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Social Security Wealth and Early Retirement in Public Pension Scheme

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ABSTRACT

The main objective of this study is to investigate the decision of workers to opt for early retirement. The study focuses on the public sector pension scheme. The simulation technique is used to calculate the social security benefit at two different ages; compulsory retirement age and early retirement age. Data gained from the simulation process represent two main social security variables, namely the social security wealth and social security accrual. Then, both variables will be estimated together with other explanatory variables such as marital status, sex, education level, experience and age using logistic method to examine its relationship with early retirement decision. The results show that the substitution effect of public sector pension scheme is more dominant than income effect. The findings of this study concludes; public sector pension scheme fails to encourage public workers to settle for early retirement and thus it is not capable of becoming a policy instrument to downsize the public sector work force and unable to create job vacancies.

Keywords: J26 - Retirement; Retirement Policies, H55 - Social Security and Public Pensions

INTRODUCTION

This study looks at the early retirement phenomenon in Malaysia, focusing on the role of social security such as the pension scheme as a factor that encourages early retirement. The study on the impact of social security on retirement has been conducted in many developed nations like United States of America (Ippolito 1990;

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Gruber & Wise 1998; Coile & Gruber 2000; Coile 2003), France (Burricand & Sedillot 2001), Denmark (Anne Møller et al. 2001) and Switzerland (Gaillard et al. 2001). All these studies suggest that social security may function as a policy tool in encouraging early retirement.

According to Kasente (1998), social security incorporates all regulations aimed to secure physical safety and give comprehensive protection to minimize risks that will effect individuals or group of individuals without relying on external aid. The individuals or group of individuals protected includes, among others, the poor, handicapped, women and pensioner. The main purpose is to create protection against any unexpected external circumstances such as old age, risky political changes, economic shocks, health complication and death.

Clearly, the main intention of introducing social security is to ensure a continuous flow of income for the needy and pensioner. Social security is also seen as a mechanism to reduce unemployment and to acheive labour market equilibrium. Sala-i-Martin (1996) proposes that employment should be redistributed from the older generation to the younger generation. Greater employment opportunity for the younger generation will increase the nation productivity. Hence, the package or social security received can be regraded as the price paid to employees who are ready for retirement. An effective social security system can be a fruitful partnerhip of manpower. A research conducted by Shesinki (1977), Boskin and Hurd (1977) and Bhattacharya *et al.* (2001) proves that there is a positive relationship between social security and retirement. Teoritically early retirement is a choice made at a person's own will after fullfiling the minimum requirement to enable the employee to receive his social security benefit, while the normal retirement is the retirement at the mandatory age (Gruber & Wise 1998; Burricand & Sedillot 2001). The normal retirement age is the mandatory age where he is 'forced' to retire whether he likes it or not. In France (Burricand & Sedillot 2001) and United States (Ippolito 1990; Gunderson & Riddle 1993) the mandatory retirement age is 65 years old.

The focus of this study is directed towards the public service pension scheme where public officers are given the options for voluntary early retirement. The pension scheme is chosen because the public sector is the largest employer in Malaysia. Moreover, the availibility of complete data enables the study of this phenomenon. The testing is further facilitated by the amendment of the Malaysia Pension Scheme in 1991 which allows a public officer to volunteer early retirement on condition that he or she is at the age of forty and has been in service not less than 10 years. From another perspective, this amendment can be seen as an instrument to reduce the size of public sector in particular. For the purpose of this study, the early retirement data will be screened to exclude samples who retired due to reasons such as unproductive, health, privatisation and mergers.

Within the framework of this study, the term early retirement includes public officers who are eligible to opt for retirement at the age of forty and has served not less than ten years. All retirees who fullfilled the stipulated condition will be receiving gratuity upon retirement. This retirement benefit becomes an important factor and may serve as an alternative substitute of income during the period before receiving their full pension. Although both retirement schemes widen employment opportunities, it is uncertain in the case of early retirement. It all depends on individual decisions and the key question on the determinants of early retirement. From previous studies, social security is capable of becoming the key determinant of early retirement. The plan of this papers is as follows, Section 2 presents the social security framework. Section 3 then presents the methodology and data. Section 4 will discuss the results and Section 5 then conclude the discussion.

SOCIAL SECURITY FRAMEWORK

In this research, the social security variable chosen is based on the Option Value Model by Stock and Wise (1990). The general idea of Option Value Model suggested by Stock and Wise (1990) is the relative utility received by individual at two different periods; first at the early retirement age and the other during compulsory age. In making decision about retirement, they state that the proxy for retirement utility level is the amount of money received in the period mentioned above.

It is assumed that in period *t* (the age before compulsory retirement) individuals decide to retire or to postpone retirement until the compulsory age. If an individual chooses to retire in period *t*, he will obtain his retirement benefit from year *t* until his death. The utility function $V_t(t)$ under the condition proposed by Stock and Wise can be written as Equation (1):

$$V_t(t) = \sum_{s=t}^{T} \beta^{s-t} U_r\left(Bs(t)\right) \tag{1}$$

In Equation (1), β is the weightage for current income relative to future income and the weightage for the decision to retire ($B_s(t)$) is the retirement benefits received if he retires in period *t*. Specifically, $U_r(B_s(t))$ is the ulitity received from the retirement benefits. It is obvious from Equation (1), if individual retires in period *t,* he will derive his utility solely from total retirement benefit obtains from period *t* until his death (*T*).

On the contrary, if an individual chooses to continue working until the end of period *s* (at compulsory age), their utility function can be divided into two main

components namely, their salary and retirement benefit. During the employment until period *s*, the individual will receive a full salary, *Y*, and after retirement at the end of period *s*, he will enjoy the retirement benefit, $B_s(r)$. The utility from salary and retirement benefit are $U_w(Y_s)$ and $U_r(B_s(r))$ respectively. Under this condition, the retirement value function can be written as:

$$V_t(r) = \sum_{s=t}^{r=1} \beta^{s-t} U_w(Y_s) + \sum_{s=r}^{T} \beta^{s-t} U_r\left(B_s(r)\right) \quad (2)$$

Equation (2) explains that deferment to retire until compulsory retirement age allows individual to enjoy total income for the whole period *s*, (Y_s), and total retirement benefit, $B_s(r)$ upon retiring. The first term in Equation (2) is the total income from period *t* to period *s* as a result of postponing retirement until period *t*. The second term of the equation explains the full retirement benefit received from the period the individual begins to retire till his lifetime. *T* is the individual total lifespan.

In period *t*, an individual will make an assumption that ($E_t(.)$) is his retirement utility based on all information available at that point of time. An individual will expect his benefits or gains from delaying retirement as shown in Equation (3):

$$G_t(r) = E_tV_t(r) - E_tV_t(t) \quad (3)$$

$E_tV_t(r)$ is the individual expected value of utility from working and unpredictable utility on the retirement value finction if he chooses to retire at compulsory retirement age. On the other hand, $E_tV_t(t)$ is the individual expected value of utility with current retirement (period t). Expectation on the unpredictable utility if he retires at period *t*. If the expected utility obtains upon compulsory retirement is not profitable, individual will choose to retire early in period *t*. The result can be represented by $G_t(r) = E_tV_t(r) - E_tV_t(t) \leq 0$. If the expected value of retirement utility between both periods are positive, then the affected individual will not retire in period *t*. Hence, employee will continue serving if Equation (4) is fullfilled,

$$G_t(r^*) = E_tV_t(r^*) - E_tV_t(t) > 0 \quad (4)$$

The simulation process is performed to get the social security wealth pattern for each individual sample. The process is done by classifying samples into two cohorts; the early retiree and the compulsory retiree. This simulation process is crucial, specifically to compute the early retiree social security wealth variable (ERSSW) and accrued social security wealth (ASSW).

METHODOLOGY AND DATA

The Logistic Model Framework

The dependent variable is limited to two values which is 1 (opt for early retirement) and 0 (still employed), hence the most suitable method to empirically interpret the discreet model is through the logistic method (Cramer 1991; Cox & Snell 1989) which limits the measurement of probability of an event occurence by using ods log ratio. Cramer (1991) logistic technique actually measures the probability of obtaining value 1 as a successful outcome. It is known that the dependent variable (Y) takes the value of one or infinity. Thus, any prediction on the value of Y will lead to the probability of obtaining the value of Y equals to one, $P(Y_i = 1)$. The conditional probability that can be formed is as the equation below:

$$P_i = P(Y = 1 \mid X_i) = \alpha_0 + \sum_{i=k}^{n} \theta_k X_{ik} \tag{5}$$

Equation (5) explains that the estimation of the probability, $P_i = P(Y_i = 1)$, depends on the constant value (α), parameter (θ) and the value of the independent variable (X). These parameter, variables and constant can take any value, whilst the probability condition is $0 \leq P_i \leq 1$. Hence, linear regression is not suitable because the value of Y takes only two values infinity and one. One way to overcome the problem is to eradicate limits on the probability ($P_i = 1$) so as not to be restricted to one, which is by looking at the ratio, $P_i / (1 - P_i)$. Through transformation, if the probability (P_i) approaches one, then the ratio $P_i / (1 - P_i)$ approximates infinity. On the other hand, to exceed the lower limits of the probability so that it is not restricted to zero, this is done by taking the natural log, log $[P_i / (1 - P_i)]$. From the natural log P_i can take any values and thus, this study assumes the error in consistent to the logistic distribution function.

$$P_i = 1 \big/ 1 + e^{-z_j} = e^{z_i} \big/ 1 + e^{z_i} \tag{6}$$

With $Z_i = \alpha_0 + \sum_{i=k}^{n} \theta_k X_{ik}$

Equation (6) is the logistic distribution function which states that Z_i (represented by α, θ and X) can take any value between $-\infty$ to $+\infty$ and P_i takes value between zero and one. However, P_i in Equation (6) is non linear with variable X and the parameter. Hence, through the transformation log, the ods ratio obtained will derive from the logit equation which is the objective of this research. Equation (7) is the result of the transformation log performed on the ods ratio and this equation is known as Logit Model.

$$L_i = \ln(P_i/1 - P_i) = \alpha_0 + \sum_{i=k}^{n} \theta_k X_{ik} \quad (7)$$

The logit Model above is not only linear on variable X but is also linear on parameter (θ). However, the explanation on Equation (7) must be done carefully because the linear relationship shown by the equation is intrinsic. This is because the parameter in Equation (7) can only be achieved, first by transformation log. Because the Logit model has an intrinsic linear characteristic, hence to estimate θ, the *iterative* method will be employed until the value of θ which has the highest likelihood is achieved (maximum likehood method).

Retirement Logistic Model

The retirement logistic Model will be estimated to explain the behaviour of early retiree in Malaysia through Equation (8)

$$L_i = \ln[P_i/(1 - P_i)] = \alpha_0 + \theta_1 ERSSW + \theta_2 ASSW + \theta_3 SEX + \theta_4 MAR + \theta_5 EXP + \theta_6 AGE + \theta_7 EDU + u_i \quad (8)$$

with

L_i	=	value is 1 if retired early, zero if still employed
ERSSW	=	wealth of social security at early retirement
ASSW	=	accumulated social security wealth
SEX	=	1 if male, zero if female
MAR	=	1 if married, zero if single
EXP	=	number of years employed
AGE	=	age in current year
EDU	=	1 if has higher education (diploma and higher), zero if, has lower education (diploma and below).
α_0	=	constant
θ_1	=	coefficient for the explanatory variable – i, i = 1,…, k.
u_i	=	random error

The independent variable, wealth of social security at early retirement (ERSSW) is the amount of money (total pension) received by individual who opts for early retirement. Ippolito (1998) and Baxter (2001), highlighted that the amount of money received by individulas who chooses early retirement is reflected in the income effect of social security on the decision to retire early.

The coefficient of variable ASSW is the proxy to the social security substitution effect, and this reflects that individual chooses compulsory retirement and delays

their early retirement. There are two impacts of this decision; which is the increase in income flows and at the same time this decreases the number of years he can enjoy the retirement benefits. Alternatively, this means that the increase in income can only be enjoyed if individual continues to work. As a result, the increase in income causes the rise in the price of leisure. When this happens, according to the law of demand, there is a decrease in the demand for leisure. Hence, the variable coefficient ASSW (increase income) can be the proxy to the social security substitution effect and when ERSSW increases, employees will opt for early retirement.

Data

Data used in this study is derived from samples in the Pension Division, Public Service Department (PSD), Malaysia in 2007. From the PSD information system, 2,548 samples were chosen at random and out of that number, 1,548 individuals are still in service and 1,000 are pensioner since 2002. To calculate the income effect (proxied as ERSSW) and substitution effect (proxied as ASSW), the samples are placed in two different scenarios; those who retired early and those who retired at the compulsory age, which is 56 years old. This categorization is important to enable the calculation of the total gratuity and pension receivable in both circumstances.

RESULTS AND DISCUSSION

This section discusses on the results of the Logit Model estimation in explaining the behaviour of people who retired early represented by the variable specified in Equation (8). To make the analysis easier, the results of the estimation on logistic regression is tabulated in Table 1. The initial signal in explaining the behaviour of retirement choices in Malaysia is the sign of the coefficient (positive or negative). The signs indicate the direction of the relationship between all variables in the logistic equation estimated, while the coefficient value known as the partial slope, measures the changes in early retirement logit for every unit change in the explanatory variables.

The ods ratio for early retirement that explains the relationship between the two variables are also clarified. Ods ratio measures the changes in ods value during an event (early retirement) when i^{th} variable changes. If the ods ratio is equal to one, the ods (propensity) of early retirement will not change but if it is more than one, then the early retirement ods will increase and if it is less than one, it means the ods for early retirement declines.

Two major variables focused in this study are the social security wealth variable (ERSSW) and social security accrual wealth (ASSW). These two variables are

important to determine the behaviour of early retirement and social security as shown in Table 1. Indirectly, both variables are proxies to the income effect and the social security substitution effect. When the individual decides to retire early, the income effect is positive whilst the substitution effect is negative. Social security accruals or ASSW represents price of leisure because to get the accumulated amount, individual has to release their retirement leisure. The net effect or final effect of the relationship between early retirement and social security can be determined by observing which has the strongest effect, either the income effect or the substitution effect.

Table 1 Results of the logistic regression estimates

Variables	Hypothesis	Estimated relationship	Variables coefficient	Standard error	ods ratio
ERSSW	H1	+	0.270	0.025*	1.310
ASSW	H2	-	-0.462	0.058*	0.630
EXP	H3	-	0.143	0.019*	1.154
SEX	H4	-	0.637	0.115*	1.890
AGE	H5	+	0.349	0.029*	1.417
EDU	H6	-	-1.023	0.204*	0.360
MAR	H7	+	0.675	0.162*	1.964
Constant			-20.317	1.298*	
Chi Square				45.23*	
Percentage correct with constant only				50.0	
Percentage correct with all variables				73.2	
McFadden R^2				0.372	
Sample size				2548	

Notes: * significant at 0.01 level
Source : Logit model regression results
EDU : Education level
MAR : Marital status
EXP : Experience in public sector
SEX : Gender
AGE : Individual age in sample
ERSSW : Social security wealth received upon early retirement
ASSW : Social security wealth accrual

Table 1 explains the results of the estimations. It was found that the variables ERSSW and ASSW fits into the predicted relationship with early retirement. Both variables ERSSW and ASSW each showing positive and negative signs with early retirement option, which means any increased in ERSSW will increase the early

retirement logit, while the increase in ASSW or the opportunity cost of leisure will reduce the early retirement logit. This evidence supports hypothesis H1 and H2 which states that the substitution effect and the income effect each relates positively and negatively.

The estimation results find that the increase in ERSSW will increase the early retirement ods ratio but with small factor of 1.31. On the other hand if the ASSW increases by a unit the early retirement propensity will decline with the factor of 1.58[1]. From the findings, this study observed that the substitution effect is greater than the income effect of the social security. The absolute value for ERSSW and ASSW respectively is 0.27 and 0.462. This indicates that the opportunity cost or the price of early retirement for pensionable employees in the public sector is huge. Empirically, the results prove that the existing social security in Malaysia, in particular the pension scheme, does not encourage early retirement. Workers especially the public sector employees will continue employment until they attain the age of compulsory retirement. The provision under *SPP 1991 Bil. 1* which guarantees substitution income after retirement is not successful in attracting workers to opt for early retirement.

From the results, it can be concluded that Malaysian social security system, in particular the public sector pension scheme, has failed to serve as an incentive to encourage early retirement. Although substituition income is given, it is not strong enough to motivate public employees to retire early. Hence, the public sector social security is not a good choice to be considered in the effort to achieve equilibrium in the labour market and to downsize the public sector. The relationship between social security and early retirement as depicted in this study in relation to pension scheme, is found to diverge from the studies done by Baxter (2001), Gruber and Wise (1998), Stock and Wise (1990) and Ippolito (1990) in United States. They found that social security and early retirement to be positively related. The divergence between Malaysian and US results derives from the fact that social security data used in the US has a wider coverage including unemployment insurance and social welfare, whereas in the case of Malaysia, only pension benefits as part of social security is being considered.

As shown in Table 1, other variables that has influenced on the behaviour to retire early for example experience (EXP), gender (SEX), age (AGE), education level (EDU) and marital status (MAR). Variables EXP and AGE show positive direction towards the propensity of early retirement. The increase in age and experience will cause the propensity of early retirement to rise. For every increase in experience it will lead to an increase in early retirement ods ratio factor of 1.154

[1] If the coefficient is negative then to measure the changes will be 1/ ods ratio

and the increase in age causes the early retirement ods ratio to increase 1.417. In other words, the increase in age and experience increase the early retirement propensity though the rate is small.

Hence, the estimated logistic regression results for hypothesis H3 (variable EXP) is reversed of the predicted relationship. This expected relationship is based on the empirical study by Blau (1994) who found that as experience increases, the rate of labour participation also increases. The results of this study indicates that the level of experience is positively related to early retirement though negatively related to manpower. Hence, hypothesis H5 (hypothesis for variable age) successfully supports the relationship predicted to be positively related to early retirement. This study confirms the previous empirical study on variable age such as the one done by Coile dan Gruber (2000), Gaillard *et al.* (2000) and Gustman and Steinmeir (1986).

For variables SEX, EDU and MAR, they are represented by dummy variables. The variable SEX is given the value one for male respondents and from the results we can conclude that males will opt for early retirement shown by positive sign on the coeffecient variable for males. Results tabulated in Table 1 clarifies that early retirement among males increase almost double (1.89) compared to females. The findings of this study at this point differs from Coile (2003), Anne Møller *et al*. (1998), Olsson (2000), Boskin and Hurds (1978), Honig (1998) and Gaillard *et al.* (2001). Hence, hypothesis H4 which predicts that females will retire earlier than man, is not supported in this study.

The relationship of variable SEX can be associated with the rationale that male workers find it easier to reenter the labour market as compared to female workers. In other words, if the male worker retires early, relatively, he would find it much easier to find new employment as depicted by consistent male labor force participation at the rate of 80 percent from the year 1980 to 2000. If he finds that the social security benefit is insufficient to sustain living expenses after early retirement, he would find it much easier to participate in the labour market as compared to his female counterpart. Unlike the females, the males have the choice to engage in self employment or enter the private sector employment market. Due to this situation, the males propensity to retire early in public sector is higher than females as proven by the empirical result of this study.

The results tabulated in Table 1 also explain the relationship between the variable education (EDU) and the decision to retire early. It can be concluded that the higher the level of individuals education, the more unlikely the individuals will retire early and hence the lower the propensity to early retirement. The highly educated public sector employees is not inclined to retire early almost three times greater (1/0.36 = 2.777) than those who has lower level of education. This result supports hypothesis H6 which states that the relationship between early retirement

and the level of education is negative. This result is more compatible with the findings of studies done by Blau (1994) and Ippolito (1998) rather than study done by Baxter (2001).

Another interesting finding is the variable on marital status (MAR) which shows positive sign with early retirement. Married individuals are more inclined to retire early almost twice greater than single employees as shown in the ods ratio in Table 1 at 1.964. Hence, this study supports hypothesis H7 which states that married individuals are prone to retire early. The research done by Pozzebon and Mitchell (1989), McCarty (1990), Anne Møller *et al.* (1998) and Olsson (2000) conclude that early retirement will increase simultaneously with marriage which is empirically congruent with the findings of this study. The results from a study by Honig (1998) and Boskin and Hurd (1978) was rejected. This relationship is further explained using the utility concept by Stock and Wise (1998). Married individuals need to allocate time with their family because time spent with family also gives utility to individuals and thus, the decision to opt for early retirement between the married and single would very different. Married workers can maximize their utility by spending time with their family.

Although in general it can be concluded that the benefits of social security does not encourage early retirement, but if each variables is observed individually, it is possible to identify which group is more responsive towards early retirement. The results tabulated in Table 1 proves that the group of workers with lower level of education, married employees, employees with longer period of service, and older employees are more responsive towards the decision to opt for early retirement. Any policy changes to make social security as an incentive to opt for early retirement must be focused towards the groups identified as having the highest probability to retire. Concentrating on these focal groups is crucial to ensure efforts are directed towards achieiving employment equilibrium via social security which should function effectively and efficiently.

All the coefficients in the logistic regression model of this research is significant at 0.01 or at a confidence level of 99 percent, in predicting the relationship between the tested variables and the decision to retire early. The value of McFadden R^2 is 37.2 percent which can be described as a good estimate for the binary model such as this study. This fact is further strengthened by the correct percentage estimation which was successfully increased from a constant 50 percent to 73.2 percent when all related variable are included. On the other hand, the best fit regression with all variables also recorded a higher value which is χ^2 of 45.225 compared to the schedule value of $(\chi^2_{(0.05,7)})$ of 14.07 All these values proves that the retirement logistic regression model gives a good estimation of the relationship of all variables and early retirement.

CONCLUSION

The empirical results found that the income effect of pension scheme benefits is positive on early retirement. On the other hand, substitution effect on early retirement is negative. Because the substitution effect is greater than the income effect, then the final impact of the benefit of the public sector pension scheme on early retirement is negative. This final effect gives an indication that the existing pension scheme is insufficient to motivate public officers to retire early. Strictly speaking, although the benefits of the pension scheme ensures a steady income after retirement, the lost of income due to early retirement is greater and that leads to the decision not to opt for early retirement. The findings has either directly or indirectly lead this study to conclude that the retirement option has failed to motivate public officers to retire early. Generally, two main reasons which form the basis of social security implementation are substitute incomes at retirement. Alternative income or preparing for old age income is considered as the basic principle of providing social security in a modern economy. Similarly, this is the same as owning wealth or children which is perceived as one of the elements of social security for parents during old age which comes in forms such as financial relief, effort and time (Lillard & Willis 1997). Thus, one of the methods in implementing social security is by allocating part of the current income during employment or at younger age for future consumption at old age (Pogue & Sgontz 1977; Becker & Murphy 1985).

To conclude this study, it is evident that the vital issue is related to the age level of the public officers as a condition to qualify for the retirement benefits. Studies shows that the probability to retire early is higher at the first qualifying age to receive retirement benefits (45 for females and 50 for males) as compared to the probability at early retirement age which is 40 years old. This is because early retirement at the qualifying age to receive pension can have an increasing income effect. Recent developments show a change in the public service schemes especially in terms of mandatory retirement age and basic salary of the employees. Mandatory retirement age of public sector has increased to 60 years and a shift of 7% to 13% of basic salary. If the mandatory retirement age change is not accompanied by changes in the early retirement scheme, substitution effects gap would be expected getting larger and employment sharing will be more difficult to be implemented. Thus, further study should be made to refine the changes as utilities vary over time and highly related to income.

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