AN ANALYSIS OF RETIREMENT EXPECTATIONS AND REALIZATIONS: EVIDENCE FROM THE US HEALTH AND RETIREMENT SURVEY

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1. Introduction

The decision on when to retire is one of the most important individual decisions over the life-cycle. After retirement, individuals rely on previously accumulated wealth and have a very low degree of flexibility to buffer unexpected events. Therefore we should expect agents planning in advance and rationally about retirement. This is consistent with the prescriptions of modern economics that generally assumes that agents are forward looking and rational, in the sense that they use all available information to make forecasts about the future.

The empirical content of this premise is controversial: life cycle theory has been widely used to study consumption and saving behavior, with mixed conclusions on whether agents really follow the theoretical model. Whether agents are or not reasonably forward looking is of the utmost importance for policy reasons: the current debate on reducing public pension expenditure in several countries moves from the belief that the State should give to its citizens more "freedom to choose". This comes from the idea that individuals are becoming more responsible and able in planning their financial needs; at the same time the paternalistic view of the welfare state is loosing support.

On the other hand, the widely observed reduction in the average retirement age has been related to the increase in the generosity of public pension programs (Gruber and Wise, 1999). It is very important to understand the degree of causality between the two phenomena if any sensible policy measure to reduce the trend toward early retirement is to be

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taken. Several papers do in fact correlate actual behavior with social security incentives. Recent papers on this topic are Gustman and Steinmeier (1986); Stock and Wise (1990); Rust and Phelan (1998). The results usually point to a significant correlation, but modest in light of the time trends in retirement behavior. Moreover actual retirement depends on many factors (health, employment changes, social security incentives) and it is therefore difficult to map the outcome (actual retirement age) to the determinants of the outcome.

This paper tries to gain some understanding of retirement plans from US data on retirement age expectations. The expectation is the solution of the individual maximization problem and therefore revealing of individual preferences. The paper makes use of the 1992 and 1994 waves of the Health and Retirement Survey (HRS), which collected extensive data on 12,652 individual respondents in the 51-61 age range. In particular the HRS asks about expected retirement age and collects a wide range of information on individual characteristics, family composition, employment, income and wealth measures. It also includes information on individual social security contribution history.

The use of two waves of the HRS makes possible to match expectations of retirement age, collected in the first wave, with subsequent behavior, observed in the second wave. I will compare expectations both with realizations (for people who actually retire between the two waves) and revised expectations (for people who do not retire between the two waves). Also, I will restrict the attention to primary earners expectations, since previous work has shown that retirement expectations of secondary earners are more "noisy".

Previous studies that compare retirement expectations with realizations are Bernheim (1989) and Disney and Tanner (1998). These studies have found that reported retirement expectations are not random and are correlated with the factors that eventually affect the actual retirement behavior. Both have tested the "rational" expectations hypothesis, based on which individuals use all the available and relevant information to forecast their retirement age. Bernheim's paper in particular makes the point that individuals, when asked about expected retirement age, will have to condense in a single number an underlying probability distribution over a number of different expected retirement ages; therefore, there is no reason to assume that individuals will make a prediction that corresponds to a mathematical expectation. In fact, Bernheim argues that respondents tend to report their most likely, rather their expected

retirement age (modes rather than means). If this is the case, it is not surprising that the distribution of actual outcomes is substantially different from the distribution of expectations. This implies that the comparison of expectations and realizations only may not be very informative.

This paper improves with respect to the previous literature in several ways. First, it compares 1992 expectations over retirement age both with realizations (for people actually retiring in the period 1992-1994) and with new expectations reported in the 1994 wave. In the latter case I do compare two homogeneous figures and avoid possible biases. Second, the HRS asks individuals to indicate the chances that they will be working at age 62 and 65. I therefore repeat the exercise using these questions. Third, I correlate the revision in expectations with a wide range of "shocks": on the basis of the rational expectations hypothesis, the revision in expectations should not be correlated with the original information set, but it should depend on "news" or "shocks" occurred between the two waves. In particular, the shocks include health variations, employment changes, changes in family composition, and an array of wealth shocks. The response of expected retirement age to shocks to wealth will also provide a test for the life cycle theory.

As far as wealth shocks are concerned, it must be noted that the HRS has made a particular effort in collecting an extensive amount of wealth data and in reducing underreporting biases (Smith, 1995; Moon and Juster, 1995).

Finally, in previous researches the comparisons of expectations and outcomes has suffered from the fact that common macro-shocks, occurred after the formation of expectations, have altered the distribution of actual retirement ages. The period 1992-94 in the USA should not suffer from such bias.

2. Framework and methodology

In this section I will briefly discuss how the choice of when to retire fits in the life-cycle framework, and how forward looking agents should adjust the retirement age to changes in their conditions.

Let us consider an agent whose utility is defined over consumption and leisure at retirement. In particular, assume agents' utility is given by $u(c_t)=\gamma \ln c_t$ during the working years, and by $u(c_t)=\gamma \ln c_t+\beta$ during the retirement years. Agents lifetime maximization problem is given by:

$$MAX \quad U_n = \int_n^R \gamma \ln c_t \cdot e^{-\rho(t-n)} dt + \int_R^T (\gamma \ln c_t + \beta) \cdot e^{-\rho(t-n)} dt \qquad (1)$$

$$subject\ to \quad \dot{a}_t = r \cdot a_t + z - c_t, \quad t \geq n$$

where n is the current year, R is the retirement year, T is the known year of death, ρ is the subjective discount rate, a is the stock of financial wealth, r is equal to 1 plus interest rate and $z=(1-\tau)w$ (net of tax earnings) if $t \leq R$, and $z=y$ (pension benefits) if $t>R$. Holding the retirement age as exogenous, the first-order optimality condition for consumption allocation, assuming r and w constant over time, implies that:

$$c_t = c_n \cdot e^{(r-\rho)\cdot(t-n)} \qquad for\ t \geq n \qquad (2)$$

where:

$$c_n = \left[\frac{\rho}{1 - e^{-\rho(T-n)}} \right] \cdot (a_n + h_n) \qquad \text{and}$$

$$h_n = \int_n^R (1-\tau_t) w_t \cdot e^{-r(t-n)} dt + \int_R^T y_t \cdot e^{-r(t-n)} dt \qquad (3)$$

That is, consumption at time n, is a linear function of wealth (equal to the sum of financial wealth a_n and human wealth h_n); the linear term depends on the subjective discount rate ρ, and the residual life span (T - n).

Substituting equation (2) into (1) yields the lifetime utility function at n:

$$U_n = \int_n^R \left[\gamma \ln \left(c_n \cdot e^{(r-\rho)\cdot(t-n)} \right) \right] \cdot e^{-\rho(t-n)} dt + \int_R^T \left[\gamma \ln \left(c_n \cdot e^{(r-\rho)\cdot(t-n)} \right) + \beta \right] \cdot e^{-\rho(t-n)} dt \qquad (4)$$

Solving equation (4) and taking the first order condition with respect to the retirement age yields:

$$ACCRUAL \cdot e^{-r(R-n)} = \left(\frac{\beta}{\gamma}\right) c_n \cdot e^{-\rho(R-n)} = \left(\frac{\beta}{\gamma}\right) \cdot \left\{\left[\frac{\rho}{1-e^{-\rho(T-n)}}\right](a_n + h_n)\right\} \cdot e^{-\rho(R-n)} \tag{5}$$

Equation (5) shows that the optimal retirement age occurs when the marginal benefit (left-hand-side) and the marginal cost (right-hand-side) of postponing retirement are equal. The marginal value is given by the increase in the individual's lifetime income made possible by working one more period of time (the ACCRUAL): this is defined as the net earnings of the additional period of work, plus the increase in discounted value of future retirement benefits, minus current period pension benefits (not received). The marginal cost of postponing retirement is given by the utility loss from the foregone leisure, and it increases with consumption at retirement, c_n.

The framework presented above is rather simple. Recent literature, in particular Stock and Wise (1990), show that it is not simply the accrual at a certain age that determines retirement, but the entire future evolution of retirement wealth. Stock and Wise develop a structural model that incorporates the "option value" of continued work, that is the value of delaying retirement to the date when the expected present value of utility is maximized. In a recent empirical work, Coile and Gruber (1999) build on this idea and show that a significant variable in explaining retirement behavior is the "peak value". The "peak value" calculates the difference between social security wealth at its maximum expected value, and the social security wealth at today's value, and it is a measure of the incentive to continue to work. From their analysis, which uses the Health and Retirement Survey, Coile and Gruber conclude that "retirement appears to respond much more to Social Security incentive variables defined with reference to the peak future year of retirement wealth, as opposed to either the level of retirement wealth or the accrual in retirement wealth over the next year alone, indicating that forward looking measures of this type are important variables to include in retirement models."

The goal of this paper is not to evaluate the incentive effects on retirement choices of the social security system. Therefore, even if I do include proxies of the social security and pension incentives (as eligibility dummies, type of pension plan dummies, number of quarters of covered

earnings and labor earnings), I do not compute the "option value" or the "peak value".

The focus of the paper is twofold. First, I test whether agents are able to make rational retirement plans, in the sense that they use all relevant and available information, so that: i) expectations should be correlated with the same determinants of actual retirement choices, and ii) there should not be systematic errors between expectations and realizations. This is a relevant issue for policy: groups of the population may decide upon their consumption and saving choices on the basis of systematically wrong expectations of their retirement age.

Second, I test whether agents make retirement plans according to the life cycle theory. According to equation (5) above, people with higher than average wealth (a_n+h_n), everything else equal, should plan to retire earlier than average. This is because these people have already a relatively high level of consumption. Therefore, they gain little in terms of utility from the additional consumption made possible by the postponement of retirement age, while missing the benefits of leisure. Also, I look at whether people adjust their retirement age after shocks that permanently change their accumulated level of wealth. In so doing, I can disregard the social security incentives, which are neither affected by the shocks nor should change over the time horizon of the analysis.

The main conclusions are:

1) The data are consistent with the original Bernheim's finding that reported expected retirement age represents the mode rather than the mean of the expected retirement age distribution.

2) If they do at all, agents seem to make reasonable plans on their retirement age. Plans are reasonable in the sense that expected retirement age is correlated with those variable that are known to determine actual retirement behavior.

3) Other things equal, wealth is negatively correlated with expected retirement age. Even though wealth is endogenous, this finding is consistent with the life-cycle theory.

4) Plan revisions provide some support for the rational expectations hypothesis. However, respondents seem not to adjust their retirement plans to shocks to their wealth.

I will discuss the data that I use in section 3, and look at the quality of retirement expectation data in section 4. I will report the detail of the tests in section 5 and conclude in section 6.

3. Data

The data used in this study are drawn from the 1992 and 1994 waves of the Health and Retirement Survey (HRS), which collected extensive data on 12,652 individual respondents. More specifically, the HRS sampled 5,000 married couples in which both spouses responded, 200 married couples in which one of the two respondents refused to answer, and 2,452 single individuals. Since a primary purpose of the HRS is to collect data on transitions into retirement, respondents are, on average, older than the general population. Indeed, the sample is representative of individuals in the 51-61 age range.

The survey provides information on health, income, wealth, pensions, social security benefits, demographics, education, housing, food consumption, family structure and transfers, current and past employment, retirement plans, cognition, health and life insurance, inter vivos gifts, inheritances, and bequests.[1] In the following I provide a description of the retirement age variable used in the analysis, discuss the issues of sample selection and attrition, and provide summary statistics of the data set.

3.1. The retirement age

The HRS asks respondents to indicate their intended ages of retirement: the variable "expected retirement age" is constructed for both years (1992 and 1994 waves) using the question "When do you think you will retire (partly/completely)?". Therefore, the expected retirement age represents the subjective expectation of the date when the respondent will retire. Not all individuals answer they want to retire. Some say they never want to stop working or that they do not know when they will stop working.

The definition of retirement that I use is therefore purely subjective: each respondent might have a different definition of retirement in mind. On the other hand, unless they change it over time, this definition should be the same also when the same question is asked at a later date. Even for

[1] Mitchell and Moore (1997a and 1997b) provide excellent descriptions of the HRS, in general, and the wealth accumulation of the HRS sample in particular.

people actually retiring between the two interviews, I assign their retirement year based on the question "When did you retire"?, therefore using the subjective definition. In the current framework, where I compare individual expectations with both realizations and expectations at a later date, it is not necessary to use an objective measure of retirement, such as the point of permanent departure from employment.

3.2. *Sample Selection*

In this paper, I focus on primary earners who were employed at the time of the first interview. For these individuals I need to have a wide range of information, among which social security covered earning records, lifetime family wealth, spouse's earnings. Therefore, I excluded observations if any of the following statements were true: a) Social Security earnings records were not available for at least one spouse; d) one spouse refused to be interviewed; e) at least one spouse was unemployed. The first criterion (availability of administrative records for both spouses) accounted for the vast majority (nearly 80 percent) of excluded observations. The remaining are due mainly to the fact that I look only at those respondents who have not yet retired by the first wave, and who respond to the question on expected age of retirement age. The final sample used in the analysis consists of 1,312 head of household and 622 singles.

The only possible source of bias comes from the fact that the HRS does not ask the expected age of retirement to individuals unemployed at the time of the second wave.[2] Therefore the rate of attrition in the expected retirement age measure is not random, since the probability of becoming unemployed is not equal across groups. However, only 46 primary earners (or singles) employed in 1991 become unemployed before 1994 and did not retire, a limited number compared to the sample size (1,934 households).

3.3. *Summary Statistics*

Table 1 provides some descriptive statistics for the 1992 sample. The top half of the table provides information on the household, while the lower half of the table provides information separately on husbands, wives, primary earners, and secondary earners. Notice that the typical individual

[2] This implies that, when confronting expectations at different dates, the underlying sample does not include respondents unemployed at either dates.

in the sample is in his or her mid-50s. Consequently, these households have relatively few dependent children (roughly one for every four households). The median value of non-housing net wealth is $36,500, but the wealth distribution is highly skewed, so that the mean is more than four times as large (near $160,000). Approximately 90 percent of these couples own their own homes, and the typical home value is in the neighborhood of $100,000. Median and mean household non-asset incomes are $47,500 and $62,500, respectively. Roughly 82 percent of the sample is white. More than one quarter of husbands and just under one fifth of wives are college educated. A total of 42 percent of husbands and 33 percent of wives are covered by private pension plans. On average, husbands account for roughly three-quarters of a household's non-asset income, but wives are primary earners in about one fifth of households.

Table 1a. Descriptive statistics: Household level variables

	Mean	Median
Non-housing net wealth	158,500	36,500
Primary home ownership	0.899	1
Primary home value	100,000	80,000
Household non-asset income	62,500	47,500
Number of children	0.236	0

Table 1b. Descriptive statistics: Individual level variables

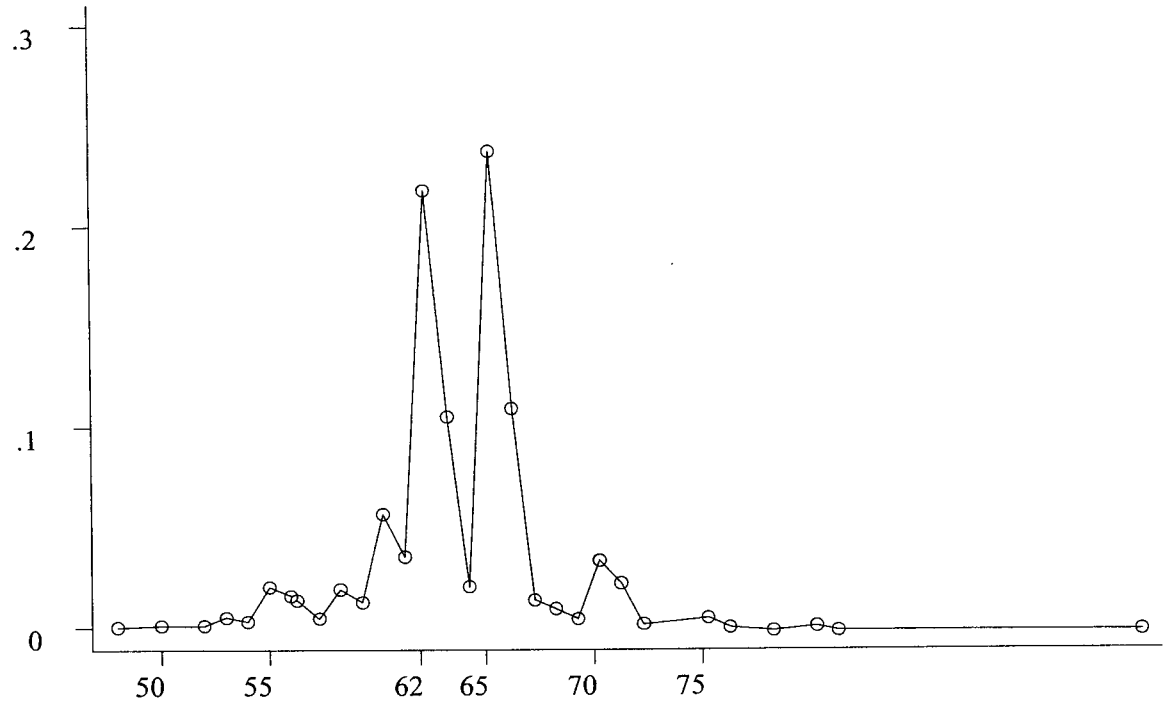
	Husband		Wife		Primary earner		Secondary earner	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Age	58	57	54	54	57	57	54	55
Non white	0.176	0	0.172	0	0.176	0	0.172	0
Sex	0	0	1	1	0.183	0	0.817	1
College degree	0.26	0	0.191	0	0.268	0	0.184	0
Pension coverage	0.423	0	0.328	0	0.472	0	0.28	0
Non-asset income	45,500	33,000	16,500	10,500	50,000	35,000	12,500	9,000

4. Analysis of retirement expectations

4.1. Descriptive statistics

In this section I will present some descriptive statistics and a regression analysis of retirement age expectations. First, Figure 1 shows that retirement expectations (in 1992) have the well known peaks of actual retirement at age 62 and 65. Figure 2a shows that the distribution of actual retirement ages is more skewed toward earlier ages than the distribution of expected retirement ages. Figure 2a is affected by the fact that, in the period 1992-94, we observe only part of our initial sample retiring. It is therefore not surprising that, among the ones who retire from 1992 to 1994, we observe those respondents who retire earlier than average. Therefore, Figure 2b shows the distributions of actual retirement ages and of expected retirement ages only for those respondents who actually retired in the period 1992-94. It is somehow unexpected that the skew is still so evident.

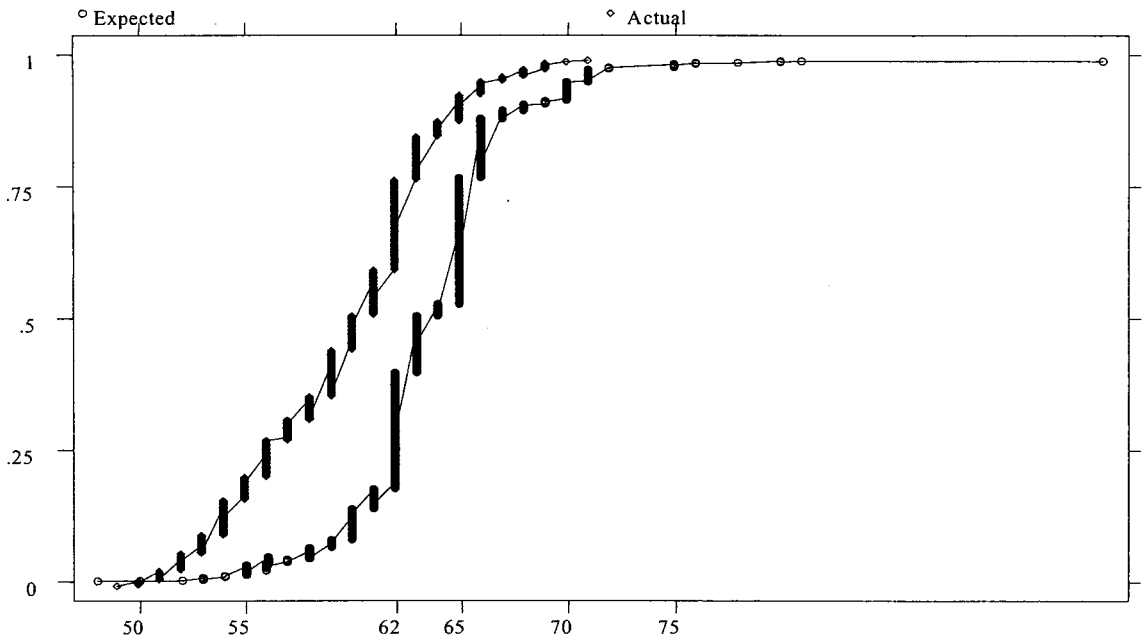
Figure 1..Distribution of expected retirement ages



Distribution of expected retirement ages

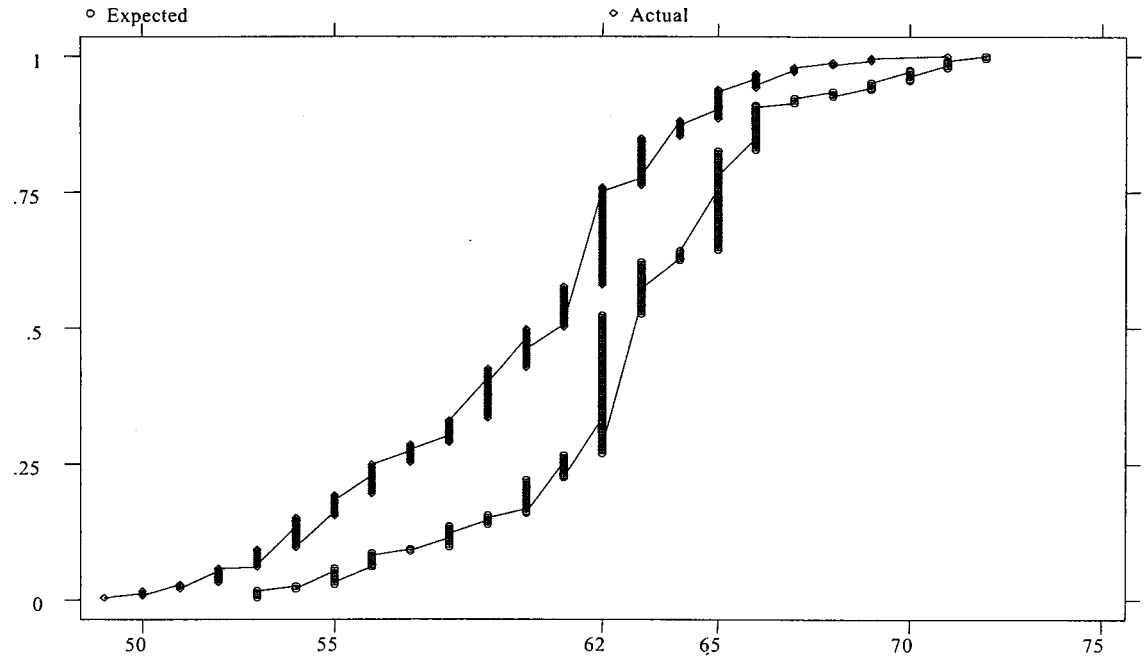
Using a longer sample, Bernheim (1989) has argued that the differences between the overall distribution of realizations and expectations may simply reflect the fact that individuals report mode rather than means. When asked about expected retirement age, agents will have to condense in a single number an underlying probability distribution over a number of different expected retirement ages; therefore, there is no reason to assume that individuals will make a prediction that corresponds to a mathematical expectation. Figure 3 reports the plot of actual retirement age grouping retirees by expected retirement age. It shows that there is evidence that expected retirement age represents a measure of central tendency. It shows also that for low expected retirement ages the conditional distribution is skewed to the right; while for high expected retirement ages the conditional distribution is skewed to the left. This is consistent with the hypothesis that expectations represent the mode of the distribution (Bernheim, 1989). The analysis here reported however suffers from the limited amount of observations of actual retirement between 92 and 94 in the sample (245).

Figure 2a. Cumulative distribution off actual and expected retirement ages



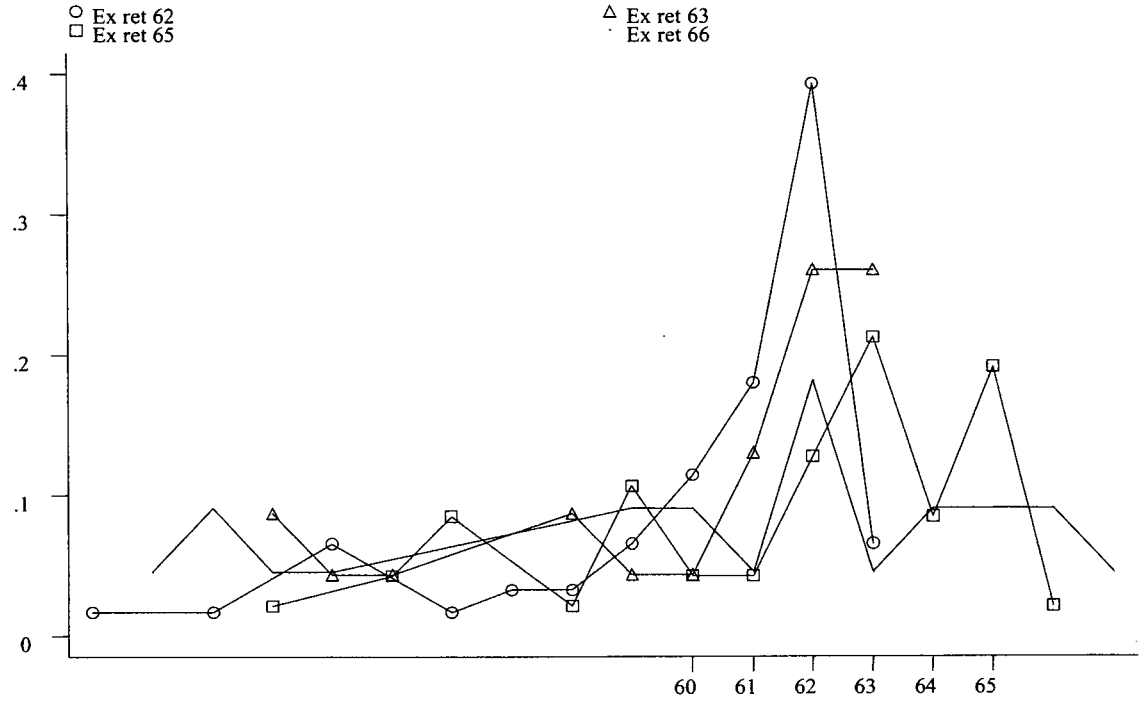
Cumulative distribution of actual and expected retirement ages

Figure 2b. Cumulative distribution of actual and expected retirement age



Cumulative distribution of actual and expected retirement ages

Figure 3. Distribution of actual retirement ageby expected retirement age



4.2. *Regression analysis*

In order to see whether expected retirement ages are correlated with the determinants of actual behavior at the individual level, I regress expectations on a set of variables which include individual characteristics, incentives of the Social Security systems and of the pension schemes, proxies for the preferences for leisure, and measures of the accumulated and retirement wealth[3]. In particular the set of dependent variables is listed below.

Individual characteristics

age = current age
life expectancy = expected subjective residual life span

[3] Retirement wealth, both Social Security and pension wealth, are computed conditional on the expected retirement age reported by the individual and discounted to 1992 with a 3% real interest rate. Respondents subjective life expectancies, used in the calculation of both Social Security and pension wealth, are computed from interpolation of respondents' reported probability of surviving at age 75 and 85. To compute Social Security wealth I use the covered earnings for the HRS sample provided by the US Social Security administration.

married = dummy for married individuals
sex = dummy for sex
college = dummy for college educated
race = dummy for non-whites
kids = dummy for kids living at home
self = dummy for self employed
home owner = dummy for home ownership
health insurance = dummy if respondent has a retiree health insurance

Social Security and pensions

eligible = respondents is eligible for old age SS benefits
quarters = number of quarters of covered earnings
income = logarithm of non-asset income
pension = dummy if included in pension plan
defined benefit = dummy if included in defined benefit pension plan

Preferences

importance of work = dummy equal to one if respondent thinks of work as more important than money (alternative: work important mainly because of the money)
preference for retirement = dummy equal to one if respondent is uneasy about the time when he/she will (completely) retire

Wealth measures

housing = logarithm of net of mortgages housing wealth
financial = logarithm of financial assets
expected social security = logarithm of expected social security wealth at retirement age
social security = logarithm of actual social security wealth at expected retirement age
pension = logarithm of expected pension wealth at retirement
household = logarithm of total family wealth

Table 2 reports the results of an ordered probit regression on a dummy variable that takes values:

1 = expect to retire before 65

2 = expect to retire at 65
3 = expect to retire after 65

where 65 is the normal retirement age. The results, reported in Table 2, show that most variables have the expected sign. In particular, from the analysis of the first column emerges that the variables that capture the incentives of the Social Security system and of the pension schemes are relevant, as the proxies for the preference for leisure. Most individual characteristics are significant and with the expected sign.

These results are only partly confirmed by the estimates reported in Table 3, where I use answers to the question: "What is the probability you will be working full-time at age 65?". Table 3 shows the results of a probit regression on a dummy variable that takes values

1 = the self-reported chances of working full-time after age 65 ≥ 0.5

0 = otherwise

The results show that the coefficients on the Social Security variables are not significant, suggesting that respondents may want to work regardless on whether receiving Social Security benefits or not, and they might have in mind a definition of retirement different from "not working full-time".

Finally, the columns 2-7 of Table 2 include measures of wealth among the independent variables. Even though the interpretation of these coefficients is complicated by the fact that wealth measures are not independent from preferences for (early) retirement, wealth is negatively correlated with expected retirement age. Even though wealth is endogenous, this is consistent with life-cycle theory. In fact both i) if individuals accumulate more wealth because they want to retire earlier, and ii) if individuals hold more wealth due to a positive shock, we should expect - once controlled for skill and tastes - a negative correlation between measures of wealth and expected retirement age

Table 2. Ordered Probit on dependent variable = expect to retire before/at/after 65

	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
age	.0674585**	.0089549	.0795956**	.010197	.0735879**	.0097275	.0839203**	.012604	.10532**	.0106613	.0751612**	.0093522	.0741993**	.0092797
life_exp	.0142024**	.0043113	.0160639**	.004958	.0141634**	.0047371	.0288472**	.0066068	.0390371**	.0056277	.0184312**	.0045251	.0184693**	.0045009
income	.0785384*	.0416709	.1185098**	.0511344	.1266842**	.0488119	.1411759**	.0626561	.0817236*	.0492058	.1220409**	.0458255	.1265124**	.0457388
married	.0254042	.0764216	.0575015	.0921419	.0427066	.0836942	.0962603	.1071445	.0226248	.0857502	.060367	.0792619	.0972475	.0799725
sex	.16421**	.0781272	.2650933**	.0952361	.1948177**	.0861476	.0227417	.1089968	-.0319217	.089632	.1535442*	.0819668	.1620994**	.0816097
college	.2440159**	.0667051	.2228592**	.0736573	.2840991**	.0707296	.2388929**	.0851638	.2991447**	.0748964	.2735914**	.0686521	.2723712**	.06869
race	-.2938948**	.072917	-.3525839**	.0901209	-.3367241**	.0854215	-.3265582**	.1073537	-.3190349**	.0809222	-.3884025**	.0777414	-.3930757**	.077741
pension	-.0565548	.0800938	-.0683423	.0919051	-.0535694	.0860891	-.0652102	.1122286	.0004764	.0916246	-.0359084	.082405	-.0463437	.0822573
db_pens	-.2560846**	.0729552	-.2268597**	.0803763	-.2688489**	.0766733	-.0401965	.0967388	-.0153897	.0843079	-.2183593**	.0743861	-.2203302**	.0743238
ss_eligible	.6422034**	.1385549	.5848137**	.1503993	.6479778**	.1460338	.5692062**	.1688562	.5074653**	.1526337	.609387**	.139795	.6081008**	.1396182
quarters	.3196065**	.1134057	.4860872**	.1327542	.4128733**	.1239366	.2256206	.1530446	.3920412**	.1298668	.3201592**	.1181844	.3152005**	.1180377
kids	.1781246**	.0526726	.1754218**	.0571616	.1891084**	.0609375	.2024693**	.0750025	.2281459**	.0603953	.1589036**	.0542483	.1518623**	.0542971
self_empl	.1903876**	.0972983	.1981606*	.1084296	.2540779**	.1044587	.2993783**	.1387484	.1508471	.1118633	.2393401**	.0997225	.2278265**	.0995618
hme_own	-.3215911**	.0785666			-.2762304**	.0905249	-.3008389**	.1142933	-.2507547**	.0870343	-.225269**	.0871548	-.253616**	.0860658
hlth_ins	-.2175767**	.0653871	-.3489401**	.0765496	-.299143**	.0718185	-.3320584**	.0910894	-.2230373**	.0735287	-.2755353**	.0675643	-.2696122**	.0674392
imp_work	.1824498**	.0596761	.2056591**	.0674873	.1968606**	.0639442	.2358433**	.0793373	.1815246**	.0665501	.1975538**	.0610467	.196432**	.0609809
pref_ret	.568986**	.0610153	.6066102**	.0699875	.6655768**	.0660035	.5372332**	.0819149	.5369411**	.0675901	.5904449**	.0627936	.586117**	.0627515
hous_wth			-.0843513**	.0386917										
fina_wth					-.0634748**	.0193429								
exss_wth							-.2420211**	.0459207						
ss_wth									-.3372153**	.040723				
pen_wth											-.1030049**	.0267155		
fam_wth													-.1062052**	.0266405
Cut1	5.13	.696088	5.79	.8868973	5.41	.783337	4.21	.9907007	4.19	.7791709	4.96	.7403428	4.89	.7402506
Cut2	5.92	.6983355	6.58	.8894787	6.24	.7859304	4.98	.9927809	5.08	.7813908	5.76	.7425206	5.68	.7423929
Number of obs	1895		1519		1675		1132		1559		1815		1819	
Prob>chi2	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
Log likelihood	-1729.99		-1350.54		-1481.61		-998.79		-1370.36		-1637.31		-1642.64	
Pseudo R2	0.09		0.10		0.11		0.11		0.12		0.10		0.10	

Coefficients marked ** are significant at 5%, coefficient marked * are significant at 10%.

Table 3 -Probit on dependent variable = chances of working full-time after age 65 > 0.5

	Coeff	SE
age	.0089488	.0092362
life_exp	.0160119**	.0045906
income	.0702843	.044119
married	-.0138095	.0816891
sex	-.0168394	.0828574
college	.3100093**	.0718089
race	-.2529006**	.076777
pension	.1060042	.0870235
db_pens	-.2316762**	.0780164
ss_eligible	-.0163857	.1504383
quarters	.0724089	.1171058
kids	.0668481	.0563321
self_empl	.4981668**	.1100733
hme_own	-.2287529**	.0858294
hlth_ins	-.1916636**	.0717327
imp_work	.1580448**	.0644242
pref_ret	.4722954**	.0670081
cons	-1.706987**	.7228784
Number of obs	1895	
Prob>chi2	0.0000	
Log likelihood	-1212.84	
Pseudo R2	0.07	

Coefficients marked ** are significant at 5%.

5. Explaining errors in expectations

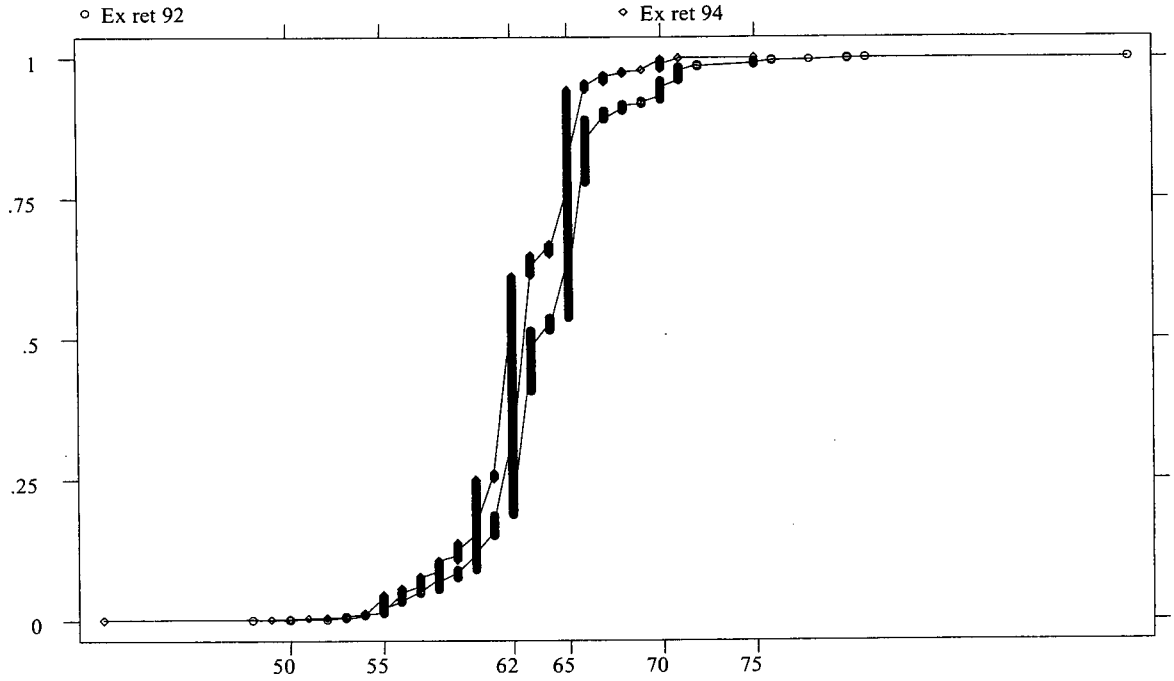
In this section I will focus on individuals' forecasting errors. I will compare expectations both with realizations (for people who actually retired between the two waves) and revised expectations (for people who did not retire between the two waves). This is motivated by the fact that the rational expectation hypothesis implies that, in absence of common shocks, there should be no systematic errors between expectations and realizations.

5.1. Descriptive statistics

We have seen in Figure 2 that the distribution of expectations and outcomes are substantially different, the distribution of actual retirement age being skewed toward earlier ages than the distribution of expected retirement age. As I already mentioned, Figure 2 is affected by the fact that, in the period 1992-94, we observe only part of our initial sample retiring.

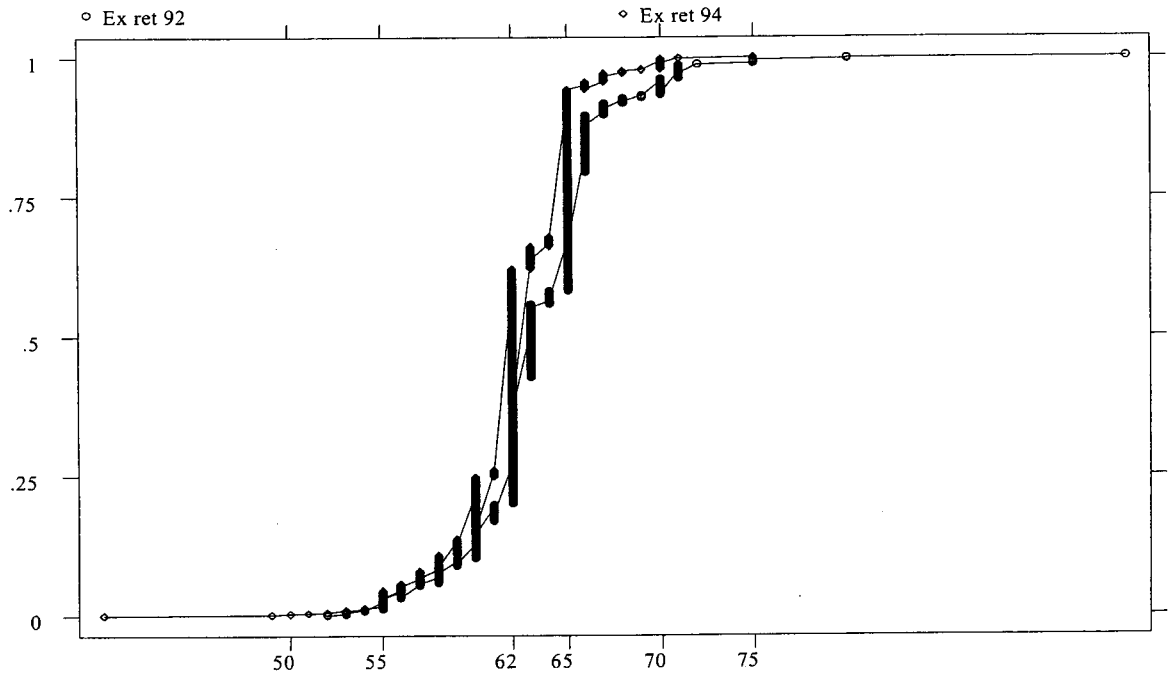
I therefore look at the differences between two homogeneous figures, that is the distribution of expectations in 1992 and the distribution of expectations in 1994. Figure 4a shows the cumulative distribution of expected retirement age in 92 and in 94, while Figure 4b reports the same cumulative distributions as in Figure 4a only for those respondents who reported the expected retirement age in both surveys. Figure 5 plots the distribution of the difference between expected retirement age in 1992 and in 1994. It can be observed from these figures that the differences in expectations are centered around zero and rather symmetric, and therefore apparently consistent with the rational expectation hypothesis. However, forecast errors are not normally distributed, being heavily concentrated around zero. As an alternative check, Figure 6a and 6b show the distributions of the difference between the 1992 and the 1994 reported chances of working full-time after both age 62 and age 65. Similar conclusion can be drawn.

Figure 4a. Cumulative distribution of expected retirement ages in 1992 and 1994



Cumulative distribution of expected retirement ages in 92 and 94

Figure 4b. Cumulative distribution of expected retirement age in 1992 and 1994



Cumulative distribution of expected retirement ages in 92 and 94

Figure 5. Differences between expectations in 1994 and in 1992 (in years)

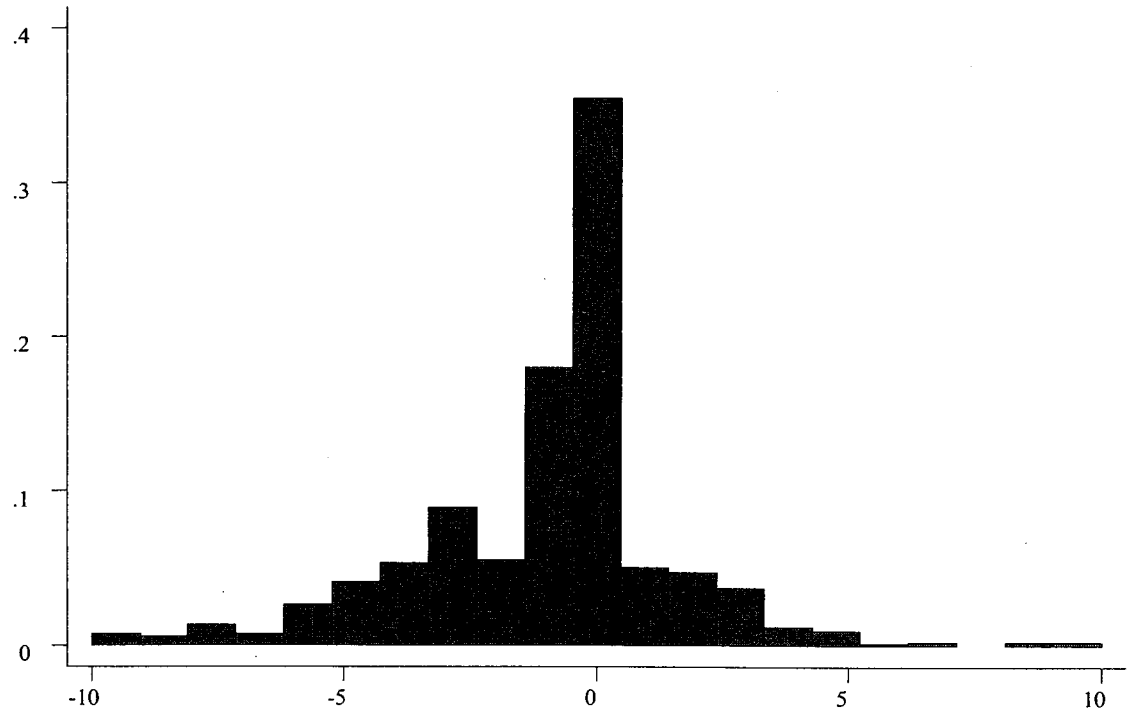


Figure 6a. Differences between expectations in 1994 and 1992 of working after age 62 (in years)

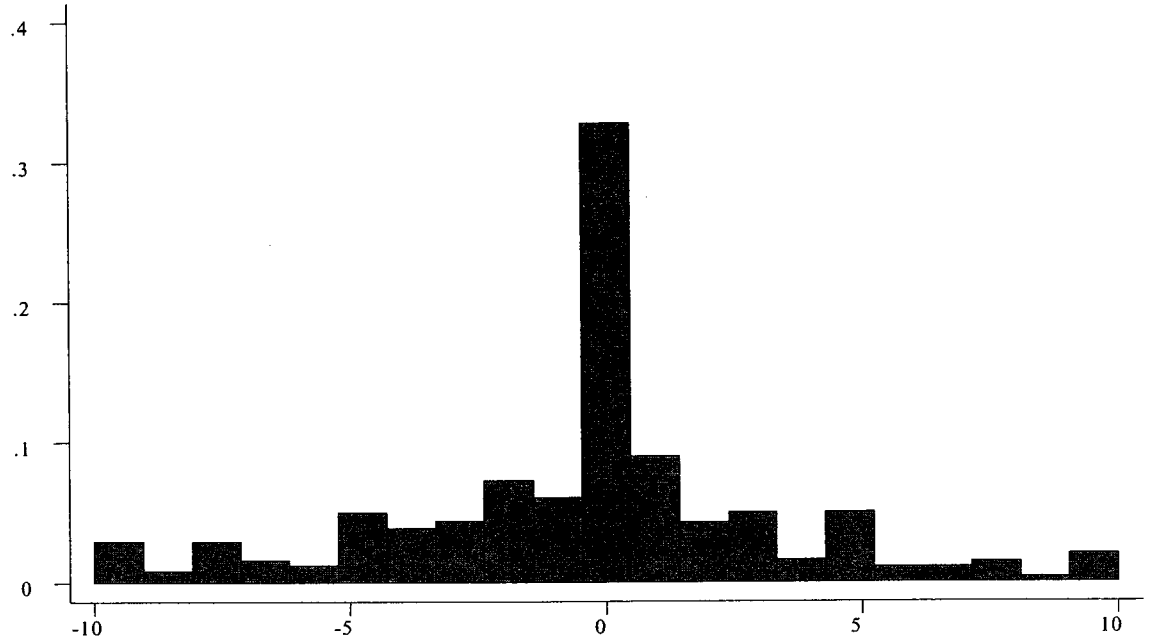
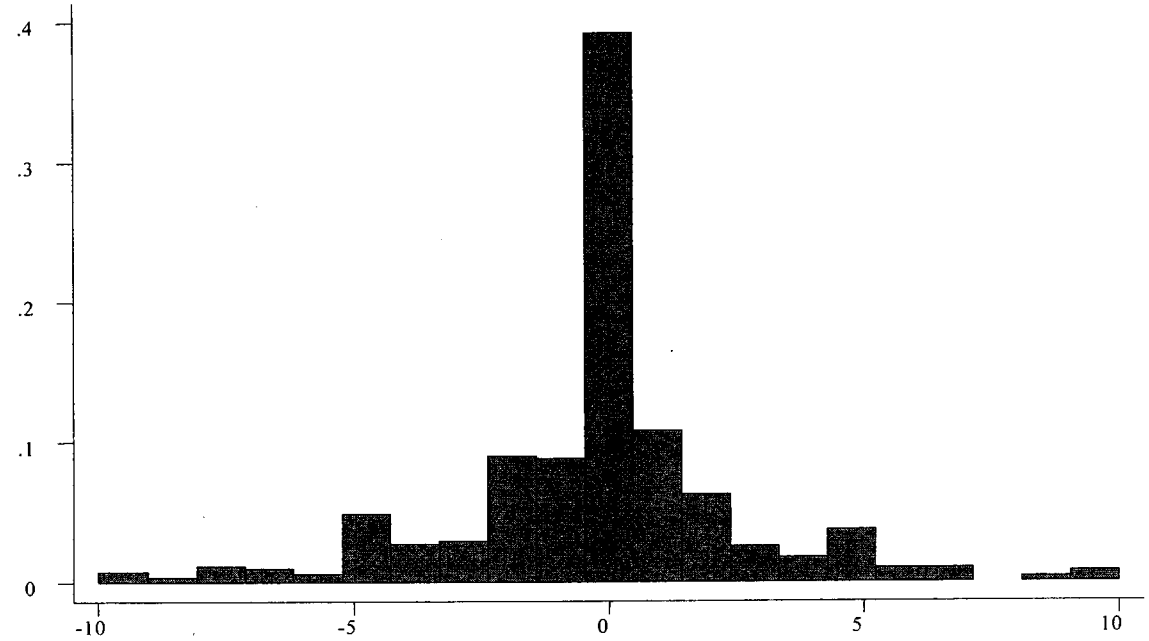


Figure 6b. Differences between expectations in 1994 and 1992 of working after age 65 (in years)



5.2. Regression analysis

I now move to test the rational expectations hypothesis, that is the claim that in absence of common shocks there should be no systematic errors between expectations and realizations. In order to do this, I therefore test whether differences between expectations at different dates, and also differences in expectations and realizations, are related in a systematic way to individuals' characteristics. As conditioning variables, on top of all the characteristics already used in section 4.2, I include a variable "distance to retirement", which represents the number of years remaining until the expected age of retirement; this variable is introduced since the sooner the expected age of retirement, the less likely is that individuals will retire before they expected to. I add also proxies for "shocks" – defined as unexpected events by the perspective of 1992, actually occurred between the first and the second survey - to test whether the revisions in expectations are consistent with the rational expectations hypothesis and the life cycle theory. In particular I consider "shocks" to the family composition, to the employment status and to the household wealth or financial position. Shocks are defined below:

Financial shocks:

- self reported unexpected and relevant negative shock to household wealth
- proxy for capital gains: net stock acquisition (pension accounts excluded)
- proxy for capital loss: net stock reduction (pension accounts excluded)
- lump-sum transfers: transfers from lottery, gambling, inheritances

Other shocks:

- change in marital status (divorced or widowed)
- change to "better job": respondent has changed job to better job
- employer provided incentive to leave the job (early retirement programs)
- change in self reported health situation
- disability

The list is certainly not exhaustive. However, I believe it includes relevant events that should affect retirement choices. An important issue is whether the financial shocks are of relevant dimension, which could suggests to what extent respondents have to adjust their retirement age instead of making other minor changes. Table 4 reports some summary statistics for the financial shock variables: in absolute value in the first column, relative to 1992 non-asset income in the second column, relative to retirement wealth (defined as the sum of Social Security wealth and annuitized pension wealth) in the third column, and relative to expected retirement wealth (defined as the sum of Social Security wealth and annuitized pension wealth, both as expected at retirement age) in the fourth column. As for the other shocks, 2.1% of the sample experienced a change in marital status (divorce or widowhood), 2.6% changed job to a "better job", 6.7% were offered an early retirement program or other incentives to leave the job, 99% reported a change in self reported health situation, and 2.2% of the sample became disabled between the first and the second wave.

The first column of Table 5 (Regression 1) reports the results of an ordered probit regression on a dummy variable that takes values

1 = age expected to retire in 92 > age expected to retire in 94

2 = age expected to retire in 92 = age expected to retire in 94

3 = age expected to retire in 92 < age expected to retire in 94

The second column of Table 5 (Regression 2) reports the same regression including data on respondents who actually retired between the two waves. The third column (Regression 3)shows the results of a similar type of regression, that is an ordered probit on a dummy variable that takes values

1 = chances of working full time after 62 in 92 > chances of working full time after 62 in 94

2 = chances of working full time after 62 in 92 = chances of working full time after 62 in 94

3 = chances of working full time after 62 in 92 < chances of working full time after 62 in 94

Table 4 – Summary statistics of the constructed "financial shocks"

	in absolute value			as a % of 1992 non asset income			as a % of retirement wealth			as a % of expected retirement wealth		
	Median	Mean	Number	Median	Mean	Number	Median	Mean	Number	Median	Mean	Number
self reported unexpected negative shock to wealth	$5,000	$16,189	293	18,8%	60,0%	293	6,0%	26,2%	240	5,7%	26,7%	162
proxy for capital gains: net stock acquisition (pension accounts excluded)	$9,600	$17,910	217	16,0%	31,7%	217	4,6%	22,7%	176	4,8%	17,1%	164
proxy for capital loss: net stock reduction (pension accounts excluded)	$5,000	$16,387	57	11,5%	34,7%	57	4,4%	11,1%	45	4,3%	21,1%	43
lump-sum transfers: transfer from lottery, gambling, inheritance	$20,000	$48,451	91	64,1%	159,8%	91	18,8%	82,5%	78	18,6%	51,6%	64

Table 5. Ordered Probits

	Regression 1		Regression 2		Regression 3		Regression 4	
age	-0.138**	0.017	-0.118**	0.015	-0.015	0.011	-0.055**	0.013
dist_to_ret	-0.247**	0.017	-0.205**	0.014	-0.029**	0.009	-0.055**	0.010
life_exp	0.011*	0.006	0.012*	0.006	-0.003	0.005	0.004	0.005
income	-0.081	0.067	-0.071	0.059	-0.055	0.046	-0.029	0.051
single	0.037	0.115	-0.030	0.105	0.122	0.078	-0.065	0.092
sex	-0.042	0.118	-0.057	0.106	-0.031	0.080	-0.005	0.093
college	0.033	0.103	0.020	0.092	0.131*	0.071	-0.076	0.081
race	0.039	0.109	0.163*	0.098	0.054	0.076	0.108	0.088
pension	0.060	0.125	0.175	0.115	0.159*	0.087	0.107	0.098
db_pens	-0.195*	0.106	-0.223**	0.097	-0.178**	0.075	-0.064	0.087
ss_eligible	0.698**	0.234	0.349**	0.168				
quarters	0.193	0.167	0.216	0.150	-0.018	0.114	0.131	0.133
kids	-0.156	0.095	-0.151**	0.085	0.057	0.056	0.072	0.061
self_empl	-0.168	0.168	-0.017	0.152	0.223**	0.109	0.096	0.118
hme_own	-0.104	0.124	-0.097	0.114	0.061	0.085	0.034	0.095
hlth_ins	-0.064	0.105	0.017	0.096	-0.068	0.071	-0.114	0.079
imp_work	0.041	0.092	0.044	0.083	0.033	0.064	0.093	0.072
pref_ret	0.058	0.103	0.033	0.093	-0.004	0.067	0.030	0.075
SHOCKS								
health	0.002	0.074	-0.021	0.064	-0.040	0.047	-0.027	0.053
divorced	0.144	0.409	0.067	0.362	-0.216	0.264	-0.366	0.279
widowed	0.172	0.436	0.312	0.402	0.136	0.317	0.362	0.355
better_job	0.304	0.265	0.389	0.254	0.284	0.171	-0.098	0.182
wealth_shck	0.014	0.014	0.003	0.013	0.004	0.010	0.011	0.011
cap_gain	-0.028*	0.014	-0.028**	0.013	-0.018*	0.011	-0.016	0.013
cap_loss	0.010	0.025	0.023	0.023	-0.001	0.018	-0.016	0.022
ls_transfer	-0.010	0.020	0.002	0.018	-0.012	0.014	-0.013	0.017
disability			-1.560**	0.365				
ret_windows			-0.475**	0.149				
Cut1	-10.253	1.360	-8.441	1.202	-2.096	0.855	-4.186	0.975
Cut2	-8.937	1.352	-7.187	1.197	-1.263	0.855	-3.233	0.973
Number of obs	865		1069		1520		1155	
Prob>chi2	0.000		0.000		0.021		0.001	
Log likelihood	-727.480		-905.040		-1648.276		-1238.747	
Pseudo R2	0.178		0.144		0.012		0.022	

Coefficients marked ** are significant at 5%, coefficients marked * are significant at 10%.

The fourth column of Table 5 (Regression 4) reports the results of the same regression as in column three using, instead of the variable reporting the chances of working full time after age 62, the variable reporting the chances of working full time after age 65.

Overall, the results provide some support for the rational expectation hypothesis, in the sense that most non-shocks variables are not significant. Therefore, there are not characteristics that are correlated with systematic errors in forecasting the retirement age. On the other hand, disability and employer provided retirement windows are significant in explaining retirement behavior (see Regression 2). Financial shocks are in general not significant, although have the expected sign on the basis of life cycle theory. The only significant financial shocks variable is the capital gains proxy (net stock acquisition - pension accounts excluded). Regarding financial shocks, before concluding that the results are inconsistent with life cycle theory, it should be assessed the extent to which the constructed measures of "shocks" do in fact capture expected events (i.e. expected capital gains, inheritances) or events that - at least in part - are the result of a choice (i.e., the case of net stock acquisition, used as a proxy for capital gains, can partly reflect saving for retirement).

6. Concluding remarks

From the presented analysis of retirement expectations we can draw the following conclusions. First, the data are consistent with Bernheim's finding that reported expected retirement age represents a measure of central tendency rather than the mean of the expected retirement age distribution. Second, if they do at all, agents seem to make reasonable plans, in the sense that expected retirement age is correlated with those variables that are known to determine actual retirement behavior. Third, wealth is negatively correlated with expected retirement age. Fourth, plan revisions provide some support for the rational expectations hypothesis. However, respondents seem not to adjust their retirement plans to shocks to their wealth.

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