SOCIAL SECURITY AND LABOR SUPPLY IN ETHIOPIA

A THESIS PRESENTED TO THE SCHOOL OF GRADUATE STUDIES
ADDIS ABABA UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN HUMAN RESOURCE ECONOMICS

BY

MELAKU DON

MAY, 1998

ADDIS ABABA UNIVERSITY
School of Graduate Studies

Social Security and Labour Supply in Ethiopia

By
Melaku Don Midakso
Faculty of Business and Economics

Approval by Board of Examiners:

Prof. Teshome Mulat
Advisor

Signature

Dr. Gerard Kambou
Examiner

Signature

Dr. Abdulhamid Bedri K.
Examiner

Signature

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ACKNOWLEDGEMENTS

Many individuals have provided valuable contributions and comments. Particular thanks are due to my advisor Professor Teshome Mulat, Dr Alemayehu Seyoum, Dr. Andre Croppenstedt, Teshome Megersa, Adugna Fikre and Tewolde Mekonnen.

ABSTRACT

This paper attempts to see the effect of social security on labor supply using traditional labor force participation model. Application of a logit regression to the survey data yields results that go counter to theory . The availability of pension income does not reduce labor force participation rates. It is also found that as age increases, participation in the labor force is significantly reduced for women than men and also for blue collar jobs than white collar ones. This result has a policy implication that there is a need for Retirement Age Discrimination Act by Sex and by Type of Job. Logit models were estimated for different age groups and it is found that there is no problem that arises due to aging or health, which are the main determinants in setting a retirement age, until age 60 to participate in the labor force. It is also found that the probability to participate in the labor force reduces by 0.09 if one goes from age group of 56-60 to the age group of 61-65.

Chapter One

Introduction

1.1 The Social Security - its Meaning

It is estimated that more than half of the world's old people rely exclusively on informal and traditional arrangements for income security (Palacious 1994). They receive food, shelter and care from close relatives or extended family, and this family-provided assistance continues to play an important role in all societies. The proportion of old people is on the increase due to the increase in life expectancy and decline in birth rates. But economic development weakens these informal arrangements. Families become smaller and more dispersed. In Urban areas people are likely to withdraw from productive work, to live alone and to depend on non-family sources of income in their old age.

It is difficult to give a direct definition or meaning of Social Security. The expression has acquired a wider interpretation in some countries than in others, but basically it can be taken to mean "the protection which society provides for its members, through a series of public measures, against the economic and social distress that otherwise would be caused by the stoppage or substantial reduction of earnings resulting from sickness, maternity, employment injury, unemployment, invalidity, old age and death; the provision of medical care; and the provision of subsidies for families with children." (ILO, 1989).

The term "Social Security" was first officially used in the title of the United States Legislation - the Social Security Act of 1935 - even though this Act initiated programs to meet the risks of old age, death, disability and unemployment only. It appeared again in an Act passed in NewZealand in 1938 which brought together a number of existing and new Social Security benefits. It was used in 1941 in the wartime document known as the Atlantic Charter. The ILO was quick to adopt the term, impressed by its value as a simple and arresting expression of one of the deepest and most widespread aspirations of people all around the world.

The Social Security programs are based on a country's social policy and the development of the economy. In the ILO Social Security (minimum Standards) convention or other international organizations the well-known programs are nine. This nine programs are not established at once, rather depending on the country's economic capacity and the citizens' contingency it will be established step by step. The programs are:

1. Medical Care Benefits

Convention No 102 establishes that medical care benefit is provided to maintain, restore or improve the health of the persons protected and their ability to work and to attend to their personal needs. The minimum content of the benefit covers general practitioner care, including home visits; specialist care in hospitals and similar institutions for in-patients and out-patients; essential pharmaceutical supplies, pre-natal, confinement and post-natal care by medical practitioners or qualified midwives; and hospitalization where necessary.

2. Sickness Benefit

Sickness benefit is payable when an insured person has to stop work because of some medical condition. Such a stoppage usually entails the reduction or suspension of earnings, and the cash benefit is designed to replace, in whole or in part, the earnings so lost. The awarding or adjusting authority must, of course, be satisfied as to the claimant's medical condition.

3. Maternity Benefit

It is a measure of the international concern for the working mother prompted by the growth in the number of women entering industrial and factory life. The purpose is to ensure that a woman worker should be able to sustain and care for herself and her baby over the period immediately before and after her confinement.

4. Work Injury Benefit

It is referred to incapacity which could be temporary or permanent, total or partial and to prescribed diseases. It includes the consequences of accidents at work and of occupational diseases; and usually differentiates between the immediate incapacity for work, the residual disablement which may be the longer-term result and, of course, the needs of survivors in fatal cases.

5. Old-Age Benefit

The most useful old-age benefit, in social security term, is a life pension. Such a pension is always granted under universal benefit schemes. A social assistance benefit, once granted, also continues for life unless the recipient acquires further resources and ceases to be in need. Established social insurance schemes are designed to pay life pensions, but members who reach the specified age without a sufficient record of employment or contributions may receive lump-sum grants.

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6. Survivors' Benefit

In the context of social security "survivors" refers to widows, children and parents of a victim. The survivors' benefit branch of social security was originally designed to meet a pattern of family life in which the married woman stayed at home, undertook the household tasks and cared for the children, while the husband and father was the provider, the breadwinner. The widow and the orphaned family were vulnerable and deprived of support when the husband died. Gradually and increasingly the roles are changing.

7. Invalidity Benefit

In one sense, invalidity benefit may be regarded as an early retirement pension, granted in prescribed circumstances. In most countries the registration is framed accordingly. Only a few countries have kept their legislation for invalidity benefit and for old-age benefit separate.

8. Unemployment Benefit.

Unemployment, as one of the contingencies normally dealt with by Social Security, refers to the situation of workers who have become unemployed as a result of circumstances beyond their control and who have consequently lost their earnings. Only involuntary unemployment is covered by social security. However, the expression "involuntary unemployment" is not a simple concept.

9. Family Benefit

Family allowances, as a component of a social security program, rest upon a foundation distinct from that of other cash benefits. Other benefit schemes stand ready to provide a guaranteed income against the day when regular wages are interrupted or are relinquished in old age. Family allowances, by contrast, recognize that the rates of regular wages in payment do not, as a rule, take into account the size of the family to be supported by the wage.

With their historic origins in Bismarkian Germany societies and governments have developed mechanisms, with varying degrees of success and resources, to provide income security for their older members as part of a social safety net for reducing poverty and to protect citizens from certain social risks such as income loss due to disability, aging, illness or unemployment. These arrangements had a beneficial effect on improving labor safety and maintaining household income levels. They also contributed to increase life expectancy and possibly reduced mortality rates. But these securities are *"a concern for all of us - rich as well as poor, young as well as old -because the arrangements adopted can either help or hinder economic growth"* (World Bank 1994).

1.2 Statement of the problem

The role of social security in the economy has been a subject of much interest partly because the aggregate amounts of money associated with the plan are very large and also because consideration of the effect of inflation on the adequacy of pension payments is another important factor. In recent years, following retirement programs of the Ethiopian government under SAP it has got a wider attention. These plans are also likely to affect the basic macro economic variables such as saving, consumption, supply of labor, investment, and there by economic growth.

The pension plan may affect labor supply. changes in the age structure of the population affect the number of people eligible for pension and hence the benefit payments associated with them. But population change may affect also the size and age composition of labor force. Then too, there may be consequences for the supply of labor, by virtue of effects on the work incentives of pension recipients. The receipt of a pension may reduce the incentive for older people to continue working and the prospect of receiving one may induce those who are not yet of eligible age to make some substitutions of leisure for income earning activities (i.e. reduce participation rate). On the other hand, pension contributions may be viewed as taxes which effectively reduce the current wages of workers and depending on one's assumption of labor force behavior, they may increase participation rate, as workers seek to offset the reduction in incomes by working longer hours or more weeks in the year.

There may also be another channel of cause and effect or relation between the pension plan and the demographic variables. Changes in disposable incomes and work incentives may affect the demand for children and hence levels of fertility. And, high (large) benefit payments to the elderly may have a positive effect on their levels of health care and a negative effect on their mortality rates. Demographic variables, which may be affected by the pension plan, may thus affect both the economic burden of a national pension plan and the ability of the economy to sustain the burden.

The contribution process associated with the pension plan may have implications for national patterns of saving and consumption. To the extent that the propensity to save is lower for pension recipients than for the non-recipients, the process will tend to reduce aggregate savings and investments. This reduction, in turn, will lower the rate of economic expansion.

Pension plans thus may affect work incentives, savings and investment, fertility and mortality rates. Indeed, at the level of an individual household the decisions which underlie all the effects are best thought of as being made simultaneously. But this study emphasizes the impact of Social Security benefit on labor supply.

1.3 Objective and Significance of the Study

The primary task of this paper is to offer an analysis of the SSA (Social Security Authority) institution, with testable implications, and then to discuss policy proposals that are consistent with and implied by this analysis.

In doing so we will try to answer (test) the following :

- Is the availability of retirement income sources such as pension (Social Security benefit) itself a powerful inducement to retirement i.e. labor force withdrawal.
- In most economies, the principal source of family income and market consumption activities is the labor earnings of family members. The question arises whether and how the family can "afford" to have the bread winner at age 55 out of the labor force. Is consumption correspondingly reduced? Are the earnings of other family members increased through their reduced leisure and home activities? or do social Security programs largely compensate for the reduced earnings?
- Do we need a legislation which outlaws the use of mandatory retirement at age 55, which is currently a common practice. We try to look at whether or not legislation outlawing mandatory retirement would benefit society i.e. the merits & demerits of mandatory retirement.

- Do we need an Age Discrimination Act i.e. does a uniform age retirement policy avoid the disadvantages of discrimination between employees. Or do we need different retirement age for different jobs since for labor intensive jobs age 55 might be late while for highly skilled labor it might be a premature (early) retirement.
- We will also try to see the behavior of pensioners. Is there a change from wage and salary to self employment or is a change from working to non-working status (leisure).

Chapter Two

Background of the Social Security Authority in Ethiopia

The History of the Social Security Authority can be divided into two parts. The first being the period preceding the issuance of "Public Service Pension Proclamation No 209/1963" and is referred to as a pre-pension era. The second, the post-pension era, refers to the period after that proclamation.

2.1 A pre-pension Era

In Ethiopia the elderly make up, in an increasing proportion, a considerable part of the population and have long been cared for by extended family arrangements, mutual aid societies, and other informal mechanisms. The responsibility to support the old and the disabled partly fell on the government due to the existence of war veterans and civil servants. This situation instigates the introduction of a pension plan. The first rudimentary pension system in Ethiopia can be traced back to the era of Menilik II who used to grant land to war veterans of the battle of Adwa (1896) and their survivors. But this system lacked a statutory basis to ensure its enforcement and its benefits were not uniform due to subjective judgment of the size and quality of the land to be given. Another drawback of the system is that this benefit is not considered a legal right for the beneficiaries which, in turn, opens a room for favoritism, nepotism and corruption and there is no specific age to qualify for the benefit i.e. the land recipients could be of working age.

This system of granting land to war veterans and to the aged Civil Servants was continued by Emperor Haileselasie I. This led to a legal order issued in May 1934 titled *"Old Age or Incapable Officers And Soldiers* 'Maderia' *Administration N0 3"* according to which they were to receive, at the age of 70, one third of their 'Maderia' land as an old age pension (Faculty of Law, 1972). Another system which was used is "keep and care" for the aged in specific locations.

Taking care of the old and the disabled by bringing them together to catering centers or granting land, due to the growth of the country's economy and the establishment of a relatively strong central government plus the expansion of the bank service and the use of money as a medium of exchange, was eventually replaced by cash grant which was to be made annually or once in four months. Money granting system of the Social Security was first proclaimed in the *"Maderia Administration N03, 1934"*, according to which the male children of the deceased pensioner who is of age 15 years or below were entitled to child benefit which amounts to between 8 and 20 Birr per Year (Mahtemeselasie, 1970).

2.2 A Post pension Era

Due to the emergence of the working class and modern governmental structure a team was organized in 1958 to study the Social Security under the *"Pension Ministry"*. While this ministry was studying how to implement a Social Security program, there was a coup d'état in 1960 and also an Ethio-Somalia war. Later, Decree N0 46/1961 amended as *"Public Service Pension Proclamation N0 209/1963"* (Faculty of Law 1970) was issued. This Decree was covering only the military and civil public workers and of autonomous institutions and agencies with Ethiopian nationality by birth or acquisition. For these groups the pension scheme was funded by a mandatory contribution. A life time payment pension strategy was preferred to a lump-sum pay (sometimes called provident fund) by - since the latter arrangement may be rendered unworkable by individuals' inclinations to dissave. The coverage was greatly expanded due to the nationalization of privately owned enterprises by the Derg Regime proclamation N0 49/1975: *"Employees of Government-Owned Undertakings Pension Proclamation".*

The three groups of employees - civil, military and the newly added employees of government owned undertakings, precipitated the establishment of 3 Fund categories - public service civilian pension fund, public service military pensions fund, and pension fund for employees of undertakings, respectively.

The Social Security Authority (SSA), which is the responsible agency to handle the case, administers four pension schemes namely: old age pension, invalidity pension, sickness benefit/pension and work injury benefit out of the nine schemes which, according to the International Labor Organization (ILO), are declared as the minimum standards which have to be fulfilled. In fact these benefits or minimum standards are positively related with economic growth. And any country depending on its economic growth is expected to exercise all the benefit step by step depending on the contingency of the people. Besides to maintain international standard and to benefit from international experience the Ethiopian SSA became an affiliate member of the International Social Security Association (ISSA) in 1985.

The main features of the pension scheme design for civilian and undertakings are as follows[1]. Normal retirement age is 55 years for both males

1. All the analysis is based on the Statistical report of the SSA.

and females and the scheme is applicable on any type of work. Minimum years of service to qualify for pension entitlement is 10 years. The pension payroll tax to the total labor cost (wage plus employer share of pension payroll tax) amounts to about 9.4 percent. Payroll tax for pension is paid on gross salary, the workers' contribution to payroll tax is 4 percent of gross salary while the employer's contribution is 6 percent of the gross salary. A retiree with 30 years of service qualifies for 50% of gross salary calculated as average of 36 months pay. For every additional year of service above 30 years the pension benefit is increased by 1 percent up to a maximum of 40 years of service and 60 percent of gross salary.

2.3 Statistical Descriptive of The SSA

In Ethiopia it is estimated that population over 60 years of age was 4.5 percent of the total in 1990 and is expected, using a time series analysis of the World Bank, to fall to 3.9 in 2020 and to rise afterwards to 4.2, 6.8 and 15.1 percent in 2030, 2050 and 2075, respectively. The dependency ratio (population over 60/population 20-59) was 11.5 percent in 1990 and expected to increase in the future.

Public pension spending is 1.1 percent of GDP while receipts as a percentage of GDP is 1.5 percent, which gives the ratio of net saving to benefit spending as 36.0 percent. These pension spending indicators show that there is a surplus of pension funds. This and a relatively small old population in the short run leaves the Social Security System to accumulate saving and there by increase national saving and stimulate investment and growth. Currently only 4.2 percent of the receipt is coming from financial investment. This is because it is only "undertaking fund" (the others being civil and military funds) that is invested and earning dividends.

Since only government employees are covered by the pension scheme, or large portion of the eligible age population is excluded.

The average of the last 36 months salary is used in the calculation of the pension benefits, which remain unaffected if there were no salary changes in that period. The authority is trying to increase benefit payments and has increased the minimum pension payments from time to time - this is part of the responses to the 1952 ILO Social Security Convention N0 102, to which Ethiopia is a signatory, and it states that pension shall be reviewed following substantial changes in the general level of earnings.

At present the total number of pension beneficiaries is 439,363 and increasing. The distribution of beneficiaries among the different types of Funds, different types of beneficiaries and different regions in the country is discussed below.

A . <u>By Type Of Fund</u>

As explained earlier there are three types of pension funds in Ethiopia: civilian Fund, military Fund and undertaking Fund beneficiaries account. From the total number of pension beneficiaries the civilian are 24.2 percent while the military and undertaking beneficiaries account for 61.6 and 14.2 percent respectively. The high proportion of military beneficiaries is the impact of the war that has been ravaging the country.

B . <u>By Type of Beneficiaries</u>

There are two types of beneficiaries : Pensioners and Survivors. Pensioners account for 49.7 percent while the survivors are 50.3 percent of the total beneficiaries. Out of this total of Pensioners 65.5 percent are military while 21.2 and 13.3 percent are civilian and undertaking Pensioners respectively. Also out of the total survivors 57.8,27.1,and 15.1 percent are military, civilian and undertaking Survivors respectively .There are three types of survivors: children, wives/husbands and parents. The proportion of survivors in each type is 37.7,42.6 and 19.7 percent for children, wives/husbands and parents respectively.

C . <u>By Region</u>

Due to the new regional structure it is difficult to tell the exact number of beneficiaries in each region. It is estimated that more than 70 percent of the beneficiaries live in three regions: Addis Ababa, Oromia and Amhara regions. Some 6 percent of the beneficiaries are located in Eritrea.

Chapter Three

Literature Survey

3.1 Theoretical Framework

3.1.1 Retirement Decision and Pensions

The retirement decision is essentially a decision by older persons not to participate in the labor force. Hence it is amenable to analysis utilizing labor force participation theory, and its underlying income-leisure choice model. The retirement decision is treated separately simply because it is an area of increasing policy concern and, as the references indicate, it has developed its own empirical literature.

The notion of retirement has many meanings, ranging from outright leaving of the labor force, to a reduction of hours worked, to simply moving into a less onerous job. The process itself may also be gradual, beginning with a reduction in time worked (perhaps associated with a job) and ending in full retirement. But in this paper we will generally talk of retirement as leaving the labor force.

The policy importance of the retirement decision stems from the fact that it can have an impact on so many elements of social policy and is further heightened by the fact that it is an area where policy changes can affect the retirement decision. This is especially the case with respect to such "policy parameters" that are subject to policy change as the mandatory retirement age and the nature and availability of pension funds. However, to know the expected impact of changes in these factors, we must know the theoretical determinants of the retirement decision, and the empirical evidence on the retirement response.

3.1.2 Theoretical Determinants of Retirement

A. Mandatory Retirement age

As indicated by Kittner (1977), the term mandatory retirement provisions refers to both compulsory retirement provisions and automatic retirement provisions. Under automatic retirement, people have to retire at a specific age and cannot be retained by the company. Under compulsory retirement provisions, however, the company can compel the worker to retire at a specific age, but it can also retain the services of a worker, usually on a year-to-year basis.

The mandatory retirement age - of which age 55 is applicable in Ethiopia- is really a result of the retirement policy of the government. Many countries have different opinions towards retirement age. This is illustrated by the fact that Europe and the United States appear to be moving in the opposite direction with respect to changes in the mandatory retirement age. Presumably to help alleviate problems of youth unemployment, in Europe the tendency is to encourage a lowering of the retirement age. In the U.S. , on the other hand, the trend seems to be in the opposite direction. Recent legislation has removed any mandatory retirement age in the federal public service and has forbidden a mandatory retirement age of 70 in most other sectors. The fact that the mandatory retirement age is not immutable suggests that it can change in response to other basic forces that affect the retirement decision and that account for the existence of mandatory retirement itself.

B. Wealth and Earnings

Economic theory, in particular the income-leisure choice theory, indicates that the demand for leisure -as indicated, for example, by the decision to retire early- is positively related to one's wealth, and is related to expected earnings in an indeterminate fashion. The wealth effect is positive, reflecting a pure income effect: with more wealth we buy more of all normal goods, including leisure in the form of retirement . The impact of expected earnings is indeterminate, reflecting the opposite influences of income and substitution effects. An increase in expected earnings increases the income forgone if one retires and therefore raises the (opportunity) cost of retirement: this has a pure substitution effect reducing the demand for retirement leisure. On the other hand, an increase in expected earnings also means an increase in expected wealth and, just like wealth from non-labor sources, this would increase the demand for retirement leisure. Since the income and substitution effects work in opposite directions, then the impact on retirement of an increase in expected earnings is ultimately an empirical proposition. Thus the increase in our earnings that has gone on overtime, and that presumably will continue, should have an indeterminate effect on the retirement decision.

C. Social insurance Pension

By altering our wealth and net earnings position, social insurance schemes can also affect the retirement decision. Social insurance refers to public pension schemes that are financed by compulsory employer and employee payroll contributions, and to pay earnings-related pensions to those who qualify by virtue of their age and work experience. As the term "insurance" implies, receipts depend on contributions, and the fund is usually designed to be self-financing without support from general tax revenues.

Features of Social Insurance

Social insurance pensions have received particular attention in recent years because many of this features can induce early retirement. Social insurance usually involves payment of an earnings-related pension retirement; however if the recipient continues to work and earn incomes, the pension gets reduced or is not given at all. This pension reduction often termed as the retirement test or work -income test- is really an implicit tax on earnings. It is implicit in that it involves forgoing pension payments as one earns additional income. In addition, there is usually an explicit payroll tax on earnings used to finance the social insurance fund.

As kirkpatrik (1974) indicates, the retirement test tends to be prevalent in the vast majority of countries with social insurance. Developing economies usually require complete withdrawal from the labor force in order to receive the pension (i.e. 100 percent tax on earnings) mainly because such countries cannot afford to pay pensions to people who also work. In contrast, some countries with the longest history of social insurance schemes have no retirement test, allowing the person to retain full earnings and pension. The motivation for this may be different: in France it appears to be because pension benefits are low and earnings are needed to supplement income; in Germany it appears to be because of a desire to encourage the work ethic. In Ethiopia if pensioners work in a pension covered sector then they forgo their pension 100%.

In the Canada pension plan the retirement test was eliminated in 1975. In the U.S., recipients who work are allowed to keep their full pension as long as their earnings do not exceed a specific amount; thereafter, pension benefits are reduced by $0.50 for every $1.00 earned (50 percent implicit tax) up to a specified amount, and after this pensions are reduced by $1.00 for every $1.00 earned (100 percent implicit tax).

Effect on Retirement

These features of the social insurance schemes can have a substantial impact on the retirement decision. The pension itself, like all fixed benefit payments, has a pure income effect inducing retirement. In addition, for those who work, the implicit tax of the pension reduction associated with the retirement test, and the explicit payroll tax used to finance the scheme, both lower the returns to work and hence make retirement more financially attractive. That is both taxes involve a substitution effect towards retirement because the opportunity cost of leisure in the form of retirement is lowered by the amount of tax on forgone earnings. To be sure, the tax on earnings also involves an income effect working in the opposite direction; that is, our reduced after-tax income means we can buy less of everything including leisure in the form of retirement. However, this income effect is outweighed by the income effect of the pension itself, since for all potential recipients their income is at least as high when social insurance is available. Thus both the substitution effect and the (net) income effect of the features of social insurance serve to unambiguously induce retirement.

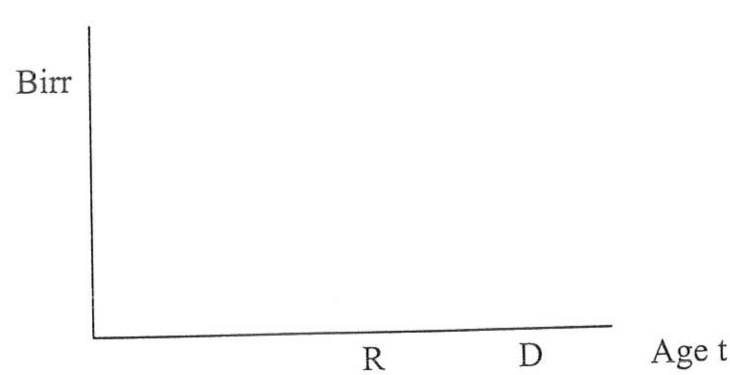
D. Health and Other Determinants of Retirement

In addition to the mandatory retirement age, wealth and earnings, and the existence of social insurance the retirement decision can be affected by other factors. The changing nature of work towards more white-collar jobs and away from physical tasks may make it feasible for many to work longer. The decline of the extended family may make retirement less attractive. On the other hand, individuals may be induced into early retirement to the extent that their jobs disappear due to economic change and dislocation.

Of prime importance in the retirement decision, however, is the potential impact of health. People approaching the usual retirement age obviously can be subject to health problems that could encourage them to retire. This may be the case, particularly if their accumulated wealth or pension income enables them to retire at a reasonable income. The various determinants of the retirement decision are obviously interrelated.

3.1.3. The Theory of Social Security and Life Cycle Savings

The different effects of social security on life cycle accumulation are easily understood with the help of the next diagram which draws heavily from Kotilkoff (1979)



In the diagram a representative life-cycler with a fixed life span (for simplicity) D faces, in the absence of social security, an earnings stream such as W(t) and chooses a consumption stream such as C(t) and an age of retirement such as R. The choice of consumption at every age t as well as the age of retirement arises from the maximization of an intertemporal utility function of consumption and leisure subject to the following budget constraint (assuming no bequests):

(The detailed mathematical computations are attached in appendix 2)

$$\int C(t)\ e^{-rt}\, dt = \int W(t)\, e^{-rt}\, dt \qquad (1)$$

where r = the rate of interest

At the micro level the introduction of social security reduces the earnings profile by the amount of the social security tax $\theta[W(t)]$ prior to retirement and provides a social security benefit stream B(t) there after. The term $\theta[W(t)]$ refers to only the tax on employees. The new budget constraint facing the individual is

$$\int C(t)\ e^{-rt}\, dt = \int W(t)\,(1 - \theta)\, e^{-rt}\, dt + \int B(t)\, e^{-rt}\, dt \qquad (2)$$

If retirement does not change ($R=R^1$) and the social security system offers an implicit yield on paid contributions or taxes equal to the market rate of interest r, then lifetime wealth is not affected by the social security system and the consumption profile is unaltered. Under these assumptions accumulated social beginning of one's productive life. For example, if the increase in consumption financed by the LWI_o was a constant C at every age, then:

$$\int \Delta C\, e^{-rt}\, dt = LWI_o \tag{5}$$

Solving (5) for ΔC yields

$$\Delta C = \left[\frac{r}{1-e^{-rD}}\right] LWI_o \tag{6}$$

In terms of the diagram, equation (6) implies, the consumption profile would shift upward by an amount $\left[\frac{r}{1-e^{-rD}}\right] LWI_o$ at every age. By age x the fraction of LWI_o consumed equals:

$$\int \frac{r}{1-e^{-rD}}\, e^{rt}\, dt = \frac{1-e^{-rx}}{1-e^{-rD}} \tag{7}$$

i.e. when X = D then he consumes all LWI_o .

The effect of this additional consumption on wealth holdings at age X is found by accumulating forward up to age X the reduction in savings due to the LWI_o and may be expressed as

$$\int \Delta s\, e^{rt}\, dt = -\frac{(1-e^{-rx})}{(1-e^{-rD})} \cdot LWI_x \tag{8}$$

Economic theory suggests then that the variable LWI_x in an accumulation should yield a coefficient ranging between 0 and -1 depending on the age of the respondent. For example, in the case of constant increment consumption at every age x, the term $(1-e^{-rx})/(1- e^{-rD})$ takes the value 0.68 for an age of death of 55, x equal to 25, and an interest rate of 0.03. Since age zero in the life cycle model corresponds not to birth but rather to the beginning of one's productive life, say age 20, 0.68 is the fraction of LWI_x of 45-year old would have consumed who is expected to live until age 70. The intra-generational resource transfers are captured by the LWI_x variable. The intertemporal transfer, holding LWI_x constant, is neatly summarized by the amount of accumulated social security contribution. The intertemporal transfer refers to the payment of pension contribution when young and the transfer back of these contributions when old in the form of benefits with an implied return equal to the market rate of interest.

3.2 Empirical Evidence

Teshome (1995) using a theoretical approach has described how non-wage incomes such as pensions adversely affect participation in work (or employment). These non-wage incomes are inversely related to the rate of participation. The implication is that if social security benefits are higher participation rates in the labor force or labor supply are reduced.

Papers by Boskin (1977), Quinn (1977) and Burkhauser (1978) argue that Social Security that make benefits conditional on market work decisions affect the labor supply of older people. Pension rules tie acceptance of a pension to leaving the job and may in some cases restrict work in other jobs. Social Security restricts market work through its test on earnings. They (these papers) indicate that these constraints on market work reduce the labor supply of older people.

Smith (1975) suggests that programs like social security which place earnings test on wages during one period of life change a worker's lifetime relative-wage pattern, inducing substitution of market work from the constrained years of life. Induced intertemporal substitution raises hours of work of prime age males, but social security may also have a wealth effect that reduces labor supply. Feldstein (1974) argues that social security inter-generational transfers are not entirely offset by private inter-generational transfers. If this is the case, increase in the wealth of recipients reduces their labor supply during all ages of life. However, if there is no net change in total transfers, as Barro (1979) argues, then no wealth-induced labor supply changes occur.

Mitchel (1982) tries to find the reasons for voluntary job changes aligning desired and actual labor supply. He looked at the effect of fringe benefits in that fringe benefit improvements are often favored during periods of wage-price guidelines, and it is of interest to determine the probable impact on labor mobility. This in the private pension area will influence the speed with which workers gain pension rights, and this, too, may affect mobility. Victor (1982) is a longitudinal analysis of the labor market behavior of older, urban white males. And it focuses on changes from wage-and-salary to self-employment and changes from working to non working status. In each two-year transition approximately 4 percent of wage-and-salary workers switched to self-employment. Controlling for a large number of economic and demographic variables, the self employed were significantly more likely to continue to work, partly by reducing their workweek to under 35 hours. Other significant predictors of continuing to work are good health, years of schooling, white collar occupation, no expectation of a private pension, and a work week longer than 50 hours. Age is also important, especially at the eligibility ages set by Social Security.

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A paper by Lazear (1979) offers an explanation of the use of mandatory retirement clauses in labor contracts i.e. it provides an explanation of the institution of mandatory retirement that is derived from optimizing behavior on the part of both workers and firms. The theory states that it pays both parties to agree to long-term wage stream which pays workers less than their value of marginal products (VMP) when young and more than the VMPs when old. By using this payment schedule, the worker's lifetime VMP is higher than it would be in the absence of that scheme because this provides valuable incentives to the worker which would otherwise be lost to moral hazard. It argues that the date of mandatory retirement is chosen to correspond to the date of voluntary retirement, but the nature of the optimal wage profile results in a discrepancy between spot wage and spot value of the worker's marginal product. By doing so, the "agency" problem is solved, so the contract with mandatory retirement is pareto efficient. A theory of agency is presented and empirical evidence which supports the hypothesis is provided. The data used in this analysis came from the Longitudinal Retirement History Survey, 1969-71. This is a panel study of about 11,000 individuals who were 58-63 years old in 1969. The paper concludes that Individuals who have longer job tenure and more rapid unanticipated wage growth are the one's who are most likely to face mandatory retirement. This finding, although consistent with the theory of this paper, is hard to reconcile in terms of queue or discrimination theories of mandatory retirement.

Vincent and David (1981) have modeled the effect of social security, pensions, and other form of social insurance on individual retirement decisions. Three strong assumptions, perfect capital markets, actuarial fairness, and certain life times - together imply that social insurance has no effect on individuals' incentives to retire. But they argued that any departure from the above assumptions implies that there is such an effect, which is often systematic. In

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Anthony (1979) using a life cycle model looked at the effect of social security on one's income. He argues that any change in lifetime income can affect the amount of labor that a person supplies in the market, i.e. if social security raises lifetime income the life cycle model would imply some decrease in labor supply. This could occur as a reduction in hours worked per year in all years of a person's working life or a decrease in the number of years of work, that is early retirement. And constrained to work full time individuals may choose early retirement as the feasible response to social security's lifetime income effect. His empirical research is based on a sample of married men aged 60-70 years entitled to social security benefits. He estimated the probability of retirement using probit analysis based on a traditional labor force participation model to which SSW was added. The model included market wages imputed from a wage regression that included measures of past earnings. Other variables used in the model were capital income, schooling, binary variables for rural residence, race and age; wife's wage, schooling, and age. And he found out that an increase in SSW raised the probability of retirement. This implies that people collect SSW when it is likely to exceed the present value of payroll taxes they pay.

Feldstein (1985) on discussing the optimal level of social security benefits, showed that, it depends on balancing the protection that these benefits offer to those who lack the foresight to provide for their own old age against the welfare costs of distorting economic behavior. The primary such cost is the distortion in private saving. The paper derives the level of social security benefits that is optimal in three basic cases. In the first section the paper derives the optimal level of benefits for an economy in which all individuals do not anticipate retirement at all and therefore do no save. The second and third sections then derive optimal benefits for two different definitions of incomplete myopia. On the analysis he has shown that even if every individual is substantially myopic (and would therefore save less for his retirement than perfect foresight utility maximum would imply), it may be optimal to have either no social security retirement pay or a very low ratio of benefits to earnings. If some fraction of the population is completely myopic and would in the absence of social security pension do no retirement saving, it cannot be optimal to have no social security program (unless some other retirement income is provided for non-savers). Nevertheless, the optimal level of benefits may be quite low, unless a large fraction of the population is completely myopic.

Paper by Burkhauser and Turner (1978), using a life-cycle asset maximization approach to social security acceptance, shows that the earnings test is not a sufficient cause for such a distortion in the constrained period or over the life cycle. They use time series analysis to test the net empirical importance of the substitution and wealth effects associated with social security on the market work of younger men and find that hours worked per week would have fallen from 2 to

3 hours since 1936 without the present social security system. Such findings suggest that large savings effects associated with social security are over estimates.

Paper by Kotlikoff (1979) using data from American NLS tries to look at the choice of consumption at every age as well as the age of retirement that arises from the maximization of an intertemporal utility function of consumption and leisure subject to a given budget constraint. The decision to retire rests on a comparison of the shadow price of leisure at a given age with the wage. A number of factors enter the calculations of the shadow price of leisure including health, work attitudes, marital status and age. Certainly a key to the decision is the level of social security benefits available when working compared to the available benefits when retired. The decision to retire implies that the shadow price of leisure at forty hours of work exceeds the wage. This comparison gives rise to a probit regression from which E (U/sample selection), which is called a mills ratio is estimated up to a constant; that is, the coefficients obtained in the probit regression are used in forming the mills ratio. Based on the regression results he concluded that social security does not significantly influence the intended age retirement for his sample of 45 - 49 years olds.

Chapter Four

Model, Methodology and Data

4.1 Retirement Age

On deciding an optimal retirement age one has to look at the influence or on the perspective of the following four parts. First is the employee. By looking at his wage and his social security benefit (pension) he chooses a retirement age which maximizes his life time utility. Second is the employer. Retiring the worker is one of the employer's way to deal with the worker's declining marginal product due to age and it is also a way to create promotion possibilities for younger workers. The employer chooses an optimal retirement age which maximizes the benefit which it can get from the worker. Third is the SSA . This institution chooses a retirement age where by one's lifetime pension payment should not exceed his contribution throughout his working years. The fourth is the government. One way to deal with unemployment is to retire older workers so that there will be job opportunities .

The fourth aspect is beyond the scope and this paper. Our main concern is the first part i.e. determining the factors that affect the employee's decision of retirement and to look at how he choose the optimal retirement age using the Lagrangean method. Also we will discuss in brief the second and third aspects next.

4.1.1 From the employer point of view

In an interview conducted with the management of some enterprises we have noticed that mandatory retirement at age 55 made them lose their experienced workers who can still make give a good contribution to the organization. Many organizations overcome this problem by employing the retired worker on a contract basis (since according to the pension proclamation, contract workers are not covered by the scheme and do not pay pension contribution and as well the service years will not be counted for pension calculation thus will not lead to a forgoing of the pension - a 100% implicit tax on pension). We have also noticed that 95% of the organization interviewed will prefer between 57 & 62.

One drawback of this paper is that it has not a deeply analyzed the factors that will affect the employers' willingness to accept a if retirement age that is higher. Besides it is difficult to come up with a specific figure on which retirement age has to be. But one point which the employers agreed about is that for many groups of workers the existing retirement age is low and needs an adjustment.

Economists argue that from the employer point of view the existence of mandatory retirement age, whether low or high, is not an optimal solution to deal with the aged workers. Using the theory of agency, which provides insight on how to compensate an agent in a manner that creates a harmony of interest between the principal and the agent, they give responses to the explanation and defenses of mandatory retirement.

Most explanations of mandatory retirement rely on the notion that:

A. A worker's productivity declines significantly after some age, say 55, and that mandatory retirement is the employer's way to deal with this reduced productivity.

B. Mandatory retirement creates promotion possibilities for younger workers.

C. A uniform retirement policy avoids the disadvantage of discrimination between employees.

The replies given by the economists is that:

A. It is known that there is a significant diversity of talent in the labor force. No one claims that only the most talented individuals are the ones who can find jobs. Instead economists believe that differences in wage rates reflect differences in productivity. The same is true of older workers. If older workers are less productive than younger workers, employers in a competitive labor market would be forced to pay older workers a lower wage rate than they pay younger workers. There is no necessity to layoff the older workers simply because their productivity is not as high as the younger workers. In fact very young workers earn less than middle aged workers as a reflection of their lower productivity. Yet we do not find researchers arguing that the minimum age for employment should be 40 (or any higher age). The correct question then is, why does employment rather than wage adjust ?

Some have argued that morale would be adversely affected by lowering the wages of older workers. But it is not obvious that terminating workers rather than lowering their wages will improve the morale of the remaining work force. A 50- year old worker who is faced with approaching termination is not necessarily going to have a better attitude than one who knows his wage rate will be lowered 5 years from now. Another view often expressed is that one cannot judge the decrease in productivity so that it would be impossible to adjust wages accordingly. But laying off a worker adjusts its wage rate to zero. This is a poorer approximation of his true productivity decline than any smooth wage adjustment.

Further more, employers face a problem of gauging productivity for all workers. There is nothing unique about 55-year-olds in this regard. Thus, a productivity decline is not a sufficient explanation for the existence of mandatory retirement. One must ask why the productivity decline is dealt with by terminating the worker rather than by reducing the wages.

B. This second explanation ignores at least two factors.

I. Young workers know that they will become old workers at some date in the future. They care about the present value of some lifetime wage path rather than the present value of any segment of it. Although they would prefer to be promoted when young, they also would prefer, if their retirement is truly mandatory, to continue working when old.

II. Promotion may be interpreted as an increase in one's wage rate (and perhaps a change in the accompanying job title) that occurs as one's productivity rises over the life cycle . The firm will, in competition, pay the workers his marginal product, no matter how old he is. Thus, there would be no incentive of a firm to mandatorily retire a worker whose marginal product was equal to or greater than his wage rate to " promote'' a younger worker.

C. A uniform retirement policy arises two questions:

I. There is nothing which requires that a uniform retirement policy be one that has a provision for mandatory retirement. One could easily set up a flexible retirement scheme, where payment varies with length of service, that is invariant across individuals but does not require mandatory retirement at any given age.

II. Another problem is that employers discriminate between employees at every level: some are promoted, others are terminated, others experience wage gain while others do not, and the existence of differences between workers is dealt with in many ways. So why should employers or employees favour a system that reduces the ability of the employer to compensate workers differentially ?

4.1.2 From the SSA point of view

The SSA needs to make an actuarial evaluation. It is the calculation of the risks involved in the pension fund i.e. comparing the present value of the likely magnitudes of pension contributions to pension payments. It involves the analysis of life expectancy, replacement ratio and also the demographic and socio-economic conditions.

On a theoretical point of view it is difficult to predict the likely effects of increase or decrease in a retirement age. For example if we increase the retirement age from 55 to 60 we can notice two effects.

I. The workers contribute for an additional 5 years to the pension fund i.e. causes an increase in the pension fund.

II. If employees continue to work, they will not be entitled to pension benefit i.e. had they been retired the SSA could have paid then a pension. So the SSA will save a 5 year pension benefit payment.

But, to the contrary, we know that pension payments or calculations are a function of average past salaries and number of service years which are positively related to pension benefit i.e. the higher the service years of the average past salary the more will be the pension benefit. So an addition of 5 working years means the service years will be higher and also there might be a wage increase which in turn makes average salary higher. This results make the pension benefit larger. And if life expectancy is higher (i.e. if a pensioner is paid for longer period) the net loss will be higher than the net gain which would lead to the drawning of the pension fund.

Thus it is recommended that a careful actuarial evaluation or study must be undertaken to judge which decision about the retirement age (increase or decrease of retirement age) benefits the SSA or its fund.

4.1.3 From the employee's point of view

Here we consider a rational employee (consumer) who maximizes his lifetime utility which is a function of his income. For the analysis we use a life cycle model. A person decides to work based on opportunities available inside and outside the market. This involves comparing the value of a pension's time in market and non-market activity, that is, the values for his work and leisure. In the life cycle model these values are influenced by social security. In this section we deal with two topics: first using the Lagrangean approach we derive the conditions of when to retire; and second, using probit/logit analysis, based on a traditional labor force participation model to which social security benefit was added, we estimate the probability of retirement for different age groups.

4.1.3.1. Optimal Policy to Retire Human Capital

The goal of this section is to explain when a worker will decide to retire given the wage structure and the retirement benefits, and to study the effects of social security retirement benefits on retirement. The basic framework is introduced in Chow (1997) and the rest of the computations are mine. Lack of experience might have caused some computational errors and the method has to be carefully analysed before use. Labour services are usually called services from human capital (see Becker (1964) and Schultz (1961)). Using this terminology we can consider when a piece of human capital (a laborer) should be retired in the same way as considering when a piece of physical capital equipment should be retired. Here a worker has to decide when to retire. The decision variable is.

$u_t = 1$ if the worker decides to continue working.

$u_t = 0$ if the worker decides to retire and receive a pension.

The model used is due to Lumsdain, Stock, and Wise(1992). One important characteristics of the models discussed is the use of a discrete control variable[1]. The observed state variable[2] X_t is the benefit (wage or pension) in year t, and the unobserved state variable E_t is assumed to be i.i.d.. The worker's utility function is:

$$r(X_t, E_t, u_t) = \begin{cases} X^{\theta 1}{}_t + \mu_1 + E_t(1) & \text{if } u_t = 1 \\ (\mu_2\, \theta_2\, X_t)^{\theta 1} + E_t(0) & \text{if } u_t = 0 \end{cases} \quad \ldots (1)$$

Where μ_1, μ_2 represent time invariant worker specific heterogeneity.

Concerning the wage and pension benefits X_s in year s, a worker at age t who continues to work will receive a given wage Y_s in subsequent years s. If a

1. If a variable is subject to the control of the agent, it is called a control variable.

2. A variable is called a state variable when its dynamic evolution has to be specified in an optimization problem.

worker retires at age r, subsequent retirement benefits will be $B_s(r)$. At age t, a worker can calculate the present value of his or her future income stream if he or she retires at age r, using a discount factor β,

$$V_t(r) = \sum_{s=t}^{r-1} \beta^{s-t} U_W(Y_s) + \sum \beta^{s-t} U_R(B_s(r)) \quad ....(2)$$

Where T = compulsory retirement age

$$U_w(Y_s) = x^{\theta 1}{}_s + \mu_1 + E_s(1) \quad \text{(i.e. the top half of equation (1))}$$

$$U_R(B_s(r)) = (\mu_2 \theta_2 X_s)^{\theta 1} + E_s(0) \quad \text{(the bottom half of equation (1), when } u_s = 0\text{)}$$

The worker is assumed to decide which year to retire (setting $u_s = 0$) by maximizing the expectation of $V_t(r)$ subject to a constraint on X_{s+1} given as:

$$X_{s+1} = u_s Y_{s+1} + (1- u_s) B_{s+1}(r)$$

The problem

$$\textbf{Max. } E(V_t(r))$$

$$\textbf{s.t. } X_{s+1} = u_s Y_{s+1} + (1-u_s) B_{s+1}(r) \quad .... (3)$$

Rewriting (2) gives

$$V_t(r) = \sum_{s=t}^{T} \beta^{s-t} [u_s U_W(Y_s) + (1-u_s) U_R(B_s(r))] \quad ....(4)$$

$$E_t(V_t(r)) = \sum_{s=t}^{T} \beta^{s-t} E_t(u_s U_W(Y_s) + (1-u_s)U_R(B_s(r))) \quad ....(5)$$

$$\text{using } E_t \sum(.) = \sum E_t(.)$$

Writing the Lagrangean L:

$$L = \sum_{s=t}^{T} \beta^{s-t} E_t(u_s (x^{\theta 1}{}_s + \mu_1 + E_s(1)) + (1-u_s) ((\mu_2\, \theta_2\, X_s)^{\theta 1} + E_s(0)) -$$

$$- \lambda_{s+1}\, \beta(X_{s+1} - u_s Y_{s+1} - (1-u_s)B_{s+1}\,(r))) \quad ....(6)$$

The Lagrange multipliers, λ_{s+1}, are introduced only for those state variables that are constrained by the control variables.

$\beta^{(s-t)+1}$ is introduced so that λ_{s+1} can be interpreted as the marginal contribution of X_{s+1} to total multiplied utility evaluated at period s+1; λ_{s+1} has to be discounted by $\beta^{(s-t)+1}$ to obtain the marginal contribution of X_{s+1} valued at the time t.

To operationalize the problem further we need to determine the law of motion of X and Y. For simplicity let's assume that:

$$Y_{s+1} = Y_s + \gamma_{y,s+1}$$

Where $\gamma_{y,s+1}$ is determined by the ''promotion rule". However it may also be a random variable.

At the beginning of period s, the worker decides whether to continue working or retire. The implications of the choices are:

(a) current

$$X_s = Y_s \qquad \text{if } u_s = 1 \qquad ......(8)$$

$$X_s = B_s(r) \qquad \text{if } u_s = 0 \qquad ......(9)$$

i.e. if he continues working he gets a wage and if he retires he gets a pension.

(b) future

$$X_{s+1} = Y_{s+1} = Y_s + \gamma_{y,s+1} \qquad \text{if } u_s = 1 \qquad ....(10)$$

$$X_{s+1} = B_{s+1}(r) \qquad \text{if } u_s = 0 \qquad ....(11)$$

Note that $B_{s+1}(r)$ may be equal to $B_s(r)$ depending on the 'pension scheme'.

Thus:

$$X_{s+1} = u_s(Y_s + \gamma_{y,s+1}) + (1\text{-}u_s)\, B_{s+1}(r) \qquad ....(12)$$

But for $u_s = 1$, $Y_s = X_s$ such that

$$X_{s+1} = u_s(X_s + \gamma_{y,s+1}) + (1\text{-}u_s)\, B_{s+1}(r) \qquad ....(13)$$

Therefore:

$$L = \sum \beta^{s-t} E_t(u_s (x^{\theta 1}_s + \mu_1 + E_s(1)) + (1-u_s) ((\mu_2 \theta_2 X_s)^{\theta 1} + E_s(0)) -$$

$$- \lambda_{s+1} \beta(X_{s+1}-u_s(x_s+ \gamma_{y,s+1}) -(1-u_s)B_{s+1} (r))) \quad ....(14)$$

Then the first order condition are obtained as follows

$$Lx: \beta^{t-s} \frac{\partial L}{\partial X} = E_t (u_s \theta 1 x^{\theta 1-1}_s + \theta 1(1-u_s)(\mu_2 \theta_2)^{\theta 1} X_s^{\theta 1-1} -$$

$$- \lambda_s + \beta u_s \lambda_{s+1}) =0 \quad ....(15)$$

i.e. differentiating L w.r.t. X_s (Leibniz's rule) and noting that X_s appears with λ_s twice (with λ_s and λ_{s+1}).

a) Expectations are formed on the basis of available information, i.e.

$$E_t(Z_s) = E(Z_s/ \Omega_t) \quad ....(16)$$

Where Ω_t is the information set at time t.

(b) The law of iterated expectation implies

$$E_t(Z_s) = E(E_s(Z_s/\Omega_s)/ \Omega_t) \quad .... (17)$$

(c) At s all time - s variables are known (an assumption) such that:-

$$E(Z_s/ \Omega_s) = Z_s$$

Using (a) - (c) we can rewrite (15) as:

$$Lx: \quad u_s \theta 1\, X_s^{\theta 1-1} + \theta 1(1-u_s)(\mu_2\, \theta_2)^{\theta 1} X_s^{\theta 1-1} -$$

$$- \lambda_s + \beta u_s E_s(\lambda_{s+1}) = 0 \qquad ....(19)$$

Because one cannot differentiate L w.r.t. the discrete control variable u_t, we consider the difference

$$\Delta Lu = L(u_s = 1) - L\,(u_s = 0) \qquad ....(20)$$

Noting

$$L(u_s = 1) = \beta^{s-t} E_t((x_s^{\theta 1} + \mu_{1\,+}\, E_s(1)) - \lambda_{s+1}\, \beta(X_{s+1}-(X_s + \gamma_{\,y,s+1})) +$$

$$\sum_{\substack{j \neq s \\ j=t}}^{T} \beta^{j-t} E_t(u_j\,(x_j^{\theta 1} + \mu_{1\,+}\, E_j(1)) + (1-u_j)\,((\mu_2\, \theta_2\, X_j)^{\theta 1} + E_j(0)) -$$

$$- \lambda_{j+1}\, \beta(X_{j+1}-u_j(x_j + \gamma_{\,y,j+1}) - (1-u_j)B_{j+1}\,(r))) \quad ......(21)$$

$$L(u_s = 0) = \quad \beta_{s-t}\, E_t((\mu_2\, \theta_2\, X_s)^{\theta 1} + E_s(0)) - \lambda_{s+1}\, \beta(X_{s+1}-B_{s+1}\,(r)) \; +$$

$$\sum \; \beta^{j-t} E_t(u_j\,(x_j^{\theta 1} + \mu_{1\,+}\, E_j(1)) + (1-u_j)\,((\mu_2\, \theta_2\, X_j)^{\theta 1} + E_j(0)) -$$

$$- \lambda_{j+1}\, \beta(X_{j+1}-u_j(x_j + \gamma_{\,y,j+1}) - (1-u_j)B_{j+1}\,(r))) \qquad .....(22)$$

$$t \leq j \leq T$$

Thus

$$\Delta Lu \quad = L(u_s = 1) - L\,(u_s = 0)$$

$$= \beta^{s-t} E_t((X_s^{\theta 1} + \mu_{1\,+}\, E_s(1)) - \lambda_{s+1}\, \beta(X_{s+1}-(X_s + \gamma_{\,y,s+1})) -$$

$$(\mu_2\, \theta_2\, X_s)^{\theta 1} - E_s(0)) + \lambda_{s+1}\, \beta(X_{s+1}-B_{s+1}\,(r)) \; = 0 \qquad ....(23)$$

Using the law of iterated expectations and that $E_s(Z_s) = Z_s$, and multiplying through by $\beta^{-(s-t)}$ we get

$$\Delta Lu = (X_s^{\theta 1} + \mu_{1} + E_s(1)) - (\mu_2\, \theta_2\, X_s)^{\theta 1} - E_s(0) + \beta(X_s + \gamma_{y,s+1})) - B_{s+1}(r))\, E_s(\lambda_{s+1}) = 0 \qquad \text{......(24)}$$

Since $(X_s + \gamma_{y,s+1}) = Y_{s+1}$ and $B_{s+1}(r)$ are assumed known .

Thus the F.O.Cs are given by equations(19) and (24).

<u>Notes</u>

$(X_s^{\theta 1} + \mu_{1} + E_s(1)) + \beta\, Y_{s+1}\, E(\lambda_{s+1})$ = Expected discounted utility from continuing employment.

Note that: $E(\lambda_{s+1})$ converts Y_{s+1} in to utility units and λ is the marginal utility of income.

$(\mu_2\, \theta_2\, X_s)^{\theta 1} - E_s(0) + \beta B_{s+1}(r))\, E(\lambda_{s+1})$ = Expected discounted utility of retiring.

Then :

(a) The worker continues in employment so long as discounted expected utility from doing so exceeds that from retiring.

(b) At the early years of employment (i.e., the further s is from T) it pays to stay in employment. As s approaches T, the differential utility from working declines. One may postulate that there is a period s*<T at which the worker is indifferent between working and retiring because they provide equal utility, i.e. at s*

$$U^*_w = U^*_R$$

Assuming that U_w and U_R are monotonic, this implies that:

$$\text{if } s < s^* \quad , U^*_w > U^*_R \quad \Rightarrow u_s = 1$$

$$\text{if } s > s^* \quad , U^*_w < U^*_R \quad \Rightarrow u_s = 0$$

The question is that: what is the level of X_s^* at which $U_w{}^* = U_R{}^*$?

To find X* let $u_s = 0$, then from (19) we obtain:

$$\lambda(X^*) = \theta 1(\mu_2\, \theta_2)^{\theta 1} X^{*\,\theta 1-1}$$

$$= \left.\frac{\partial r(0)}{\partial X}\right|_{X=X^*}$$

At X_s=X*, (19) also holds for Us=1 (since the worker is indifferent different between working and retiring); such that:

$$\beta E_s(\lambda_{S+1}) = \lambda(X^*) - \theta_1 X_S{}^{*\,\theta 1-1}$$

$$= r_x{}^*(0) - r_x{}^*(1) \qquad (26)$$

Substituting (26) for βE_S (λ_{S+1}) in(24), we obtain:

$$r^*(1) - r^*(0) - [Y_{S+1} - B_{S+1}(r)]\,[r_X{}^*(0) - r_X{}^*(1)] = 0$$

$$\Rightarrow r^*(1) - r^*(0) + [X^* + \gamma_{Y,S+1} - B_{S+1}(r)]\,[r_X{}^*(1) - r_X{}^*(0)] = 0$$

$$\Rightarrow X^*\,[r_X{}^*(1) - r_X{}^*(0)] = r^*(1) - r^*(0) - [B_{S+1}(r) - \gamma_{Y,S+1}]\,[r_X{}^*(1) - r_X{}^*(0)]$$

$$\Rightarrow X^* = \frac{-[r^*(1) - r^*(0)]}{[r_X{}^*(1) - r_X{}^*(0)]} - [B_{S+1}(r) - \gamma_{Y,S+1}]$$

$$X^* = [B_{S+1}(r) - \gamma_{Y,S+1}]\ \frac{-[r^*(0) - r^*(1)]}{[r_X{}^*(0) - r_X{}^*(1)]} \qquad (27)$$

The optimal policy is to continue working until X reaches X* given by (27). The critical income X* is the difference between the opportunity cost of not retiring and the ratio of the period t net utility gain from retiring to the difference between the marginal utilities from retiring and not retiring.

Equation (27) can be re-written as

$$X^* = \frac{B(r)\,[r_X^*(0) - r_X^*(1)] - [\gamma_Y [r_X^*(0) - r_X^*(1)] + [r^*(0) - r^*(1)]]}{[r_X^*(0) - r_X^*(1)]}$$

$$X^* : \; [r^*(1) - r^*(0)] = [(X^* + \gamma_Y) - B(r)]\,[r_X^*(0) - r_X^*(1)]$$

$$= [B(r) - (X^* + \gamma_Y)]\,[r_X^*(1) - r_X^*(0)] \qquad (29)$$

$r^*(1) - r^*(0)$ = the net utility gain or return to staying in employment

$[B(r) - (X^* + \gamma_Y)]\,[r_X^*(1) - r_X^*(0)]$ = the net loss (or opportunity cost of) from staying in employment (not retiring).

Thus the optimal policy to retire human capital is when the net utility gain from staying in employment equals the opportunity cost of not retiring (staying in employment).

4.1.3.2. The Data

The data used for the analysis is collected by survey. The survey was undertaken in five towns including Addis Ababa. The selection of the town is made based on the concentration of the pensioners .The questionnaire used on the survey is attached at appendix 1.

Here we will discuss how the data are coded and used for the analysis. 279 pensioners were interviewed. Though due to financial and time constraints we couldn't make the sample larger, we have noticed that the responses given are very similar. This assures us that although we do not have large samples, we will not miss the basic observation.

The variable names and their code are given as:

AGENOW : is the respondent's current age and is taken as given.

AGEPR : If there is a problem that arises due to age.

AGEPR = 0 if the respondent says there is;

= 1 if there is no problem that arises due to age.

AVPRETAG : Average proposed retirement age (from the respondent's point of view)

FS : Family Size

HEALTH : the respondents health condition

HEALTH = 0 if respondent is not healthy

= 1 if healthy

(for manipulation purposes we have coded as 1 those who respond both good and fair).

JOBTYP : type of job that the respondent used to work

JOBTYP = 0 if type of job is labor intensive

= 1 if type of job is non laborious.

PENINC : Pension income

RETAGE : age at retirement

SERVYR : number of years of service

SEX : sex of the respondent

SEX = 0 if respondent is male

SEX = 1 if female

WGBFR : wage before retirement

PEDUC : dummy for primary education

PEDUC = 1 if respondent's education level is primary

= 0 otherwise.

SECEDUC : dummy for secondary education

SECEDUC = 1 if education level is secondary

= 0 otherwise.

TER EDUC : dummy for tertiary education

TEREDUC = 1 if education level is tertiary

= 0 Otherwise

WTPLF : willingness to participate in the labor force at current age

WTPLF = 1 if willing

= 0 if not willing

WTP1 : willingness to participate in the labor force if age is between 56-60.

WTP2 : willingness to participate in the labor force if age is between 61-65.

WTP3 : willingness to participate in the labor force if age is between 66-70.

The descriptive statistics for the variables can be seen in annex I

4.1.3.3. Econometric Specification

A. The Model

As discussed in section 4.1.3.1 the phenomenon we seek to model is discrete rather than continuous. That is a person is willing to participate in labor force (=1) or not willing to participate (=0). Models for explaining a binary (0/1) dependent variable should not be treated as the same sort of regression model we used to analyze a continuous dependent variable. It will generally turn out that the models and techniques used are different. Thus we apply or use what is known as **qualitative response models.**

The probability of retirement was estimated using qualitative response models(probit/logit) based on a traditional labor force participation model to which pension income was added. There is a difference between the parameters of the probit and the logit models, but this difference is unimportant. The differences between the models are normally reduced when we compare the marginal effects of the two bivariate dependent variable models. Of course, the marginal effects are the only parameters we can and should compare. For a bivariate dependent variable Logit and probit are generally equally good. Though some argue that probit is to be preferred in the bivariate case, while logit should be used for a multivariate discrete variable. In the case of a multivariate discrete variable logit and probit might give different marginal parameters. If so it becomes important to compare the goodness of fit of the two models, and select the model which shows a relatively best fit, given that the results make sense.

As discussed in Greene (1997) a goodness-of-fit measure is a summary statistic indicating the accuracy with which a model approximates the observed data (like the R^2 measure in the familiar regression model). In the case in which the dependent variables are qualitative, accuracy can be judged either in terms of the fit between the calculated (predicted) probabilities and the observed (actual) response frequencies or in terms of the model to forecast observed responses. An analog to the R^2 in a conventional regression model is the likelihood ratio index (LRI) which is found from the maximum likelihood estimate of the models.

$$LRI = 1 - \frac{\ln L}{\ln L_0}$$

where $\ln L$ = maximized value of the log likelihood function with respect to all the parameters.

$\ln L_0$ = the log-likelihood computed with only a constant term.

LRI = likelihood ratio index.

The LRI is obviously related to the likelihood ratio statistic for testing the hypothesis that the coefficient vector is zero. Other similar fit measures have been proposed. Although they are suggestive, it is not clear whether they have any relationship to maximizing any type of fit in the more familiar sense. The maximum likelihood estimator is not chosen so as to maximize a fitting criterion based on prediction of the dependent variable*, as it is in the classical regression (which maximizes R^2). It is chosen to maximize the joint density of the observed dependent variables. Here we choose a model with the highest LRI value.

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* note that the predicted value is a probability where as the actual is either zero or one.

The second factor used to choose between the logit and probit is to compare their prediction power i.e. what percent of the observations are predicted correctly. From the summary table of the models which shows the frequencies of the actual and the predicted observations we sum up those where by the actual and the predicted have the same observation and divide it by the total frequency. This gives us the proportion or the percentage of the observations that the model predicts correctly. This value sometimes is called count R^2.

$$\text{Count } R^2 = \frac{\text{number of correct predictions}}{\text{total number of observations}}$$

Therefore we choose the one with the highest count R^2.

From the comparisons, as it is shown in the next sections, for our analysis the logit model is chosen.

The estimated qualitative response models are all non linear, therefore the coefficients of the models are not equal to the marginal effects that we are looking for. Thus in the LIMDEP package we have computed the marginal effects. The method we used in building a model is that: to include a lot of parameters from the beginning and then step by step remove the variable with the smallest insignificant value, though, one should not remove variables of particular interest. While omitting a relevant explanatory variable is not good, including a variable that is some thing insignificant will not harm the model.

The model included age, wage before retirement, pension income, family size, year of service, retirement age, three dummies for education (primary, secondary and tertiary) and binary variables for sex, existence of other income, job type, health condition, existence of problem that arises due to aging. The model was estimated separately for age groups: 56-60, 61-65, 66-70 and a general willingness to participate model for current age. Other models were estimated for comparing the effect of different attributes by splitting the sample. We have tried to compare the effects of men and women and also the effect of being involved in laborious type of job to the non laborious for the above specified age groups independently. The result is two tables of estimated parameters from which one can judge the relative difference between the two sexes or type of jobs. By comparing the slope of the marginal parameters of the two groups we can see if there is any difference in their willingness to participate in the labor force. We can "see" a difference even for insignificant variables, though we have to remember that they are point estimates which are not significant. (For detailed out look computer results are attached in the annex).

B. Prediction of Effects of changes in the Explanatory Variable

After estimating the parameters or the slopes of the explanatory variables, we would like to know the effects of changes in any of the explanatory variables on the probabilities of the dependent variable i.e. willingness to participate in the labor force. To deal with this problem and to understand it very well it will be helpful to explain the basic ideas underlying the logit model following Gujarati (1995).

The (cumulative) **logistic distribution function** is given as

$$P_i = E(Y = 1/X_i) = \frac{1}{1+e^{-\beta' X_i}} \qquad (1)$$

where X_i = a vector of explanatory variables

β = a vector of the coefficients.

$$\text{Let } Z_i = \beta' X_i \tag{2}$$

Re writing (1) yields

$$P_i = \frac{1}{1+e^{-Z_i}} \tag{3}$$

It is easy to verify that as Z_i ranges from $-\infty$ to $+\infty$, P_i ranges between 0 and 1 and that P_i is non lineary related to Z_i.

If P_i, the probability of participating in the labor force is given by (3), then $(1-P_i)$, the probability of not participating in the labor force, is

$$1-P_i = \frac{1}{1+e^{Z_i}} \tag{4}$$

Thus we can compute the **odds ratio** as

$$\frac{P_i}{1-P_i} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Z_i} \tag{5}$$

where $\frac{P_i}{1-P_i}$ is the odds ratio in favor of participating in the labor force. It is the ratio of the probability that an individual will participate in the labor force to the probability that it will not participate.

Now if we take the natural log of (5), we obtain the log of the odds ratio:

$$L_i = \ln \frac{P_i}{1-P_i} = Z_i$$

$$= \beta' X_i \tag{6}$$

(6) is not only linear in X, but also (from the estimation view point) linear in parameters. L is called the **logit** and hence the name **logit models** for models like (6).

From running regression of (6) the estimated slope coefficient suggests that for a unit increase in the explanatory variable the log of the odds in favor of participating in the labor force changes by about the coefficient of the explanatory variable. Taking the antilog of this coefficient measures for a unit increase in the explanatory variable the odds in favor of participating in the labor force change by the antilog value. *In general, if you take the antilog of the j^{th} slope coefficient, subtract one from it, and multiply the result by 100, you will get the percent change in the odds for a unit increase in the j^{th} regressor.*

Thus the coefficients of the logit model does not give the change in the probability of participating in the labor force rather they give the change in log of the odds ratio of participating in the labor force per unit change in explanatory variable. Therefore, using calculus, the change in the probability due to a change in the explanatory variable, say X_j, is computed from (1) as

$$\frac{\partial P_i}{\partial X_{ij}} = \beta_j P_i (1 - P_i) \tag{7}$$

(7) shows that the rate of change in probability involves not only the coefficient (β_j) but also the level of probability from which the change is measured [1]. Usually this probability value is computed at the mean values of the explanatory variables.

1. Willingness to Participate Model for Current Age

The major regression outputs for this section are attached in the annex from Page II to X.

Before the analysis we will try to choose between the logit and probit models based on the criteria's discussed above. The LRI for probit equals 0.309 ($\ln L$ and $\ln L_0$ equals 122.24 and 176.89 respectively) while for the logit it is 0.324 ($\ln L$ and $\ln L_0$ equals 119.56 and 176.89 respectively).

Table 1. Cross-tabulated frequencies of predicted and actual

Probit					Logit				
	Predicted					Predicted			
		D = 0	D = 1	Total			D = 0	D = 1	Total
Actual	D = 0	59	33	92	Actual	D = 0	59	33	92
	D = 1	16	171	187		D = 1	14	173	187
	Total	75	204	279		Total	73	206	279

The probit model predicts 230 of the 279 or 82.4 percent of the observations correctly, while the logit model predicts 232 of the 279 or 83.1 percent of the observations correctly. Thus we have chosen a logit model for our analysis.

---

1. Note that the effect of a unit change in the explanatory variable on P is greatest when P=0.5 and least when P is close to 0 or 1.

Our chosen model - which is a logit model is highly significant, with a likelihood ratio test of the hypothesis that the coefficients (13 of them) are zero based on a chi-squared value of 114.65 with 13 degrees of freedom at any significance level. Test for hetroskedesticity is not done since the tests are specifically for the probit model and are not well suited to the logit model - which is our choice.

The logit regression results which are partial derivatives of probabilities with respect to the vector characteristics are presented below. They are computed at the mean values of the explanatory variables.

Table 2. Logit Regression Result

Variable	Coefficient	S.e.	t ratio
CONSTANT	- 1.2434	0.58411	- 2.129
AGENOW	- 0.01179	0.00853	-1.382
AGEPR	0.44305	0.0992	4.466
SECEDUC	- 0.17408	0.1259	-1.383
TEREDUC	- 0.20245	0.13892	-1.457
FS	0.02446	0.01761	1.389
HEALTH	0.38634	0.10231	3.776
RETAGE	0.04028	0.01408	2.860
SERVYR	- 0.02141	0.00831	- 2.576
SEX	- 0.04594	0.07544	- 0.609
WGBFR	-0.000654	0.000291	- 2.250
JOBTYP	- 0.03085	0.08063	- 0.383
OTHINC	- 0.01831	0.07195	- 0.254
PENINC	0.00134	0.000613	2.191

As seen in the table the probability that an individual is willing to participate in labor force declines for the factors AGENOW, SECEDUC, TEREDUC, SERVYR, SEX, WGBFR, JOBTYP and OTHINC by the given coefficient for a unit increase in them. This probability will increase for the rest of the variables by their coefficient if they are increased by a unit value.

For this regression family size, job type, and existence of other income are not significant at 10 percent significant level, while all the rest are significant. This might be due to the smallness of the sample or the coverage. On the model current age is negatively related with willingness to participate, which coincides with the theory that the higher the age the lower will be the willingness. The existence of age problem, health condition, family size, job type (of non laborious) are positively related to the willingness to participate which also coincides with the theory, i.e, if people are healthy and there is no problem due to age and also if the type of job is non laborious they will be more willing. The same is true with a family size, if family size is large there is a great need for larger income which increases one's willingness to participate in the labor force.

In contrast to the theory, the existence of social security benefit is positively related to the willingness to participate in the labor force. One reason could be that the substitution effect outweighs the income effect. An explanation for this can be derived from the existing pension rule that once a person is entitled to a benefit he can be employed in an enterprise which is not covered by the pension scheme and this will not yield to an implicit tax on benefits i.e. he can earn his wage as well as his pension. This would give incentive for an individual to participate in the labor force. Thus causing a positive relationship between pension income and willingness to participate.

Regardless of the sign or the theory, the probability that the willingness to participate in the labor force will be affected due to the existence of a pension is very negligible i.e. by about 0.0013. Therefore we can say that willingness to participate in the labor force (or labor supply) is not much affected by the existence of social security. One reason for this is that pension benefits are small that there is a need for supplementary income which of course induces the person to continue working (or participation in the labor force).

Table 3: Marginal Effects for Sexes

Variable	Men	Women	All Obs.
ONE	- 1.0408	- 1.4069	- 1.2434
AGENOW	- 0.0099	- 0.0133	- 0.0118
AGEPR	0.3709	0.5013	0.4431
SECEDUC	- 0.1457	- 0.1970	- 0.1741
TEREDUC	- 0.1695	- 0.2291	- 0.2024
FS	0.0205	0.0277	0.0245
HEALTH	0.3234	0.4371	0.3863
RETAGE	0.0337	0.0456	0.0403
SERVYR	- 0.0179	- 0.0242	- 0.0214
SEX	- 0.0385	- 0.0520	- 0.0459
WGBFR	- 0.0005	0.0007	- 0.0007
JOBTYP	- 0.0258	- 0.0349	- 0.0308
OTHINC	- 0.0153	- 0.0207	- 0.0183
PENINC	0.0011	0.0015	0.0013

We have also tried to compare the effects of different attributes. One is for different sexes (see table 3). The result shows that the probability that each factor will affect the willingness to participate is higher for women than men. For example the marginal effect that women will not participate in the labor force due to the existence of other income is 0.021 while for men it is 0.015. The other important factor is their age .As age increases the willingness to participate in the labor force is reduced more for women than for men. This result might need a biological support or explanation such as maternity problems or so forth. But this paper ,without giving explanations to the results, discusses only the implication of the result. One implication is that there is a need for Age Discrimination Act by Sex.

Table 4: Marginal Effects for Job Types

Variable	Nonlaborious	Laborious	All Obs.
ONE	- 1.2087	- 1.2812	-1.2434
AGENOW	- 0.0115	- 0.0122	- 0.0118
AGEPR	0.4307	0.4565	0.4431
SECEDUC	-0.1692	- 0.1794	- 0.1741
TEREDUC	-0.1968	- 0.2086	- 0.2024
FS	0.0238	0.0252	0.0245
HEALTH	0.3755	0.3981	0.3836
RETAGE	0.0392	0.0415	0.0403
SERVYR	- 0.0208	- 0.0221	- 0.0214
SEX	- 0.0447	- 0.0473	- 0.0459
WGBFR	- 0.0006	- 0.0007	- 0.0007
JOBTYP	- 0.0300	- 0.0318	- 0.0308
OTHINC	- 0.0178	- 0.0189	- 0.0183
PENINC	0.0013	0.0014	0.0013

The other factor which we saw is the impact of being involved in laborious or non laborious type of job on their willingness to participate (see table 4). Here it is shown that the higher the age the probability of being not willing to participate in the labor force is higher for those who are involved in the laborious type of job. This result has an implication for a need of Age Discrimination Act by Job Type. The act has to be of a kind that allows early retirement for those who are involved in the labor intensive job and a higher retirement age for non-laborious type of job.

The above analysis is based on the reported current age. Next we will try to see this implications and the willingness to participate in the labor force within a specific age interval.

2. Willingness To Participate Model For Ages Between 56 And 60.

The major regression outputs for this section are attached in the annex from page XI to XIX.

The LRI for probit equals 0.314 (lnL and $\ln L_0$ equals 121.80 and 177.59 respectively), while for the logit it is 0.321 (lnL and $\ln L_0$ equals 120.59 and 177.59 respectively).

Table 4. Cross tabulated frequencies of predicted and actual

Probit					Logit				
	Predicted					Predicted			
		D = 0	D = 1	Total			D = 0	D = 1	Total
Actual	D = 0	59	34	93	Actual	D = 0	59	34	93
	D = 1	16	170	186		D = 1	14	172	186
	Total	75	204	279		Total	73	206	279

The probit model predicts 229 of the 279 or 82.1 percent of the observations correctly, while the logit model predicts 231 of the 279 or 82.8

percent of the observations correctly. Thus here also we choose a logit model for our analysis.

The chosen logit model is significant based on a chi-squared value of 113.99 with 13 degrees of freedom at any significance level.

The regression result of annex XII shows the probability of willingness to participate in labor force evaluates at the mean values of the explanatory variables:

The results, the signs of coefficients and implications are more or less similar to that of current age regression model except that there is a little difference on the magnitudes of the probabilities. One important factor which we have to see carefully here is that the effect of age on the probability of participating (or not participating) in the labor force. Here we see that the probability that age will reduce the willingness to work is 0.108 which is still very small. And the coefficients of the binary variables existence of problem due to age and health condition shows that there will not be much problem due to this factor. Implication here is that if retirement age is raised from 55 to 60 there will not be much problem in the productivity of the worker that arises due to aging or health - which are indeed the main factors used in setting a retirement age.

3. Willingness To participate model for ages between 61 and 65

The major regression outputs for this section are attached in the annex from page XX to XXVIII.

For this age group using the same methodology and criteria, we have chosen a logit model. This logit model is significant based on a chi-squared value of 100.86 with 13 degrees of freedom at any significance level.

Here also the regression result of annex XXI gives the probability of willingness to participate in the labor force evaluated at the mean values of the explanatory variables.

Thus we can say that for the age group of 61 - 65 those who favor participating in the labor force is lower compared to the age group of 56 - 60 i.e. for the age group 56 -60 those who favor participating were larger than those who do not but here those who do not favor participating are the ones who are larger.

Also P, the probability of participating in the labor force declines from 0.546 to 0.455 i.e. declines by about 0.09.

For all the variables except SEX the change in the probability of participating in the labor force has declined as compared to the previous section.

For this age groups things get a bit complicated. Many explanatory variables which were significant in the previous regressions become insignificant now and also the magnitudes of the coefficients one smaller. This implies that the probability to participate in the labor force declines significantly due to health and age problems. This result is derived because the binary variables health and problem due to age are coded one for those who are healthy and who do not have a problem that arises due to their age respectively. Thus the coefficient of this variables being insignificant as well as very small implies that many have given a response in this age group that they have health or age problems.

Thus, based on our sample result, we can infer that a retirement age policy will not be optimal or best on the employee side, if it exceeds age 60.

4. Willingness to participate model for ages between 66 and 70

The regression outputs are attached in the annex from page XXIX to XXXVII.

Here the probit model is not estimable at all. The only possible estimation we have for the marginal effects is the logit estimation. This logit model is significant with a likelihood ratio test based on a chi-squared value of 50.14 with 13 degrees of freedom at 1 percent significant level.

For this age group, our sample data regression shows that no variable is significant (see annex XXX). This indicates that irrespective of the factors people are not willing to participate in the labor force. This holds true whether they are men or women (see annex XXXIII) and also whether the job is labor intensive or not (see annex XXXVI).

Chapter Five

Conclusion and Policy Implication

5.1 Conclusion

The results of the qualitative response model regression have shown that social security benefit or pension does not induce retirement or withdrawal from the labor force participation in contrast to the theory which says that non wage incomes such as social security benefits will affect negatively or reduce the supply of labor. One difference between the theory and our analysis is that the theory considers all types of social security benefits discussed in chapter one (and mainly on unemployment benefit) while our study focuses only on old age pension. Thus it is difficult to conclude that the results contradict to the labor force participation theory. Rather at this stage we tentatively conclude that social security (or old age pension) does not significantly influence the intended age of retirement or withdrawal from the labor force for our sample. One of the reasons given for such a result is that pension payments are small or inadequate to cover living expenses. We also found that the probability to participate in the labor force reduces by 0.09 if one goes from age group of 56-60 to the age group of 61-65.

There is also a difference in the willingness to participate in the labor force between men and women and also between those who are involved in labor intensive job and non laborious job. The result shows that women are less willing to continue working after age 55 as compared to men. It is also shown that those who are involved in the labor intensive type of job are less willing to continue working as age increases as compared to those who are involved in non-laborious type of job.

The regression when done separately for different age groups have shown that for the age group of 56-60 health and aging does not significantly affect one's productivity or willingness to participate in the labor force. But for the age groups 61-65 and 66-70 this factors significantly affect one's productivity or willingness to participate.

5.2 Policy Implications

The above conclusions and observations have policy implications and support possible policy reforms for of the SSA given from looking at its objectives of reallocation of a person's lifetime income to provide support for his own retirement and redistribution of income between individuals to provide a really adequate support.

In setting a retirement age the basic factors used are health and aging problem in that as one gets older his productivity declines and he/she will be vulnerable to health problems. But our result shows that there is no significant problem due to these factors until age 60. The policy implication of this result is that there is a need to revise the existing retirement age rule which mandatorily retires workers at age 55. The reform would be to increase this mandatory retirement age to 60. This in turn makes pension payments higher and may somehow solve the inadequacy of the pension benefits.

The other policy implication which we can deduce from the results is that there may be a need to have an Age Discrimination Act depending on the type of job and sex. The Job Discrimination Act reform would allow early retirement for those who are involved in blue-collar jobs. The sex Discrimination Act reform would allow early retirement for women.

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LIMDEP Estimation Results Run log line 5 Page 1
Current sample contains 279 observations.

Descriptive Statistics

Variable	Mean	Std. Dev.	Skew.	Kurt.	Minimum	Maximum	Cases
AGENOW	59.3154	6.3553	0.6	4.7	44.0000	81.0000	279
AGEPR	0.7348	0.4423	-1.1	2.1	0.0000	1.0000	279
SECEDUC	0.2473	0.4322	1.2	2.4	0.0000	1.0000	279
TEREDUC	0.5269	0.5002	-0.1	1.0	0.0000	1.0000	279
FS	6.0824	2.2800	1.2	5.9	2.0000	16.0000	279
HEALTH	0.8065	0.3958	-1.5	3.4	0.0000	1.0000	279
RETAGE	53.5054	3.1313	-2.1	7.0	41.0000	57.0000	279
SERVYR	28.4588	5.0648	-0.7	3.2	14.0000	39.0000	279
SEX	0.5018	0.5009	0.0	1.0	0.0000	1.0000	279
WGBFR	742.1792	394.9652	0.9	3.6	105.0000	2100.0000	279
JOBTYP	0.4695	0.5000	0.1	1.0	0.0000	1.0000	279
OTHINC	0.5018	0.5009	0.0	1.0	0.0000	1.0000	279
PENINC	355.5627	197.6611	0.7	3.0	50.0000	980.0000	279

LIMDEP Estimation Results Run log line 7 Page 2
Current sample contains 279 observations.

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	WTPLF
Number of observations	279
Iterations completed	6
Log likelihood function	-119.5624
Restricted log likelihood	-176.8862
Chi-squared	114.6477
Degrees of freedom	13
Significance level	0.0000000

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-6.0473	2.8339	-2.134	0.03285	
AGENOW	-0.57351E-01	0.41310E-01	-1.388	0.16504	59.32
AGEPR	2.1547	0.47825	4.505	0.00001	0.7348
SECEDUC	-0.84663	0.61397	-1.379	0.16792	0.2473
TEREDUC	-0.98457	0.67775	-1.453	0.14631	0.5269
FS	0.11895	0.86070E-01	1.382	0.16697	6.082
HEALTH	1.8789	0.47318	3.971	0.00007	0.8065
RETAGE	0.19568	0.68519E-01	2.859	0.00425	53.51
SERVYR	-0.10409	0.40140E-01	-2.593	0.00951	28.46
SEX	-0.22344	0.36748	-0.608	0.54316	0.5018
WGBFR	-0.31783E-02	0.14009E-02	-2.269	0.02328	742.2
JOBTYP	-0.15002	0.39274	-0.382	0.70247	0.4695
OTHINC	-0.89038E-01	0.34957	-0.255	0.79895	0.5018
PENINC	0.65297E-02	0.29609E-02	2.205	0.02743	355.6

LIMDEP Estimation Results   Run log line   7 Page 3
Current sample contains   279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are All Obs.

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.2434	0.58411	-2.129	0.03327	
AGENOW	-0.11793E-01	0.85312E-02	-1.382	0.16688	59.32
AGEPR	0.44305	0.99200E-01	4.466	0.00001	0.7348
SECEDUC	-0.17408	0.12590	-1.383	0.16674	0.2473
TEREDUC	-0.20245	0.13892	-1.457	0.14503	0.5269
FS	0.24458E-01	0.17610E-01	1.389	0.16487	6.082
HEALTH	0.38634	0.10231	3.776	0.00016	0.8065
RETAGE	0.40277E-01	0.14083E-01	2.860	0.00424	53.51
SERVYR	-0.21403E-01	0.83092E-02	-2.576	0.01000	28.46
SEX	-0.45944E-01	0.75441E-01	-0.609	0.54253	0.5018
WGBFR	-0.65352E-03	0.29047E-03	-2.250	0.02446	742.2
JOBTYP	-0.30848E-01	0.80630E-01	-0.383	0.70203	0.4695
OTHINC	-0.18308E-01	0.71952E-01	-0.254	0.79915	0.5018
PENINC	0.13426E-02	0.61280E-03	2.191	0.02845	355.6

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	59	33	92
1	14	173	187
TOTAL	73	206	279

LIMDEP Estimation Results Run log line 9 Page 4
Current sample contains 279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are MEN

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.0408	0.50061	-2.079	0.03761	
AGENOW	-0.98711E-02	0.72118E-02	-1.369	0.17108	59.76
AGEPR	0.37086	0.90045E-01	4.119	0.00004	0.7410
SECEDUC	-0.14572	0.10554	-1.381	0.16737	0.3165
TEREDUC	-0.16946	0.11669	-1.452	0.14644	0.3381
FS	0.20473E-01	0.14999E-01	1.365	0.17227	6.338
HEALTH	0.32338	0.92905E-01	3.481	0.00050	0.8058
RETAGE	0.33714E-01	0.12059E-01	2.796	0.00518	53.65
SERVYR	-0.17915E-01	0.71767E-02	-2.496	0.01255	27.83
SEX	-0.38457E-01	0.60025E-01	-0.641	0.52172	0.0000
WGBFR	-0.54703E-03	0.25199E-03	-2.171	0.02994	629.0
JOBTYP	-0.25821E-01	0.67574E-01	-0.382	0.70238	0.4317
OTHINC	-0.15325E-01	0.60263E-01	-0.254	0.79927	0.5108
PENINC	0.11239E-02	0.53073E-03	2.118	0.03421	301.4

LIMDEP Estimation Results   Run log line 9 Page 5
Current sample contains 279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are WOMEN

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.4069	0.66281	-2.123	0.03378	
AGENOW	-0.13343E-01	0.96586E-02	-1.381	0.16713	58.88
AGEPR	0.50130	0.11466	4.372	0.00001	0.7286
SECEDUC	-0.19697	0.14332	-1.374	0.16933	0.1786
TEREDUC	-0.22907	0.15812	-1.449	0.14742	0.7143
FS	0.27674E-01	0.19908E-01	1.390	0.16449	5.829
HEALTH	0.43713	0.11510	3.798	0.00015	0.8071
RETAGE	0.45572E-01	0.16185E-01	2.816	0.00487	53.36
SERVYR	-0.24217E-01	0.94482E-02	-2.563	0.01037	29.08
SEX	-0.51984E-01	0.87399E-01	-0.595	0.55198	1.000
WGBFR	-0.73944E-03	0.32776E-03	-2.256	0.02407	854.6
JOBTYP	-0.34904E-01	0.91253E-01	-0.382	0.70210	0.5071
OTHINC	-0.20715E-01	0.81388E-01	-0.255	0.79909	0.4929
PENINC	0.15192E-02	0.69175E-03	2.196	0.02808	409.4

LIMDEP Estimation Results Run log line 9 Page 6
Current sample contains 279 observations.

Marginal Effects for MltLogit

Variable	MEN	WOMEN	All Obs.
ONE	-1.0408	-1.4069	-1.2434
AGENOW	-0.0099	-0.0133	-0.0118
AGEPR	0.3709	0.5013	0.4431
SECEDUC	-0.1457	-0.1970	-0.1741
TEREDUC	-0.1695	-0.2291	-0.2024
FS	0.0205	0.0277	0.0245
HEALTH	0.3234	0.4371	0.3863
RETAGE	0.0337	0.0456	0.0403
SERVYR	-0.0179	-0.0242	-0.0214
SEX	-0.0385	-0.0520	-0.0459
WGBFR	-0.0005	-0.0007	-0.0007
JOBTYP	-0.0258	-0.0349	-0.0308
OTHINC	-0.0153	-0.0207	-0.0183
PENINC	0.0011	0.0015	0.0013

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	59	33	92
1	14	173	187
TOTAL	73	206	279

LIMDEP Estimation Results Run log line 11 Page 7
Current sample contains 279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are NONLABOR

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.2087	0.58064	-2.082	0.03737	
AGENOW	-0.11463E-01	0.83019E-02	-1.381	0.16735	58.60
AGEPR	0.43067	0.10030	4.294	0.00002	0.7365
SECEDUC	-0.16922	0.12089	-1.400	0.16157	0.3108
TEREDUC	-0.19679	0.13329	-1.476	0.13983	0.3784
FS	0.23775E-01	0.17332E-01	1.372	0.17014	5.595
HEALTH	0.37554	0.10155	3.698	0.00022	0.7770
RETAGE	0.39151E-01	0.13875E-01	2.822	0.00478	52.91
SERVYR	-0.20805E-01	0.81601E-02	-2.550	0.01079	27.09
SEX	-0.44660E-01	0.73568E-01	-0.607	0.54381	0.4662
WGBFR	-0.63526E-03	0.28367E-03	-2.239	0.02513	625.7
JOBTYP	-0.29986E-01	0.76623E-01	-0.391	0.69554	0.0000
OTHINC	-0.17796E-01	0.70048E-01	-0.254	0.79945	0.4122
PENINC	0.13051E-02	0.59545E-03	2.192	0.02839	288.0

LIMDEP Estimation Results Run log line 11 Page 8
Current sample contains 279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are LABORIOU

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.2812	0.60165	-2.129	0.03321	
AGENOW	-0.12151E-01	0.88625E-02	-1.371	0.17037	60.12
AGEPR	0.45650	0.10793	4.230	0.00002	0.7328
SECEDUC	-0.17937	0.13246	-1.354	0.17568	0.1756
TEREDUC	-0.20860	0.14641	-1.425	0.15423	0.6947
FS	0.25201E-01	0.18093E-01	1.393	0.16367	6.634
HEALTH	0.39806	0.11041	3.605	0.00031	0.8397
RETAGE	0.41499E-01	0.14893E-01	2.786	0.00533	54.18
SERVYR	-0.22052E-01	0.87506E-02	-2.520	0.01173	30.00
SEX	-0.47338E-01	0.77629E-01	-0.610	0.54199	0.5420
WGBFR	-0.67336E-03	0.30526E-03	-2.206	0.02740	873.7
JOBTYP	-0.31784E-01	0.84930E-01	-0.374	0.70823	1.000
OTHINC	-0.18864E-01	0.74048E-01	-0.255	0.79892	0.6031
PENINC	0.13834E-02	0.64632E-03	2.140	0.03232	431.8

LIMDEP Estimation Results   Run log line   11 Page 9
Current sample contains   279 observations.

Marginal Effects for MltLogit			
Variable	NONLABOR	LABORIOU	All Obs.
ONE	-1.2087	-1.2812	-1.2434
AGENOW	-0.0115	-0.0122	-0.0118
AGEPR	0.4307	0.4565	0.4431
SECEDUC	-0.1692	-0.1794	-0.1741
TEREDUC	-0.1968	-0.2086	-0.2024
FS	0.0238	0.0252	0.0245
HEALTH	0.3755	0.3981	0.3863
RETAGE	0.0392	0.0415	0.0403
SERVYR	-0.0208	-0.0221	-0.0214
SEX	-0.0447	-0.0473	-0.0459
WGBFR	-0.0006	-0.0007	-0.0007
JOBTYP	-0.0300	-0.0318	-0.0308
OTHINC	-0.0178	-0.0189	-0.0183
PENINC	0.0013	0.0014	0.0013

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	59	33	92
1	14	173	187
TOTAL	73	206	279

X

LIMDEP Estimation Results	Run log line 13	Page 10
Current sample contains 279 observations.		

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	WTPLF
Number of observations	279
Iterations completed	3
Log likelihood function	-176.8862

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	0.70932	0.12735	5.570	0.00000	

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	0	92	92
1	0	187	187
TOTAL	0	279	279

LIMDEP Estimation Results Run log line 15 Page 11
Current sample contains 279 observations.

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	WTP1
Number of observations	279
Iterations completed	6
Log likelihood function	-120.5889
Restricted log likelihood	-177.5875
Chi-squared	113.9970
Degrees of freedom	13
Significance level	0.0000000

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-5.8110	2.7987	-2.076	0.03786	
AGENOW	-0.52068E-01	0.40963E-01	-1.271	0.20369	59.32
AGEPR	2.1608	0.48050	4.497	0.00001	0.7348
SECEDUC	-0.84651	0.61274	-1.382	0.16712	0.2473
TEREDUC	-1.1136	0.67328	-1.654	0.09813	0.5269
FS	0.11321	0.85709E-01	1.321	0.18656	6.082
HEALTH	1.8911	0.47548	3.977	0.00007	0.8065
RETAGE	0.19097	0.68275E-01	2.797	0.00516	53.51
SERVYR	-0.11530	0.40413E-01	-2.853	0.00433	28.46
SEX	-0.24640	0.36392	-0.677	0.49836	0.5018
WGBFR	-0.30732E-02	0.13988E-02	-2.197	0.02802	742.2
JOBTYP	-0.37400E-01	0.38931	-0.096	0.92347	0.4695
OTHINC	-0.17536	0.34768	-0.504	0.61400	0.5018
PENINC	0.65795E-02	0.29610E-02	2.222	0.02628	355.6

LIMDEP Estimation Results Run log line 15 Page 12
Current sample contains 279 observations.

Partial derivatives of probabilities with respect to the vector of characteristics. They are computed at the means of the Xs. Observations used for means are All Obs.

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.2082	0.58250	-2.074	0.03806	
AGENOW	-0.10826E-01	0.85514E-02	-1.266	0.20552	59.32
AGEPR	0.44927	0.10071	4.461	0.00001	0.7348
SECEDUC	-0.17601	0.12707	-1.385	0.16603	0.2473
TEREDUC	-0.23154	0.13942	-1.661	0.09678	0.5269
FS	0.23538E-01	0.17742E-01	1.327	0.18461	6.082
HEALTH	0.39319	0.10387	3.785	0.00015	0.8065
RETAGE	0.39706E-01	0.14172E-01	2.802	0.00508	53.51
SERVYR	-0.23972E-01	0.84602E-02	-2.834	0.00460	28.46
SEX	-0.51230E-01	0.75527E-01	-0.678	0.49758	0.5018
WGBFR	-0.63897E-03	0.29324E-03	-2.179	0.02933	742.2
JOBTYP	-0.77761E-02	0.80915E-01	-0.096	0.92344	0.4695
OTHINC	-0.36460E-01	0.72417E-01	-0.503	0.61463	0.5018
PENINC	0.13680E-02	0.61951E-03	2.208	0.02723	355.6

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	59	34	93
1	14	172	186
TOTAL	73	206	279

LIMDEP Estimation Results Run log line 17 Page 13
Current sample contains 279 observations.

Partial derivatives of probabilities with respect to the vector of characteristics. They are computed at the means of the Xs. Observations used for means are MEN

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.0020	0.49398	-2.028	0.04251	
AGENOW	-0.89785E-02	0.71540E-02	-1.255	0.20947	59.76
AGEPR	0.37260	0.90365E-01	4.123	0.00004	0.7410
SECEDUC	-0.14597	0.10555	-1.383	0.16667	0.3165
TEREDUC	-0.19202	0.11624	-1.652	0.09853	0.3381
FS	0.19521E-01	0.14938E-01	1.307	0.19128	6.338
HEALTH	0.32609	0.93560E-01	3.485	0.00049	0.8058
RETAGE	0.32930E-01	0.12011E-01	2.742	0.00611	53.65
SERVYR	-0.19881E-01	0.72796E-02	-2.731	0.00631	27.83
SEX	-0.42488E-01	0.59222E-01	-0.717	0.47311	0.0000
WGBFR	-0.52993E-03	0.25141E-03	-2.108	0.03505	629.0
JOBTYP	-0.64491E-02	0.67118E-01	-0.096	0.92345	0.4317
OTHINC	-0.30238E-01	0.60162E-01	-0.503	0.61524	0.5108
PENINC	0.11345E-02	0.53153E-03	2.135	0.03280	301.4

LIMDEP Estimation Results   Run log line 17 Page 14
Current sample contains 279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are WOMEN

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.3691	0.66163	-2.069	0.03852	
AGENOW	-0.12267E-01	0.96881E-02	-1.266	0.20543	58.88
AGEPR	0.50908	0.11625	4.379	0.00001	0.7286
SECEDUC	-0.19944	0.14479	-1.377	0.16838	0.1786
TEREDUC	-0.26236	0.15905	-1.650	0.09904	0.7143
FS	0.26671E-01	0.20097E-01	1.327	0.18448	5.829
HEALTH	0.44553	0.11658	3.822	0.00013	0.8071
RETAGE	0.44992E-01	0.16275E-01	2.764	0.00570	53.36
SERVYR	-0.27164E-01	0.96346E-02	-2.819	0.00481	29.08
SEX	-0.58051E-01	0.87653E-01	-0.662	0.50779	1.000
WGBFR	-0.72404E-03	0.33124E-03	-2.186	0.02883	854.6
JOBTYP	-0.88113E-02	0.91692E-01	-0.096	0.92344	0.5071
OTHINC	-0.41314E-01	0.82020E-01	-0.504	0.61447	0.4929
PENINC	0.15501E-02	0.70017E-03	2.214	0.02683	409.4

LIMDEP Estimation Results Run log line 17 Page 15
Current sample contains 279 observations.

Marginal Effects for MltLogit			
Variable	MEN	WOMEN	All Obs.
ONE	-1.0020	-1.3691	-1.2082
AGENOW	-0.0090	-0.0123	-0.0108
AGEPR	0.3726	0.5091	0.4493
SECEDUC	-0.1460	-0.1994	-0.1760
TEREDUC	-0.1920	-0.2624	-0.2315
FS	0.0195	0.0267	0.0235
HEALTH	0.3261	0.4455	0.3932
RETAGE	0.0329	0.0450	0.0397
SERVYR	-0.0199	-0.0272	-0.0240
SEX	-0.0425	-0.0581	-0.0512
WGBFR	-0.0005	-0.0007	-0.0006
JOBTYP	-0.0064	-0.0088	-0.0078
OTHINC	-0.0302	-0.0413	-0.0365
PENINC	0.0011	0.0016	0.0014

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	59	34	93
1	14	172	186
TOTAL	73	206	279

LIMDEP Estimation Results   Run log line   19 Page 16
Current sample contains   279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are NONLABOR

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.1875	0.58362	-2.035	0.04188	
AGENOW	-0.10640E-01	0.84082E-02	-1.265	0.20571	58.60
AGEPR	0.44156	0.10249	4.308	0.00002	0.7365
SECEDUC	-0.17299	0.12346	-1.401	0.16117	0.3108
TEREDUC	-0.22756	0.13510	-1.684	0.09209	0.3784
FS	0.23134E-01	0.17628E-01	1.312	0.18940	5.595
HEALTH	0.38644	0.10397	3.717	0.00020	0.7770
RETAGE	0.39025E-01	0.14072E-01	2.773	0.00555	52.91
SERVYR	-0.23561E-01	0.84028E-02	-2.804	0.00505	27.09
SEX	-0.50351E-01	0.74496E-01	-0.676	0.49911	0.4662
WGBFR	-0.62301E-03	0.28926E-03	-2.171	0.02993	625.7
JOBTYP	-0.76427E-02	0.79102E-01	-0.097	0.92303	0.0000
OTHINC	-0.35835E-01	0.71383E-01	-0.502	0.61566	0.4122
PENINC	0.13445E-02	0.60833E-03	2.210	0.02709	288.0

LIMDEP Estimation Results   Run log line   19 Page 17
Current sample contains   279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are LABORIOU

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.2310	0.59352	-2.074	0.03807	
AGENOW	-0.11030E-01	0.87745E-02	-1.257	0.20872	60.12
AGEPR	0.45775	0.10826	4.228	0.00002	0.7328
SECEDUC	-0.17933	0.13214	-1.357	0.17476	0.1756
TEREDUC	-0.23590	0.14591	-1.617	0.10593	0.6947
FS	0.23982E-01	0.18022E-01	1.331	0.18329	6.634
HEALTH	0.40061	0.11080	3.615	0.00030	0.8397
RETAGE	0.40455E-01	0.14814E-01	2.731	0.00632	54.18
SERVYR	-0.24425E-01	0.88485E-02	-2.760	0.00578	30.00
SEX	-0.52197E-01	0.76835E-01	-0.679	0.49692	0.5420
WGBFR	-0.65103E-03	0.30428E-03	-2.140	0.03239	873.7
JOBTYP	-0.79228E-02	0.82898E-01	-0.096	0.92386	1.000
OTHINC	-0.37148E-01	0.73648E-01	-0.504	0.61398	0.6031
PENINC	0.13938E-02	0.64611E-03	2.157	0.03099	431.8

LIMDEP Estimation Results	Run log line 19 Page 18
Current sample contains 279 observations.	

Marginal Effects for MltLogit			
Variable	NONLABOR	LABORIOU	All Obs.
ONE	-1.1875	-1.2310	-1.2082
AGENOW	-0.0106	-0.0110	-0.0108
AGEPR	0.4416	0.4578	0.4493
SECEDUC	-0.1730	-0.1793	-0.1760
TEREDUC	-0.2276	-0.2359	-0.2315
FS	0.0231	0.0240	0.0235
HEALTH	0.3864	0.4006	0.3932
RETAGE	0.0390	0.0405	0.0397
SERVYR	-0.0236	-0.0244	-0.0240
SEX	-0.0504	-0.0522	-0.0512
WGBFR	-0.0006	-0.0007	-0.0006
JOBTYP	-0.0076	-0.0079	-0.0078
OTHINC	-0.0358	-0.0371	-0.0365
PENINC	0.0013	0.0014	0.0014

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	59	34	93
1	14	172	186
TOTAL	73	206	279

LIMDEP Estimation Results Run log line 21 Page 18
Current sample contains 279 observations.

Multinomial Logit Model
Maximum Likelihood Estimates

Dependent variable	WTP1
Number of observations	279
Iterations completed	3
Log likelihood function	-177.5875

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	0.69315	0.12700	5.458	0.00000	

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	0	93	93
1	0	186	186
TOTAL	0	279	279

LIMDEP Estimation Results Run log line 23 Page 20
Current sample contains 279 observations.

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	WTP2
Number of observations	279
Iterations completed	7
Log likelihood function	-93.50565
Restricted log likelihood	-143.9353
Chi-squared	100.8593
Degrees of freedom	13
Significance level	0.0000000

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-6.5092	4.6019	-1.414	0.15723	
AGENOW	-0.13831E-01	0.53180E-01	-0.260	0.79480	59.32
AGEPR	0.65040	0.64774	1.004	0.31533	0.7348
SECEDUC	-0.68529	0.53615	-1.278	0.20119	0.2473
TEREDUC	0.57422	0.75838	0.757	0.44895	0.5269
FS	0.28342	0.10272	2.759	0.00579	6.082
HEALTH	2.4384	0.87869	2.775	0.00552	0.8065
RETAGE	0.11109	0.88377E-01	1.257	0.20876	53.51
SERVYR	-0.10053	0.52136E-01	-1.928	0.05383	28.46
SEX	-3.4012	0.59611	-5.706	0.00000	0.5018
WGBFR	-0.44025E-02	0.27207E-02	-1.618	0.10563	742.2
JOBTYP	-0.31509	0.52574	-0.599	0.54896	0.4695
OTHINC	-0.37791	0.42276	-0.894	0.37137	0.5018
PENINC	0.78941E-02	0.49151E-02	1.606	0.10826	355.6

LIMDEP Estimation Results Run log line 23 Page 21
Current sample contains 279 observations.

Partial derivatives of probabilities with respect to the vector of characteristics. They are computed at the means of the Xs. Observations used for means are All Obs.

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-0.47596	0.35250	-1.350	0.17694	
AGENOW	-0.10113E-02	0.38888E-02	-0.260	0.79481	59.32
AGEPR	0.47558E-01	0.47681E-01	0.997	0.31856	0.7348
SECEDUC	-0.50109E-01	0.40002E-01	-1.253	0.21033	0.2473
TEREDUC	0.41988E-01	0.54842E-01	0.766	0.44390	0.5269
FS	0.20724E-01	0.80500E-02	2.574	0.01004	6.082
HEALTH	0.17830	0.63557E-01	2.805	0.00503	0.8065
RETAGE	0.81230E-02	0.66788E-02	1.216	0.22390	53.51
SERVYR	-0.73506E-02	0.37700E-02	-1.950	0.05121	28.46
SEX	-0.24870	0.50182E-01	-4.956	0.00000	0.5018
WGBFR	-0.32191E-03	0.19133E-03	-1.683	0.09247	742.2
JOBTYP	-0.23040E-01	0.38393E-01	-0.600	0.54844	0.4695
OTHINC	-0.27633E-01	0.30307E-01	-0.912	0.36190	0.5018
PENINC	0.57722E-03	0.34821E-03	1.658	0.09738	355.6

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	203	17	220
1	25	34	59
TOTAL	228	51	279

LIMDEP Estimation Results   Run log line 25 Page 22
Current sample contains 279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are MEN

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.4565	1.0152	-1.435	0.15135	
AGENOW	-0.30949E-02	0.11883E-01	-0.260	0.79452	59.76
AGEPR	0.14554	0.14487	1.005	0.31507	0.7410
SECEDUC	-0.15334	0.11975	-1.280	0.20037	0.3165
TEREDUC	0.12849	0.16955	0.758	0.44856	0.3381
FS	0.63421E-01	0.22935E-01	2.765	0.00569	6.338
HEALTH	0.54562	0.18254	2.989	0.00280	0.8058
RETAGE	0.24858E-01	0.19543E-01	1.272	0.20339	53.65
SERVYR	-0.22494E-01	0.11461E-01	-1.963	0.04969	27.83
SEX	-0.76107	0.15541	-4.897	0.00000	0.0000
WGBFR	-0.98512E-03	0.60000E-03	-1.642	0.10062	629.0
JOBTYP	-0.70506E-01	0.11741	-0.601	0.54817	0.4317
OTHINC	-0.84563E-01	0.93930E-01	-0.900	0.36797	0.5108
PENINC	0.17664E-02	0.10808E-02	1.634	0.10218	301.4

LIMDEP Estimation Results Run log line 25 Page 23
Current sample contains 279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are WOMEN

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-0.93337E-01	0.83964E-01	-1.112	0.26630	
AGENOW	-0.19833E-03	0.76978E-03	-0.258	0.79668	58.88
AGEPR	0.93262E-02	0.10136E-01	0.920	0.35753	0.7286
SECEDUC	-0.98265E-02	0.89646E-02	-1.096	0.27301	0.1786
TEREDUC	0.82339E-02	0.11111E-01	0.741	0.45864	0.7143
FS	0.40641E-02	0.23473E-02	1.731	0.08339	5.829
HEALTH	0.34964E-01	0.20159E-01	1.734	0.08284	0.8071
RETAGE	0.15929E-02	0.15376E-02	1.036	0.30022	53.36
SERVYR	-0.14415E-02	0.95492E-03	-1.510	0.13116	29.08
SEX	-0.48770E-01	0.20498E-01	-2.379	0.01735	1.000
WGBFR	-0.63128E-04	0.44824E-04	-1.408	0.15903	854.6
JOBTYP	-0.45181E-02	0.77676E-02	-0.582	0.56080	0.5071
OTHINC	-0.54189E-02	0.62913E-02	-0.861	0.38905	0.4929
PENINC	0.11319E-03	0.82273E-04	1.376	0.16887	409.4

LIMDEP Estimation Results Run log line 25 Page 24
Current sample contains 279 observations.

Marginal Effects for MltLogit

Variable	MEN	WOMEN	All Obs.
ONE	-1.4565	-0.0933	-0.4760
AGENOW	-0.0031	-0.0002	-0.0010
AGEPR	0.1455	0.0093	0.0476
SECEDUC	-0.1533	-0.0098	-0.0501
TEREDUC	0.1285	0.0082	0.0420
FS	0.0634	0.0041	0.0207
HEALTH	0.5456	0.0350	0.1783
RETAGE	0.0249	0.0016	0.0081
SERVYR	-0.0225	-0.0014	-0.0074
SEX	-0.7611	-0.0488	-0.2487
WGBFR	-0.0010	-0.0001	-0.0003
JOBTYP	-0.0705	-0.0045	-0.0230
OTHINC	-0.0846	-0.0054	-0.0276
PENINC	0.0018	0.0001	0.0006

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	203	17	220
1	25	34	59
TOTAL	228	51	279

LIMDEP Estimation Results Run log line 27 Page 25
Current sample contains 279 observations.

Partial derivatives of probabilities with respect to the vector of characteristics. They are computed at the means of the Xs. Observations used for means are NONLABOR

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-0.48642	0.35664	-1.364	0.17260	
AGENOW	-0.10336E-02	0.39803E-02	-0.260	0.79512	58.60
AGEPR	0.48603E-01	0.48355E-01	1.005	0.31483	0.7365
SECEDUC	-0.51211E-01	0.41111E-01	-1.246	0.21289	0.3108
TEREDUC	0.42911E-01	0.57595E-01	0.745	0.45625	0.3784
FS	0.21180E-01	0.92041E-02	2.301	0.02138	5.595
HEALTH	0.18222	0.70216E-01	2.595	0.00946	0.7770
RETAGE	0.83015E-02	0.67807E-02	1.224	0.22085	52.91
SERVYR	-0.75122E-02	0.39498E-02	-1.902	0.05718	27.09
SEX	-0.25416	0.66395E-01	-3.828	0.00013	0.4662
WGBFR	-0.32899E-03	0.19393E-03	-1.696	0.08980	625.7
JOBTYP	-0.23546E-01	0.42371E-01	-0.556	0.57841	0.0000
OTHINC	-0.28240E-01	0.31945E-01	-0.884	0.37668	0.4122
PENINC	0.58991E-03	0.35395E-03	1.667	0.09558	288.0

LIMDEP Estimation Results Run log line 27 Page 26
Current sample contains 279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are LABORIOU

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-0.46436	0.36647	-1.267	0.20512	
AGENOW	-0.98668E-03	0.37952E-02	-0.260	0.79488	60.12
AGEPR	0.46399E-01	0.48321E-01	0.960	0.33695	0.7328
SECEDUC	-0.48888E-01	0.40638E-01	-1.203	0.22897	0.1756
TEREDUC	0.40964E-01	0.52761E-01	0.776	0.43751	0.6947
FS	0.20219E-01	0.83228E-02	2.429	0.01513	6.634
HEALTH	0.17395	0.70552E-01	2.466	0.01368	0.8397
RETAGE	0.79249E-02	0.68540E-02	1.156	0.24758	54.18
SERVYR	-0.71714E-02	0.39905E-02	-1.797	0.07232	30.00
SEX	-0.24263	0.64737E-01	-3.748	0.00018	0.5420
WGBFR	-0.31406E-03	0.20395E-03	-1.540	0.12358	873.7
JOBTYP	-0.22478E-01	0.34181E-01	-0.658	0.51079	1.000
OTHINC	-0.26959E-01	0.29253E-01	-0.922	0.35674	0.6031
PENINC	0.56315E-03	0.36939E-03	1.525	0.12738	431.8

LIMDEP Estimation Results	Run log line 27 Page 27
Current sample contains 279 observations.	

Marginal Effects for MltLogit

Variable	NONLABOR	LABORIOU	All Obs.
ONE	-0.4864	-0.4644	-0.4760
AGENOW	-0.0010	-0.0010	-0.0010
AGEPR	0.0486	0.0464	0.0476
SECEDUC	-0.0512	-0.0489	-0.0501
TEREDUC	0.0429	0.0410	0.0420
FS	0.0212	0.0202	0.0207
HEALTH	0.1822	0.1739	0.1783
RETAGE	0.0083	0.0079	0.0081
SERVYR	-0.0075	-0.0072	-0.0074
SEX	-0.2542	-0.2426	-0.2487
WGBFR	-0.0003	-0.0003	-0.0003
JOBTYP	-0.0235	-0.0225	-0.0230
OTHINC	-0.0282	-0.0270	-0.0276
PENINC	0.0006	0.0006	0.0006

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	203	17	220
1	25	34	59
TOTAL	228	51	279

LIMDEP Estimation Results	Run log line 29 Page 28
Current sample contains 279 observations.	

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	WTP2
Number of observations	279
Iterations completed	4
Log likelihood function	-143.9353

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-1.3161	0.14661	-8.977	0.00000	

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	220	0	220
1	59	0	59
TOTAL	279	0	279

LIMDEP Estimation Results Run log line 31 Page 29
Current sample contains 279 observations.

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	WTP3
Number of observations	279
Iterations completed	18
Log likelihood function	-7.638225
Restricted log likelihood	-32.70855
Chi-squared	50.14066
Degrees of freedom	13
Significance level	0.2819541E-05

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	84.318	6064.3	0.014	0.98891	
AGENOW	1.4003	36.007	0.039	0.96898	59.32
AGEPR	-14.353	846.10	-0.017	0.98647	0.7348
SECEDUC	-6.8074	2055.6	-0.003	0.99736	0.2473
TEREDUC	38.803	1019.0	0.038	0.96962	0.5269
FS	4.7474	69.403	0.068	0.94546	6.082
HEALTH	57.007	1051.5	0.054	0.95676	0.8065
RETAGE	-2.9901	140.73	-0.021	0.98305	53.51
SERVYR	-2.6613	114.99	-0.023	0.98153	28.46
SEX	-16.418	899.30	-0.018	0.98543	0.5018
WGBFR	-0.21479	5.3644	-0.040	0.96806	742.2
JOBTYP	-20.027	1030.0	-0.019	0.98449	0.4695
OTHINC	-1.7281	491.02	-0.004	0.99719	0.5018
PENINC	0.29066	7.7007	0.038	0.96989	355.6

LIMDEP Estimation Results	Run log line 31 Page 30
Current sample contains 279 observations.	

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are All Obs.

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	0.85562E-24	0.54917E-21	0.002	0.99876	
AGENOW	0.14210E-25	0.90724E-23	0.002	0.99875	59.32
AGEPR	-0.14565E-24	0.91528E-22	-0.002	0.99873	0.7348
SECEDUC	-0.69078E-25	0.44502E-22	-0.002	0.99876	0.2473
TEREDUC	0.39375E-24	0.24978E-21	0.002	0.99874	0.5269
FS	0.48174E-25	0.30743E-22	0.002	0.99875	6.082
HEALTH	0.57848E-24	0.36992E-21	0.002	0.99875	0.8065
RETAGE	-0.30342E-25	0.19507E-22	-0.002	0.99876	53.51
SERVYR	-0.27006E-25	0.17010E-22	-0.002	0.99873	28.46
SEX	-0.16660E-24	0.10771E-21	-0.002	0.99877	0.5018
WGBFR	-0.21795E-26	0.14001E-23	-0.002	0.99876	742.2
JOBTYP	-0.20323E-24	0.13191E-21	-0.002	0.99877	0.4695
OTHINC	-0.17536E-25	0.13111E-22	-0.001	0.99893	0.5018
PENINC	0.29495E-26	0.18951E-23	0.002	0.99876	355.6

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	269	3	272
1	1	6	7
TOTAL	270	9	279

LIMDEP Estimation Results Run log line 33 Page 31
Current sample contains 279 observations.

Partial derivatives of probabilities with respect to the vector of characteristics. They are computed at the means of the Xs. Observations used for means are MEN

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	0.27042E-18	0.23804E-15	0.001	0.99909	
AGENOW	0.44911E-20	0.39482E-17	0.001	0.99909	59.76
AGEPR	-0.46034E-19	0.38882E-16	-0.001	0.99906	0.7410
SECEDUC	-0.21832E-19	0.15123E-16	-0.001	0.99885	0.3165
TEREDUC	0.12445E-18	0.10914E-15	0.001	0.99909	0.3381
FS	0.15226E-19	0.13425E-16	0.001	0.99910	6.338
HEALTH	0.18283E-18	0.16155E-15	0.001	0.99910	0.8058
RETAGE	-0.95897E-20	0.85251E-17	-0.001	0.99910	53.65
SERVYR	-0.85352E-20	0.72708E-17	-0.001	0.99906	27.83
SEX	-0.52654E-19	0.48362E-16	-0.001	0.99913	0.0000
WGBFR	-0.68885E-21	0.61808E-18	-0.001	0.99911	629.0
JOBTYP	-0.64230E-19	0.58405E-16	-0.001	0.99912	0.4317
OTHINC	-0.55423E-20	0.58609E-17	-0.001	0.99925	0.5108
PENINC	0.93219E-21	0.83712E-18	0.001	0.99911	301.4

LIMDEP Estimation Results   Run log line 33 Page 32
Current sample contains 279 observations.

Partial derivatives of probabilities with respect to the vector of characteristics. They are computed at the means of the Xs. Observations used for means are WOMEN

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	0.29635E-29	0.26434E-26	0.001	0.99911	
AGENOW	0.49217E-31	0.43717E-28	0.001	0.99910	58.88
AGEPR	-0.50447E-30	0.45754E-27	-0.001	0.99912	0.7286
SECEDUC	-0.23926E-30	0.25032E-27	-0.001	0.99924	0.1786
TEREDUC	0.13638E-29	0.12062E-26	0.001	0.99910	0.7143
FS	0.16686E-30	0.14771E-27	0.001	0.99910	5.829
HEALTH	0.20036E-29	0.17737E-26	0.001	0.99910	0.8071
RETAGE	-0.10509E-30	0.92993E-28	-0.001	0.99910	53.36
SERVYR	-0.93536E-31	0.84396E-28	-0.001	0.99912	29.08
SEX	-0.57703E-30	0.49617E-27	-0.001	0.99907	1.000
WGBFR	-0.75490E-32	0.66113E-29	-0.001	0.99909	854.6
JOBTYP	-0.70389E-30	0.61469E-27	-0.001	0.99909	0.5071
OTHINC	-0.60737E-31	0.52519E-28	-0.001	0.99908	0.4929
PENINC	0.10216E-31	0.89409E-29	0.001	0.99909	409.4

LIMDEP Estimation Results Run log line 33 Page 33
Current sample contains 279 observations.

Marginal Effects for MltLogit			
Variable	MEN	WOMEN	All Obs.
ONE	0.0000	0.0000	0.0000
AGENOW	0.0000	0.0000	0.0000
AGEPR	0.0000	0.0000	0.0000
SECEDUC	0.0000	0.0000	0.0000
TEREDUC	0.0000	0.0000	0.0000
FS	0.0000	0.0000	0.0000
HEALTH	0.0000	0.0000	0.0000
RETAGE	0.0000	0.0000	0.0000
SERVYR	0.0000	0.0000	0.0000
SEX	0.0000	0.0000	0.0000
WGBFR	0.0000	0.0000	0.0000
JOBTYP	0.0000	0.0000	0.0000
OTHINC	0.0000	0.0000	0.0000
PENINC	0.0000	0.0000	0.0000

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	269	3	272
1	1	6	7
TOTAL	270	9	279

LIMDEP Estimation Results   Run log line   35 Page 34
Current sample contains   279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are NONLABOR

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	0.14251E-19	0.12405E-16	0.001	0.99908	
AGENOW	0.23668E-21	0.20457E-18	0.001	0.99908	58.60
AGEPR	-0.24260E-20	0.20285E-17	-0.001	0.99905	0.7365
SECEDUC	-0.11506E-20	0.85599E-18	-0.001	0.99893	0.3108
TEREDUC	0.65582E-20	0.55918E-17	0.001	0.99906	0.3784
FS	0.80239E-21	0.69426E-18	0.001	0.99908	5.595
HEALTH	0.96350E-20	0.83631E-17	0.001	0.99908	0.7770
RETAGE	-0.50537E-21	0.44343E-18	-0.001	0.99909	52.91
SERVYR	-0.44980E-21	0.37561E-18	-0.001	0.99904	27.09
SEX	-0.27749E-20	0.24649E-17	-0.001	0.99910	0.4662
WGBFR	-0.36302E-22	0.31710E-19	-0.001	0.99909	625.7
JOBTYP	-0.33849E-20	0.30462E-17	-0.001	0.99911	0.0000
OTHINC	-0.29208E-21	0.30349E-18	-0.001	0.99923	0.4122
PENINC	0.49126E-22	0.42942E-19	0.001	0.99909	288.0

LIMDEP Estimation Results   Run log line   35   Page 35
Current sample contains   279 observations.

Partial derivatives of probabilities with
respect to the vector of characteristics.
They are computed at the means of the Xs.
Observations used for means are LABORIOU

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	0.14550E-28	0.12518E-25	0.001	0.99907	
AGENOW	0.24165E-30	0.20827E-27	0.001	0.99907	60.12
AGEPR	-0.24769E-29	0.21733E-26	-0.001	0.99909	0.7328
SECEDUC	-0.11747E-29	0.11613E-26	-0.001	0.99919	0.1756
TEREDUC	0.66960E-29	0.58160E-26	0.001	0.99908	0.6947
FS	0.81924E-30	0.70487E-27	0.001	0.99907	6.634
HEALTH	0.98374E-29	0.84538E-26	0.001	0.99907	0.8397
RETAGE	-0.51599E-30	0.44062E-27	-0.001	0.99907	54.18
SERVYR	-0.45925E-30	0.40452E-27	-0.001	0.99909	30.00
SEX	-0.28331E-29	0.23998E-26	-0.001	0.99906	0.5420
WGBFR	-0.37065E-31	0.31789E-28	-0.001	0.99907	873.7
JOBTYP	-0.34560E-29	0.28936E-26	-0.001	0.99905	1.000
OTHINC	-0.29821E-30	0.24762E-27	-0.001	0.99904	0.6031
PENINC	0.50158E-31	0.42993E-28	0.001	0.99907	431.8

LIMDEP Estimation Results Run log line 35 Page 36
Current sample contains 279 observations.

Marginal Effects for MltLogit

Variable	LABORIOU	NONLABOR	All Obs.
ONE	0.0000	0.0000	0.0000
AGENOW	0.0000	0.0000	0.0000
AGEPR	0.0000	0.0000	0.0000
SECEDUC	0.0000	0.0000	0.0000
TEREDUC	0.0000	0.0000	0.0000
FS	0.0000	0.0000	0.0000
HEALTH	0.0000	0.0000	0.0000
RETAGE	0.0000	0.0000	0.0000
SERVYR	0.0000	0.0000	0.0000
SEX	0.0000	0.0000	0.0000
WGBFR	0.0000	0.0000	0.0000
JOBTYP	0.0000	0.0000	0.0000
OTHINC	0.0000	0.0000	0.0000
PENINC	0.0000	0.0000	0.0000

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	269	3	272
1	1	6	7
TOTAL	270	9	279

LIMDEP Estimation Results   Run log line 37 Page 37
Current sample contains 279 observations.

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	WTP3
Number of observations	279
Iterations completed	6
Log likelihood function	-32.70855

Variable	Coefficient	Standard Error	z=b/s.e.	P[|Z|≥z]	Mean of X
Constant	-3.6595	0.38273	-9.562	0.00000	

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	272	0	272
1	7	0	7
TOTAL	279	0	279

Appendix 1

Questionnaire

Town ________________

1. Profession ________________
2. Sex ______________________
3. Why do you retire
    a. due to age
    b. due to health
    c. due to structural adjustment measures (mandatorily)
    d. if other specify_______________________________
4. Age at retirement______
5. Age now ________________
6. Health Condition
    a) Good
    b) Fair
    c) Poor
7. Is there any problem that arises due to your age_____________________
8. Now, are you willing to work, if you get any_______________________
9. For the following different age groups, please tell whether you are/were willing to work or not

	Yes	No
a) 56-60	___________	___________
b) 61-65	___________	___________
c) 66-70	___________	___________

10. What (in your opinion) is an appropriate retirement age ______________

____

why do you choose that age______________________________________

____

____

11. Your Family size (wife + husband + No of children + any other member who lives & eats together)______________________________

12. Number of years of service before retirement______________________

13. Type of last job (before you retire)____________________________

14. Pension income ____

15. Previous income (before retiring)______________________________

16. Educational level (in years)___________________________________

17. Are you now involved in any income generating activity______________

____

If yes :

- how much do you earn per month______________________

If no :

-What are you doing now ______________________

____

- Are you willing to work______________________________

____

18. Are any other member of the family involved in any income generating activity____

If yes:

For what purpose do they use the money

a. to support family expense

b. own use

c. for both a & b

d. If other specify__________________________

19. Apart from the above do you have any other source of income_________

____

If yes what____

20. Have you ever thought of your pension while you were at work?______

____

If yes in what sense do you thought about your pension______________

____

____

21. Did you make a saving while you were working

If Yes :

- on average how much (in percent) per month______________
- why did you make a saving____________________________

____

If no :

why not? ____

____

22. What is your opinion if retirement age is 60

____

____

____

23. As you might be aware, when you retire your income is reduced. What was your plan so as to deal with the reduced income and its effect on your consumption

a. Compensate it using previous saving and other sources so as to keep pre-retirement consumption level.

b. reduce consumption correspondingly

c. never thought of it

d. if other specify____________________________

24. Any comment you want to give about Social Security in Ethiopia_

____

____

Appendix 2

Rewriting the first four equations of section 3.1

$$\int_0^D C(t)\ e^{-rt}\,dt = \int_0^R W(t)\ e^{-rt}\,dt \qquad (1)$$

where r = the rate of interest

$$\int_0^D C(t)\ e^{-rt}\,dt = \int_0^{R'} W(t)\,(1-\theta)\ e^{-rt}\,dt + \int_{R'}^D B(t)\ e^{-rt}\,dt \qquad (2)$$

$$A_T + \int_T^R W(t)\,(1-\theta)\ e^{-r(t-T)}\,dt + \int_R^D B(t)\ e^{-r(t-T)}\,dt = \int_T^D C(t)\ e^{-r(t-T)}\,dt \qquad (3)$$

$$\int W(t)\,\theta\ e^{-rt}\,dt = \int B(t)\ e^{-rt}\,dt \qquad (4)$$

which will be referred to as the replacement effect.

Rewriting equation (3) gives :

$$A_T + \int W(t)\ e^{-r(t-T)}\,dt - \int W(t)\,\theta\ e^{-r(t-T)}\,dt + \int B(t)\ e^{-r(t-T)}\,dt = \int C(t)\ e^{-r(t-T)}\,dt \qquad (5)$$

Substituting (4) into (5) yields :

$$A_T + \int_T^R W(t)\, e^{-r(t-T)}\, dt - \int_T^R W(t)\, \theta\, e^{-r(t-T)}\, dt + \int_0^R W(t)\, \theta\, e^{-rt}\, dt$$

$$= \int_T^D C(t)\, e^{-r(t-T)}\, dt \qquad (6)$$

Decomposing the last term of the left hand side gives

$$\int_0^R W(t)\, \theta\, e^{-rt}\, dt = \int_0^T \theta W(t)\, e^{-r(T-t)}\, dt + \int_T^R \theta W(t)\, e^{-r(t-T)}\, dt \qquad (7)$$

Substituting (7) into (6) yields

$$A_T + \int_T^R W(t)\, e^{-r(t-T)}\, dt + \int_0^T \theta W(t)\, e^{-rt}\, dt = \int_T^D C(t)\, e^{-r(t-T)}\, dt$$

Rearranging gives :

$$A_T + \int_0^T \theta W(t)\, e^{r(T-t)}\, dt = \int_T^D C(t)\, e^{-r(t-T)}\, dt - \int_T^R W(t)\, e^{-r(T-t)}\, dt \qquad (8)$$

Since the right-hand side is independent of social security, private assets are offset Birr-for-Birr by accumulated social security taxes.

If the increase in consumption financed by the LWI_o was a constant C at every age, then:

$$\int_0^D \Delta C\, e^{-rt}\, dt = LWI_o \qquad (9)$$

Solving for ΔC from (6) implies

$$\int_0^D \Delta C\, e^{-rt}\, dt = \Delta C \int_0^D e^{-rt}\, dt \qquad (10)$$

since ΔC is constant

$$\text{But} : \int_0^D e^{-rt}\, dt = \frac{-\, e^{-rt}}{r} \Big| = \frac{-e^{-rD}}{r}\, dt + \frac{1}{r} = \frac{1-e^{-rD}}{r} \qquad (11)$$

substituting (11) into (10) yields

$$\Delta C \left[\frac{1-e^{-rD}}{r}\right] = LWI_o \qquad (12)$$

Solving (12) for ΔC yields

$$\Delta C = \left[\frac{r}{1-e^{-rD}}\right] LWI_o \qquad (13)$$

By age x the fraction of LWI_o consumed equals:

$$\int_0^x \frac{r}{1-e^{-rD}}\, e^{rt}\, dt = \frac{r}{1-e^{-rD}} \int_0^x e^{-rt}\, dt$$

$$= \frac{r}{1-e^{-rD}} \cdot \frac{1-e^{-rx}}{r}$$

$$= \frac{1-e^{-rx}}{1-e^{-rD}} \qquad (14)$$

i.e. when $X = D$ then he consumes all LWI_o .

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented in any university. All sources of materials for this thesis have been fully acknowledged.

Name : Melaku Don

Signiture :

Date : May, 1998

Place : Addis Ababa