Female earnings and wealth accumulation

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Abstract

In this paper, I study the effect of a rise in female earnings on wealth accumulation decisions of households. I argue that spousal labor supply acts as a form of insurance, thus influencing household savings behavior. Since the rise in female participation in the U.S. was primarily driven by married women, the role of this insurance has changed over time. The theoretical framework in this paper predicts that as wealth levels increase, households are able to invest in riskier assets. Further, couples invest a higher fraction of their wealth in riskier assets as compared to their single counterparts. Also, higher-income couples are able to take on more risk as compared to those with low incomes. Thus, as female earnings rise, the wealth accumulated by couples increases.

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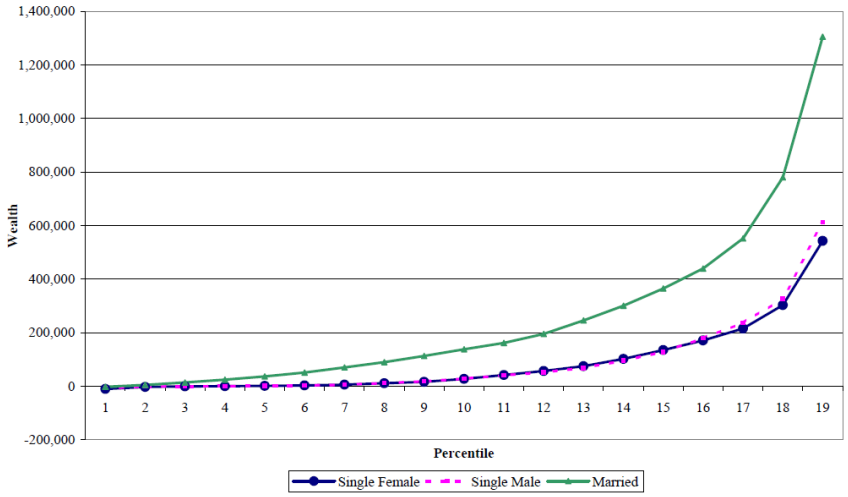
†See: https://github.com/PubaliC/JMP/blob/master/Pubali_JMP.pdf

1 Introduction

Between 1970 and 2014, total hours worked by women in the U.S. increased by almost 54 percent. This rise was predominantly driven by an increased participation from married women. During this time, the gender wage gap also narrowed by approximately 20 percentage points. As the income of women, traditionally considered to be the secondary earner in a household, increases, the extent of insurance provided by them also rises. The purpose of this paper is to explore the implications of this rise in female income on the wealth accumulation decisions of households.

There is empirical evidence that suggests that marriage is important for wealth differences across households. Schmidt and Sevak (2006) document that there exist differences in wealth levels across households by gender and marital status in the U.S., and this gap exists even after controlling for observable characteristics. As illustrated in Figure 1, which plots the wealth distribution by family type in 2001, they find that married households hold more than twice the wealth held by single households. Borella, De Nardi, and Yang (2018) find that these differences exist along the lifecycle as well, as is illustrated in Figure 2, which represents the average asset levels for the 1945-born cohort.

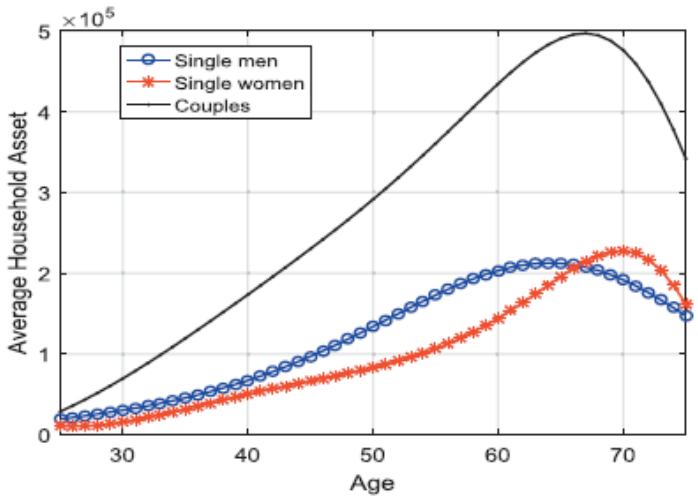
Figure 1: Wealth distribution by family type: 5th to 95th percentile



Source: Schmidt and Sevak (2006)

There is a substantial literature that finds evidence that as wealth increases, households invest a higher fraction of their assets into riskier assets (Fessenden, Lazaryan,

Figure 2: Lifecycle profile of assets by family type



Borella et al. (2018) use PSID and calculate the average household asset for the 1945-born cohort

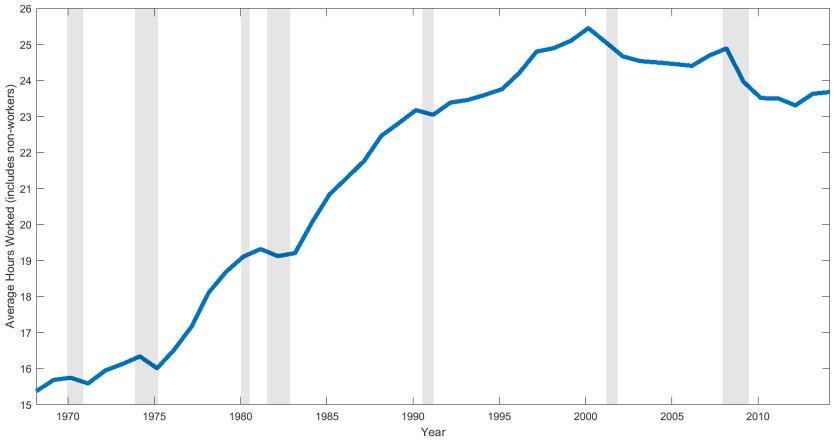
Neelakantan, et al. (2017); Bertaut and Starr-McCluer (2002); Polkovnichenko (2007)). Further Bertocchi, Brunetti, and Torricelli (2011) use Italian data to find evidence that married households have a higher propensity to invest in risky assets as opposed to single females and all households have increased their propensity to invest in riskier assets over time. This paper explores the mechanisms through which an increase in spousal earnings will influence wealth accumulation of households.

Further, there has been a substantial change in the labor market conditions for women in the post-war era. Figure 3 graphs the changes in average hours worked (includes all those who worked zero hours) by U.S. women over the last few decades. Average hours worked increased from 15.5% in 1968 to 23.8% in 2014.

Also, the gender wage gap has narrowed from 44% to 20%, as illustrated in Figure 4. As was illustrated by Chakraborty (2020), the increase in female hours was driven predominantly by married women. This implies that the total earnings for married women has substantially increased over time.

The questions I explore in this paper are multi-fold. Why are couples per capita richer than their single counterparts? Why do single women have a lower propensity to invest in risky assets? Why has propensity to invest in risky assets increased for all households? To what extent does the rise in female earnings explain the rise in propensity to invest

Figure 3: U.S. Female Labor Hours Worked



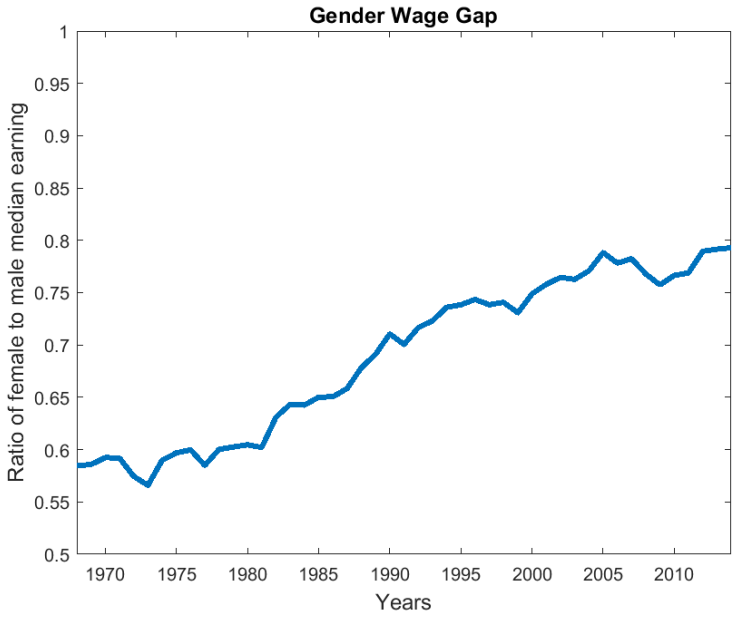
Using CPS ASEC data

in risky assets? In particular, I study the changing role of spousal insurance towards influencing wealth accumulation decisions of households.

In this paper, I use an overlapping generations model with both married and single (or divorced) households. I assume that married households comprise of one male and one female member. Individuals differ with respect to their age, marital status, gender, individual productivity. There are two kinds of assets available to households: one risk-free and one which has a risky return. Labor supplied by each individual is fixed. Households decide how much to consume and how much to save in each type of asset. My model predicts that as wealth levels increase, households are able to invest in riskier assets. Further, couples invest a higher fraction of their wealth in riskier assets as compared to their single counterparts. Also, higher income couples are able to take on more risk as compared to those with low incomes.

The remainder of the paper is organized as follows. Section 2 describes the theoretical framework used. Section 3 details the parameter choices. Section 4 discusses the preliminary results and Section 5 concludes.

Figure 4: Evolution of the gender wage gap



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2 Model

2.1 Overview

In this paper, we use an overlapping generations framework to model our economy which is populated by a continuum of individuals of 2 genders, equally many males and females. Each individual lives for upto J periods. They work for upto J-1 periods. In the final period of their life, they retire and consume out of their assets. There are three types of households: (a) married, which comprise of one male and one female (b) single men and (c) single women. Individuals get married with probability π at the beginning of their working life ($j = 0$). I assume that there are no marriage or divorce shocks in this environment.

Every period ($j \leq J$), households decide how much to consume and how much to save in each type of asset available. There are two asset choices available: one which yields a risk-free return, R_f, and the other which yields a high return, $R = R_H$, with probability ϕ and low return, $R = R_L$, with probability $1-\phi$. Given the probabilities and prices, individuals also decide on the fraction they want to invest in each asset. I assume that labor choice is fixed. Furthermore I assume that all singles and married men work.

Only a fraction of married women work. This simplifying assumption is made because the changes in female hours were predominantly driven by married women, as seen is Figure **??**. Each member has gender-specific wages w_g for every unit of their individual productivity. Their earnings therefore is equal to $w_g\epsilon_g$. Productivity is idiosyncratic and follows a stochastic AR(1) process which has a persistence ρ and variance σ_ν^2.

$$\log \epsilon_g' = \rho \log \epsilon_g + \nu; \nu \sim G(0, \sigma_\nu); g \in \{m, f\} \tag{1}$$

I assume that the wage rate for women as compared to men is subject to a discrimination tax:

$$w_f = (1 - \tau)w_m \tag{2}$$

I further assume that there is no aggregate uncertainty in this economy.

2.2 Single Households

Single (or divorced households) male ($g = m$) or female ($g = f$) households derive utility from consumption (c). The total realized value of their asset in the current period is represented by ψ whereas current savings is given by a'. Individuals choose θ which denotes the fraction of their savings that they choose to invest in the risk-free asset. The idiosyncratic productivity of the worker is denoted by ϵ_g.

The optimization problem for a single household headed by an individual of gender $g \in \{m, f\}$ at age j with realized value of assets ψ is given by:

$$V_{g,s}(\psi, \epsilon_g, j) = \max_{c,a',\theta} u_1(c) + \mathbb{1}_{j<J}\beta\Big\{\phi E\big[V_{g,s}(\psi_H', \epsilon_g', j+1)|\epsilon_g\big] + (1-\phi)E\big[V_{g,s}(\psi_L', \epsilon_g', j+1)|\epsilon_g\big]\Big\} \tag{3}$$

subject to

$$c + a' \leq \mathbb{1}_{j<J} w_g \epsilon_g + \psi \tag{4}$$

$$\psi_i' = [\theta R_f + (1-\theta)R_i']a' \tag{5}$$

$$R_i' = \kappa_i g((1-\theta)a') \tag{6}$$

$$\log \epsilon_g' = \rho \log \epsilon_g + \nu; \nu \sim G(0, \sigma_\nu) \tag{7}$$

$$c, a' \geq 0; \theta \in [0, 1] \tag{8}$$

where $i \in \{H, L\}$ and $\kappa \in \{\kappa_H, 0\}$ I assume that $g(x) = x^n$, where $n \geq 0$. Thus I assume that the risky rate of return depends on the fraction invested in the risky asset. In the final stage of their lives, individuals retire in which case they consume out of their savings.

2.3 Married Households

Married households share consumption, which is subject to an equivalence scale, χ. Within married households, women may or may not work ($e_f \in \{0, 1\}$) with probability $p(e_f)$. The optimization problem for the married household thus is given by:

$$V_p(\psi, \epsilon_m, \epsilon_f, e_f, j) = \max_{c,a',\theta} u_1\Big(\frac{c}{1+\chi}\Big) + \mathbb{1}_{j<J}\beta\Big\{\phi \sum_{e'_f} p(e'_f) E\big[V_p(\psi'_H, \epsilon'_m, \epsilon'_f, e'_f, j+1)|\epsilon_m, \epsilon_f\big] + (1-\phi)\sum_{e'_f} p(e'_f) E\big[V_p(\psi'_L, \epsilon'_m, \epsilon'_f, e'_f, j+1)|\epsilon_m, \epsilon_f\big]\Big\} \tag{9}$$

subject to

$$c + a' \leq \mathbb{1}_{j<J}\{w_m \epsilon_m + \mathbb{1}_{e_f=1} w_f \epsilon_f\} + \psi \tag{10}$$

$$\psi'_i = [\theta R_f + (1-\theta) R'_i] a' \tag{11}$$

$$R'_i = \kappa_i g((1-\theta)a') \tag{12}$$

$$\log \epsilon'_g = \rho \log \epsilon_g + \nu; \nu \sim G(0, \sigma_\nu) \tag{13}$$

$$c, a' \geq 0; \theta' \in [0, 1] \tag{14}$$

Similarly, couples transition into the final stage of their life, retirement and consume out of their assets.

3 Parameterization and Solution

A quantitative assessment of this framework requires the use of numerical methods. In this section, I describe the solution method and describe the parameter choices made in order to conduct this exercise. Table 1 lists the other parameters.

Table 1: Parameter Choices

Name	Definition	Value
σ	Coeff of RA	3
β	Discounting factor	0.96
χ	Adult equivalence scale	0.7
ϵ_m,	Mean ability	1
ρ	Persistence of productivity	0.95
σ_ν	S.D. of productivity	0.096
w_m	Male Wage rate	1
R_f	Risk free rate	1.02
κ	Risky returns parameter	[3 0]
ϕ	Prob of good state	0.5

My model is annual and therefore the discount factor, β is assumed to be equal to 0.96. Agents in my model are risk averse. I assume a constant relative risk aversion per period utility function where $U(c) = \frac{c^{1-\sigma}}{1-\sigma}$. The value of $\sigma = 3$ is standard in the literature. The adult equivalence scale for couple households is taken from the OECD tables, and therefore, $\chi = 0.7$.

I use the Rouwenhorst algorithm to discretize the earnings process for the individuals and obtain the probabilities associated with transitioning from one state to the other. I use a persistence of 0.95 and variance of 0.096 for the idiosyncratic process. I normalize the men's base wage rate, w_m at 1. Since women are subject to a gender wage tax, their base wage rate is $(1-\tau)w_m$. For the benchmark case, which corresponds to 1968, I directly measure from the data, the gender wage gap which equals $\tau = 0.405$ and the employment rate which equals 40%, which corresponds to $p(1) = 0.4$. For simplicity, I assume that agents live for only $J = 3$ periods.

As discussed earlier, I assume that the risky rate of return is a function of the amount of assets invested in the risky asset, $R_H = \kappa_H g((1-\theta)a)$. I assume that in the event of the low realization, $\kappa_L = 0$, whereas in the event of a high realization, $\kappa_H > 0$. I assume that $g(x) = x^n$ is a concave function with $n = 0.5$. This implies that the risky return increases at a decreasing rate with respect to the total assets invested. The risk-free gross return $R_f = 1.02$.

4 Results

For the set of parameter choices in the previous section, I solve for the steady state of the economy. The preliminary set of results are solved under fixed set of prices, in order to illustrate the choices of different kinds of households at different stages of life. I consider the benchmark to correspond to 1968, when the gender wage gap was 0.405 and employment rate equaling 0.40. Then, I compare the steady state of the economy under three circumstances: (a) when the gender wage gap falls to 0.20 (b) when employment rate increases to 0.55 and (c) when both wage gap and employment rate change to their 2014 values of 0.20 and 0.55 respectively.

4.1 Single Households

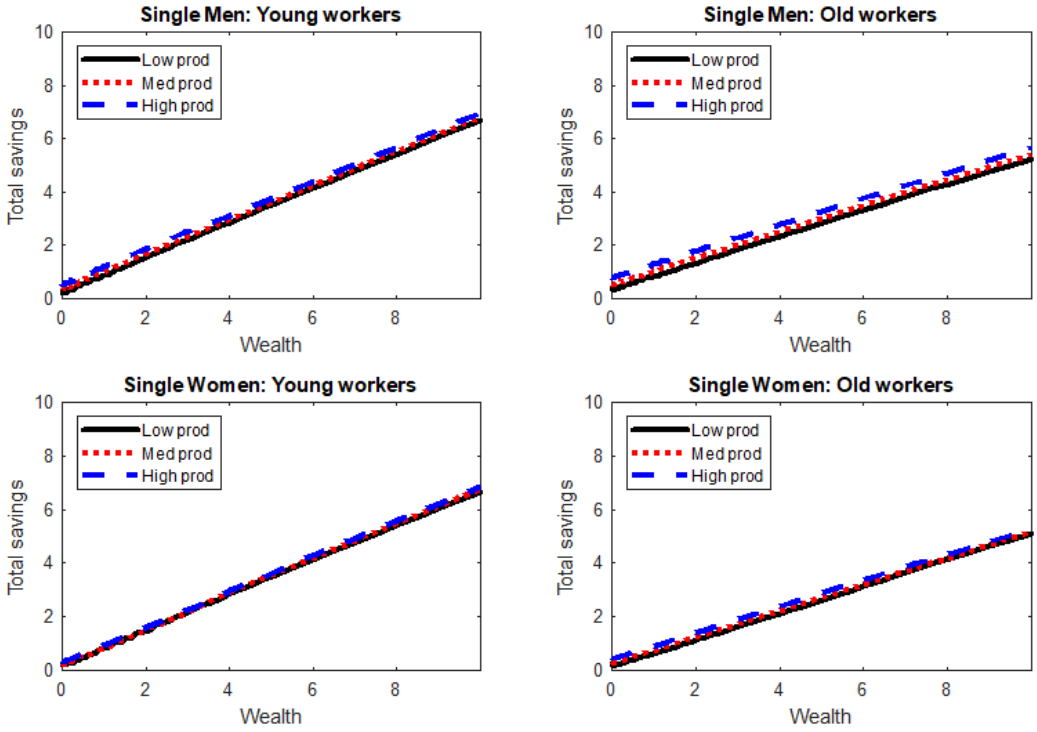
First we study the savings behavior of single households. Figure 5 below illustrates the total savings for single households at different stages of life. Households save less as they age. This is because they have lesser number of years to survive. As expected, savings increases with an increase in productivity. Since women earn less than men, savings is less for single women as compared to men.

Next, we study the fraction of total savings invested in risky assets for single households. The results are illustrated in Figure 6. I find that consistent with the empirical literature, households invest a higher fraction of their wealth in the risky assets, which yield higher returns in expectation, as they get richer. Further, the ability to take risk increases for higher income households. As households age, the risk-taking behavior reduces and the gap between portfolio allocation of households with different productivity levels falls. Also, since women earn less than men, they exhibit less risk taking behavior as compared to men.

4.2 Singles vs couples

Next, we compare the results obtained for the single households with those of couple households. Figure 7 illustrates the total savings for single and couple households, where

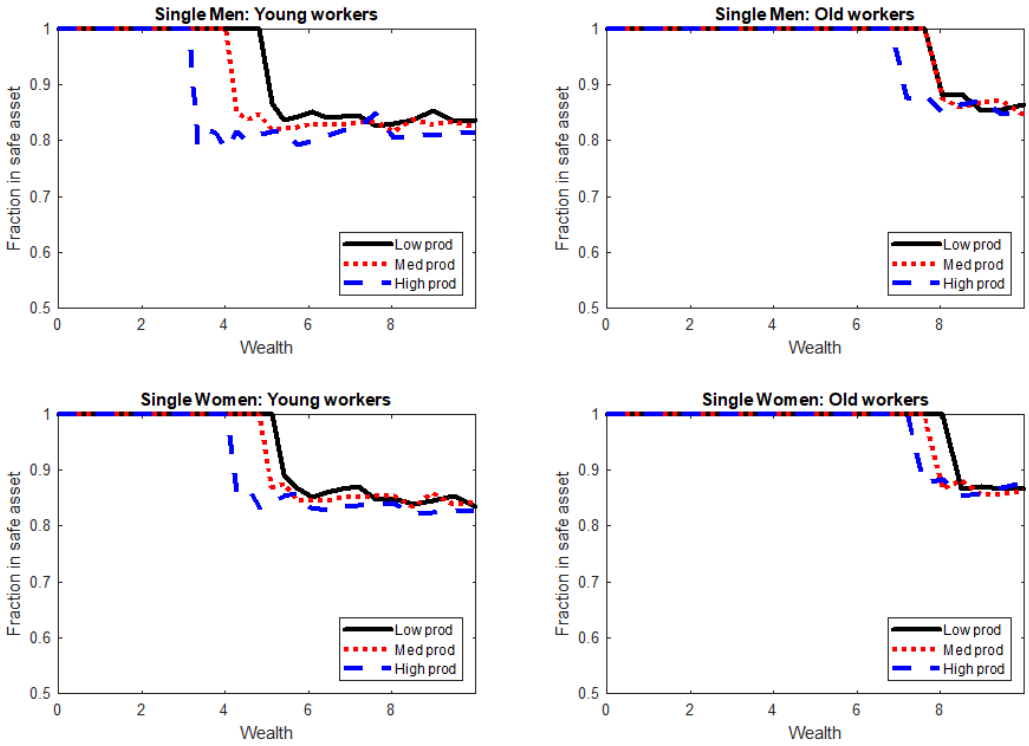
Figure 5: Savings for single households



median productive individual is matched with either a low, medium or highly productive spouse. As we saw for singles, couple households also save less as they age. Singles save a lesser fraction of their assets as compared to couples. The savings rate increases as the productivity of the partner increases.

When we compare the risk-taking behavior of singles vs couples, an interesting pattern emerges. The results are represented in Figure 8. I find that for couples, the threshold wealth level beyond which they invest in risky assets is lower than single households. The threshold further decreases when the individual is matched with higher productive spouses, as they can provide higher insurance which allows households to undertake more risky investments, which have higher expected return.The difference between single and couple households magnifies for younger households, which is consistent with the empirical evidence that was cited earlier.

Figure 6: Portfolio allocation for single households



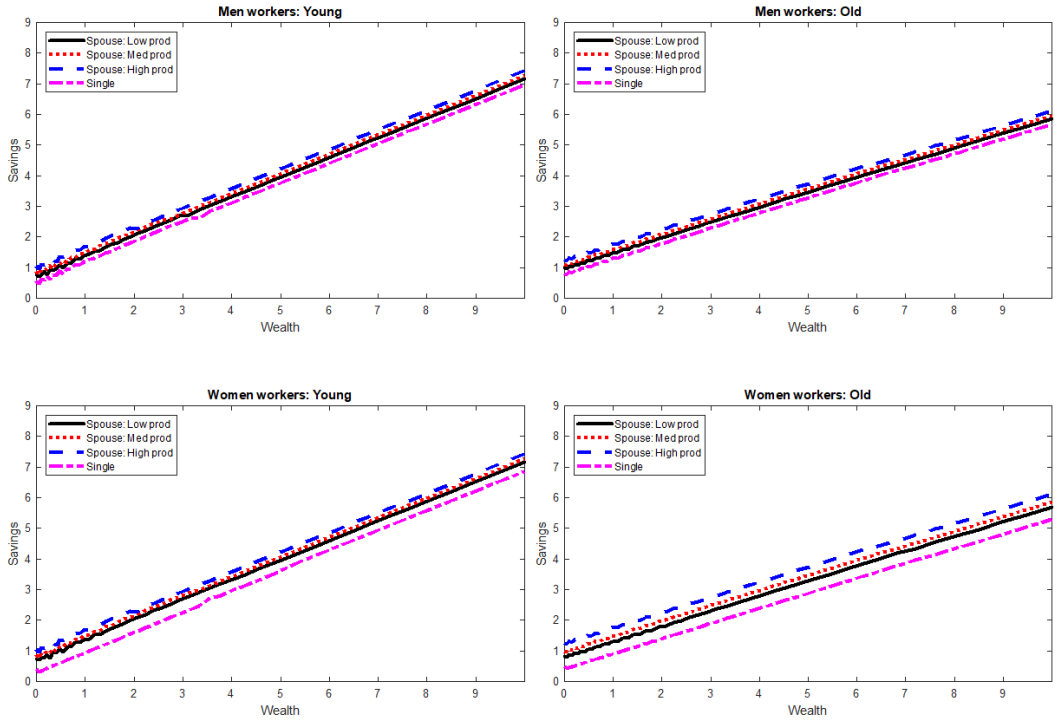
4.3 Comparisons over time

Now, I compare the benchmark case (1968) to changes that correspond to 2014 to study the effect of a change in female earnings. I study the implications for (a) a narrowing of the gender wage gap (b) rise in the fraction of married women who are working and (c) narrowing of the gender wage gap as well as a rise in the fraction of married women who are working. The results are discussed below.

4.3.1 Narrowing of the gender wage gap

As the gender gap narrows from 0.405 to 0.20 (corresponding to 2014), there is a rise in female earnings. Savings rates increase for all households. The results for the median productivity individual in couple households in terms of their savings behavior, are illustrated in Appendix A. The risk taking behavior of households increase overall with the narrowing of the gender wage gap. The results are illustrated in Figure 9. The patterns observed are similar for low and high productivity individuals in couple households.

Figure 7: Total savings for single vs couple households



4.3.2 Rise in fraction of married women working

Next, I fix the gender wage gap at its 1968 level, but only allow for changes in the fraction of married women working. As a result, the probability of working $p(1)$ is increased to 0.55. The results for the median productivity individual in couple households in terms of their savings behavior, are illustrated in Appendix A. The risk taking behavior of households increase overall with an increase in the the probability of married women working. The results are illustrated in Figure 10. The patterns observed are similar for low and high productivity individuals in couple households.

4.3.3 Narrowing of the wage gap and rise in fraction of married women working

Finally I look at changes in wealth accumulation behavior of households if both the gender wage gap as well as probability of working for married women are allowed to change to its 2014 level. The results for the median productivity individual in couple households in terms of their savings behavior, are illustrated in Appendix A. The risk taking behavior

Figure 8: Portfolio allocation for single vs couple households

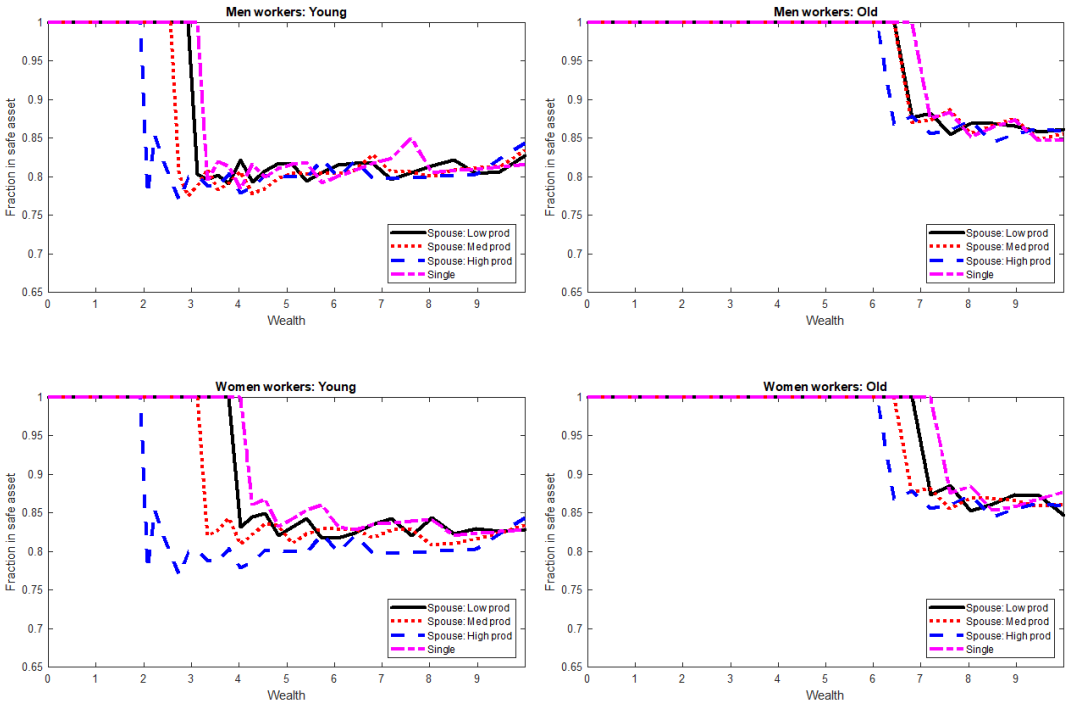
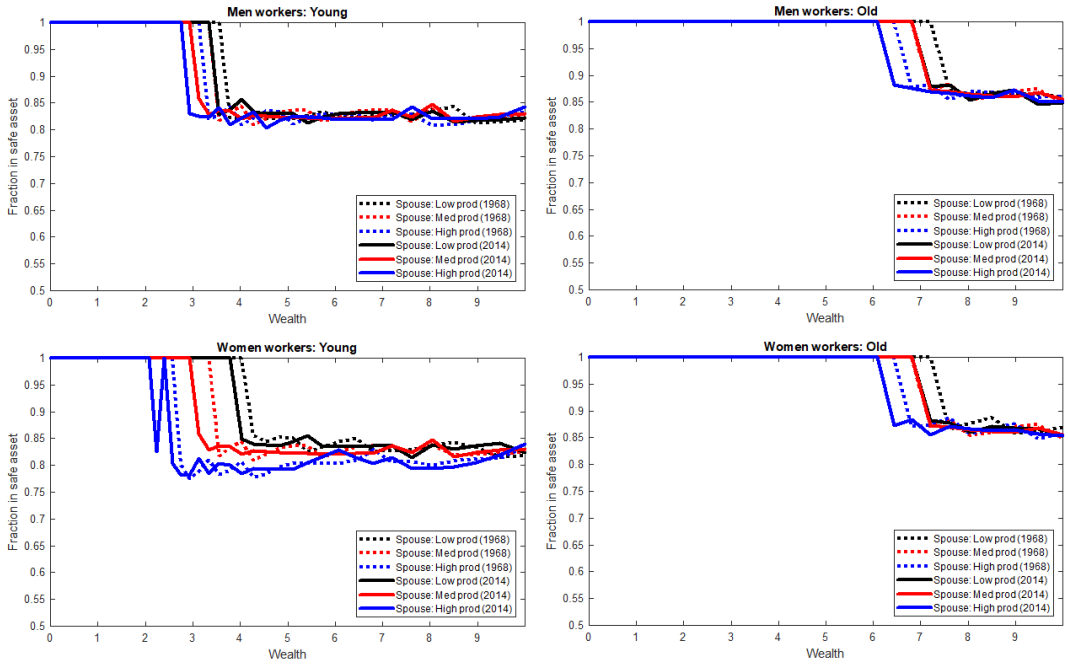


Figure 9: Portfolio allocation under changes in gender wage gap



of households increase overall with the total change in female earnings. The results are illustrated in Figure 11. The patterns observed are similar for low and high productivity individuals in couple households.

Figure 10: Portfolio allocation under changes in fraction of married women working

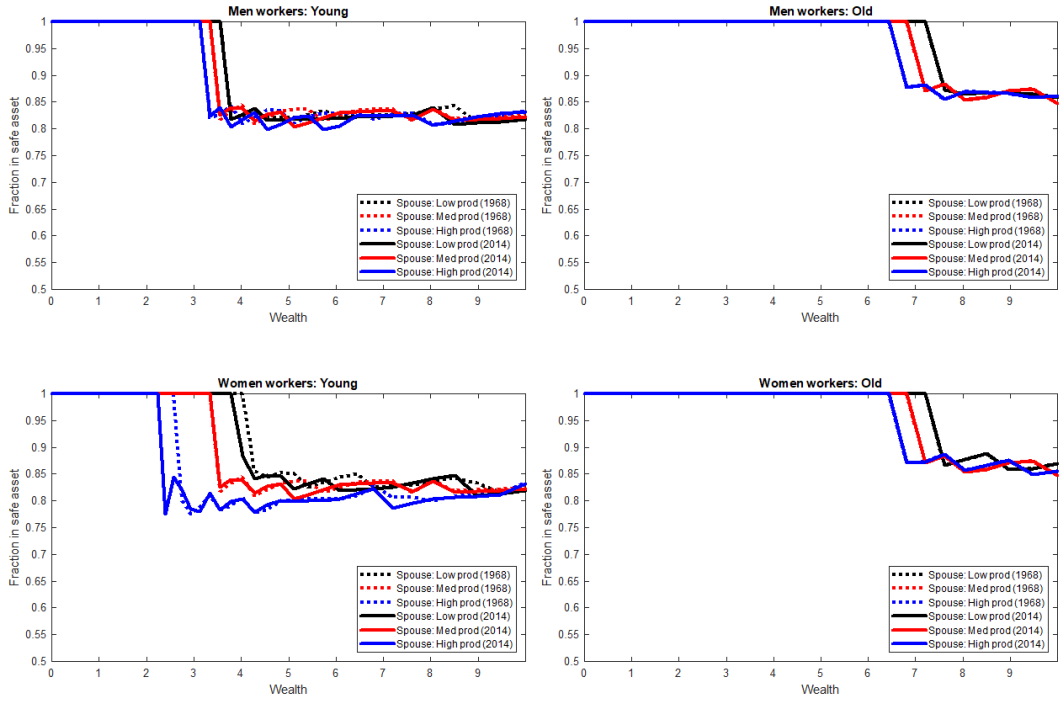
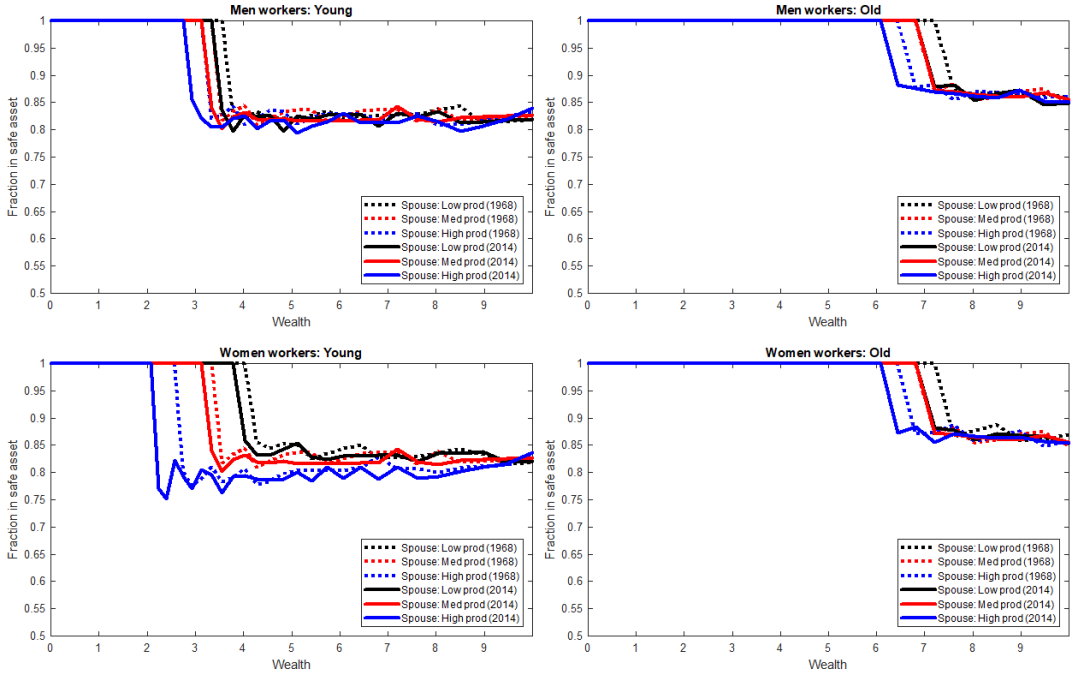


Figure 11: Portfolio allocation under total changes in female earnings



Thus the above mentioned exercises suggest that as female earnings rise, households are able to save more and they save a higher fraction of their wealth in risky assets.

5 Conclusion

In this paper, I study the mechanisms through which increase in female earnings can influence household wealth accumulation through the spousal insurance channel. Additional insurance reduces the precautionary motive to save. However, I find that spousal insurance enables households to undertake risky investments which have a higher expected rate of return and hence influence the wealth accumulation.

The next steps of this analysis would involve extending this framework to study the evolution of wealth inequality in the U.S., which has substantially increased over the last few decades. Since the degree of assortative matching has also increased over the last few years, the high income couple households will be able to accumulate wealth faster through risky high-return investments, which the low income couples or single households will relatively not be able to do. It would be an interesting extension to study the role of a rise in female labor force participation on the rise in wealth inequality in the U.S.

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A Appendix

Figure 12: Savings under changes in gender wage gap

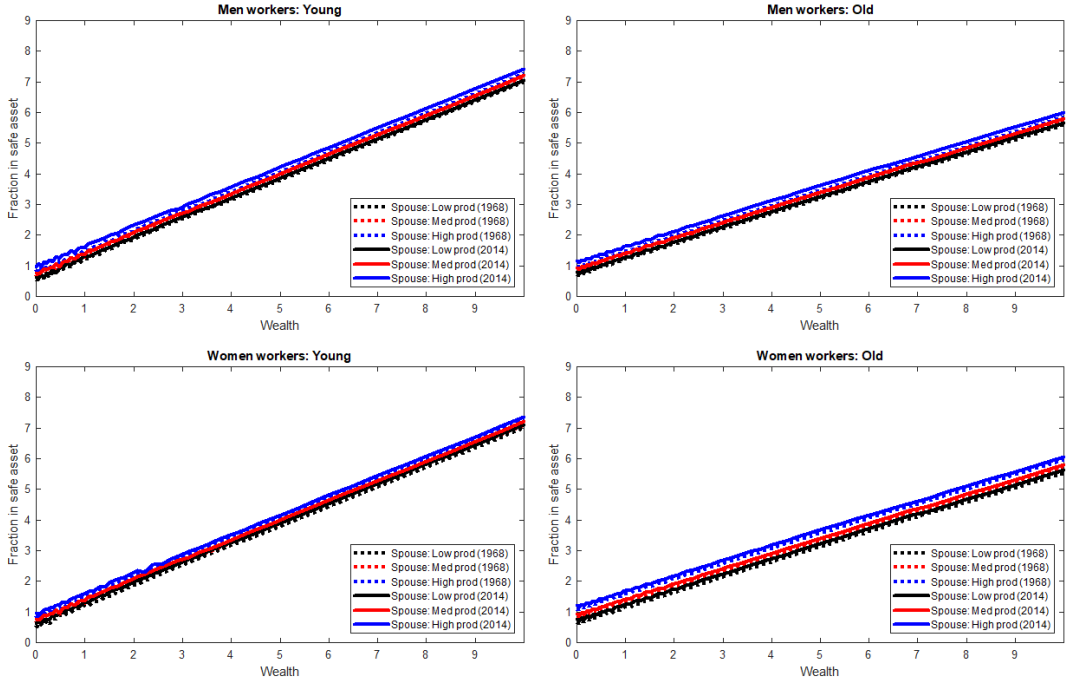

Figure 13: Savings under changes in fraction of married women working

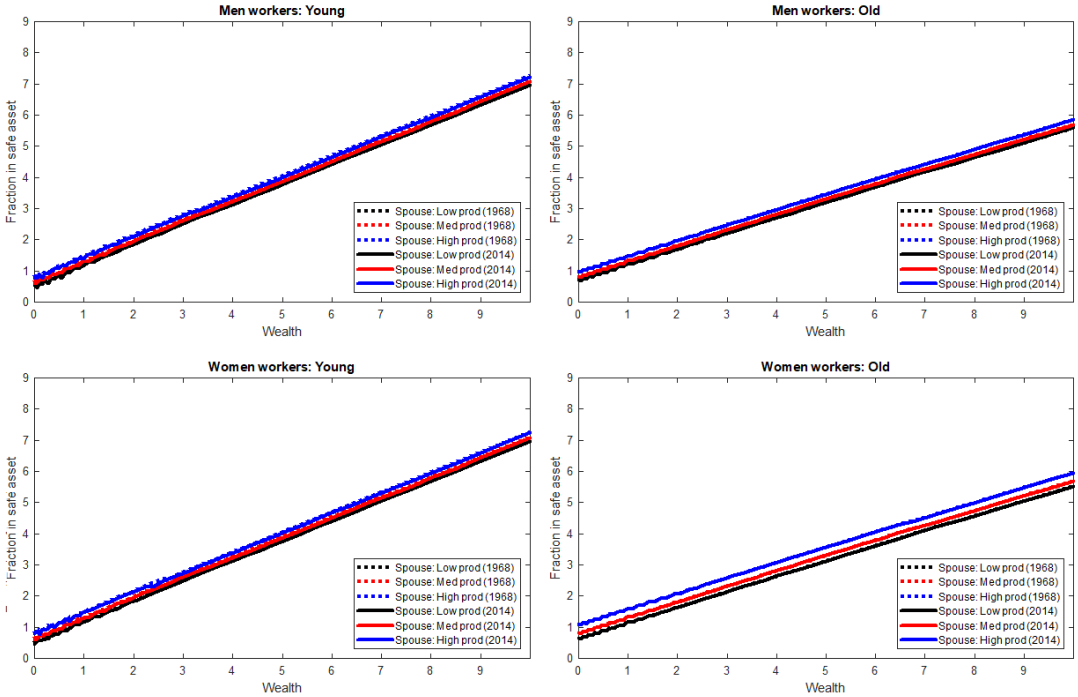

Figure 14: Savings under total changes in female earnings