Retirement Preparation of Older and Younger Baby Boomers

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The purpose of the study was to examine factors related to retirement preparation of older and younger cohorts of the baby boomers using a criterion of having investment assets greater than 25% of net worth. Using the 1989 Survey of Consumer Finances, logit analyses showed that being white and expecting a large inheritance were positively related to meeting the guideline for younger boomers. The older cohort of the baby boomers had increased likelihood of meeting the guideline if the household head was in good health, was male, and had pension coverage. For both cohorts, as age and education increased, it was more likely that households would meet the guideline for retirement preparation.

KEY WORDS: *retirement planning,investment, saving, Survey of Consumer Finance*

Introduction

Baby boomers, the 75 to 80 million Americans who were born between 1946 and 1964 and who make up about one-third of the U.S. population, are beginning to approach middle age (Congressional Budget Office, 1993). When the baby boomers begin to retire, the extremely large numbers of their cohort are expected to strain retirement, health care, and other social institutions. Opinions differ on whether the nation will be able to respond to their needs while providing for the needs of other groups (Kingston, 1992). The Congressional Budget Office (1993) expects that boomers will have higher real pre-retirement earnings than today's older people had in their working years if the assumption is made that real wage growth is positive in the next 20 to 40 years. Higher earnings should enable boomers to save more for retirement and pension benefits should be higher as a result of higher earnings. Further, increased participation by women in the labor force should provide both higher pensions and higher Social Security benefits for women. Some of the boomers expect to receive substantial inheritances. Economists have estimated that persons 50 and over in 1989 will leave their children $10.4 trillion, or an average bequest of $90,167, during the next half century (Whitestone, 1994, p. C1).

According to the Fifth Annual Merrill Lynch Retirement Planning Survey (1993), 15% of baby boomers are saving nothing at all while only 35% of the boomers say they are saving for retirement. The study developed a Retirement Index Savings rate based on age, sex, marital status, income level, and whether or not the individual was expecting a pension. The results indicated that the older baby boomers were saving at about one-third the rate they will need to retire at age 65 and maintain their standard of living. Further, 75% of baby boomers say they expect to have the same standard of living in retirement as they enjoy now, or higher. Boseman and Smith (1992) found that, on average, boomers plan to retire at age 59.

A survey by the Chartered Life Underwriters (CLU) and Chartered Financial Consultants (ChFC) in 1992 found that baby boomers put retirement planning last out of a list of five *current* concerns. When asked to rank the priority of *future* concerns, retirement planning was first; at the same time the CLU and ChFC study showed that baby boomers have little confidence that Social Security and Medicare benefits will be there when they need them (Stone, 1993).

Most research on the savings behavior of baby boomers implies that the boomers are a homogeneous group. This study suggests that the older and younger boomers

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may differ according to socioeconomic characteristics and the effects of events occurring as they matured. The life cycle hypothesis of savings suggests that individuals will dissave during the household formation stage and then will save a larger proportion of income as they approach retirement age (Hanna, Chang & Fan, in press). Age stratification theory (Hooyman & Kiyak, 1993) suggests that individuals are influenced by societal processes as they age. The purpose of this study is to assess the factors related to retirement preparation of older and younger boomers.

Background

Factors Affecting Preparation for Retirement

The Employee Benefit Research Institute (EBRI) suggests that retirement incomes of the baby boomer generation are likely to be higher than incomes of current elders when measured in dollars which are adjusted for inflation (Burkhauser & Salisbury, 1993). While EBRI suggests that the replacement rate which is the proportion of pre-retirement earnings replaced by Social Security is likely to fall in comparison to today's retirees, the Social Security Administration projects that purchasing power for retirees will stay the same or increase.

Benefit amounts and replacement ratios will decline, under current law, for those who retire before the age of eligibility for full benefits. For example, benefits for workers retiring in 2022 at the earliest allowable age (62) will be reduced from 80% of those available at the normal retirement age, as is the case today, to 70% (Congressional Budget Office, 1993). Social Security replaces larger proportions of income for earners with low salaries. Expected replacement rates for the baby boom cohort in retirement are 28% for high earners, 44% for average earners, and 56% for low earners (National Academy on Aging, 1994). This suggests that middle and upper income earners must provide more retirement income through their own pensions and private savings.

In addition to Social Security, private savings and pensions are the main components of retiree's incomes. According to Bovenberg (1990), personal savings declined in the 1980s. The personal savings rate was 6.2% of net national product from 1970 to 1979, from 1980-84, it declined to 5.3%, and from 1985-89, it was only 3.4% (Bovenberg, 1990, p. 10). At least two segments of the population were believed to impact this drop in savings: the baby boomers and the retirees. During the 1980s, increasing numbers of baby boomers reached the ages of 20 to 35, an age group in which individuals typically save less of their disposable income than older people who haven't yet retired. The boomers would not have reached peak earning levels and their expenditures on child rearing, durable goods, and interest payments on mortgages were typically higher than older people who were still working. However, the older boomers may be engaged in more saving behavior than the younger boomers. Boomers on the whole have delayed marriage and child bearing and thus may be involved in paying for children's college education at the time when their own parents were focusing on retirement savings. Retirees, in general, have relatively low savings rates.

Kingston (1992) observed that three trends in private pensions will impact the baby boomers' retirement incomes. First, private pension coverage has not increased substantially since 1975. Second, employers have moved away from defined benefit (DB) plans and into defined contribution (DC) plans. This change to DC plans tends to shift the investment risk from the employer to the employee. The decision to participate in DC plans could reduce retirement income for those with a low preference for savings such as low-wage and younger workers. The third trend, the right to a benefit under a private pension plan regardless of whether the earner stays with a firm until retirement age, favors the baby boomers. The right to a benefit of a private pension plan is known as vesting. However, while vesting has increased from 1977 to 1985, "the purchasing power of private pensions for those actually receiving them has essentially remained the same" (Kingston, 1992, p. 33). While the effect of increased vesting may favor the younger boomers, the advantage may be offset by the shift from DB plans to DC plans if fewer choose to participate voluntarily in DC plans, make less than the maximum contribution allowable, or make investment choices that are too conservative. Another concern about the increased use of DC plans is that they are not guaranteed by the federal government (Polacheck, 1994) while DB plans are insured through the Pension Benefit Guaranty Corporation (PBGC).

A fourth trend in pensions which has significance for the baby boomers is the growing availability and pre-

retirement "cash out" of lump sum distributions from pension plans (National Academy on Aging, 1994). The growth of 401(k) plans makes lump sum distributions and loans available to individuals who have not yet retired. The tendency for lump sums to be consumed rather than saved raises the possibility of substantial retirement income losses for boomers prior to retirement. A Gallup survey released in 1993 showed that nearly a third say they would use money in employer-sponsored retirement plans to pay for college, medical, and other emergencies (Ferguson, 1994). Further, the ability to use the money for purposes other than retirement affects participation and savings rates. More than 35% of those who said they may use the money in their plans for college, home buying or other pre-retirement purposes said they would stop or reduce contributions if they couldn't use this money for non-retirement purposes (Schultz, 1993).

Understanding the Baby Boomers

In addition to being differentiated by income, occupation, and education, the baby boomers may be differentiated according to their experiences as they move through the life course (Russell, 1993). Because they were born at different times in the generation, the boomers are often expected to differ in values and attitudes. By the early 1960s, the divorce rate exploded. That, coupled with increasing labor force participation rates for women changed the home life of many children. Older boomers could have been affected by the civil rights crises and the Vietnam War while younger boomers could have been affected by the Watergate scandal and Nixon's resignation.

In addition to the large size of their cohort, the baby boomers tend to perceive that they are different from other generations (Russell, 1993). The baby boomer families are more socially diverse than the previous generation, i.e., families are more likely to be headed by a single parent, more likely to experience a divorce when children are young, and are more likely to have two working parents. The boomers are much less cautious than their parents who experienced the Depression and World War II. On the whole, the baby boomers have been described as being more eager to take risks, willing to job-hop, and to search for instant gratification (Ferguson, 1994). Whether the socialization process of the boomers will affect their propensity to prepare for retirement is unknown. Socioeconomic factors about the boomers which can frequently be observed and recorded are the level of education, occupational status, marital status, health, and income.

Conceptual Framework

The purpose of this study was to examine factors related to retirement preparation of the baby boomers. Two theoretical frameworks guided the separation of baby boomers into older and younger cohorts. The life cycle hypothesis of savings (Ando & Modigliani, 1963) implies that young individuals will borrow against the future if they expect increases in future income and they have a preference for a steady stream of consumption. Dissaving is likely to occur during the early years of household formation. According to the hypothesis, individuals tend to save a greater proportion of income in the years approaching retirement.

A second theoretical framework is age stratification theory which "is less a formal theory than a conceptual framework for viewing societal processes and changes that affect aging" (Hooyman & Kiyak, 1993, p. 73). Using age as a primary criterion of allocation, government, business, and family-related institutions channel individuals into different statuses and roles. Because the baby boomers were born during a generation in which there were numerous changes in social trends and varying economic conditions and events, it is possible that those who were born earlier in the generation could be different from those born later in the generation. Consequently, the generation was divided into older and younger cohorts for data analysis. A similar technique of using older and younger boomers was used by the Congressional Budget Office (1993) to analyze the baby boomers' assets.

Empirical Model

Preparation for retirement was assessed through a financial ratio approach. A financial ratio can provide an easily remembered rule of thumb or guideline. For example, debt to income ratios are widely used to qualify home purchasers. Further, debt to income ratios are used to qualify individuals who initiate borrowing for other consumer purchases (Lytton, Garman & Porter, 1991). In contrast, the study by Merrill Lynch, Pierce, Fenner & Smith Inc. (1993, p. 5) used 18 values to analyze the Retirement Savings Index for older and younger boomers. The Index had a separate value for

each of three income levels calculated separately for each age cohort and for married couples, single men, and single women. While the Savings Index appears to be useful, this approach suggests that financial advisors will need to provide the essential information to each client and then continue to advise each client as their situation changes. It seems unlikely that people in general will learn and apply a complex approach to assess their financial status. A rule of thumb approach could be more useful.

The investment assets/net worth ratio reveals how well an individual or family is progressing toward financial goals other than home ownership because it compares the value of actual investment assets which have been accumulated to net worth. Investment assets are used to provide additional income or to increase net worth over time (Winger & Frasca, 1993). Net worth provides a comprehensive picture of how assets and debts have been apportioned and what kind of life style is being supported (Oliver & Shapiro, 1990). The investment assets/net worth ratio should increase as the family moves through the life cycle. A criterion of having invested assets equal to at least 25% of net worth is suggested as a general guideline (Lytton, Garman & Porter, 1991).

Based on previous research, age (Newman, Sherman & Higgins, 1982), education (Beck, 1984), and income (Turner, Bailey & Scott, 1994) are expected to have a positive relationship with financial preparation for retirement. Whites and those in professional or managerial occupations (Kilty & Behling, 1986; Richardson & Kilty, 1989) are expected to prepare more for retirement. It is expected that persons in poor health would have less financial preparation for retirement (Atchley, 1992). Household size is expected to have a negative relationship with retirement preparation (Turner et al, 1994). Married households are expected to have increased preparation for retirement (Szinovacz, 1987). Men are expected to be more involved with retirement preparation (Newman et al, 1982; Szinovacz, 1987).

Methodology

Data

Data were drawn from the 1989 Survey of Consumer Finances (SCF) which is sponsored by the Federal Reserve Board of Governors and collected by the Survey Research Center of the University of Michigan (Kennickell & Shack-Marquez, 1992). The public use tape contained detailed information about the assets and liabilities of 3,143 households. About 75% of the households were randomly selected from the population of the United States. The remaining households were selected from tax data to insure that the sample included a sufficient number of wealthy households. This over-sampling of the wealthy households skews the data as a whole. The data were weighted to control bias caused by the number of high income households and to provide more accurate information about the representation of the U.S. population in the observed sample.

A method known as multiple imputation was used to replace missing values in the data with a set of values which represent a distribution of possibilities for that missing value (Rubin, 1987). The use of a single value does not take into account the variability due to the unknown missing values. In the SCF, each missing value was replaced with five imputed values in order to represent the uncertainty about which values to impute. This resulted in five data sets. Only the first data set was used in the logistic regression.

Dependent Variable

The dependent variable was related to the ratio of invested assets to net worth. The value of the ratio for each household was compared to the criterion of holding invested assets which were at least 25% of net worth. The variable was coded as one if the household met the criterion and coded as a zero, if otherwise. Because division by zero is not possible, households with zero net worth were given a value of 1 for net worth. If net worth was negative, the ratio value was zero.

Invested Assets consisted of stocks, bonds, pension plan assets, certificates of deposit, mutual funds, cash value of life insurance, loans owed to the household, art work, antiques, tax-deferred savings plans, other real estate but not the home, and net business assets.

Net Worth was the sum of liquid assets, investment assets, and property assets minus consumer debt and property debt. Property assets consisted of the value of the home and vehicles, land and other property net of property debt. Consumer debt included credit card debt, amounts owed on line of credit loans, home

improvement debt, amounts borrowed from life insurance, and other consumer debt. Because division by zero is not possible, households with zero net worth were given a value of 1 for net worth. If net worth was negative, the ratio value was zero.

Independent Variables

The independent variables in the model act as predictors of the dichotomous dependent variable. Income, education, age, and household size were coded as continuous variables. Income was the total pre-tax income received by the household. Education was the highest year of education attained by the head of the household. Race was coded as white or non-white. Health was self-reported and was coded as good or otherwise. Sex was coded according to the sex reported for the head of household. Occupation was coded as professional (or managerial) or all other occupations. Marital status was coded as married or other which included single, divorced, separated, and widowed. The variable for inheritance was coded as 1 if the respondent expected to inherit a large sum of money, if otherwise, 0. Home ownership was coded as 1 if the home was owned or zero, if otherwise. If the head of household was covered by a pension, the variable for pension was coded as 1. There were two interaction variables to test for the effects of age and income and age and education. The independent variables are presented in Table 1.

Table 1
Independent Variables

Income	Continuous	
Education	Continuous	
Age	Continuous	
Household size	Continuous	
Race	1 = White,	0 = other
Health	1 = Good,	0 = other
Gender of household head	1 = Male,	0 = female
Professional and/or managerial	1 = Yes,	0 = no
Married	1 = Yes,	0 = no
Expect to inherit large amount	1 = Yes,	0 = no
Home ownership	1 = Yes,	0 = no
Pension coverage	1 = Yes,	0 = no
Age*income		
Age*education		

Analysis

The value of the ratio for each household was compared to the criterion for the ratio. A positive relationship between the criterion and an independent variable would mean that there was increased likelihood in the odds of the household meeting the criterion if the variable was positive and significant, all else equal. A logit estimation procedure was used to examine the factors associated with a household's propensity to meet the criterion. When estimated, the logit equation predicts the natural logarithm of the odds ratio of the probability an event occurs given the level at which the independent variables were set.[a]

The regression coefficients are interpreted as the change in the odds ratio, i.e., the ratio between the odds of one event occurring versus the other event occurring. Goodness of fit for a qualitative dependent variable is measured with a pseudo R^2 (Maddala, 1992, p. 334). The percentage of concordant pairs is reported in each logistic regression as another measure of goodness of fit. The concordant probability measurement indicates that proportion of unmatched pairs in the sample which are correctly discriminated by the model (SAS Institute Inc., 1989, p. 1090).

Findings

Characteristics of the Sample

There were 409 households in the younger baby boomer cohort (ages 24-33) and 621 households in the older cohort (ages 34-42). Average income was $40,609 for older boomers and $26,486 for younger boomers. The average for the highest level of education achieved was 13.4 years for older boomers and 12.9 years for younger boomers. To test if the cohorts differed according to education, income, and household size, a covariance matrix was used to combine the five data sets. Then the computed averages were compared using a t-test. The results of the t-tests showed that highest level of education attained was significantly different between younger and older cohorts ($t = 4.24$, $p < .001$). Household size was significantly different between the two cohorts ($t = 4.60$, $p < .001$). Income was significantly different between older and younger cohorts ($t = 2.28$, $p < .05$). The descriptive statistics are presented in Table 2.

It was not possible to test for differences between older and younger cohorts for the categorical variables. Instead, the values in the five data sets were treated as data points and a mean was calculated. Obviously, the combined analyses of the categorical variables does not

provide a test of statistically significant differences comparable to the t-test provided for the continuous variables. The computed mean of each categorical variable is shown in Table 2. To further illustrate the approximate frequencies for the categorical variables, the proportion of the sample for each variable is shown in Table 2 but only for the first data set.

Younger boomers were less likely to be white than were older boomers (69.3 and 75.4%, respectively). There was little difference in sex of head between the cohorts. In each cohort about 77% of the households were male-headed. One-third (32.0%) of the older boomers were in professional or managerial occupations while only 21.1% of younger boomers were in this category. Older boomers were more likely to be married than the younger boomers, 66.9% compared to 58.9%, respectively. About 8% of each cohort expected to receive a large sum of money as an inheritance.

Table 2
Characteristics of the Sample

	Younger Boomers n = 409 Mean[a]	Older Boomers n = 621 Mean[a]
Age in years (mean)	28.7	37.9
Age in years (median)	29.0	38.0
Education in years (mean)	12.9	13.4***
Education in years (median)	13.0	14.0
Household size (mean)	3.1	3.4***
Household size (median)	3.0	4.0
Income (mean)	26,486	40,609*
Income (median)	24,000	41,000

	Mean[a]	%[b]	Mean[a]	%[b]
White	0.74	69.3	0.79	75.4
Health, good	0.90	89.9	0.90	87.0
Male-headed	0.80	76.9	0.82	78.3
Professional	2.55	21.1	2.26	32.0
Married	0.64	58.9	0.73	66.9
Expect to inherit	0.10	7.7	0.09	8.0

* p < .05 ** p < .01 *** p < .001

[a]The mean represents the "average" of all five data sets.
[b]The percentage represents the proportion meeting that characteristic for the first data set.

Logistic Regression Results

The logistic regression analysis was performed using the statistical package SAS (SAS Institute Inc., 1989). Variables affecting retirement preparation of the younger and older baby boomer cohorts were analyzed separately. The dependent variable, preparation for retirement, was indicated by meeting the criterion of having investment assets greater than 25% of net worth. The proportion meeting the guideline was 42.5 and 55.4% for younger and older cohorts, respectively. The proportion of concordant pairs in each regression was 73.4% and 75.9% for younger and older cohorts, respectively. The results are shown in Table 3.

Table 3
Logistic Regression of Likelihood of Investment Assets > .25 of Net Worth

	Younger Boomers		Older Boomers	
Variable	Estimate	p-value	Estimate	p-value
Intercept	10.4066	0.133	8.2194	0.266
Income	-0.00001	0.799	0.0001	0.075
Education	-1.0392	0.045*	-1.1105	0.042*
Age	-0.4525	0.056	-0.3059	0.113
Household size	-0.0444	0.619	-0.0054	0.938
White	0.7438	0.007**	0.3909	0.096
Health	0.0321	0.938	1.0089	0.003**
Male-headed	0.4342	0.238	0.8875	0.011*
Prof/mgr	-0.0319	0.661	-0.0426	0.527
Married	-0.3964	0.242	-0.1663	0.631
Inheritance	1.1365	0.004**	0.8253	0.065
Home ownership	-0.6587	0.024*	-0.9719	0.001***
Pension coverage	0.2834	0.252	0.6790	0.001***
Age*income	6.21E-7	0.688	1.967E-6	0.153
Age*education	0.0398	0.028*	0.0308	0.030*

* p < .05. ** p < .01. *** p < .001.

In general, different factors appeared to predict the likelihood of retirement preparation of the younger and older baby boomer cohorts. Households in the younger cohort were more likely to meet the criterion if the household head was white and if there was an expectation of receiving a large inheritance. For the older cohort, the household was more likely to meet the criterion if the household was male-headed, if the head was in good health, and if the household head was covered by a pension. Variables which had similar effects for each cohort were education and home ownership status.

The effect of race for the younger cohort was consistent with previous research which shows that white households tend to hold more invested assets than non-white households (Kennickell & Starr-McCluer, 1994). The younger cohort is more racially diverse than the older cohort. The literature suggests that younger non-

white households are less likely to be headed by a male earner than before. This trend suggests that non-white households are less likely to be financially prepared for retirement.

The effect of the inheritance variable is consistent with the prediction reported earlier. The fact that it was not significant for the older cohort suggests several possibilities. Perhaps older boomers have already received an inheritance which has increased their net worth. Alternatively, as a result of parents' increased longevity or parents' need for long term care, older boomers may realize that there is less likelihood of receiving an inheritance.

The was little difference in the proportion of households in each cohort that were male-headed, yet the variable was significant for the older cohort. This could be explained by males receiving higher incomes because of more continuous participation in the labor force. In general, male-headed households have higher incomes and more assets, especially pension assets, than female-headed households (Polacheck, 1994). The effect of the variable for pension coverage for the older cohort implies that having a pension plan is a robust indicator of retirement preparation.

It may be necessary to examine the home ownership variable in more detail. The result suggests that household heads who rent have a large proportion of their net worth in invested assets. Although this is logical, the idea that renters are more prepared for retirement is counter-intuitive since a norm of most households is to own a home before retirement. Perhaps renters and homeowners should be examined separately to determine what factors predict their retirement preparation.

The effect of education was similar for both younger and older cohorts. The combined effect of the education variable and the interaction of age and education suggested that as education increased, the likelihood of meeting the guideline for retirement preparation increased. This is consistent with previous research. However, the effect of education decreased with age, and was somewhat lower for the older boomers than for the younger boomers.

In summary, the results support the age stratification theory which suggested that there might be differences between younger and older baby boomer cohorts. It could be argued, however, that these differences are life cycle effects given the importance of education, pension coverage, and health. As younger boomers age, they may experience gains in education and pension coverage but, for some, health may deteriorate. Renters may become homeowners and, initially, experience a decrease in the value of investment assets relative to net worth followed by an increase in the ratio value. Also younger households may dissave as they accumulate needed durable goods and older households tend to save more as they approach retirement.

Limitations and Implications

Although differences between cohorts support age stratification theory, it may be necessary to include variables which represent values and attitudes to test the theory. Age stratification provides a conceptual basis but attempting to measure differences in cohorts without attitudinal variables may provide results which can only be described as tentative.

A measure of the amount saved on an annual basis would be more appropriate than a comparison of invested assets to net worth. However, data tend to be collected in balance sheet format (at one point in time) instead of cash flow format (annual record of inflows and outflows). Without a measure of cash flow, it is not possible to determine annual savings. The advantage of balance sheet information is the inclusion of assets and liabilities which are usually not collected in surveys. Having a broad collection of assets and liabilities makes it possible to analyze the proportion which is invested relative to overall assets and liabilities, e.g., net worth.

Implications for Further Research

Changes in retirement preparation by the baby boomer cohorts could be shown through the use of panel data. Members of the younger cohort may complete additional years of education becoming as well-educated as the members of the older cohort. Subsequently, the proportion of the younger cohort who are in the professional and managerial occupations could increase. However, the younger cohort may be experiencing the crowding of the older cohort and education and professional/managerial status equivalent to the older cohort may not be attained.

The effect of changes in marital status on investment assets and net worth could be examined using panel data. Boseman and Smith (1992) speculate that baby boomers who divorced and remarried may have two or more separate families with children from each marriage. Whether these families would be able to prepare adequately for retirement provides an interesting question to examine.

Female members of the baby boomer generation are believed to be better educated and to have more consistent labor force participation than earlier generations (Polacheck, 1994). It would be interesting to analyze whether female boomers have experienced the expected gains in income and longevity which would help make them better prepared for retirement.

As shown by the inheritance variable for the younger cohort, the expectation of an inheritance seems to be associated with retirement preparation. It will be interesting to observe whether older households will continue to accumulate increased wealth and will be able to provide large bequests to their boomer children as is currently expected.

Implications for Practitioners and Educators

If the trend toward employers' use of defined contribution plans instead of defined benefit plans continues as expected, the need to educate earners to select investments wisely becomes even more important. The need to offer educational programs on retirement planning within the work setting seems essential. Financial advisors should recommend that investment assets provide both a cushion for emergencies and a source of future income. Home ownership is a goal of most households and is usually viewed as a means of saving. Financial counselors may be able to help families improve the management of their spending and thus enable them to invest in both a home and other financial assets.

The study suggests that those who are less likely to be accumulating investment assets are younger, minorities, in poor health, employed in blue collar occupations, and those with less education. Some members of these groups are likely to need job training to provide them with skills for more lucrative employment. They may also need income assistance on a permanent basis. Some may be receiving government provided health care while others may be unable to qualify for needed health care. Funding for educational programs, job training, and health care may be necessary to enable these persons to earn an adequate living and be able to save.

Endnotes

a. *The equation is stated as follows (Maddala, 1983):*

$$log\ (P/1\text{-}P)) = \beta_0 + \beta_1 X_1 \ . \ . \ . \ \beta_k X_k \qquad (1)$$

where P = the probability that the dependent variable = 1, (1-P) = the probability that the dependent variable = 0, k = the number of independent variables in the model.

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