm) = f\ (\underset{(-)}{AGE},\ \underset{(-)}{HEALTH},\ \underset{(+)}{HIGHSCHL},\ \underset{(+)}{COLLEGE},\ \underset{(-)}{MANDRET},\ \underset{(+)}{TOKYOMET},\ \underset{(+)}{LAMBDA})$$

All coefficients are statistically significant, and all signs are theoretically consistent.

Table 2. Empirical Results of the Market Wage Function

Variable	Coefficients of the Market Wage Function
ONE	1.26281
	(4.321)
AGE	−0.0280409
	(−5.803)
HEALTH	−0.281854
	(−4.935)
HIGHSCHL	0.390829
	(15.438)
COLLEGE	0.699679
	(12.333)
MANDRET	−0.361453
	(−8.298)
TOKYOMET	0.21099
	(7.338)
LAMBDA	0.543983
	(5.143)
Sample size	4559
Adjusted R-squared	0.12737
F-statistic(df=7,4551)	96.03786

Note: T-values are in parentheses.
Source: Seike (1989)

The most significant coefficients are the dummy variables related to education. Having either a high school or a college education increases the market wage of an individual even when he is in his 60's. The health-limitations dummy variable and the age variable are negative as expected. Mandatory retirement from the previous job substantially reduces the market wage. The dummy variable for residence in the Tokyo metropolitan area, reflecting the demand side of the labor market, is significantly positive. The statistical significance of lambda indicates the importance of correcting for selectivity in estimating a wage equation for the working sample.

Appendix

The data used in this analysis and shown in Tables 1 and 2 were extracted from the *Employment Status Survey of the Elderly*, which was conducted by the Japanese Ministry of Labour in 1983. The sample population surveyed was chosen as representative of persons 55 to 69 years old by a two-phase sampling method.

Variables and Definitions

WORK: 1 if employed; 0 otherwise
WORKHOUR = [(daily hours worked) × (days worked per week) × 52]/12
WAGE = (monthly earnings)/WORKHOUR
AGE: Each individual's actual age
HEALTH: 1 if health problems exist; 0 otherwise
MANDRET: 1 if had experienced mandatory retirement; 0 otherwise
PENELG: 1 if eligible to collect a public pension; 0 otherwise. This includes all those who satisfy the months-of-contribution and age requirements.
NONPEN: Non-wage income excluding public pension benefits
HIGHSCHL: 1 if completed high school; 0 otherwise
COLLEGE: 1 if received college degree; 0 otherwise
TOKYOMET: 1 if living in the Tokyo metropolitan area; 0 otherwise
LAMBDA: Correction for sample selectivity bias

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