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## Retirement and Home Production: A Regression Discontinuity Approach<sup>†</sup>

By ELENA STANCANELLI AND ARTHUR VAN SOEST\*

Existing studies argue that the drop in consumption expenditures upon retirement, known as the retirement consumption puzzle, may be at least partly explained by increased home production. The earlier literature focuses on retirement of the male head of the household and its effects on consumption and individual home production. However, retirement of one (or both) of the partners in a couple may change the time use of both partners.

In this paper we analyze the causal effect of retirement on hours of home production of individuals in a couple, allowing for endogeneity of the retirement decision. Our identification strategy exploits the legislation on the earliest age at which an old age pension can be drawn in France. This makes the probability to be in retirement a discontinuous function of age, with a substantial positive jump at age 60. We therefore can use a regression discontinuity approach: keeping retirement status constant, time spent on home production is assumed to be a continuous function of the age of both partners, whereas the probability of retirement is discontinuous at age 60 (of the individual and, possibly, the partner). In other words: the age at least 60 dummies for both partners can be excluded from the equations

for the time spent on home production but do have power in the equations for retirement.

Retirement may directly affect the marginal utility of home production and make it attractive to spend more time on it, while at the same time reducing expenditures on consumption goods and services bought in the market. Not only the home production of the partner who retires (and has more time available for home production, leisure activities, etc.) may increase—there may also be an effect on home production of the other partner, induced by the change in the retiree's home production, or to compensate for a reduction in household income. This is why our aim is to analyze how retirement of each partner in a couple affects the hours of home production of both partners and the household as a whole.

The relation between life cycle consumption or home production and retirement has been studied extensively (see, for example, Hamermesh 1984; Hurst 2008; Battistin et al. 2009; Aguiar and Hurst 2005 and 2007a; Hurd and Rohwedder 2008). None of these earlier studies considered the retirement of the partner. On the other hand, the scant literature on explaining joint retirement does consider time use of both partners, emphasizing externalities in leisure: joint retirement leads to utility from joint leisure activities exceeding the utility from leisure activities without the partner (Hurd 1990; Gustman and Steinmeier 2000 and 2009). These studies did not consider how joint retirement affects consumption or home production.

We analyze the effect of retirement of both partners on various home production activities, including shopping, cooking, gardening, and, more generally, doing household chores, and caring for adults and children. These activities differ in how enjoyable (or dislikeable) they are and have obvious market substitutes in the form of maids, gardeners, private enterprises, and public or private care providers.

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The data for the analysis are drawn from the 1998–99 French Time Use Survey, carried out by the French National Statistical Offices (INSEE). The sample includes about 1,000 couples with both partners aged 50 to 70. In our data, age is available in months, which is helpful to identify respondents very close to the age threshold of 60.

We find that the probability to be retired and the expected number of hours of paid work have a substantial and statistically significant discontinuity at age 60, supporting our identification strategy. Our results show that retirement increases own housework time, but also affects the partner's time allocation. We therefore conclude that considering both partners' retirement and home production is crucial to understanding the effect of retirement on home production at the household level.

The next section presents the econometric approach. Description of the data follows. The last section discusses the results of the estimations and draws conclusions.

### I. A Regression Discontinuity Approach

To identify the causal effect of retirement on home production, we exploit the legislation on early retirement in France, which sets 60 as the earliest retirement age for most workers. This creates a discontinuity in the probability of retirement as a function of age that enables us to apply a regression discontinuity (RD) framework (see, for example, Lee and Lemieux 2010, or Van der Klaauw 2008, for a review of RD).

In our data, year and month of birth were collected, so we can treat age as measured continuously. Our approach accounts for the fact that some people retire earlier than sixty—due to special early retirement schemes and sector specific agreements—and others later.<sup>1</sup> It follows that we face a “fuzzy” regression discontinuity design: the jump in the probability of retirement at age 60 is greater than zero but less than one.

Let  $R_m$  and  $R_f$  be dummies for retirement of the male ( $m$ ) and female ( $f$ ) partners, equal to one for individuals who have retired from market work and zero otherwise, and let  $T_{jm}$  and  $T_{jf}$

be the hours allocated to housework of type  $j$ . Our model is specified as follows:

$$(1) \quad T_{jm} = \mathbf{Z}_m \beta^{jm} + \mathbf{Z}_f \beta^{jf} + R_m \gamma^{jm} + R_f \gamma^{jf} + \mathbf{Agepol}_m \psi^{jm} + \mathbf{Agepol}_f \psi^{jf} + \nu^{jm}$$

$$(2) \quad T_{jf} = \mathbf{Z}_m \lambda^{jm} + \mathbf{Z}_f \lambda^{jf} + R_m \delta^{jm} + R_f \delta^{jf} + \mathbf{Agepol}_m \zeta^{jm} + \mathbf{Agepol}_f \zeta^{jf} + \nu^{jf}$$

$$(3) \quad R_{im}^* = \mathbf{Z}_m \beta^{rm} + \mathbf{Z}_f \beta^{rf} + D_m \gamma^{rm} + \mathbf{Age}_m D_m \eta^{rm} + \mathbf{Age}_m (1 - D_m) \pi^{rm} + D_f \gamma^{rf} + \mathbf{Age}_f D_f \eta^{rf} + \mathbf{Age}_f (1 - D_f) \pi^{rf} + \nu^{rm};$$

$$R_{im} = 1 \text{ if } R_{im}^* > 0 \text{ and } R_{im} = 0 \text{ if } R_{im}^* \leq 0$$

$$(4) \quad R_{if}^* = \mathbf{Z}_m \lambda^{rm} + \mathbf{Z}_f \lambda^{rf} + D_m \delta^{rm} + \mathbf{Age}_m D_m \tau^{rm} + \mathbf{Age}_m (1 - D_m) \mu^{rm} + D_f \delta^{rf} + \mathbf{Age}_f D_f \tau^{rf} + \mathbf{Age}_f (1 - D_f) \mu^{rf} + \nu^{rf};$$

$$R_{if} = 1 \text{ if } R_{if}^* > 0 \text{ and } R_{if} = 0 \text{ if } R_{if}^* \leq 0.$$

Here

$$\mathbf{Age}_m = [(Age_m - 60), (Age_m - 60)^2, \dots, (Age_m - 60)^n],$$

$$\mathbf{Age}_f = [(Age_f - 60), (Age_f - 60)^2, \dots, (Age_f - 60)^n],$$

$$\mathbf{Agepol}_m = [(Age_m), (Age_m)^2, \dots, (Age_m)^n], \text{ and}$$

$$\mathbf{Agepol}_f = [(Age_f), (Age_f)^2, \dots, (Age_f)^n].$$

<sup>1</sup> In France, labor force participation interruptions will not translate into later pension entitlement since unemployment and sick leave periods all contribute to the pension claim.

The vectors  $\mathbf{Z}_m$  and  $\mathbf{Z}_f$  contain control variables (other than age functions) such as education level, presence of children, and local labor market variables like the regional unemployment rate;  $D_m$  and  $D_f$  are dummies for whether the male and female partners have reached age 60 (720 months of age); Greek letters denote (vectors of) coefficients. The  $v$ 's are normally distributed errors, independent of  $\mathbf{Z}_m$  and  $\mathbf{Z}_f$  and the ages of both partners but allowed to be correlated across equations. The equations for retirement are probits; the housework equations are linear equations.<sup>2</sup> The four equations are estimated jointly by simulated maximum likelihood (see Roodman 2007, 2009). By allowing the error terms in equations (1)–(4) to be correlated in an arbitrary way, own and partner's retirement are allowed to be endogenous to housework.

Alternatively, we also analyze models in which retirement is replaced by hours of paid (market) work. This model uses the same explanatory variables and identification strategy, since reaching age 60, through retirement, leads to a discontinuous drop in average hours of market work (given the control variables).

We also use similar models for the sum of the male and female partner's hours of housework, using a system of three instead of four equations: two retirement equations (one for each partner) and one housework equation at the household level. The advantage of this is that it makes it easier to interpret the effect of retirement of one or both partners on the total hours allocated to home production by the couple.

Finally, since most individuals do not perform market work at weekends, retirement might simply lead to a reallocation of housework from weekends to weekdays. We therefore also consider observations on time use on weekend days, including a weekend dummy and its interactions with the retirement dummies (or market hours) in the home production equations, as well as interactions of the "age at least 60" dummies and weekend diary dummies in the market hours equations.

<sup>2</sup> We found similar results with tobit equations accounting for the bunching of some housework activities at zero.

## II. The Data: Sample Selection and Covariates

The data for the analysis are drawn from the 1998–99 French time use survey, carried out by the National Statistical offices (INSEE). This survey is a representative sample of more than 8,000 French households. We then applied the following criteria to select our estimation sample out of the 5,287 heterosexual couples surveyed:

- Both partners responded to the survey and were aged 50 to 70.
- Both partners filled in the time diary.
- The partners did not fill in the time diary on an atypical day, defined as a special occasion such as a vacation day, a day of a party, a funeral, or a sick day.
- None of the partners were unemployed or inactive.
- We dropped one man who reported to be a home-maker, but we kept housewives.

Applying these criteria led to a sample of 1,043 couples. We distinguish the following time use categories collected in the diary:

1. Market work (at the workplace or at home, etc.).
2. Housework, and its subcomponents:
  - (i) "Core" household work, including cleaning, doing the laundry, ironing, cleaning the dishes, setting the table, and doing administrative paper work for the household.
  - (ii) Shopping.
  - (iii) Cooking.
  - (iv) "Other" household work, including gardening, house repairs, knitting, sewing, making jam, and taking care of pets.
3. Caring for children and/or adults living in the same or in other households.

We separate cooking and shopping activities from other "core" chores as these two activities are the ones that received most attention in the earlier literature on substituting home production for private expenditure (for instance, Aguiar and Hurst 2005 and 2007a). We also single out "other" housework, sometimes named "semi-leisure" chores in the time use literature, since they may well be more enjoyable tasks than

other sorts of housework (see, for example, Aguiar and Hurst 2007b). Finally, we separate care tasks from other household chores as earlier studies do.

The employment or retirement status is derived from the respondent's self-assessed occupational status. In particular, respondents were asked to choose among the following possible states: employment; unemployment; in education; in the military; retired or early-retired; housewife; other inactive. The indicator for retirement takes value one for respondents that self-reported to be retirees or early-retirees. In the analysis, housewives will be considered together with retired women,<sup>3</sup> as opposed to those employed and, thus, still at work.

### III. Results

First, we have carried out some exploratory graphical analysis of the discontinuities in retirement, market hours, and housework at age 60 for each partner (see Charts 1 and 2 in the online Appendix). We find evidence of a clear discontinuity in retirement and hours of paid work at the age cutoff of 60 for both men and women. There is also a substantial jump at age 60 for some of the home production activities considered.

Estimation results of the four equations model of retirement and hours of home production of each partner are summarized in Table 3 in the online Appendix. We find that at (own) age 60, the probability of being retired increases significantly (by 23 and 13 percentage points for men and women, respectively), which supports our identification strategy. The fact that the partner reaches age 60 has no significant effect on individual retirement or market hours. A few other variables are significant: respondents living in Paris tend to retire later, as do respondents with higher education level.

We find that own retirement increases significantly husband's and wife's housework hours (Table 3), by more than three hours on a weekday for men and by two hours and 40 minutes for women. This large increase in housework hours partly reflects the fact that upon retirement a considerable amount of time is reallocated to other

"productive" activities. Moreover, the wife's retirement leads to a significant reduction of the husband's hours of home production of almost two hours per day, while her housework does not respond significantly to his retirement. Men living in Paris tend to do less housework than other men. For women, cohabiting instead of marriage and education are negatively related to the time spent on housework. Finally, the strongly significant and positive correlation between unobservables driving the retirement decisions of the two partners (Table 5 in the online Appendix) reflects a tendency to retire jointly. The positive and significant correlation between unobservables in the two partners' housework equations suggests that shared preferences or prices of market alternatives to home production are more important than substitution patterns.

Estimation results for the model with hours of paid work instead of retirement are more or less the "mirror" image of this (see Table 4 in the online Appendix). Hours of paid work also drop significantly at age 60 (by 173 and 130 minutes on a weekday for men and women, respectively). As expected, the drop in market hours at age 60 is much larger on weekdays than on weekends.<sup>4</sup> The individual's hours of paid work are not significantly affected by the partner's age at least 60 dummy.

Each additional hour of market work substantially reduces own housework hours for both partners, though the effect is significant at only the 10 percent level for women (Table 4). For men, a one hour drop in market work on a weekday results in an increase of own home production of 26 minutes. For women, the effect is 19 minutes. On weekend days, the effects are smaller, particularly for men. Women hardly respond to a change in market hours of the husband. Men respond more to a change in female market hours, and the effect is positive, as expected, but it is significant only on weekend days. The larger response of male housework to the woman's hours of paid work than vice versa is in line with the larger response of male housework to the woman's retirement discussed above.

<sup>3</sup> Dropping couples where the female partner reported to be a housewife did not substantially affect the results, though the sample size drops to about 700 households.

<sup>4</sup> As reflected by the large negative estimates for the dummy on weekend diaries, paid work hours are much lower in weekends than on weekdays, for both genders and before and after age 60. In other words, few people in couples aged 50–70 worked on a weekend day.

The effects of retirement of each partner on the total housework hours at the household level (Table 8 in the online Appendix) indicate that total housework increases by about four hours on a weekday following retirement of the husband,<sup>5</sup> while the retirement status of the wife does not have a significant effect, since the negative effect on housework by the husband and the positive effect on own housework largely cancel. This shows the importance of considering housework of both partners in the couple—looking at the individual only would lead to misleading conclusions for home production at the household level.

Similar models were estimated for the separate home production activities (Tables 10 to 13 in the online Appendix). The results show that the men's hours of "other" or "semi-leisure chores" (mostly gardening and house repairs) and female hours of "core" chores (mostly cleaning, ironing, washing dishes and clothes), cooking, and shopping increase substantially upon (own) retirement. On weekdays, men in a couple devote almost three extra hours per day to "other" chores upon their retirement, though this falls (by almost two hours) if their wife also retires. Remarkably, hours devoted to cooking and shopping by both the household and the woman herself increase significantly (by over one hour for cooking and almost 50 minutes for shopping) if the woman retires. The time devoted to caring for others increases significantly for both partners with own retirement. In the model with hours of paid work, caring time by the male partner is particularly responsive—it increases by 15 minutes for a drop in paid work hours by one hour. At the household level, the largest effect is found if the male partner retires (almost one hour per day).

#### IV. Conclusion

We have found that considering the effect of retirement on both partners in a couple is crucial to understanding the effect of retirement on home production at the household level. There is a substantial increase in the hours of housework of males and females upon their own retirement, and this increase is larger for males than

for females. Retirement of the female partner also significantly and substantially reduces the housework done by the man, but not vice versa. This implies that ignoring the partner's retirement and its effect on home production may lead to a biased estimate of the scope for substitution between private expenditure and home production at the household level. Moreover, considering the effect of retirement of the male breadwinner only will also lead to an incomplete picture of how retirement affects time use and productive activities in the household.

Furthermore, our findings for specific types of housework like cooking, shopping, or gardening and doing house repairs suggest that the increase in housework hours of retired French men is mostly concentrated in activities such as gardening and house repairs, while for women in a couple, mostly cooking and shopping increase at retirement. Thus, taking the retirement of women in a couple into account helps explain the potential for substitution between consumption expenditures and home production upon retirement.

The asymmetry between responses of male and female partners is striking, both for home production (that is, housework at an aggregate level) and for more disaggregate time use categories such as shopping, cooking, and gardening. How these asymmetries can be explained from theories of household decisions is beyond the scope of the current paper but remains an interesting topic of future research. Time use data for couples seem a necessary condition for such a research direction.

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