Will Women Save more than Men?
A Theoretical Model of Savings and Marriage

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Abstract

This paper presents an inter-temporal model of individual behavior with uncertainty about marriage and divorce and which accommodates the possible presence of economies or diseconomies of scale from marriage. We show that a scenario of higher marriage rates and higher divorce rates will be associated with higher savings rates in the presence of economies of marriage and with lower savings rates in the presence of diseconomies of marriage. In the context of traditional gender roles, this implies higher saving rates by young men and lower saving rates by young women than in less traditional countries, the opposite being the case with saving rates of married women relative to those of married men. We establish the relevance of traditional gender roles and marital status to understanding cross-country variation in gender differentials in savings behavior.

JEL-Code: E21, J12.

Keywords: savings behavior, marriage, divorce, economics of marriage, gender roles.

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1. Introduction

Personal savings behavior is a very important variable influencing economic growth. Conventional economic theory, however, does not seem to provide a good understanding of the determinants of personal savings. For instance, there are currently no good explanations for the considerable decrease in personal savings rates observed in the United States over the last few decades from around 12% in the middle 1970s to the current 2.7% [see, for example, Auerbach and Kotlikoff (1990), Hungerford (2006), and Guidolin and La Jeunesse (2007)] or for the large differences in household savings traditionally observed among industrialized countries [on average over the last decade personal savings rates were, according to OECD (2009), close to zero for Australia, Denmark, and Finland, around 5% for Japan and Korea, and over 10% for France and Germany, for example].

Some of the most commonly used explanations for variations in household savings are related to demography and family decision-making. Demographic characteristics are expected to influence savings to the extent that the motives for savings - such as the desire to prepare for retirement, to bequest, or to fund education - vary over the life-cycle. Using a life-cycle model of consumption and savings, economists have previously related savings to, for example, the age structure of the population, life expectancy, and labor force participation rate of the aged [see, for example, Horioka (1989, 1997), Horioka and Wan (2007), and Horioka and Terada-Hagiwara (2010)], retirement age, family size, percent of working age population [see, for example, Smith (1990)], and percent of women in the labor force (see, for example, Apps and Rees (2010)].

The focus of this paper is on a particular demographic characteristic: marital status. Economists have written about the effect of marriage considerations on savings. Men preparing for marriage appear to save more [see Horioka (1987) on the effects of marriage-related expenses on savings and Du and Wei (2010) on the effects of high sex ratios on savings]. That marriage and divorce are related to savings has also been established, for example, by Auerbach and Kotlikoff (1990) and

Lupton and Smith (2003). In this paper we examine the role of both marriage [understood as including cohabitation] and divorce [understood as including separation and widowhood]. Our theoretical model stands out in that it simultaneously models the marriage and savings decisions. It offers a novel perspective by incorporating in an inter-temporal model of savings behavior under uncertainty several factors related to couple formation: the likelihood of marriage, the likelihood of divorce, and the presence of economies or diseconomies from marriage.

The key role of economies or diseconomies from marriage in our model is suggested by the mixed evidence in the empirical literature on the gender differentials in savings behavior. Women save more than men according to a number of studies based, for example, on data from South Korea [see Kim (1997) and Lee and Pocock (2007)], Kenya [Anderson and Baland (2002)] and the US [Hungerford (1999)]. Seguino and Floro (2003) analyzed a panel data set for semi-industrialized countries and showed that the higher women's income is relative to that of men, the higher is a country's gross domestic savings rate. However, when Phipps and Woolley (2008) estimated midlife men and women's probability of ever having contributed to a 'Registered Retirement Savings Plan' (or RRSP, a Canadian cousin of IRA programs in the US) they found that greater female control was associated with a lower probability of having contributed, as well as lower contribution levels. They also found that an increase in male earnings had a much larger effect on total savings into this kind of retirement plan than an equivalent increase in female earnings. It is also the case that according to the 2008 Family Income and Expenditure Survey (Statistics Bureau, Japan, 2008), single men save more than single women in Japan.

Our model attempts to reconcile some of these apparent contradictions in the empirical literature. In the context of traditional gender roles, marriage entails economies of marriage for women and diseconomies of marriage for men. Our model incorporates such gender asymmetry and therefore accommodates different savings behavior by young single men, relative to those of young single

women, and different savings behavior by married women relative to those of married men. In cultures with more egalitarian gender roles we expect fewer gender differences in savings rates at both youth and midlife. As a result, cross-cultural variation in norms regarding gender roles in the household could possibly explain gender differences in savings rates.

While we view marriages like firms composed of individuals who produce together and/or consume together, in the tradition of the *New Home Economics* pioneered by Becker (1960, 1965) and Mincer (1962, 1963), our model's decision-makers are individuals who can be either single, married, or single again (via divorce or death). The income from which they save is their individual disposable income. Economies or diseconomies of marriage expand or reduce the purchasing power of individual income. Our analysis builds on Becker's (1973) pioneering economic analyses of marriage and on economic models analyzing intra-marriage transfers as compensations for work in marital household production, such as Grossbard-Shechtman and Neuman (1988).

This paper is organized as follows. In section 2 we present the analytical model. In section 3 we present the analytical results on the impact of changes in the probability of marriage on the savings rate of agents at different stages of their lives. In section 4 we do the same with changes in the probability of divorce. Finally, in section 5 we discuss some of the empirical implications of our results and provide suggestions for future work.

2. The Analytical Framework

We consider households as composed of individual agents, even if married. Our stylized agent – a male or a female - lives for three periods: youth, or period 1, midlife, or period 2, and old age, or period 3. The agent maximizes an individual inter-temporal utility function (1) defined on consumption c_i with i = 1, 2, and 3. Various potential marital states are possible. In case of marriage, both private and household public goods, i.e., goods consumed jointly with the spouse, are possibly

consumed by the agent, but we don't formally distinguish between the two types of goods. The utility function is assumed to satisfy positive marginal utility, decreasing marginal utility, and constant absolute risk aversion. Future consumption is discounted by a factor δ that captures impatience.

(1) $$Ma\ [U(c_1) + \delta U(c_2) + \delta^2 U(c_3)$$

This utility function is maximized subject to budget constraints for each of the three periods. The agent can derive income from two sources: work or interest on past savings. It is assumed that the agent earns the same wage *w* in every one of the three periods, which assumes inter-temporal smoothing of earnings. Savings earn a return *r*. In the absence of intergenerational altruism and/or uncertainty as to the time of death, there are no savings in period 3.

The model considers that individual agents continue to make their own consumption and savings decisions whether married or single. Marriage is defined as being-in-couple and includes cohabitation, and accordingly, divorce includes separation where individuals did not tie the knot. We assume that the agent is unmarried in the first period. There is a probability p_2 that the agent will remain single in the second period, the alternative being to marry. There is a probability p_3 that the agent will be single, widowed, or divorced in the third period. For the sake of simplicity we will refer to p_3 as the probability of divorce. It is assumed that p_2 and p_3 are exogenous and independent, that the divorced state is equivalent to the single state, that agents can not marry in period 3, and that divorce does not entail either extra expenses or extra income. In periods 2 and 3 (midlife and old age), the budget constraint depends on marital status of the agent.

Consumption and savings are personal, not household based. From a purchasing power perspective, an agent can benefit from marriage to the extent that the agent has access to the spouse's

income to buy goods consumed by the agent. How much the agent benefits from spousal earnings is captured by an 'economies of marriage' parameter, γ. In the case of $\gamma = 1$ marital status does not affect the consumption value of earnings w. This could be a situation where the agent is single or a situation where married people's earnings generate neither economies of marriage nor diseconomies of marriage.

If $\gamma > 1$ there are economies of marriage in the sense that in the married state individual income w can generate more consumption and savings for agents than if they were to stay single. One possible reason for the economies of marriage is that the individual expects to obtain a higher disposable income after marriage, via access to his or her spouse's income. Alternatively, the spouse may purchase goods benefiting this individual's private consumption or his consumption of household public goods. Such intra-marriage transfers of income may be the result of that agent doing more work in household production and getting compensation for such work from the spouse. In a context in which leisure does not enter the utility function, such division of labor within the household is an economy of marriage to the person doing the household production work.

In contrast, if $\gamma < 1$, there are diseconomies of marriage in the sense that in the married state individual income w has a lower purchasing power for agents than if they were to stay single. This could include a situation where the agent's income is used to 'pay' the spouse and the spouse buys goods that don't benefit the agent, so that the consumption value of the agent's income is lower than what it would be if the agent were single. Another possibility is the case in which the spouse does not participate in the labor force and therefore does not have independent income.

Given these considerations, the budget constraints for the three periods can be written as:

(2) $w = c_1 + s_1$

$w + (1 + r)s_1 = c_2 + s_2$ with probability p_2

$\gamma w + (1+r)s_1 = c_2 + s_2$ with probability (1- p_2)

$w + (1+r)s_2 = c_3$ with probability p_3

$\gamma w + (1+r)s_2 = c_3$ with probability (1- p_3)

The optimal level of savings in the first two periods is obtained by maximizing (1) subject to (2) and can be presented in general terms as:

$$(s_1, s_2) = \text{argmax V}$$

where,

$$V = U(w - s_1) + \delta\{p_2 U[w + (1+r)s_1 - s_2] + (1 - p_2)U[\gamma w + (1+r)s_1 - s_2]$$

(3)

$$+ \delta^2\{p_3 U[w + (1+r)s_2] + (1 - p_3\}U[\gamma w + (1+r)s_2]\}$$

Given the properties of the utility function (s_1, s_2) are determined by

(4) $$\frac{\partial V}{\partial s_1} = -U'(w - s_1) + \delta(1+r)\{p_2 U'[w + (1+r)s_1 - s_2] + (1 - p_2)U'[\gamma w + (1+r)s_1 - s_2]\} = 0$$

(5) $$\frac{\partial V}{\partial s_2} = -\delta\{p_2 U'[w + (1+r)s_1 - s_2] + (1 - p_2)U'[\gamma w + (1+r)s_1 - s_2]\}$$

$$+ \delta^2(1+r)\{p_3 U'[w + (1+r)s_2] + (1 - p_3)U'[\gamma w + (1+r)s_2]\} = 0$$

Let these first order conditions be denoted in an implicit form by

(4') $$F_1(s_1, s_2; p_2, p_3) = 0$$

(5') $F_2(s_1, s_2; p_2, p_3) = 0$

Functions (4')-(5') represent savings rates implicitly, where $s_i = s_i(s_1, s_2; p_2, p_3) = 0$, with i = 1,2. The effects of the different arguments on savings behavior can be obtained by using the implicit function theorem and the related information presented in the Appendix.

3. On the Effects of Changes in the Probability of Marriage on Savings Behavior

We now consider the effects of changes in the probability of marriage $(1 - p_2)$ on savings in both youth and mid-life and thereby on lifetime savings.

***Proposition 1** [Effects of changes in the probability of marriage on savings at youth] Savings at youth decrease with the probability of marriage if there are economies of marriage* $(\gamma > 1)$ *and increase with the probability of marriage if there are no economies of marriage* $(\gamma < 1)$.

Proof: Using standard techniques we obtain

(6) $$\frac{\partial s_1}{\partial p_2} = \left(-\frac{\partial F_1}{\partial p_2} \cdot \frac{\partial F_2}{\partial s_2} + \frac{\partial F_2}{\partial p_2} \cdot \frac{\partial F_1}{\partial s_2}\right) / \det(F_s)$$

It can be shown that

$$sign\left(\frac{\partial s_1}{\partial p_2}\right) = sign\left\{\frac{\partial F_1}{\partial p_2} + \frac{\partial F_2}{\partial p_2}\left[\frac{\partial F_1}{\partial s_2} / \left(-\frac{\partial F_2}{\partial s_2}\right)\right]\right\}$$

where the term in the square bracket is positive. Furthermore, the reason why the sign is ambiguous is because $sign\frac{\partial F_1}{\partial p_2} \neq sign\frac{\partial F_2}{\partial p_2}$ regardless of the value of γ.

Now it can be shown that:

$$sign(\frac{\partial s_1}{\partial p_2}) = sign\{(1+r) - [\frac{\partial F_1}{\partial s_2} / (-\frac{\partial F_2}{\partial s_2})]\} \; if \; \gamma > 1 \; and$$

$$sign(\frac{\partial s_1}{\partial p_2}) \neq sign\{(1+r) - [\frac{\partial F_1}{\partial s_2} / (-\frac{\partial F_2}{\partial s_2})]\} \; if \; \gamma < 1$$

From the derivatives above and (A.2') it can be seen that $[\frac{\partial F_1}{\partial s_2} / (-\frac{\partial F_2}{\partial s_2})] = (1+r)B$, where $0 < B < 1$ (numerator is lower in absolute value than the denominator).

Accordingly,

$$\frac{\partial s_1}{\partial p_2} > 0 \; if \; \gamma > 1$$

$$\frac{\partial s_1}{\partial p_2} < 0 \; if \; \gamma < 1. \qquad \text{QED}$$

The intuition behind Proposition 1 is clear. Economies of marriage are interpreted as situations where marriage helps stretch the value of each dollar earned by the agent. In this case, the agents save less in youth in preparation for marriage, since they anticipate with a higher probability a state of the world with a higher purchasing power. The reverse is true in the presence of diseconomies of marriage.

***Proposition 2** [Effects of changes in the probability of marriage on savings in midlife] Savings in midlife increase with the probability of marriage if the agent experiences economies of marriage* $(\gamma > 1)$. *In contrast, if marriage generates diseconomies* $(\gamma > 1)$*, midlife savings decrease with the probability of marriage.*

Proof:

(7) $$\frac{\partial s_2}{\partial p_2} = (-\frac{\partial F_1}{\partial s_1} \cdot \frac{\partial F_2}{\partial p_2} + \frac{\partial F_1}{\partial p_2} \cdot \frac{\partial F_2}{\partial s_1}) / \det(F_s)$$

It can be shown that

$$sign(\frac{\partial s_2}{\partial p_2}) = sign\{\frac{\partial F_1}{\partial p_2} + \frac{\partial F_2}{\partial p_2}[(-\frac{\partial F_1}{\partial s_1}) / \frac{\partial F_2}{\partial s_1})]\}$$

where the term in the square bracket is positive. Now, it can also be shown that

$$sign(\frac{\partial s_2}{\partial p_2}) = sign\{(1+r) - [(-\frac{\partial F_1}{\partial s_1}) / \frac{\partial F_2}{\partial s_1})]\} \; if \; \gamma > 1$$

and

$$sign(\frac{\partial s_2}{\partial p_2}) \neq sign\{(1+r) - [(-\frac{\partial F_1}{\partial s_1}) / \frac{\partial F_2}{\partial s_1}]\} \; if \; \gamma < 1.$$

From the derivatives above and (A.6) it can be seen that $[(-\frac{\partial F_1}{\partial s_1}) / \frac{\partial F_2}{\partial s_1}] = (1+r) + C$, where $C > 0$ (numerator is lower in absolute value than the denominator). Accordingly,

$$\frac{\partial s_2}{\partial p_2} < 0 \; if \; \gamma > 1$$

$$\frac{\partial s_2}{\partial p_2} > 0 \; if \; \gamma < 1.$$

QED

The predicted impact of a change in the probability of marriage on individual savings in midlife goes in a direction that is opposite to that of the predicted impact of a change in the probability of marriage on individual savings in youth. An agent who expects marriage to be a costly proposition due to diseconomies of marriage will be savings more in youth, before marriage, as he or she anticipates a

drain on earnings after marriage. However, once married and actually experiencing the drain on earnings, such individuals will be savings less than a comparable single. In contrast, the individual facing economies of marriage will be savings less in youth, before marriage, and more in mid-life, after marriage. Effectively, economies of marriage amount to a higher income to save from.

We now turn to the effect of marriage on lifetime savings. As we have shown, a change in the probability of marriage has opposite effects on savings at youth and midlife. Accordingly, a relevant question is whether or not anything can be said about the overall effect of the probability of marriage on the present value of lifetime savings, i.e., what we can we say about $\frac{\partial s_1}{\partial p_2} + \frac{1}{1+r} \cdot \frac{\partial s_2}{\partial p_2}$. The sign of the aggregate effect is, in general, ambiguous. It is possible, however, to identify a definite sign in the following particular, but rather interesting, case.

***Proposition 3** [Effects of changes in the probability of marriage on lifetime savings] Consider an agent with a relatively high rate of impatience (δ sufficiently lower than $1/(1+r)$). Then, an increase in the probability of marriage increases the present value of lifetime savings for agents experiencing economies of marriage and decreases that present value if there are no economies of marriage [unless both the probability of divorce and economies of marriage are very low].*

Proof:

From (6), (7), (A.3), and (A.8)

$$sign[\frac{\partial s_1}{\partial p_2} + \frac{1}{1+r} \cdot \frac{\partial s_2}{\partial p_2}] = sign[\frac{\partial F_1}{\partial s_1} - (1+\mathrm{r})^2 \frac{\partial F_2}{\partial s_2}] \; if \; \gamma > 1, (\neq if \; \gamma < 1)$$

In turn, using (A.1) and (A.7)

$$sign[\frac{\partial F_1}{\partial s_1} - (1+\mathrm{r})^2 \frac{\partial F_2}{\partial s_2}] =$$

$$sign[U''(w-s_1)-\delta^2(1+r)^4\{p_3U''[w+(1+r)s_2]+(1-p_3)U''[\gamma w+(1+r)s_2]\}]$$

Suppose now that the rate of time impatience is such that $\delta^2(1+r)^4=1$ and as assumed that $U(\cdot)$ displays constant relative risk aversion c, such that $\frac{U''(\cdot)}{U'}=-c$.

In this case

$$sign[\frac{\partial F_1}{\partial s_1}-(1+\mathrm{r})^2\frac{\partial F_2}{\partial s_2}]=$$

$$sign[p_3U'[w+(1+r)s_2]+(1-p_3)U'[\gamma w+(1+r)s_2]-U'(w-s_1)]$$

Notice that $w-s_1<w+(1+r)s_2$, and from concavity of $U(\cdot)$, for a sufficiently high p_3, the sign of the above expression is negative. Moreover, if $\gamma>1$, then the sign of the above equation is unambiguously negative since the first two terms are a convex combination of two terms each of which is lower than the third term in absolute value. In this case the magnitude of the probability of divorce does not matter. On the other hand, if $\gamma<1$, the sign of the equation will also be negative unless both γ and p_3 are very low.

It should be noted that in reality one would expect $\delta^2(1+r)^4>1$. For the results to hold it is sufficient that the discount rate is sufficiently low (the rate of time impatience is sufficiently high) for the above expression not to be much larger than one.

QED

This result establishes that for a relatively impatient agent the present value of lifetime savings increases with the probability of marriage in the presence of economies of marriage and decreases in the presence of diseconomies of marriage. Overall, economies of marriage represent higher lifetime purchasing power for a married agent. Despite the fact that they save less when they are young they

end up savings proportionally more when they are mature. Intuitively, a high degree of impatience guarantees that savings are reduced less at youth than are increased at maturity.

The opposite is true for agents with diseconomies of marriage. An interesting exception, however, is that even for such agents if the probability of divorce and diseconomies are very low, an increase in the probability of marriage will also increase lifetime savings. Intuitively, the diseconomies of marriage are dramatic and the likelihood of returning to a higher purchasing power state of the world is small so overall anticipated future purchasing power from marriage is relatively low and greater savings are required.

4. On the Effects of Changes in the Probability of Divorce on Savings Behavior

Proposition 4 *[Effect of the probability of divorce on savings] Savings of agents throughout their lifetimes decrease with the probability of divorce if there are diseconomies of marriage* $(\gamma < 1)$. *If there are economies of marriage* $(\gamma > 1)$ *a higher probability of divorce affects savings positively. Furthermore, the probability of divorce affects savings behavior (negatively or positively) the most at midlife.*

Proof:

(8) $$\frac{\partial s_1}{\partial p_3} = (\frac{\partial F_1}{\partial s_2} \cdot \frac{\partial F_2}{\partial p_3}) / \det(F_s)$$

(9) $$\frac{\partial s_2}{\partial p_3} = (-\frac{\partial F_1}{\partial s_1} \cdot \frac{\partial F_2}{\partial p_3}) / \det(F_s)$$

Notice that given the results above,

$$sign(\frac{\partial s_1}{\partial p_3}) = sign(\frac{\partial s_2}{\partial p_3}) = sign(\frac{\partial F_2}{\partial p_3})$$

which is positive if $\gamma > 1$ and negative if $\gamma < 1$.

Notice also that from (A.1) and (A.2), $-\frac{\partial F_1}{\partial s_1} > \frac{\partial F_1}{\partial s_2}$, which implies that $\frac{\partial s_1}{\partial p_3} < \frac{\partial s_2}{\partial p_3}$, i.e., the probability of divorce affects savings behavior (negatively or positively) more at midlife than in youth.

QED.

The intuition behind this proposition is that agents expecting diseconomies of marriage will view divorce as representing higher income. Therefore, for such agents the more likely divorce is, the less they have to save to hedge against future states of the world. In contrast, individuals expecting economies from marriage will save more if they expect a higher probability of divorce in anticipation of a more likely state of the world with a lower purchasing power.

5. Concluding Remarks and Directions for Future Work

In this paper we present an inter-temporal model of individual behavior with uncertainty about marriage and divorce in which we accommodate the existence of economies or diseconomies of scale from marriage. We show, in general, that a scenario of higher marriage rates and higher divorce rates is associated with higher savings rates in the presence of economies of marriage and with lower savings rates in the presence of diseconomies of marriage. Accordingly, the existence of economies or diseconomies of marriage plays a central role in the determination of savings behavior of different agents at different life-cycle stages.

Our results have important empirical implications in terms of observed gender differences in savings behavior. In a society with traditional gender roles, being male or female will affect whether agents expect economies or diseconomies of marriage. In traditional societies, women are expected to perform most of the home production in marriage, husbands earn more than wives, and men make more of their earnings available to their spouses than women do. As a result, traditional gender roles

translate in our model into men experiencing diseconomies of marriage, and women experiencing economies of marriage.

It follows from our results that under traditional gender roles at the pre-marriage stage, women will save more if they expect to stay single than if they expect to marry, and men will save more if they expect to marry than if they expect to stay single. It also follows that in traditional societies single men will have higher savings rates than single women. Consider the case of Japan. As shown, for example, by Hendry (1985), Japan has a traditional culture in which most household production responsibilities fall on women while men are expected to share more of their income with their wives than the other way around. As predicted by our model, the savings rate of salaried single male workers aged 34 or younger was 31.9 percent, compared to 22.4 percent for single women according to the Family Income and Expenditure Survey (2008).

In contrast, it also follows from our results that in traditional societies at midlife men will save less and women will save more the more they are likely to be married. It is also likely that married women's propensity to save will exceed that of men. This helps explain why in South Korea, another traditional society, Lee and Pocock (2007) found that the higher the fraction of earnings earned by women, the more couples saved and that among dual-earner couples the individual savings of wives exceeded those of husbands.

Our results also suggest that the opposite patterns of savings behavior will occur in populations with more egalitarian gender roles. For instance, our analysis helps explain why among a sample of couples interviewed in Ottawa, Canada, in 1995 (Phipps and Woolley 2008) women saved less relative to their husbands than did married women in a nationally representative South Korean sample. Phipps and Woolley (2008) showed that the more Canadian women earned relative to their mates, the less households saved in the form of retirement accounts. Also, according to that study, women had smaller amounts of savings if they had financial control than if that control was in the hands of their

husbands. Given that Ottawa is a government town, this Canadian sample was highly educated, and in North America high education tends to be positively associated with egalitarian gender roles. Interestingly, an analysis by Hungerford (1999) of individual contributions to 401(K) pension plans in the United States, also performed in 1995, showed that women participants had significantly higher contribution rates to their plans than men, possibly reflecting the fact that the sample of U.S. households was broader and less educated - and therefore more traditional - than the Canadian sample. Also, the U.S. sample was not limited to couples and covered a wide age range, and we expect gender differentials to vary with life-cycle stage and marital status.

While our results establish the conceptual relevance and potential empirical significance of marital status and economies and diseconomies of marriage in understanding differences in savings behavior, the results in this paper should be regarded as just a first look at the rather complex interaction of marriage and savings behavior. From a conceptual perspective, the theoretical underpinning of the model should be refined to allow for richer results and more detailed testable implications. For example, we assume that the rate at which agents share their income with their spouses is given. This assumption is related to our assumption that utility is solely generated by commercial consumption goods, and not by home produced goods. One should therefore consider a fuller model that places home-produced goods in the utility function and takes account of how the economies of marriage are related to the incentives for home production - for instance, women getting more access to their husbands' income are likely to produce more home-produced goods. In addition, further research should relax the assumption of constant earnings over the lifetime of the agent, which excludes gender differences in earnings. This would enrich the possibility of gender comparisons. Finally, we ignore the costs of divorce. Clearly, it is not simply the divorce rate that influences savings, but also what the anticipated property settlements are in case of divorce. Further work should also examine the possible connection between savings rates and regime of property division.

It could be extremely interesting to determine the extent to which the predictions of this model can help explain observed differences in savings behavior – along the life cycle, across genders, and across countries. In particular, future research should include a full analysis of male/female differences in savings rates at youth and at midlife using a cross-country sample. It follows from our models that such analysis of gender-specific and overall savings rates should take account not only of marriage rates and divorce rates, but also of degree of traditionalism in the definition of gender roles. It may be helpful to use a measure of such traditionalism of the type incorporated in the research of Sevilla-Sanz (2010).

Finally, this line of research has the potential for rather strong implications from a public policy perspective. It could establish to what degree more structural patterns of social behavior are at the root of the lack of effectiveness of conventional policy instruments, such as tax incentives, when it comes to promoting personal savings [see, for example, Tanzi and Zee (1998) and Hungerfort (2006)].

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APPENDIX

To study the effects of changes in the probabilities of marriage and divorce on savings behavior we use the implicit function theorem. The determinant of the Jacobian matrix of the first order conditions with respect to s_1 and s_2, that is (4') and (5'), is positive, i.e., $Det(F_s) > 0$. This is a direct requirement of the optimization problem in that it relates to the strict concavity of the objective function with respect to the decision variables s_1 and s_2. Furthermore, since $Det(F_s) \neq 0$, the conditions of the implicit function theorem are also satisfied. To obtain the necessary information for the identification of the effects on savings behavior we totally differentiate F_1 and F_2 as given by (4') and (5') to obtain:

(A.1) $$\frac{\partial F_1}{\partial s_1} = U''(w - s_1) + \delta(1+r)^2\{p_2 U''[w + (1+r)s_1 - s_2] + (1 - p_2)U''[\gamma w + (1+r)s_1 - s_2]\} < 0$$

(A.2) $$\frac{\partial F_1}{\partial s_2} = -\delta(1+r)\{p_2 U''[w + (1+r)s_1 - s_2] + (1 - p_2)U''[\gamma w + (1+r)s_1 - s_2]\} > 0$$

From (A.1) and (A.2) it follows that

(A.2') $$-\frac{\partial F_1}{\partial s_1} = -U''(w - s_1) + (1+r)\frac{\partial F_1}{\partial s_2} > \frac{\partial F_1}{\partial s_2}$$

(A.3) $$\frac{\partial F_1}{\partial p_2} = \delta(1+r)\{U'[w + (1+r)s_1 - s_2] - U'[\gamma w + (1+r)s_1 - s_2]\} > 0 \; if \; \gamma > 1 \; (< 0 \; if \; \gamma < 1)$$

(A.4) $$\frac{\partial F_1}{\partial p_3} = 0$$

(A.5) $$\frac{\partial F_2}{\partial s_1} = \frac{\partial F_1}{\partial s_2} = -\delta(1+r)\{p_2 U''[w+(1+r)s_1 - s_2] + (1-p_2)U''[\gamma w + (1+r)s_1 - s_2]\} > 0$$

(A.6) $$\frac{\partial F_2}{\partial s_2} = \delta\{p_2 U''[w+(1+r)s_1 - s_2] + (1-p_2)U''[\gamma w + (1+r)s_1 - s_2]\}$$

$$+ \delta^2(1+r)^2\{p_3 U''[w+(1+r)s_2] + (1-p_3)U''[\gamma w + (1+r)s_2]\}$$

$$= -\frac{1}{1+r}\cdot\frac{\partial F_1}{\partial s_2} + \delta^2(1+r)^2\{p_3 U''[w+(1+r)s_2] + (1-p_3)U''[\gamma w + (1+r)s_2]\} < 0$$

From (A.1), (A.2), and (A.6) it follows that

(A.6') $$\frac{\partial F_2}{\partial s_2} = -\frac{1}{(1+r)^2}\cdot[U''(w-s_1) - \frac{\partial F_1}{\partial s_1}]$$

$$+ \delta^2(1+r)^2\{p_3 U''[w+(1+r)s_2] + (1-p_3)U''[\gamma w + (1+r)s_2]\} < 0,$$

where given (A.1) the first term has a negative sign.

(A.7) $$\frac{\partial F_2}{\partial p_2} = -\delta\{U'[w+(1+r)s_1 - s_2] - U'[\gamma w + (1+r)s_1 - s_2]\} < 0 \; if \; \gamma > 1 \; (> 0 \; if \; \gamma < 1)$$

From (A.3) and (A.7) it follows that $\frac{\partial F_1}{\partial p_2} = -(1+r)\frac{\partial F_2}{\partial p_2}$. Accordingly these two derivatives will always have the opposite sign regardless of γ.

(A.8) $$\frac{\partial F_2}{\partial p_3} = \delta^2\{U'[w+(1+r)s_2] - U'[\gamma w + (1+r)s_2]\} > 0 \; if \; \gamma > 1 \; (< 0 \; if \; \gamma < 1)$$

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