Social Security and Couples' Joint Retirement Decisions in Brazil

Bernardo Lanza Queiroz
CEDEPLAR
Universidade Federal de Minas Gerais
lanza@cedeplar.ufmg.br

February 24, 2006

Abstract

In recent years, a large number of studies investigated the relationship between social security benefits and male retirement decision in developed countries. However, couples' retirement decisions and the patterns of retirement in emerging economies are much less studied. This paper uses Brazilian data to examine how social security financial incentives and personal characteristics affects one's own and spouse's retirement decisions. I find that couples synchronize retirement, and that they respond similarly to their own characteristics. Moreover, I find that wives' are more responsive to husbands' incentives than vice-versa. Policy simulations show that equalizing male and female normal retirement ages would have a large impact on male's retirement but a small direct impact on female retirement.

1 Introduction and Overview

There is widely concern about how demographic changes, especially population aging, affect macroeconomic variables and public sector fiscal balance. The rapidly aging population presents one of the greatest public policy challenges in Brazil. Compared to other emerging economies, Brazil is distinct for combining a relatively large public sector with rapidly aging population. The percentage of individuals age 65 and over are projected to be 18% in 2050, compared to 3% in 1970 (UN 2003). These changes in population age structure may impose severe pressures on the public sector (Bongaarts 2004). In 2002, social security benefits and other forms of elderly support represented about 12% of the GDP (Brazil 2003), and are expected to be the fastest growing component of public spending (Gruber and Wise 2001; Giambiagi and Alem 1997).

A second related question is how the provision of social security benefits affects retirement decisions of older workers (Wise 2004). The literature on male retirement behavior is extensive [1]. People know a great deal about male labor force participation in different countries around the world. The knowledge on female and couple's retirement behavior is less developed. However, the increasing female labor force participation implies that they are also important part of the retirement decision and social security problem. Because of data limitation, very few empirical studies exist on this topic (Hurd 1990; Coile 2003; Maestas 2001; Blau 1998). This paper tries to contributed to this field by estimating couple's joint retirement behavior determinants in Brazil.

Male retirement studies assume a simple framework focusing on economic considerations as the main explanatory variable. The basic idea of these models is that workers will evaluate the gains (or losses) of retiring now to working one more year (Gruber and Wise 2004; Gruber and Wise 1999). However, whether one member of the household retires, or is deciding to do so, affects the socioeconomic situation of the family and of his/her partner. Therefore, family variables should be taken into account as well.

One question of interest might be how one's spouse's retirement decision affects the behavior of the other spouse. One possible outcome is that couples decide to withdraw from the labor force at the same time. Several reasons explain this outcome:

[1] See Lazear (1986) and Lumsdaine and Mitchell (1999) for a nice and complete review of the economics of retirement.

- share leisure time together. Spouses would like to have more time with each other in older age after leaving the labor force and not having kids at home (Becker 1993);

- couples share similar tastes, as a result of assortative mating one can expect that couples have similar career paths and/or working behavior (Becker 1993);

- financial incentives, social security wealth, and other economic reasons (Hurd 1990).

In particular, I use the Brazilian Household Survey (PNAD) to estimate the effect of each spouse's characteristics and retirement incentives on their own and their partner retirement probabilities. The aim is to explore the following questions: do couples synchronize their retirement?; what is the effect of one spouse incentives/variables on the other spouse decision?, what are the possible implications of changes in the rules governing retirement benefits in Brazil?.

The paper contributes to the empirical literature by analyzing couple's and women's retirement in a developing country. The contribution to the existent literature is twofold: first, it studies social security incentives in a developing country with a large public system. Second it analyzes a system with different rules for males and females, which is not the case of the USA. In addition to that, it provides empirical results in a time of intense debate over changes in the system. Therefore it also aims to provide support for policy makers by investigating possible impacts of legislation changes on retirement.

In Brazil, as is the case of many European countries, female normal retirement age and time of contribution to the social security system is lower than for males. The normal age of retirement for women is 60 years and for men is 65. If retiring by length of service, women need to prove 30 years of working life whereas men need to prove 35 years. Given the differences in life expectancy, and assuming similar trajectories in the labor market, the Brazilian system transfers income from male to female workers.

Zweimuller, Winter-Ebmer, and Falkinger (1996) show that lower retirement ages have historically served two purposes. First, these regulations would open jobs for younger workers. Second, retirement rules allow couple's joint retirement, since women normally marry older men. A third explanation is based on a patriarchal view of the society, which suggests that the

husband should not retire before his wife leaving to her the role of bread-winner. The Brazilian legislation gives as reasons for such differences the need to compensate for (Afonso and Fernandes 2004):

- to the time dedicated to the family and reproduction,
- female frailty,
- jobs with lower wages,
- double burden of job and housework,
- and due to the difference in age at marriage to allow that partners retire at the same time.

In recent years European countries have faced continuous debate over the validity of such rules. The political argument is that such rules do not complain basic principles of equal treatment. Interestingly, in the beginning of the debate the main reason for change came from the political side. Only later on did the possible economic impacts of legislation change become relevant to the debate. In 2000, all OECD countries have the same retirement age for both sexes, except Italy, where women can retire 5 years before men[2].

One of the propositions to the current debate on social security change in Brazil is to equalize male and female rules. The premise is that equalizing requirements would lead to a higher average retirement age for women. It is important, however, to measure the impact of such change since it may also have implication on male retirement age [3]

There are several important findings. First, I have evidence that the social security system in Brazil creates incentives to retirement and that are more beneficial to the better-off. Second, I observe that males and females respond in the same way to their variables; older age, higher education and worse health increase retirement probabilities for both in the same way. Third, and more interesting, I find that husbands and wives react different to the other spouse's variables. In particular, I find that husbands respond positively to wives' education, which measures wealth and income, but the opposite effect is negative.

[2]Although statutory retirement ages are the same observed transition ages for males and females may vary

[3]See Spratin and Holden (2000) for a review of the impacts of social security reform on women's well-being

2 Evidence of Joint Retirement

Empirical research on retirement decisions of couples and married women is not very common. Bowen and Finegan (1969) is one of the classic works in this field. They estimate a model using the 1960 US Census and find that older wives work less when husbands are retired and in households with high income. Henretta and O'Rand (1983) present a more sophisticated model, using the Retirement and History Survey. They estimate logistic regression models comparing the joint retirement decisions to when one spouse retires before the other. They find that economic and non-economic variables influence wives' retirement. Pozzenbon and Mitchell (1989) developed a model to examine the economic and family determinants of retirement among married women. The results show that wives do not respond to changes in social security wealth. However, familial determinants, husband health and leisure time are the main determinants of married women's retirement behavior. Vitnes (1994) finds that increase in social security wealth from additional work increases the chances of married women to staying in the labor force.

The previous studies focused on a descriptive and empirical analysis of the problem. More recent research has incorporated economic models to consider couples' utility when studying the process. The classical paper using this approach is Hurd (1990). In this paper he studies couple's retirement dates using a sample from the New Beneficiary Survey. The results, using a Stone-Geary utility function, support the idea of joint process. He observes that couples retire within a short period of time, as about 30% of couples retire within a year of each other. Hurd estimates two separate regression models, one for males and one for females, and finds that increasing wife's retirement age by 1 year increases husband's retirement age by 0.25 year. Increasing husband's retirement age by 1 year increases wife's retirement age by 0.37 year. Gustman and Steinmeier (2000) and Blau (1998) developed structural econometric models to study the issue of joint retirement. The results indicate a coincidence of retirement dates, even when wife is much younger than the husband. The main explanation for such behavior in these studies is similar tastes for leisure. The authors show that economic variables and financial incentives are not the only explanation for the high incidence of joint retirement. Maestas (2001) develops a structural model for the determination of joint retirement decision using data from the Health and Retirement Survey (HRS). Her results go in the same direction as previous studies, supporting the idea that couples with greater leisure complementarity tend to

retire together.

Zweimuller, Winter-Ebmer, and Falkinger (1996) analyzed the impact of changes in the minimum retirement age in Austria on couple's retirement decision. The results confirm the existence of joint leisure preferences. However, the results also indicate that financial and economic variables are relevant and that the impact of changes in retirement age is stronger for wives than for husbands. Coile (2003) argues that the literature has not addressed two important aspects of joint retirement decision: the effect of women's retirement financial incentives on their decision and the spillover effects of spouse's financial incentives on the other spouse decision. She finds that both are equally responsive to their own financial incentives and that men are more responsive to their wives incentives than the other way around.

In the case of Brazil very few studies have tried to understand retirement behavior. To my knowledge, Legrand (1995) and Carvalho-Filho (1999) are the only study on retirement in Brazil. Legrand (1995) concentrates on male retirement and uses the 1980 Census when rules were much different than today's. Carvalho-Filho (1999) studies the impact of social security changes for rural workers. In a time of intense debate on social security changes, it is fundamental to understand what determines retirement in Brazil and how possible changes would affect this behavior [4]

3 Data

I use data from the *Pesquisa Nacional por Amostra de Domicilios (PNAD)* 1998. The PNAD is a nationally representative stratified random sample of the Brazilian population comprised of about 90,000 households. The survey consists of cross-sections collected annually since 1971, except in 1994 and during censuses years (1980, 1991 and 2000). The PNAD contains a comprehensive and comparable set of demographic and economic variables, including detailed information on economic activities, contribution for social security programs and whether individuals receive benefits. In this paper, I concentrate the analysis on the 1998 data to take advantage of its health supplement.

Data limitation prevents me from examining different types of social security benefits. I can only know if the respondent is receiving retirement

[4]There are very few studies investigating retirement in developing countries. There are some research on the Chilean and South Africa pension reforms.

or survival benefits. I do not know whether the retirement is due to old-age, length of service, disability or social assistance. In addition, I do not know whether the respondent is enrolled in the general system or civil servants programs. I solve this problem by looking at the individual's previous occupation help by the individual and her status in the labor force. Carvalho-Filho (1999) uses similar approach. I do not believe this limitation affects my conclusions. I compare retirement estimates with those based on official data from the Social Security Administration and obtained similar results.

3.1 Summary Statistics and Preliminary Evidence

I select married couples living in urban areas, both formal and informal unions, between the ages of 45 and 70 [5]. I further restrict the sample to couples who were retired or still on the labor force in the week of reference but with at least one member in the labor force during the year of reference, resulting in 16,343 couples. The couple's mean age differential is 3.26 years (St.Dev. 5.10), 93% of the women were married with men of the same age or older. Spouses share similar observed characteristics, such as education and race, [6]; indicating positive assortative mating what can help explain certain patterns of retirement (Becker 1993).

Summary statistics are presented in Table 1. In my sample, men are , on average, slightly older than women, with average ages 59.9 and 53.7 respectively. Educational levels in Brazil are very low, especially for older cohorts, couples analyzed in this paper have completed, on average, less than 6 years of education. In 1998, 41% of males and 18% of females received pension benefits (were retired). If one compare this number with the percentage in the labor force the sum is not 100% because some individuals remain in the labor force after being granted benefits. Also, for some women discontinuity in their working history affects the possibility of receiving a pension benefit. 44% of men declare themselves in fair or bad health, and 50% of women responded having fair or bad health. The percentage of individuals in fair/bad health increases with age and concentrates in the less developed areas of the

[5] The age selection is in accordance with the retired population age structure observed in the Brazilian Social Security Administration records.

[6] I use two measures of education: years of schooling and educational group less than 4 years, between 5 and 8 years, between 9 and 11, and more than 12. I find that 73% of the couples are in the same educational group. The racial composition of couples shows similar sign: I find that 80% of couples are formed by partners of the same race.

Variable	Mean	Std. Dev.
Husband's Age	59.97	6.83
Wife's Age	53.70	6.39
Husband's Education	5.67	4.54
Wife's Education	5.64	4.37
% Husband in LF	75.53	-
% Wife in LF	43.75	-
% Husbands Retired	41.87	-
% Wives Retired	18.88	-
% Husbands Poor Health	44.04	-
% Wives Poor Health	49.44	-

Source: PNAD, 1998

Table 1: Summary Statistics, Couples, Brazil, 1998

country.

In the week of reference, 44% of the women are in the labor force and 56% not, whereas for men 75% are in the labor force and 25% are not. Among the couples, 19% both are both out of the labor force, in 37% of the couples both are active in the labor market, in 37% only the male is active, and in only 6% of the couples the female is the sole spouse in the labor force.

A better view of joint retirement decision can be seen in Table 2. The table shows couples divided by age group and four stages in the labor force: both active, both retired, husband active and wife active. The data contain interesting patterns of labor supply. For any age, wives tend to be out of the labor force as the age of husband increases. A similar pattern is observed for males, as wives get older the proportion of couples in which both are active in the labor force diminishes and it increases the proportion of couples with both spouses retired. There are some interesting patterns: younger males married to older females are more likely to be in the labor force than their counterparts married to younger females. For older males there is no difference in labor force participating controlling for the wife's age. In very few couples the wife is the only spouse in the labor force, ans such wives are normally younger females married to older males.

Table 2 provides some evidence of joint retirement decision. It supports the idea of incorporating household behavior variables to the analysis of retirement, especially when considering changes in the social security leg-

islation.

Wife's Age	Husband's Age	Both Active	Husband Active	Wife Active	Both Retired
50-54	50-54	43.17	42.30	4.73	9.80
	55-59	41.07	36.44	7.36	15.13
	60-64	35.77	34.25	9.81	20.17
	65-70	26.80	27.58	22.16	23.45
55-59	50-54	39.49	44.75	5.98	9.78
	55-59	35.05	41.79	6.03	17.13
	60-64	31.17	34.10	7.52	27.22
	65-70	26.02	26.02	11.73	36.24
60-64	50-54	32.52	56.91	2.44	8.13
	55-59	27.30	47.18	5.93	19.58
	60-64	25.67	40.15	5.32	28.86
	65-70	18.73	30.64	7.09	43.55
65-70	50-54	18.88	65.31	4.08	11.73
	55-59	21.88	53.65	3.13	21.35
	60-64	16.03	46.15	4.17	33.65
	65-70	16.24	28.60	4.73	50.43

Source: PNAD, 1998

Table 2: Retirement Patterns of Married Couples, Brazil, 1998

3.2 Age Profiles of Joint Retirement

Figure 1 shows husbands' labor force participation rates by age. The age profile for males is very standard, as labor force participation rates decline with age. As opposed to what is observed in several developed countries, in Brazil there is no sharp decline between ages 62 and 65, the early and normal ages of retirement in the USA and other OECD countries. The possibility of retiring by length of contribution at younger ages explains the non-existence of a clear peak. In addition, workers can stay in the labor force receiving pension benefits without penalty. Women have much lower labor force participation rates, and the percentage out of the labor force increases faster at younger ages than what is observed for males. Figure 2 show that for wives aged 50 more than 50% is already out of the labor force, and husbands reach this percentage at much older ages.

Figure 1: Labor Status by age, Husbands (Source: PNAD, 1998)

Figure 3 shows couples joint labor force participation by age of husband. The percentage of both spouses out of the labor force increases rapidly as husband's age increase. The incidence of household in which only the wife is in the labor force is relatively small but increases as the age of the husband increases. This provides more evidence to support the idea of incentives to

Figure 2: Labor Status by age, Wives (Source: PNAD, 1998)

joint retirement in the Brazilian pension system just as observed in the US and other European countries.

4 Methodology

I estimate retirement hazard rates from the data in two ways. First, I can calculate stocks of couples in and out of the labor force in 1998 , and then I can estimate the risk of retiring between ages and other characteristics. Second, I use information from questions regarding labor force participation during the year preceding the survey and survey's reference week to measure retirement flows. The PNAD asks respondents whether they had employment during the week preceding the interview and, if not, whether they worked during the preceding year. The survey emphasizes the full year period in the interview (Legrand 1995).

It is important to distinguish the main impacts on retirement stock and flow. The first is a function of cumulative impact of past age and period effects (e.g. earning history, health, work conditions), whereas the latter is more strongly influenced by short-term events. The main problem of analyz-

Figure 3: Joint Labor Status by husband's age (Source: PNAD, 1998)

ing retirement flows using only one year of data is that I am also capturing period effects. For instance, retirement might have been particularly low or high in that year which might affect the results. In this paper, I estimate retirement risks using both the stock and flow approaches, using all possible variables that exist for individuals in and out of the labor force, and the results are presented and briefly compared.

In accordance with the theoretical discussion and questions of interest presented in the previous section, I selected variables that may affect the behavior by influencing individual's preferences and expectations. Because of data limitations I cannot construct time time varying variables, and the specification includes most fixed covariates.

4.1 Incentive Measures

Carvalho-Filho (1999) argues that individuals in the developing world face more liquidity constrain than those in the developed countries. Also, Reimers and Honig (1996) show that some individuals tend to be myopic because of risk aversion, credit constraints and shorter life expectancy, which can be the case in developing countries. Therefore, the timing, availability, and

replacement level of pension benefits are more important than the social security wealth regarding the retirement decision. Thus, I also use pension replacement rate as a relevant variable in my model.

I have two limitations performing this analysis. First, the non-availability of proper data, that is, worker's earnings history or administrative data, does not allow me to calculate worker's pension. Second, I am using cross-sectional data[7], which only contains income information on the current labor market status of the individual.

The alternative to both of these problems is to estimate an earnings equation and then impute replace rate from the regression outcomes. However, since I only have earnings' information for the current status I face sample selection problem, that is, I have working earnings only of those who are employed and pension benefits only of those who are retired. I solve this by using traditional selective correction methods (Heckman 1979; Greene 2003).

4.1.1 Estimating Wages and Benefits

I present the results for the human capital equations, for wage and benefits, in Tables 3 and 4. I use the same set of explanatory variables for both equations. I assume that since wages are dependent on individual characteristics and pension benefits are dependent on wages, this would give the best possible outcome. The selection problem arises because I do not observe worker's wages and benefits at the same point in time. Therefore, I have an unmeasured variable that affects both the dependent variable and the chances a person is in the sample (Greene 2003; Heckman 1979).

The results of the earning equations have the expected results. Education increases both wage and social security benefits. The terms age and age-squared, representing experience, go on the expected directions. The regional variables, which I do not show here, also confirm expectations, that is, workers in the more developed areas of the countries have higher wages and benefits. The Inverse Mill's Ratio coefficient is small and not statistically significant for males, and the results of the OLS model are very similar to the one that corrects for selection, indicating that the selection does not bias the result. For women, the coefficient on the Inverse Mill's Ratio is large and statistically significant, which gives evidence of the importance to correct for selection bias when estimating the model.

[7] As I discussed above to use the information on health status available in this particular

Variable	Wage	Benefit
Constant	3.58 (2.19)	4.23 (0.84)
Education	0.147 (0.006)	0.139 (0.002)
Age	0.094 (0.06)	0.036 (0.025)
Age-squared	-0.001 (0.0005)	-0.0003 (0.0002)

Source: PNAD, 1998

Table 3: Regression Results, Income and Benefit Equation, Husbands, 1998.Note: Std. Errors in parentheses.

Variable	Wage	Benefit
Constant	-0.074 (1.63)	3.09 (1.36)
Education	0.193 (0.139)	0.135 (0.005)
Age	0.154 (0.057)	0.021 (0.037)
Age-squared	-0.001 (1.63)	-0.00006 (0.0002)

Source: PNAD, 1998

Table 4: Regression Results, Income and Benefit Equation, Wives, 1998. Note: Std. Errors in parentheses

4.2 Eligibility to Pension Benefits

I construct eligibility measures to pension benefits based on the rules in effect in 1998. This way I can determine which individuals could be granted retirement benefits in that year. I will construct dichotomous variables indicating whether the individual in entitled pension for length of service and/or normal age of retirement based on individual's age, years of schooling and age entered the labor force.

The social security system has two main types of retirement benefits. They are the old-age pension benefit and the length-of-service benefit. For the latter, eligibility occurs after 35 years for males and 30 years for females of declared documented work, although it is possible to receive a reduced benefit after proving 30 and 25 years of work for males and females, respectively. The length-of-service benefit does not have a minimum age requirement. Workers are eligible for old-age pension benefits at age 65 and 60 for males and females, respectively.

year

The eligibility for length-of-service and old-age retirement benefits are shown in the following equations, where NR is the normal retirement age, ER is the early retirement age and LS is the period in the labor force.

$$NR = 1 if Age_m \geq 65 or Age_f \geq 60 \tag{1}$$

$$ER = 1 if Age_m \leq 65, or Age_f \leq 60, and LS \geq 35, and LS \geq 30 \tag{2}$$

The construction of a variable indicating whether an individual is eligible to old-age pension benefit is straight forward and show in equation 2. The age for normal retirement is 65 for males and 60 for women.

The construction of the variable for early retirement eligibility is a little more complicated, since the survey does not have information on work tenure. First, I considered only those younger than the old-age requirement. Second, I combine the information on the age an individual started to work and years of schooling to construct this measure. I add to the age a person reported started working the years of obtained education after that age. If the sum is greater than 35 (30) years, the worker is eligible for length-of-service benefit.

4.3 Individual Characteristics

Age is the most important variable explaining retirement. I estimate the models using age in different ways: as a linear variable, quadratic, cubic, as identification variables for age groups, and combinations. By using dummies I expect to capture peaks on retirement probabilities at certain ages, especially the normal retirement ages regulated by the system.

Education also plays a role in retirement behavior. Education is highly correlated with income, wealth and the type of job an individual holds. The net effect of education will be the result of income and substitution effects. The first creates more incentives to retire since more educated workers are more able to afford retirement while the latter implies higher opportunity costs to leave work. Education is also related to the age a worker enters the labor force. I assume that workers with lower levels of education entered the labor force earlier. I also assume these workers normally entered in more physical demanding jobs, which can play a role in the decision of whether to leave the labor force.

Occupation is related to the educational level but also to access to social security benefits. Workers in the formal market have more direct access to social security than workers in the informal sector and self-employed workers. The first are enrolled in the system by their employers while the second has to decide on their own whether to join the pension system. This variable will give a good indication of the impacts of the pension system on the retirement propensities of workers in Brazil. I also include variables of enrollment in the social security system and private pension systems. I expected that enrollment in these systems will have a positive impact on individuals leaving the labor force.

I included region of residence as a explanatory variable. Researchers argued that the existence of length of service pension benefit is important especially in less developed areas where life expectancy is lower than in more developed regions. the existence of this possibility would allow individuals who would live past age 65 to retire at an earlier age. I expect to find that workers in the Northeast and North retire at earlier ages than workers in other regions of the country.

4.4 Familial Incentives

I constructed different measures of family incentives. I expect the labor force status of the one spouse to have an important influence on the retirement decision of the other spouse. I construct this measure in two ways: for the stock regression I simply include a variable indicating whether the spouse is retired; for the flow models I constructed a variable indicating whether or not the spouse retired during that year. I also estimate the couple's age differences using information on date of birth of each spouse. The hypotheses is that couples with different age differentials would behave differently. More specific I postulate that couples closer in age have higher propensity to retire at the same time because they share similar trajectories in the labor market. I use a variable to control for the existence of dependent children in the household, considering children under 14 years of age as dependents. My hypotheses is that households with dependent children would stay in the labor force because of higher consumption demands that might not be fulfilled with pension benefits.

The last variable I use is the health status of each spouse. The assumption is that having a spouse in bad health condition would lead individuals to seek retirement to provide help. The problem of using current health status

is reverse causality, health status affects the ability to work, but not being in the labor force might affect one's health, and employment also affects health (Smith 1999). In addition to that, the PNAD does not provide information on previous health status or the occurrence of health shocks that might have affected labor force participation. One last problem is unobservable characteristics that influence labor supply decisions and health status at the same time (McGarry 2004).

5 Estimation Procedures

I use use a bivariate probit model to study retirement behavior of married individuals in Brazil, for most of the analysis. One of the equations is for the retirement decision of the husband and the other one is for the retirement decision of the wife (Greene 2003). I also perform some additional analysis using multinomial logit and univariate probit models (Greene 2003).

Equation 3 and Equation 4 represent the general bivariate probit model, where Probit(p) represents the probability of being retired (or retiring), X the matrix of explanatory variables and ϵ is the error term. The main interested of this chapter is how individual's own characteristics and spouse's characteristics affect their own retirement decision. Therefore, the matrix X contains both husband's and wife's characteristics described above.

$$\text{Probit}(p_m) = \beta_0 + \beta_1 * \text{X} + \epsilon_m \tag{3}$$

$$\text{Probit}(p_f) = \beta_0 + \beta_1 * \text{X} + \epsilon_f \tag{4}$$

The central part of the bivariate probit is that the error terms in each equation are jointly normally distributed with correlation coefficient denoted ρ. The distribution of disturbances are conditional on both husband's and wife's characteristics. The statistical significance of the correlation term between the two equations indicates whether the two outcomes of interest are dependent or not (Greene 2003). A positive value of ρ indicates that the outcomes of the two regression models are positively correlated. The positive value indicates that spouses tend to jointly decide about their retirement.

I face the problem of identification, which is very common in the analysis of retirement and other economic variables. The issue, as discussed by Gruber and Wise (2004), is how to separate the effect of each variable as distinct

from other variables. The problem arises because different individual characteristics can influence their retirement behavior and are used, or very related, to construct other variables of interest. This problem arises when trying to estimate the effects of incentive measures of retirement. For example, age and wage are important determinants of all incentive measures. Estimating a model including age, wage and incentive measures can make it harder to separate the effects of financial incentive measures to worker heterogeneity on retirement decisions.

6 Labor Market Status of Couples

6.1 The Determinants of Couple's Labor Force Participation

Table 5 shows the results of multinomial logistic regression comparing three patterns of couple labor force participation: both retired, both in the labor force and at least one spouse in the labor force. I cannot use an extensive set of variables in this model because some of the information is not collected to those who are out of the labor force (e.g. previous job, member of social security system, among others). I use couples with both spouses retired as the comparison. I find that increasing spouses' age differential reduces the probability that one spouse or both will be in the labor force. That is, couples with higher age differential have higher probability of both being retired.

Variable	Both in LF vs. None	One in LF vs. None
Age Difference	0.973 (0.0041)	0.971 (0.0041)
Education		
Husband's	0.911 (0.0067)	0.968 (0.0007)
Wife's	1.077 (0.0084)	1.013 (0.007)
Health Status, Poor=1		
Husband's	0.563 (0.0281)	0.507 (0.0278)
Wife's	0.8645 (0.043)	1.051 (0.0518)
Dep. Children, No=1	0.870 (0.038)	1.017 (0.044)

Source: PNAD, 1998

Table 5: Odds-Ratio - Multinomial Logit, Retirement Status, Couples, Brazil, 1998. Note: Std. Errors in parentheses

Education, measured in years of schooling, has opposite effects for males and females. The results indicate that increasing husband's education reduces the probability that one family member or both are in the labor force. The wife's educational level has an effect in the opposite direction, as increasing wife's education increases the chances that at least one member of the family will be in the labor force.

Health status has the predicted and expected effect. If in a couple either spouse has bad health, there is a higher chance that both are going to be out of the labor force compared to a couple where both are in the labor force. When comparing couples in which only one member is in the labor force to one in which both are out of the labor force, having a husband in bad health increases the chance that both members are retired.

Couples with dependent children, defined as children with less than 14 years of age, are more likely to have both spouses in the labor force. The impact of household type for couples with only one member in the labor force goes on the opposite direction, that is, couples without dependent children are more likely to have at least one member in the labor market than both spouses being retired, however the result is not statistically significant.

6.2 The Determinants of Receiving Pension Benefits

In Table 6 I present the results for the determinants of individuals receiving pension benefits in 1998. I specified several different univariate probit models but present only the model with the best fit, I selected the best model by comparing deviances from alternative specifications.

The direction and magnitude of the age coefficients are the expected ones. The propensity of being retired increases monotonically with age, men who are 65 years and older are 68% more likely to be retired than males aged 50 to 54 when controlling for all variables. For women, I estimate a 64% points increase in retirement probabilities when comparing similar age groups. The reasons for that are eligibility to social security benefits, decline in labor strength, and more desire to leisure.

The likelihood of being retired also increases with education, for both men and women. For individuals with less than 4 years of education, I estimate a decline of 25 and 29 percentage points in the chances of being retired, for males and females respectively. This is indicating several aspects of the Brazilian labor market: income effect is stronger than substitution effect, that is, more educated workers have higher ability to afford retirement and

Variable	Husbands	Wifes
Age		
45-49 years	.4617 (.0388)	.4568 (.041)
50-54 years (baseline)	1	1
55-59 years	.8197 (.0387)	1.1022 (.0405)
60-64 years	1.427 (.039)	1.7026 (.0430)
65 over	2.231 (.044)	1.912 (.0506)
Years of Education		
0-4 years	-.6527 (.038)	-1.145 (.0456)
5-8 years	-.266 (.044)	-1.110 (.0536)
9-11 years	-.062 (.0488)	-.4414 (.0547)
12 years + (baseline)	1	1
Health Status, Poor=1	.121 (.0228)	.1807 (.0268)
Dep. Children, No=1	.115 (.0219)	-.091 (.0257)
Constant	-.842 (.045)	-.883 (.046)

Source: PNAD, 1998

Table 6: Probit Model, Probability of Receiving Pension Benefit, Husbands and Wives, Brazil, 1998. Note: Std. Errors in Parentheses.

also more access to social security benefits. This effect is also stronger than the opportunity costs of being retired for more educated workers.

Health status seems to play an important role in explaining retirement behavior. The estimated parameters show that poor health status increases retirement probability for both males and females by about 4 percentage points retirement probability. Adding an interaction term between health and schooling, shows that health effects are stronger for less educated workers (results not shown). Less educated workers have more physically demanding jobs, and normally entered the labor force at younger ages, meaning that they depend much more on the health conditions than more educated workers.

The sign of asymmetric response appears on household composition. The presence of dependent children in the household, defined as having children younger than 14 years old in the household, has opposite effects for husbands and wives. I estimate that having dependent children increases the probability of retiring for females but reduces it for males. This may reflect the trade-off between labor market participation and caring for children faced by women. I also estimated a model adding interaction terms between wives'

age and the presence of dependent children. The effects are stronger for younger women but results are not statistically significant.

7 Joint Retirement Decisions

7.1 The Impacts of Spouses on Labor Force Status

In Table 7, I present estimates of the impact of wives' labor force status on husbands' retirement, and vice-versa, using a probit model. The results tell a fairly consistent story. Husbands whose wives are not in the labor force (already retired or not working) experience a relative increase in their retirement probabilities, but wives' whose husbands are not in the labor force have lower retirement probabilities. Men respond more sensitively and positively to women's retirement status rather than vice-versa. The negative effect for women might be indicating that since labor force participation for older women is relatively low, those in the labor force have more incentives to stay than leave. For example, and they might need to stay in the labor force to complement household income.

Specification	Husbands	Wives
1: Only Spouse's Status	.0074 (.0054)	-.0029 (.0067)
2: 1 + Age	.0076 (..0053)	-.0031 (.0071)
3: 2 + Education	.0069 (.0053)	-.0024 (.0078)
Including all Covariates	.0065 (.0051)	-.0008 (.0078)

Source: PNAD, 1998

Table 7: The Estimated Effect of Having a Retired Spouse on Retirement Transition. Note: Parameters refer to marginal effects(dF/dx). Std. Errors in parentheses

The other variables behave as expected: retirement probability increases with age, more educated workers have higher probability of retirement, having dependent children at home reduces probability of retirement, and poor health status also increases chances of retiring. Self-employed and informal sector workers are less likely to retire than workers in the formal sector. The latter are covered by the welfare system and they have better access to retirement benefits.

7.2 The Determinants of Retirement

I now turn to the analysis of the joint retirement decision model using the bivariate probit model. The results are shown in Table 8. I use most of the explanatory variables from the previous section but also include some which I could not use before. I find these results have similar directions but different magnitudes than those I estimate before.

Variable	Husband's Outcomes	Wife's Outcomes
Benefit Rep. Rate		
Husband	20.459 (6.053)	12.267 (6.622)
Wife	-.3299 (.1850)	.6194 (.2324)
Eligibility Soc. Sec		
Husband Old-Age	-.0382 (.111)	-.1170 (.1223)
Husband LS	-.2474 (.0644)	.0557 (.0749)
Wife Old-Age	.0072 (.0737)	.6492 (.0844)
Wife LS	-.098 (.0566)	-.2555 (.0617)
Age		
Husband	.0652 (.0149)	-.0192 (.0167)
Wife	.0225 (.0098)	.0572 (.0117)
Education		
Husband's	.0197 (.0081)	-.0248 (.0087)
Wife's	.0014 (.0102)	.1005 (.0124)
Health Status, Poor=1		
Husband's	.1328 (.0436)	.00517 (.0497)
Wife's	-.061 (.0441)	.1452 (.0500)
Dep. Children, Yes=1	.1165 (.0387)	.0022 (.0439)
Labor Status, Formal=1	-.139 (.0492)	-.2032 (.0611)
Constant	-23.84 (4.782)	-15.805 (5.237)
ρ	.3399 (.0277)	

Source: PNAD, 1998

Table 8: Bivariate Probit, Probability of Retirement, Couples, Brazil, 1998. Note: Std. Errors in parentheses

Age affects retirement decision in several ways. The two most important ones are the eligibility for pension benefits and increase in utility for leisure. I find that person's age increases the propensity of retirement, as older individuals have higher chance of being retired. Spouse's age also affect retirement

behavior but in different ways. Spouse's age have opposite impacts, being married to an older women increases the chance of husbands of being retired. However, women married to older males have lower retirement probabilities. For males, being eligible to either old-age and early-age retirement have a negative impact on retirement but the coefficients are not statistically significant. For wives, being eligible for early retirement has a negative impact on the chances of not being in the labor force. The labor force participation of older women is relatively low, and those eligible to early retirement have much more attachment to the labor market than their counterparts who are not (e.g. have longer working histories, better occupation, etc). Thus, their incentives to stay working are greater than the benefits of retiring.

Educational levels produce an asymmetrical result. Both husbands and wives respond positively to their own educational status, while husbands have a positive response to their wives's education but the latter respond negatively to the former. In this model education is indicating the net effect of income and substitution effects. I am assuming that more educated workers command a higher wage and higher pension benefits, which are positively correlated to larger social security wealth. A positive value indicates that income effect is higher, so more educated workers have more ability to afford retirement and do retire earlier. The interdependent effect for husbands confirm a priori postulates, as a more educated wife increase husband's retirement propensity. The results for wives is counterintuitive, since I observe a negative response to husband's education on wife's retirement. The result seems to indicate that men's retirement is affected by wife's retirement and financial measures, but husband's spillover effects have small and statistically insignificant effects on wife's retirement.

Spouse's health status seems to affect the decision to retire during the year in asymmetric ways. I find that having a wife in bad health reduces the probability to retire, but having a husband in bad health increases the probability to retire. My hypotheses was that wives' health would have a negative impact on husbands' retirement because of financial needs, for instance to afford for possible extra health care costs. On the other side, wives' would leave the labor force to spend provide direct care for their husbands. However, more analysis in this issue is necessary.

Surprisingly, self-employed and informal workers are less likely to be retired than individuals employed in the formal sector who, theoretically, have more and easier access to social security benefits. The negative effect of formal relation might be explained by an unusual trend in retirement in that

particularly year, and because education and region of reference are capturing the effects of labor market status. I also find that residents of more developed areas, South and Southeast, have higher retirement propensities than workers in less developed areas (estimates not shown). The results show how the system is more beneficial to the better-off population. The social security system justifies the introduction of early retirement to improve well-being in poorer areas of the country (Brasil 2002), which does not seem to be happening.

I now turn my attention to the correlation between the two outcome equations to test the joint retirement hypothesis. The estimate of *rho* is 0.339, with marginal significance of 0.027, providing statistically significance in favor of joint retirement hypothesis. In light of earlier discussion, the results indicate that spouses tend to retire together.

7.3 The Determinants of Retirement Transition

In this section, I use information from questions regarding labor force participation during the year preceding the survey and survey's reference week to measure retirement flows. Legrand (1995) uses similar approach using the 1980 Brazilian census. My analysis is limited by the low number of individuals who reported a transition in the labor market in that particular year. Nevertheless, I observed some interesting patterns worth comparing with the probability of being retired in a particular year.

I present the estimates of the best models in Table 9. First, I turn my attention to the correlation between the two outcome equations to test the joint retirement hypothesis. The estimate of *rho* is 0.3916, with marginal significance of 0.041, providing statistically significance in favor of joint retirement hypothesis. In light of earlier discussion, the results indicate that couples tend to retire at the same time.

The results are very similar in direction, but not in magnitude, to the estimates using retirement stocks. I find that greater social security replacement rates increase the probability of transitioning into retirement in 1998. I also observed that one's health status increase the chances of retirement. However, as before, wives seem to be more sensitive to husband's health status than the opposite. I interpret this outcome as a results of time allocation issues. Wives would leave the labor force to provide care for their spouses. In any event, more analysis on this issue is necessary. I should stress, however, that most of the parameters estimated are not statistically significant. In

Variable	Husband's Outcomes	Wife's Outcomes
Benefit Rep. Rate		
Husband	3.692 (9.035)	3.7263 (6.454)
Wife	-.1212 (.2053)	.31011 (.2468)
Eligibility Soc. Sec		
Husband Old-Age	.1786 (.1760)	.1894 (.1338)
Husband LS	-.244 (.1020)	.1296 (.0763)
Wife Old-Age	-.0883 (.1207)	.0658 (.0941)
Wife LS	-.0252 (.1020)	.0404 (.0675)
Age		
Husband	.0041 (.0228)	-.0222 (.0163)
Wife	.0176 (.0132)	-.0178 (.1273)
Education		
Husband's	-.0037 (.0037)	
Wife's		.0029 (.0118)
Health Status, Poor=1		
Husband's	.2599 (.0694)	.0133 (.0523)
Wife's	.00008 (.0694)	.1728 (.0528)
Dep. Children, Yes=1	.00252 (.0603)	-.0041 (.0461)
Labor Status, Formal=1	.3481 (.0679)	-.0842 (.0063)
Constant	-6.410 (7.1601)	-3.350 (5.119)
ρ	0.3916 (0.0412)	

Source: PNAD, 1998

Table 9: Bivariate Probit, Probability of Retirement Transition, Couples, Brazil, 1998. Note: Std. Errors in parentheses

general, in the previous analysis, I observe that wives are more responsive to familial incentives to retire than their husbands.

I find previous employment status to be a very important determinant of retirement behavior. I find that males who held a formal job in the previous year have a higher chance of retirement than those who were not in the formal sector. On the contrary, I observe that females who were in the formal sector have lower retirement probabilities. The labor force participation of older women is relatively low, and those with formal labor relations have much more attachment to the labor market than their counterparts who are not (e.g. have longer working histories, better occupation, etc). Thus, their incentives to stay working are greater than the benefits of retiring.

7.4 Sensitivity Analysis

I check for the robustness of the previous results, retirement probability, regarding the specification of the model. One theoretical concern is that some variables included in the model, especially other spouse's characteristics are endogenous. One alternative would be to obtain an instrumental variable to reestimate the model. For example, presence of dependent children is endogenous to the decision to work (for women), and the above mentioned problem of dual causality of health. I did not find any valid instrument for dependent children given my theoretical model and the structure of the data. The alternative is to reestimate the previous models with different specifications and check the significance of the correlation coefficients.

Table 10 displays the results of the robustness checks. I estimate the model for retiring in the past year with six different specifications. The table shows correlation coefficients and standard errors for the different specifications. The first model is the same as the previous section. The second model excludes all variables from the model, the correlation coefficient is still positive and statistically significant. The results indicate that the correlation term is robust to the model specification and that couples tend to jointly decide whether to retire or not.

8 Policy Simulation

In the simulation model I will reestimate retirement probabilities based on changes in the social security eligibility rules. I simulated changes in the

Variables Excluded	Coefficient	St. Err.
None	.3391	.0277
All Variables	.5298	.0250
Other Spouse Char.	.3413	.0278
Other Educ.	.3414	.0278
Health Status	.3535	.0278
Dep. Children	.3338	.0277

Source: PNAD, 1998

Table 10: Sensitivity Analysis, Correlation Coefficient under different specifications

eligibility ages, first by eliminating the length-of-service benefit and, second, by equalizing male's and female's age requirements. The aim of these simulations is to measure the impacts of rules changes and provide inputs for policy makers.

The results are depicted in Figure 4 and Figure 5, they show the estimated probability of retirement of male workers based on equalizing retirement ages of males and females. I simulate it using 65 as the minimum retirement age for both males and females. The first graph shows the change for all males, one can see a small difference in retirement probabilities at older ages. I also estimated the probabilities considering only the males who are married with women who were directly affected by the policy simulation. In this case, it is clear that change retirement eligibility there is a strong effect on retirement, retirement probabilities at all ages are much lower than before. After the reform, males tend to retire later in life especially after their wives become eligible to receive a benefit.

9 Conclusion

Labor force participation rates for older men fell significantly between 1950 and 2000. During this time, the Brazilian pension system expanded absorbing a larger group of the population helping to accelerate the trends toward early retirement. Social security regulations in Brazil, as in many other countries, provide incentives for the working population to postpone retirement until the age in which benefits are available but do not create incentives to stay in the labor force after that age.

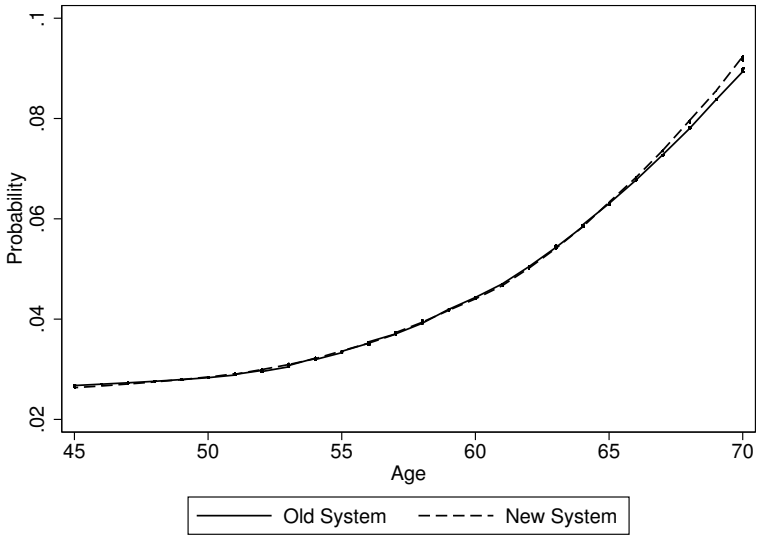

Figure 4: Probability of Retiring under different scenarios, Husbands, 1998 (Source: PNAD, 1998)

Data from the 1998 PNAD support the idea that social security creates incentives to early retirement. In the analysis of retirement flows, older and more educated workers who are employed in the formal sector and reside in more developed regions had much higher retirement rates when compared to their counterparts who were not in the formal sector. I find health to be a major determinant of retirement. Workers who reported being in bad or very bad health have much higher propensities to retire than those who reported being in good health.

The results from the stock of retirees show similar results to the ones observed in the analysis of flows. There is an important effect of age, health status and region of residence. In addition, education plays an important role. I observed monotonic increase in the likelihood of retirement as educational levels increase. Education is highly correlated with income, wealth and type of job. The net effect of education is a result of income and substitution effects. The first creates incentives to retire while the second by rising the price of retirement implies in higher opportunity costs.

The main interest of this paper was, however, to understand how spouse's

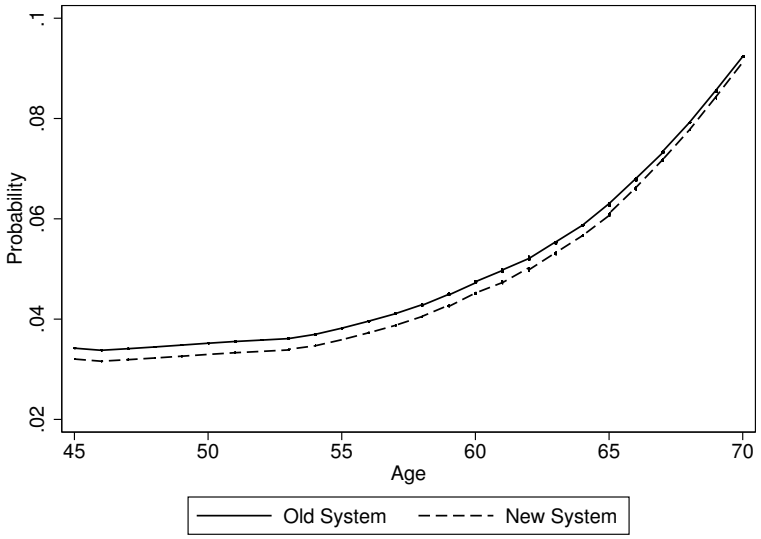

Figure 5: Probability of Retirement under different scenarios, Husbands with Wives aged 60-64, 1998 (Source: PNAD, 1998)

retirement behavior is influenced by their own characteristics and by interdependent variables (spillover effects). I find that husbands and wives respond similarly to their own personal characteristics and variables, in the direction discussed in the literature. I also find strong evidence of joint retirement decision, since having a retired spouse or a spouse retirement in the previous year increases the probability of own retirement.

A very important finding is that husbands have a positive response to wives incentives, measured by educational level, but wives respond negatively to husband's incentives. A possible explanation for this results is how each spouse values leisure complementarity. According to my results, husbands seems to value it more than women. Therefore, resulting in different spillover effects. This results is similar to what Coile (2003) finds for the USA.

These asymmetries indicate the importance of taking familial variables into consideration when studying retirement behavior. They will also influence the simulation results. I expect, based on those results, that affecting women's retirement age will affect not only her decision but also her spouse's behavior which might create more positive effects to the pension system.

The system also plays a perverse rule by creating more incentives to early retirement for workers with higher income and better social economic status. The system which was created to transfer income from the wealthy to the poor is operating in the opposite way.

The results presented in this paper should be interpreted with caution. The use of cross-sectional data for the study of life-cycle behaviors are very complicated and pose several problems. However, in the absence of longitudinal data in developing countries, the existence of large and high quality cross-sectional household surveys may shed some light on this problem.

References

Afonso, Luis Eduardo and Reynaldo Fernandes. 2004. "Uma Estimativa dos Aspectos Distributivos da Previdencia Social no Brasil." Working Paper.

Becker, Gary. 1993. *A Treatise on the Family*. Harvard University Press.

Blau, David. 1998. "Labor Force Dynamics of Older Married Couples." *Journal of Labor Economics* 16:595–629.

Bongaarts, John. 2004. "Population Aging and the Rising Cost of Public Pensions." *Population and Development Review* 30:1–23.

Bowen, W.G. and T.A. Finegan. 1969. *The Economics of Labor Force Participation*. Princeton University Press.

Brasil. 2002. *Livro Branco da Previdencia Social*. Ministerio da Previdencia Social.

Brazil. 2003. "Gasto Social do Governo Central: 2001 e 2002." Technical report, Ministerio da Fazenda - Secretaria de Politica Economica.

Carvalho-Filho, Irineu. 1999. *Old-Age Benefits and Retirement Decisions of Rural Elderly in Brazil*. Ph.D. thesis, Massachusets Institute of Technology.

Coile, Courtney. 2003. "Retirement Incentives and Couple's Retirement Decisions." NBER Working Paper 9496.

Giambiagi, Fabio and Ana Claudia Duarte Alem. 1997. "A Despesa Previdenciaria no Brasil: evolucao, diagnostico e perspectivas." Texto para Discussao do IPEA.

Greene, William. 2003. *Econometric Analysis*. Prentice Hall, 5th edition.

Gruber, Jonathan and David Wise (eds.). 1999. *Social Security and Retirement Around the World*. The University of Chicago Press.

Gruber, Jonathan and David Wise. 2001. "An International Perspective on Policies for an Aging Society." NBER Working Paper No. 8103.

Gruber, Jonathan and David Wise (eds.). 2004. *Social Security and Retirement Around the World: micro-estimation*. The University of Chicago Press.

Gustman, Alan and Thomas Steinmeier. 2000. "Retirement in Dual-Career Families: a structutal model." *Journal of Labor Economics* 18:503–545.

Heckman, James. 1979. "Sample Selection Bias as a Specification Error." *Econometrica* 47:153–61.

Henretta, J.C. and A.M. O'Rand. 1983. "Joint Retirement in the Dual Worker Family." *Social Forces* 62:504–520.

Hurd, Michael. 1990. "The Joint Retirement Decision of Husbands and Wives." In *Issues in the Economics of Aging*, edited by David Wise, pp. 231–258. The University of Chicago Press.

Lazear, Edward. 1986. "Retirement from the Labor Force." In *Handbook of Labor Economics*, edited by O. Ashenfelter and R. Layard, volume 1, chapter 5, pp. 305–355. Elsevier Science Publishers.

Legrand, Thomas. 1995. "The Determinants of Men's Retirement Behavior in Brazil." *The Journal of Development Studies* 31:673–701.

Lumsdaine, Robin and Olivia Mitchell. 1999. "New Developments in the Economic Analysis of Retirement." In *Handbook of Labor Economics*, edited by O. Ashenfelter and D. Card, volume 3, chapter 49, pp. 3261–3307. Elsevier Science.

Maestas, Nicole. 2001. "Labor, Love and Leisure: complementarity and the timing of retirement by working couples." Working Paper.

McGarry, Kathleen. 2004. "Health and Retirement: do changes in health affect retirement expectantions?" *The Journal of Human Resources* 39.

Pozzenbon, Silvana and Olivia Mitchell. 1989. "Married Women's Retirement Behavior." *Journal of Population Economics* 2:39–53.

Reimers, Cordelia and Marjorie Honig. 1996. "Responses to Social Security by Men and Women: myopic and far-sighted behavior." *The Journal of Human Resources* 31:359–382.

Smith, James. 1999. "Healthy bodies and thick wallets: the dual relation between health and socioeconomic status." *Journal of Economic Perspectives* 13:145–166.

Spratin, Janet and Karen Holden. 2000. "Women and Economic Security in Retirement: Implications for Social Security Reform." *Journal of Family and Economic Issues* 21:37–61.

UN. 2003. "World Population Prospectus: the 2002 revision." Technical report, United Nations - Population Division.

Vitnes, Jessica. 1994. "An Empirical Analysis of Married Women's Retirement Decision." *National Tax Journal* 48:135–155.

Wise, David. 2004. "Social Security Provisions and the Labor Force Participation of Older Workers." *Population and Development Review* 30.

Zweimuller, Josef, Rudolf Winter-Ebmer, and Josef Falkinger. 1996. "Retirement of Spouses and Social Security Reform." *European Economic Review* 40:449–472.