

Spousal Insurance, Precautionary Labor Supply, and the Business Cycle - A Quantitative Analysis

Kathrin Ellieroth*

Indiana University

This Version: February 15, 2019

[Click here for most recent version.](#)

(Preliminary. Please do not cite.)

Abstract

I document that aggregate hours worked and employment are significantly less cyclical for married women than for married men and single women. Married women are less likely to leave the labor force and are more attached to employment in recessions. Furthermore, I show that men have a strongly countercyclical job loss probability. Using a two-person household model with labor market frictions, I show that married women exhibit precautionary labor supply in response to the higher threat of job loss experienced by their husband in recessions and thus, offer spousal insurance. The cyclicity of men's job loss probability accounts for the majority of married women's low cyclicity of employment.

*Address: Department of Economics, Indiana University, 100 South Woodlawn Avenue, Bloomington, IN 47405, USA. Email: kelliero@indiana.edu. I would like to thank my dissertation committee Amanda Michaud, Bulent Guler, and Gerhard Glomm as well as the brown bag participants at the Federal Reserve Bank of Richmond and participants at the IU Macro brown bag.

1 Introduction

I document using data from the Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) that the cyclicity of hours worked in the United States differs substantially by gender and marital status. In particular, married women have a significantly lower cyclicity of hours worked in the aggregate than the other groups. Figure 1 shows the detrended (aggregate) hours worked for married women, married men, and singles. While aggregate hours worked for



Figure 1: Married women have lowest cyclicity of aggregate hours worked

single individuals are highly procyclical and barely distinguishable between single men and single women, married women's aggregate hours worked are acyclical in the 1990s and mildly procyclical starting in the mid 2000s. For example, aggregate hours worked for married women drop by significantly less during the 2007-2009 recession and display a lower recovery than the other groups afterwards.

Why is married women's employment so acyclical relative to single women and married men? This paper poses the hypothesis that spousal insurance contributes to the observed low cyclicity of married women's employment by exploring the relationship between men's strongly countercyclical job loss probability and labor supply responses by their wives. Furthermore, the paper sheds light on the way households react to aggregate risk and shocks to members of the household by disentangling different channels of spousal insurance.

I find that married women are less likely to leave the labor force in recessions and are more attached to employment in recessions, but only weak evidence for the added-worker effect. Furthermore, I document that men have a strongly countercyclical job probability. The quantitative analysis shows that the cyclical nature of men’s job loss probability induces precautionary labor supply behavior among married women and accounts for the majority of married women’s transition rates.

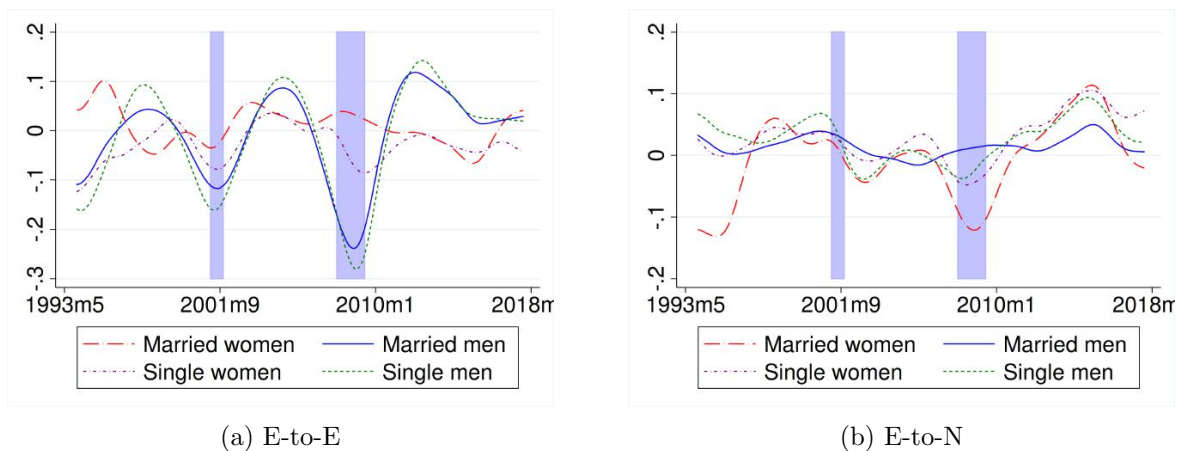


Figure 2: Change from a year ago transition rates

Figures 2a and 2b display the monthly transition rates from employment to employment (E-to-E) and from employment to not-in-the-labor force (E-to-N) for married women, married men, single women, and single men. Figure 2a shows the strong attachment for married women during recessions. Their change in the E-to-E rate is consistently positive during the recent recession and increases during both the early-2000 and recent recession, whereas all other three groups experience a decline in their E-to-E transition rates. Figure 2b further supports this notion of increased attachment since married women experience a strong decline in their E-to-N rate, which is particularly pronounced in the recent recession, and implies that married women are less likely to leave the labor force during recessions.

I argue that this attachment to employment and low cyclical nature of hours for married women is related to spousal insurance and a response to the (threat of) job loss experienced by their husband during recessions. Married women respond to both the higher risk of job loss and the higher incidence of job loss of their husbands during recessions by increasing their labor supply relative to normal times. Thus, during recessions some married women will increase their hours worked relative to normal times (in particular those married to an unemployed husband or husband with a high risk of job loss) which in the aggregate will dampen the decline in hours worked by

married women affected by the recession. So that in the aggregate hours worked appear acyclical.

In general, there are two mechanisms of spousal labor supply present, the added-worker effect and precautionary labor supply. Recent studies did not find much support for the existence or only a moderate added-worker effect (see Gorbachev (2016), Juhn and Potter (2007)). This paper complements the studies on spousal insurance but focuses primarily on the precautionary labor supply channel: households anticipate higher probability of job loss for the husband and the wife responds to this higher threat of job loss probability experienced by the husband. In particular, I will document empirically and assess quantitatively that wives will respond by remaining employed during recessions rather than quitting their jobs as it would be optimal in normal times. Furthermore, I will investigate the importance of the added-worker effect, i.e. the labor supply response of the secondary earner, usually the wife, in response to actual job loss experienced by the primary earner, usually the husband, in the quantitative model.

This paper first documents empirical evidence on the cyclicity of employment and labor market frictions for married women, married men, single women, and single men in the United States. Analyzing transition rates between employment, unemployment, and not in the labor force, I find that married women are less likely to leave the labor force and are more attached to employment in recessions compared to both normal times and married men and singles. In line with the literature¹ on industries, demographics, and the recent recessions I show that men have a strongly countercyclical job loss probability. Furthermore, I estimate residual job loss probabilities for married men controlling for observed characteristics such as education and industry.

I explore the mechanism of threat of job loss quantitatively in a two-person incomplete markets household model which features labor market frictions and endogenous movements between labor market states for married women. My analysis shows that the threat of job loss for the husband faced by the household accounts for a substantial part of the observed transition rates and cyclicity of employment for married women in the data.

The structure of the paper is as follows. Section 2 reviews the existing empirical and quantitative literature on the added-worker effect and female labor supply. Section 3 presents empirical evidence on the cyclicity of different labor market outcomes for married women, married men, and single individuals. The quantitative model is presented in section 4. Section 5 presents the calibration of model parameters and quantitative analysis. Section 6 concludes.

¹see for example Sahin, Song, and Hobijn (2010)

2 Related Literature

This paper relates to a relatively large empirical literature on the added-worker effect and determinants of female labor supply as well as a more recent strand of literature which focuses on female labor supply and its impact on the macroeconomy in structural quantitative models. Lastly, this paper relates to papers focusing on the labor supply of individuals on the extensive and intensive margin.

Starting with the seminal work by Lundberg (1985), there has been a significant empirical literature focusing on the added-worker effect, i.e. studying how the secondary earner reacts to job loss experienced by the primary earner. While these studies show that wives respond to job loss of their husbands and adjust their labor supply by joining the labor force to make up partially for the income loss, more recent studies find only little or no evidence of the importance of the added-worker effect during recessions. Mankart and Oikonomou (2016b) and Starr (2014) find an added worker effect during recessions as well as normal times, but it is relatively small in magnitude. Juhn and Potter (2007) and Gorbachev (2016), however, find no added worker effect and conclude that households rely on different mechanisms of insurance in particular since the number of non-participating wives has declined. This paper relates to this empirical literature and shows both empirically and theoretically that there is an added-worker effect, which, however, is small in magnitude and is not particularly more pronounced during recessions. Furthermore, the paper proposes a different mechanism of spousal insurance which is more apparent now and focuses on the response of wives to an increased threat of job loss rather than actual job loss.

This paper is probably closest related to Mankart and Oikonomou (2016a) who analyze the cyclicity of the labor force participation rate in the United States focusing on the differential response of singles, married men and married women to aggregate risk. This work complements their paper by focusing in more detail on spousal labor supply and insurance and disentangles the channels through which married women respond to their husbands. Furthermore, this paper allows to quantify the impact of individual responses and household behavior on Macro outcomes, such as employment and hours, and sheds light on factors determining spousal labor supply. In particular, I estimate crucial parameters from the data and do not impose any ex-ante differences between men and women others than the gender wage gap and labor market frictions estimated from micro data.

A relatively recent strand of literature analyzes female labor supply over time in order to ex-

plain the trend in female labor supply as well as to identify crucial determinants explaining female labor supply and differences between labor market outcomes between men and women such as Albanesi (2017), Albanesi and Sahin (2018), Attanasio, Low, and Sanchez-Marcos (2005), Attanasio, Low, and Sanchez-Marcos (2008), Fukui, Nakamura, and Steinsson (2018), Jones, Manuelli, and McGrattan (2015), Blundell, Pistaferri, and Saporta-Eksten (2016). This paper greatly builds on their advances, but focuses on business cycle fluctuations and cyclicalities of labor supply and leaves out the trend.

Lastly, this paper relates to recent papers featuring models of individual and household labor supply which incorporate labor market frictions in an incomplete markets model. In particular, this paper uses the methodology developed in a paper by Krusell, Mukoyama, Rogerson, and Sahin (2018) and incorporates a richer household structure similar to Mankart and Oikonomou (2016a).

3 Empirics

This section will present empirical evidence regarding the differences in volatility of labor market outcomes for the different gender-marital status groups and differences in labor market risk. I use data from the Current Population Survey, both the Basic Monthly Files as well as the Annual Social and Economic (ASEC) supplement.

3.1 Macro Evidence

Cyclicalities of hours worked

Figure 1 showed that married women have a significantly lower cyclicalities in the aggregate hours worked than the other three groups. This volatility in hours worked can further be decomposed into volatility that is due to business cycle fluctuations and volatility due to other factors, such as personal reasons, household formation, etc. Following Jaimovich, Siu, and Pruitt (2013) and Doepke and Tertilt (2016), I estimate the cyclical aggregate hours worked cyclicalities for each group and compare it to the total aggregate hours worked cyclicalities for each group. Table 1 shows this decomposition into total volatility and cyclical volatility. The top panel shows total and cyclical volatility for both the intensive and extensive margin, thus, it includes all individuals, in and out of the labor force, whereas the bottom panel only considers working individuals.

Both panels show total volatility, which is simply the percent standard deviation from trend for the data in figure 1. Cyclical volatility is estimated by projecting the detrended aggregate hours

	Married		Single	
	Men	Women	Men	Women
Intensive and extensive margin				
Total Volatility	0.5542	0.5827	1.0846	1.0513
Cyclical Volatility	0.1835	0.0782	0.4258	0.3950
R^2	10.97	4.08	22.73	21.67
Share	0.33	0.13	0.39	0.39
Intensive margin				
Total Volatility	0.2854	0.3413	0.3796	0.3696
Cyclical Volatility	0.2209	0.1059	0.2020	0.2074
R^2	50.12	10.85	40.25	37.71
Share	0.77	0.31	0.53	0.56

Table 1: Married women have the lowest cyclical volatility

worked on a business cycle indicator, here the detrended unemployment rate, and then compute the percent standard deviation from trend for this projection. Therefore, cyclical volatility only captures that volatility in aggregate hours worked which is due to fluctuations in the unemployment rate.

First, total volatility is greater for all individuals when considering both the intensive and extensive margin. This is not surprising since changes in hours are usually smaller than changes in hours from switching between non-employment and employment.

I start by considering volatility of aggregate hours worked for all individuals, i.e. the top panel. With regards to total volatility, there are differences by marital status, but not by gender. Single men and women have a total hours volatility that is almost twice as large as the volatility of married men and women. In fact, married women’s total volatility is slightly greater than married men’s. Married men and women, however, differ greatly with respect to their cyclical volatility. Single individuals still have a similar cyclical volatility which is about twice as large as for married men. Married women’s cyclical volatility, however, is only half of that for married men. This indicates that married women’s aggregate hours worked are significantly less cyclical than aggregate hours worked by singles and married men. Not surprisingly, the R^2 from the regression of the detrended aggregate hours worked series on the unemployment rate is also lowest for married women since fluctuations in the unemployment rate explain only little of the variation in their aggregate hours worked. Lastly, the share of total volatility which is due to cyclical fluctuations is lowest for married

women as well.

A similar result arises when only considering working individuals in the bottom panel. Again, married women have the lowest cyclical volatility, R^2 and share of total volatility due to cyclical volatility. The share of cyclical volatility of total volatility for married women, however, is greater for working married women than all married women, which gives some indication that much of the low cyclical volatility is due to the extensive margin rather than the intensive margin. The next section supports this point more formally.

Extensive vs. intensive margin

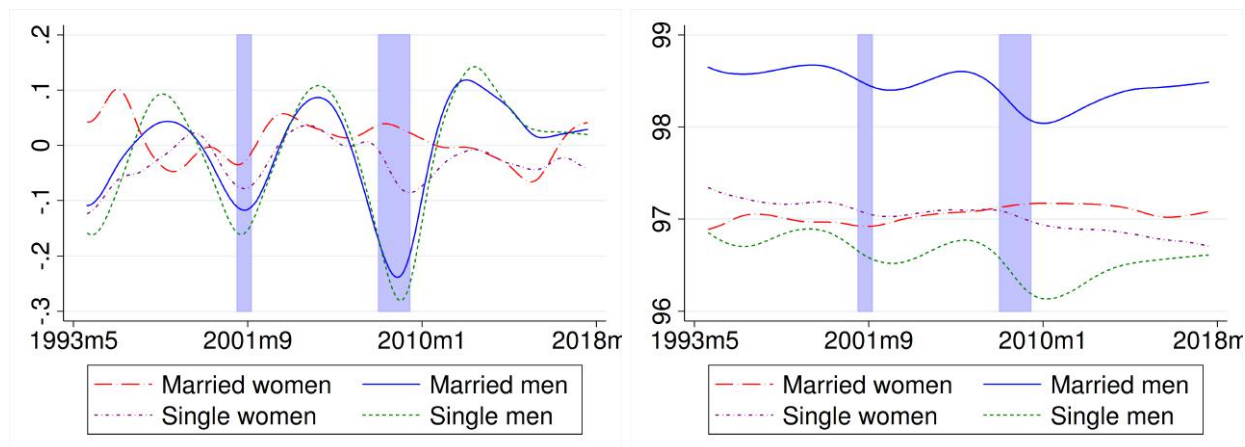
Aggregate hours worked for individuals can vary due to two reasons: individuals moving between employment and non-employment and changes in hours by employed individuals. A simple variance decomposition shows that for married women variation on the extensive margin accounts for about 78% of the hours volatility and the intensive margin accounts for only 22%. Since movements between labor market states account for the majority of the aggregate hours worked cyclical volatility for married women, the rest of my empirical section as well as the model will only consider the extensive margin.

Transition rates

Since the majority of the cyclical volatility in hours worked for married women stems from movements between employment and non-employment rather than pure adjustments of hours by working married women, this section analyzes the cyclical volatility of transitions between employment and non-employment. As highlighted in the introduction, contrary to past analyses of married women and spousal insurance, the important margin to consider is the transition from employment to not-in-the-labor force.

Figures 5 and 6 display the transition rates relating to the classic added-worker effect, i.e. transitions from not-in-the-labor force (N) into the labor force into either employment (E) or unemployment (U). While the change from a year ago of the N-to-E transition rate for married women is barely distinguishable from single women and married women, the change from a year ago in the N-to-U transition rate is actually lowest for married women compared to married men and singles. If the added-worker effect was the main reason for the low cyclical volatility of married women, we would expect their N-to-E and N-to-U transition rates higher during recessions and in particular higher than for the other groups, but this is not the case. While these observations do

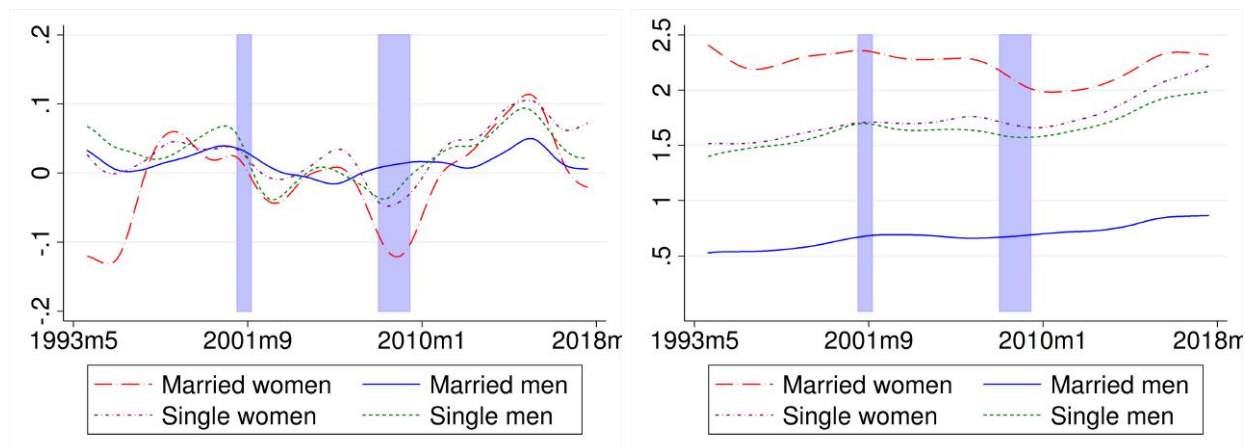
not contradict the existence of the added-worker effect, they present evidence that the added-worker effect is not able to explain the volatility of hours in the aggregate.



(a) Change from a year ago

(b) Level

Figure 3: E-to-E transition rate



(a) Change from a year ago

(b) Level

Figure 4: E-to-N transition rate

However, married women differ substantially from married men and single individuals in the cyclicity of the transitions out of employment. Figure 3 shows that while married men and singles experience a decline in their E-to-E transition rates married women's rates are positive for the whole period of the 2007-2009 recession and significantly less negative for the early 2000 recession. The important margin to consider to understand this countercyclicity in married women's E-to-E transition rates are the transitions from employment out of the labor force. Figure 4 highlights that married women are less likely to leave the labor force than both during recessions as well

as than married men and single individuals. While E-to-N transition rates are fairly acyclical for married men and moderately procyclical for single men and women, they are highly countercyclical for married women. I will argue in the following that much of the lower employment and hours cyclicity for married women stems from their different attachment to employment in recessions and normal times and will relate this to the cyclicity of job finding and job loss probabilities highlighted in the next section.

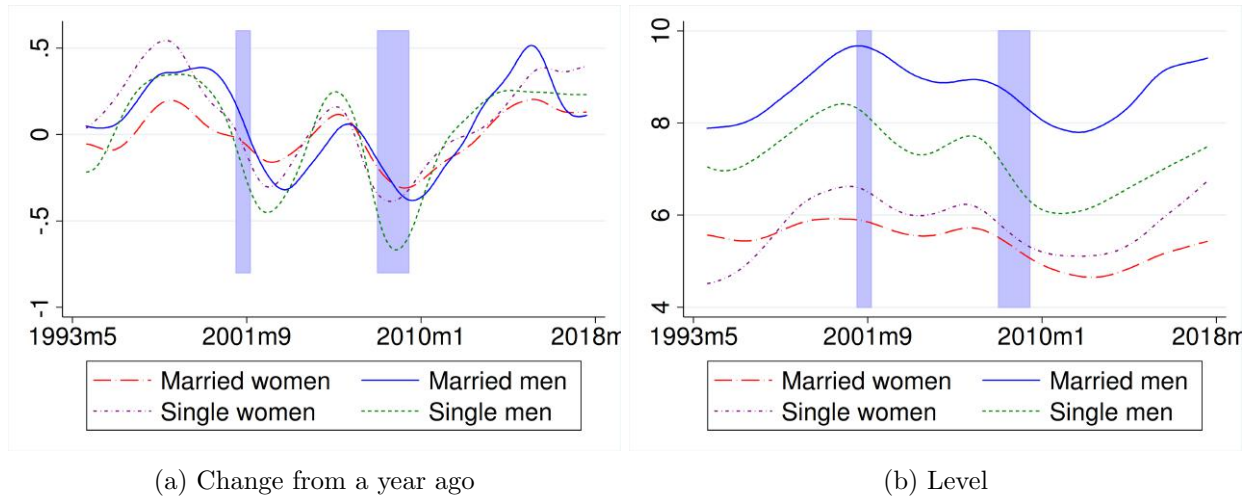


Figure 5: N-to-E transition rate

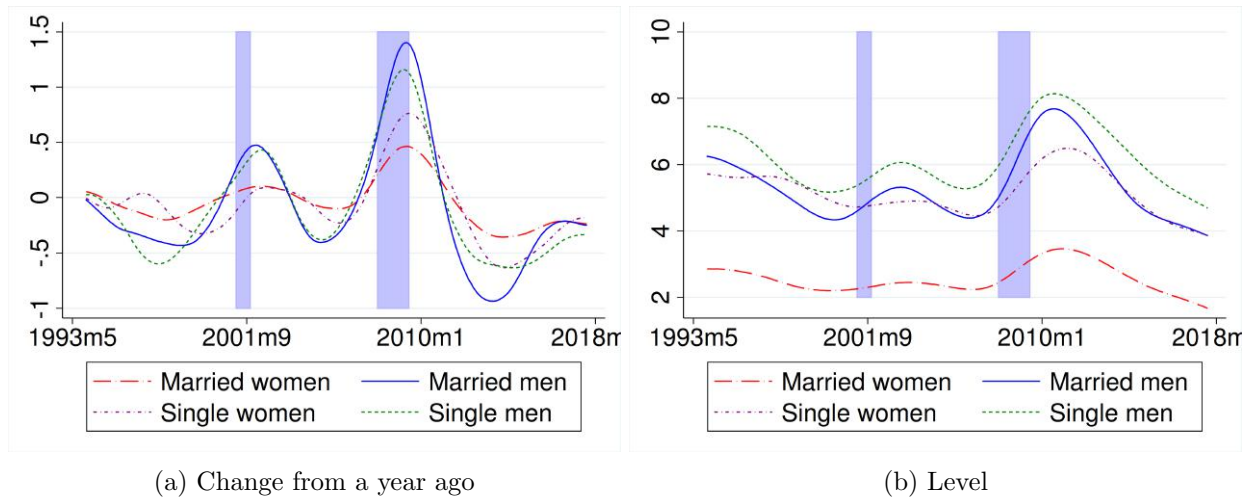


Figure 6: N-to-U transition rate

Labor Market Frictions

In my quantitative model I will show that part of the employment and hours cyclicality of married women can be explained by cyclical risk faced by their spouses. This section explores job finding and job loss probabilities for men and women in the United States between 1995 and 2015 using monthly CPS data.

I follow the methodology by Shimer (2012) and estimate job finding and job loss probabilities for men and women controlling for time aggregation in transition rates.² For now, I make the assumption that individuals who lose their jobs become unemployed and do not leave the labor force immediately. Therefore, I only consider movements from employment to unemployment when computing job loss probabilities. The reason for that is that I can observe in the data the reason individuals become unemployed, i.e. I can distinguish job losers from quits but I cannot observe this classification for individuals leaving the labor force. This is important since later on a significant fraction of E-to-N transition are voluntary and do not result from job loss. If I were to include these to compute the job loss probabilities I would likely overstate these probabilities. Therefore, my estimates are a conservative lower bound. However, when estimating job finding probabilities, I consider transitions from both unemployment and not in the labor force into employment.

I estimate the job loss and finding probabilities separately for men and women in the United States rather than for married men and married women in order to control for selection bias resulting from certain individuals choosing marriage while others may not.

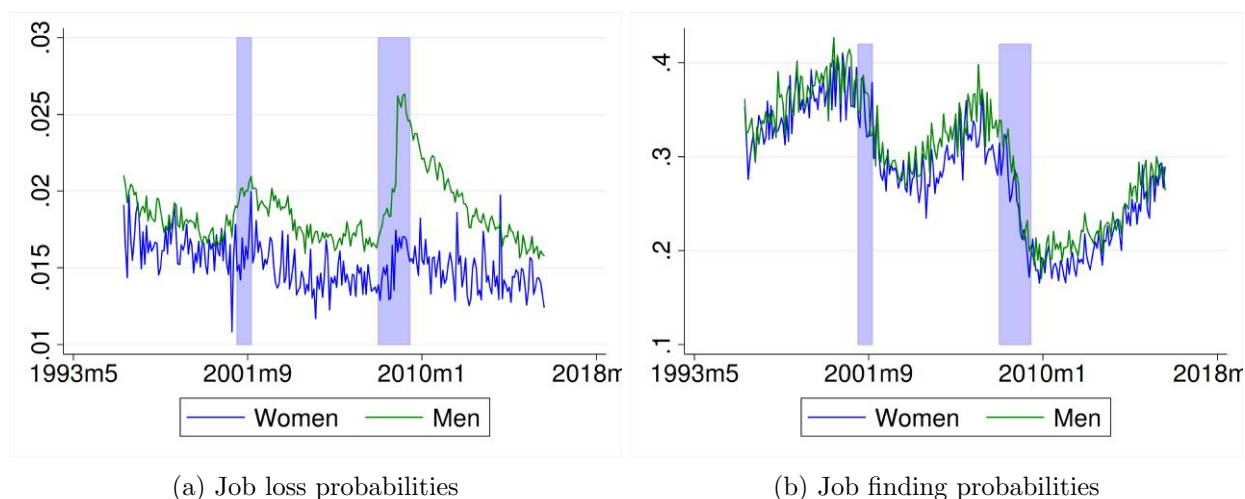


Figure 7: Job loss and finding probabilities for men and women in the United States 1995 until 2015

²See Shimer (2012) for a more detailed explanation of using a continuous model with discrete data.

		Men	Women
Average	Job loss probability	0.0186	0.0152
	Job finding probability	0.3004	0.2837
Cyclical	Job loss probability	0.2501*** (0.0207)	-0.0236 (0.0231)
	Job finding probability	-0.8023*** (0.0148)	-0.8433*** (0.0175)

Table 2: Correlation of job loss and finding probabilities for men and women with the unemployment rate

Figure 7b shows that men and women in the United States face very different job loss probabilities over the business cycle. While job loss probabilities are only mildly countercyclical for women, men have strongly countercyclical job loss probabilities. In particular in the recent recession, men experience job loss probabilities which were about 60 percent higher than what women experienced. On the other hand, figure 7a shows that there is no difference in the level or cyclical of the job finding probability between men and women.

Table 2 highlights the findings from the figures. In order to compute the cyclical measure each time series is detrended using a HP-filter and then cyclical is measured as the regression coefficient when regressing the detrended job finding and job loss series on the detrended unemployment rate. With regards to the average, men and women do not differ by much. Men have a slightly higher job loss and job finding probability than women on average. Also, they do not differ much in the cyclical of their job finding probability. But while for women there is no statistically significant relationship of their job loss probability with the business cycle as measured by the unemployment rate, men have a strongly countercyclical and statistically significant job loss probability. Therefore, men and women differ significantly in risk they face over the business cycle.

3.2 Summary

Before moving to the model and the quantitative analysis, this section briefly summarizes the most important empirical results.

I find that 1) Married women have a lower hours and employment cyclical than married men and single individuals; 2) Married women are more attached to employment and less likely to leave the labor force in recessions; and 3) Men have a significantly higher cyclical of job loss

than women. In the next section I will use a quantitative model to analyze whether 2) and 3) can explain 1).

4 Model

As documented in the previous section, much of the observed low cyclical for married women stems from movements between employment and not in the labor force which appears to be related to the labor market risk faced by their husband. Therefore, I model an economy with two-person households, incomplete markets, and labor market frictions which allows for endogenous movements between employment, unemployment, and not in the labor force. This model is similar to Mankart and Oikonomou (2016a) and Krusell, Mukoyama, Rogerson, and Sahin (2018) by adding labor market frictions to a incomplete markets heterogeneous agents model similar to a Bewley-Huggett model. In particular, the model distinguishes explicitly between the labor market states employment, unemployment, and not in the labor force.

All households in the economy are comprised of two members, husband ($i = 1$) and wife ($i = 2$). The household is unitary, which means the spouses pool their income and choose joint consumption. Therefore, I abstract from any bargaining within the household. Men and women differ in their wages, job finding and job loss probabilities. Both spouses face an idiosyncratic income process, which is the same for men and women. Since the majority of employment cyclical is due to movements between the different labor market states rather than changes in the hours worked, women in the model only make extensive labor supply decisions. Husbands' labor supply is fully exogenous and households take as given the movement between employment and unemployment for husbands. This means men work until they get laid off due to an exogenous job destruction shock and then become unemployed. Once without a job, they become unemployed and remain unemployed until they receive a job offer. If they receive a job offer, they have to accept it and become employed. Women on the other hand can also lose their job due to an exogenous job destruction shock, but otherwise move endogenously between employment, unemployment, and not in the labor force.

Recessions in this economy are periods of low job finding and high job loss probabilities and normal times are characterized by high job finding and low job loss probabilities. Therefore, the aggregate state of the economy only impacts the labor market frictions. Lastly, I also abstract from divorce and household formation and therefore, the terms husband/wife and man/woman are used

synonymously in this paper.

4.1 Agents

The economy is populated by a continuum of infinitely lived unit measure households comprised of husband ($i = 1$) and wife ($i = 2$).

4.2 Preferences

The unitary household has a joint consumption choice c_t as well as a discrete labor supply e_t^2 and discrete search choice s_t^2 for the wife leading to the following preferences

$$\log(c_t) - \alpha e_t^1 - \kappa s_t^1 - \alpha e_t^2 - \kappa s_t^2 \tag{1}$$

where α denotes the disutility of working and κ the cost of searching and they are the same for both spouses. The household can choose $e_t^2 \in \{0, 1\}$ for the wife, whereas the husband takes $e_t^1 = 1$ as given when he has a job offer, and $e_t^1 = 0$ when he is unemployed. In order to map the model into the data and explicitly distinguish between unemployment and not in the labor force, wives can choose whether to actively search $s_t^2 = 1$ or not $s_t^2 = 0$. If she chooses to actively search, she is considered unemployed, otherwise not in the labor force. The husband does not have a choice and will always have $s_t^1 = 1$ if he is without a job.

4.3 Income

Both, men and women, have stochastic productivity which follows the same AR(1) process

$$\log \varepsilon_t = \rho \varepsilon_{t-1} + \nu_t$$

So that both spouses have exogenous labor income $w^i \varepsilon$. Furthermore, households have access to a risk-free asset a , which pays an exogenous real interest rate r . Therefore, both wages for husband and wife and the real interest rate are exogenous.

4.4 Labor Market Frictions

Both spouses face labor market frictions, a job finding probability $p^i(s, y)$ and a job loss probability $\lambda(y)$. Furthermore, the business cycle is indicated by y and determines the level of

frictions in recessionary and normal times.

When employed, a worker will lose his/her job exogenously with probability $\lambda(y)$ in the given period and with probability $1 - \lambda(y)$ the worker will keep his/her job. If the husband is unemployed, he will find a job in the current period with probability $p^1(1, y)$ or remain unemployed with probability $(1 - p^1(1, y))$. If the wife is unemployed, she will find a job with probability $p^2(1, y)$ or stay unemployed without a job offer with probability $(1 - p^2(1, y))$. If she is not in the labor force she will receive a job offer with probability $p^2(0, y)$ or remain out of other labor force with probability $(1 - p^2(0, y))$. Active search increases the probability of finding a job relative to passive search, and therefore, $p^2(1, y) > p^2(0, y)$.

Lastly, the probability of finding a job is lower in recessions, $p^i(s, 1) < p^i(s, 0)$ and the probability of losing a job is higher in recessions, $\lambda^i(1) > \lambda^i(0)$.

4.5 Households' decisions

The following shows the recursive formulation of the household problem once both the idiosyncratic and aggregate shocks are realized. Households are distinguished by the job status of their spouses: Each spouse starts a period either as jobless (L) or with a job offer (J). Thus, at the beginning of the period, the households face either of the four value functions: $W^{JJ}(a, \varepsilon, y)$ if both spouses have a job offer, $W^{LL}(a, \varepsilon, y)$ if both spouses are jobless, and $W^{JL}(a, \varepsilon, y)$ or $W^{LJ}(a, \varepsilon, y)$ if one of the spouses has a job offer and the other is jobless.

If the husband has a job offer, he will always be employed (E). If the wife has a job offer, the household can choose for her between employment (E), unemployment (U), and not in the labor force (N). If the husband is jobless, he will always be unemployed (U), whereas the household can choose between unemployment (U) and not in the labor force (N) if the wife is jobless.

Thus, if both spouses are jobless

$$W^{LL}(a, \varepsilon, y) = \max\{V^{UU}(a, \varepsilon, y), V^{UN}(a, \varepsilon, y)\}$$

the husband will be unemployed and the wife can choose between unemployment and not in the labor force.

If the husband has a job offer and the wife if jobless

$$W^{JL}(a, \varepsilon, y) = \max\{V^{EU}(a, \varepsilon, y), V^{EN}(a, \varepsilon, y)\}$$

the husband will be employed and again the wife can choose between unemployment and not in the labor force.

If the husband is jobless and the wife has a job offer

$$W^{LJ}(a, \varepsilon, y) = \max\{V^{UE}(a, \varepsilon, y), V^{UU}(a, \varepsilon, y), V^{UN}(a, \varepsilon, y)\}$$

the husband is unemployed and the wife chooses between employment, unemployment, and not in the labor force.

Lastly, if both spouses have a job offer

$$W^{JJ}(a, \varepsilon, y) = \max\{V^{EE}(a, \varepsilon, y), V^{EU}(a, \varepsilon, y), V^{EN}(a, \varepsilon, y)\}$$

the husband is employed and the wife can choose between all three labor market states.

Problem for EE household

A household which has both spouses employed chooses joint consumption and savings and has to pay the disutility cost 2α since both household members are working. β is the household's discount factor. The value function for a household which has both spouses employed is

$$\begin{aligned} V^{EE}(a, \varepsilon, y) = \max_{c, a'} & \log(c) - 2\alpha + \beta \mathbb{E}[(1 - \lambda^1(y))(1 - \lambda^2(y))W^{JJ}(a', \varepsilon', y') + \\ & \lambda^1(y)(1 - \lambda^2(y))W^{LJ}(a', \varepsilon', y') + \\ & (1 - \lambda^1(y))\lambda^2(y)W^{JL}(a', \varepsilon', y') + \\ & \lambda^1(y)\lambda^2(y)W^{LL}(a', \varepsilon', y')] \\ \text{s.to } & c + a' = (1 + r)a + w^1\varepsilon + w^2\varepsilon \end{aligned}$$

The household faces four mutually exclusive situations tomorrow: (1) With probability $(1 - \lambda^1(y))(1 - \lambda^2(y))$ both spouses keep their job and start tomorrow with a job offer $W^{JJ}(a, \varepsilon, y)$; (2) or with probability $(1 - \lambda^1(y))\lambda^2$ the husband remains employed and the wife receives an exogenous job destruction shock so that tomorrow the husband will have a job offer but the wife will start as jobless $W^{JL}(a, \varepsilon, y)$; (3) the household will start tomorrow with the wife having a job offer and the husband jobless $W^{LJ}(a, \varepsilon, y)$ if he loses his job with probability $\lambda^1(y)$ and the wife keeps hers with probability $(1 - \lambda^2(y))$; (4) lastly, with probability $\lambda^1(y)\lambda^2(y)$ they will start as household with

both spouses not having a job offer $W^{LL}(a, \varepsilon, y)$.

Problem for EL household

A household in which the husband is employed and the wife is jobless chooses joint consumption, savings, and whether the wife searches or not. If they choose $s^2 = 1$, then the wife is unemployed and the household has to pay the disutility cost of searching κ . If they choose $s^2 = 0$, the wife does not actively search and is considered not in the labor force. The value function for this type of household is

$$\begin{aligned}
V^{EL}(a, \varepsilon, y) = \max_{c, a', s^2} & \log(c) - \alpha - \kappa s^2 \beta \mathbb{E}[(1 - \lambda^1(y))p^2(s, y)W^{JJ}(a', \varepsilon', y') + \\
& \lambda^1(y)(1 - p^2(s, y))W^{LJ}(a', \varepsilon', y') + \\
& (1 - \lambda^1(y))(1 - p^2(s, y))W^{JL}(a', \varepsilon', y') + \\
& \lambda^1(y)(1 - p^2(s, y))W^{LL}(a', \varepsilon', y')] \\
\text{s.to } & c + a' = (1 + r)a + w^1\varepsilon
\end{aligned}$$

Both spouses will have a job offer tomorrow $W^{JJ}(a', \varepsilon', y')$ if the husband keeps his job with probability $(1 - \lambda^1(y))$ and the wife receives a job offer with probability $p^2(s, y)$. They will be a LJ household $W^{LJ}(a', \varepsilon', y')$ if the husband becomes unemployed with probability $\lambda^1(y)$ and the wife finds a job with probability $p^2(s, y)$. Similarly, the husband has a job offer next period and the wife will not $W^{JL}(a', \varepsilon', y')$ if the husband remains employed with probability $(1 - \lambda^1(y))$ and the wife remains jobless with probability $(1 - p^2(s, y))$. They will be a jobless household $W^{LL}(a', \varepsilon', y')$ if the husband loses his job $\lambda^1(y)$ and the wife does not receive a job offer $(1 - p^2(s, y))$.

Problem for UL household

If the husband is jobless, he has to be unemployed and the household has to pay the search cost κ . The wife, however, can choose between unemployment and not in the labor force. In the case in which both husband and wife are jobless the household has a consumption, savings, and search intensity for the wife choice. If the wife decides to search the household has to pay the search

cost κ for her as well. Then the value function for a jobless household is

$$\begin{aligned}
V^{UL}(a, \varepsilon, y) = \max_{c, a', s^2} & \log(c) - \kappa - \kappa s^2 + \beta \mathbb{E}[p^1(s, y)p^2(s, y)W^{JJ}(a', \varepsilon', y') + \\
& (1 - p^1(s, y))p^2(s, y)W^{LJ}(a', \varepsilon', y') + \\
& p^1(s, y)(1 - p^2(s, y))W^{JL}(a', \varepsilon', y') + \\
& (1 - p^1(s, y))(1 - p^2(s, y))W^{LL}(a', \varepsilon', y')] \\
\text{s.to } & c + a' = (1 + r)a
\end{aligned}$$

With probability $p^1(s, y)p^2(s, y)$ both spouses will have a job offer tomorrow and the continuation value is $W^{JJ}(a', \varepsilon', y')$, whereas both spouses are jobless next period $W^{LL}(a', \varepsilon', y')$ with probability $(1 - p^1(s, y))(1 - p^2(s, y))$. The household will have a spouse with a job offer and one without if either the husband finds a job with probability $p^1(s, y)$ or the wife receives a job offer with probability $p^2(s, y)$.

5 Quantitative Analysis

5.1 Calibration

This section describes my calibration and estimation of the parameters in the model. A time period in the model is one month.

Targeted or externally set parameters

Since the model period is one month, I set the discount factor β to be 0.996 which is standard in the literature and choose the real interest rate to be 4%.

The parameters for the exogenous productivity process for both husband and wife, the persistence of productivity ρ and the standard deviation of productivity are from Krusell, Mukoyama, Rogerson, and Sahin (2018) and are 0.98 and 0.10, respectively.

This leaves me with the utility cost parameters for the cost of search κ for both men and women and the disutility from working α for both spouses. The two parameters are chosen so that the model unemployment rate for married women and the model employment-population ratio for married women matches their counterparts in the data³. In particular, κ is set to be 0.348 and I

³ Since the labor force participation rate is a combination of the unemployment rate and the employment-population ratio I match it implicitly as well

choose α to be 0.532. To emphasize the parameters are set to match labor market *stocks* for married women in the data and not the *flows* between labor market states, which are the main interest of this paper. Furthermore, I choose to match labor market stocks for married women rather than for all married households, since wives in my model can choose between the labor market states, whereas husbands are completely exogenous.

Table 3 summarizes the values and targets or source for the externally set parameters.

Parameter	Targeted Parameters		
		Value	Target
Discount factor	β	0.996	Krusell et al. (2017)
Persistence of productivity	ρ	0.98	Krusell et al. (2017)
Std. deviation of productivity	σ	0.10	Krusell et al. (2017)
Cost of search	κ	0.348	Unemployment Rate married women
Disutility of work	α	0.532	Employment-Population Ratio married women

Table 3: Targeted and externally set parameters

Estimated Parameters

All other parameters, i.e. the wages and labor market frictions for both spouses are estimated from the data. The data used are the monthly basic files from the Current Population Survey (CPS) for the years 1995 until 2015. The wage for men w_1 is normalized to 1 and the wage for women w_2 is 0.82 and reflects the average wage gap between men and women in the United States between 1995 and 2015.

In order to estimate the job finding and job loss probabilities for men and women, I follow the methodology described in Shimer (2012). Shimer (2012) allows for the estimation of job exit probabilities from employment into unemployment and job finding probabilities from both unemployment and not in the labor force into employment accounting for the time aggregation bias. First, I compute the job finding and job loss probabilities for the whole sample between 1995 until 2015. Then, I define the job finding and job loss probability during a recession as the average during all recessions. Similarly, the probabilities during normal times are simply the averages of the job finding and job exit rate across all non-recessionary periods. Table 4 shows the estimated wages and job finding and job loss probabilities for men and women in recessionary and normal times.

One of the key parameters in the model and in the quantitative analysis is the job separation

Estimated Parameters			
Parameters		Value	
Wage husband	w_1	1	normalized
Wage wife	w_2	0.82	
Offer high men G	$p^1(1, 0)$	0.300	
Offer high men B	$p^1(1, 1)$	0.276	
Offer high women G	$p^2(1, 0)$	0.284	
Offer high women B	$p^2(1, 1)$	0.250	
Offer low women G	$p^2(0, 0)$	0.040	CPS
Offer low women B	$p^2(0, 1)$	0.036	
Separation shock men G	$\lambda^1(0)$	0.017	
Separation shock men B	$\lambda^1(1)$	0.021	
Separation shock women G	$\lambda^2(0)$	0.015	
Separation shock women B	$\lambda^2(1)$	0.015	

Table 4: Estimated parameters from CPS

rate and in particular the differences between normal times and recessions for men and women. The last four rows of table 4 show the exogenous separation shock or job loss probability for men and women. While the job loss probability for women on average is the same in recessions and during normal times, for men the separation shock is substantially higher during recessions than during non-recessionary periods. Figure 7a in section 3 shows that a significant part of the volatility in men’s job loss probability is actually hidden in the average, since it peaks during the recent recession at 0.027 and reaches its low at 0.017. However, I will show in the following section that even without a richer process for the job loss probability, the differences between the average job exit probability in normal times and the average job exit probability in recessions will be able to cause precautionary labor supply behavior for the households.

5.2 Mechanism Intuition

Before getting into my quantitative results, this part illustrates the two mechanisms of spousal insurance, precautionary labor supply and the added-worker effect, generated in my model. The two mechanisms are shown for a fixed productivity level for husband and wife and the policy functions are computed given the above specified parameters.

Added-worker effect

First, the added-worker effect describes the situation in which the secondary spouse, in the model the wife, joins the labor force into either employment or unemployment following job loss by the primary earner, in the model the husband. Thus, it captures the change in labor market state by the wife in response to the husband's movement from employment to unemployment. The added-worker effect is present regardless whether the economy is in a recession or not. There are just more households affected during recessions since more husbands are going to lose their jobs.

Figure 8 illustrates a situation in which the added-worker effect occurs, in particular a case in which the wife joins the labor force into employment. Figure 8 shows the household's policy functions for the joint labor market states for both spouses as functions of the household's assets. The top line shows the joint labor market states policy function in which both spouses have a job offer (JJ). The bottom line illustrates a household, in which the husband has a job offer and the wife is jobless (JL). We start by considering the top line. The husband is employed at all asset levels because he has a job offer and due to the definition of his optimization problem. The wife also has a job offer, but the household can choose the optimal labor market state for her given their asset level, the spouses' productivity levels, and the husband's labor market state. Figure 8 shows that the household finds it optimal to have the wife employed if they are asset-poor and choose her to be not in the labor force if they have more assets. This is the result of a standard wealth effect.

Now suppose the husband loses his job due to an exogenous job destruction shock and unexpectedly moves from employment to unemployment. This constitutes a change in the type of household from JJ to LJ. Now for a certain range of assets levels (identified here as the red bracket), the household will find it optimal to have the wife employed rather than not in the labor force since the job loss of the husband means lower household wealth. So for households close enough to the wife's threshold between non-employment and employment, job loss for the household results into the wife joining the labor force, i.e. into the added-worker effect.

Figure 9 similarly illustrates the added-worker effect, however, now the wife does not have a job offer and therefore, she joins the labor force into unemployment.

The top line illustrates the joint labor market states policy function for a household in which the husband has a job offer and the wife is jobless (JL). The bottom line shows a household in which both spouses are jobless (LL). Start by considering the top line. The husband is employed for all asset levels if he has a job offer by definition of his optimization problem. The wife does

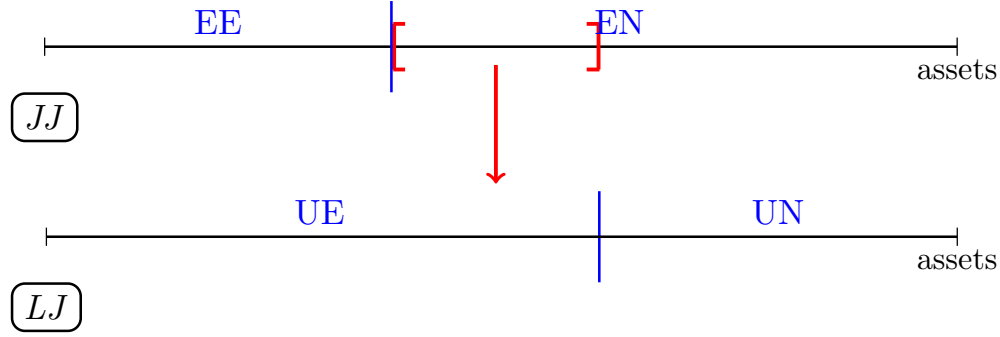


Figure 8: Added-worker effect into unemployment

not have a job offer and therefore is non-employed. She will be unemployed if the household is asset-poor and not in the labor force once the household has enough wealth.

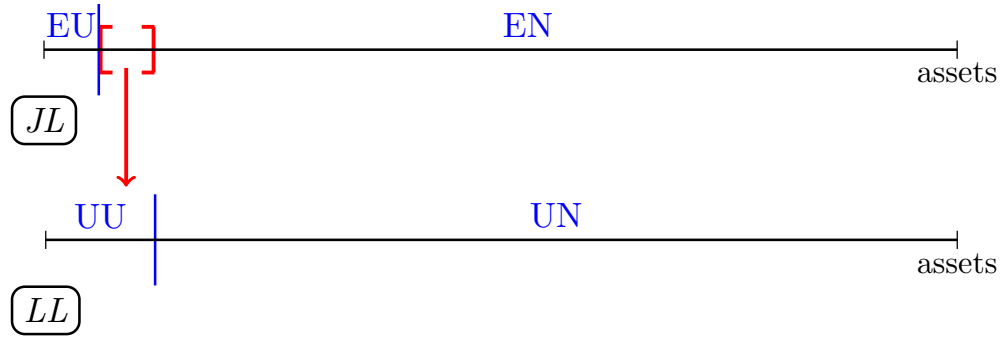


Figure 9: Added-worker effect into unemployment

Now consider the husband loses his job through an exogenous job destruction shock, which constitutes an unexpected movement from employment to unemployment. In figure 9, this can be seen from moving to the top line to the bottom line, i.e. the household went from being a JL household to being a LL household. Now for household in the asset range indicated by red brackets it will be optimal to choose active search for the wife and therefore, she will be considered unemployed. Similar to the added-worker effect into employment, for households close enough to the wife's threshold between unemployment and not in the labor force, job loss for the husband is associated with the wife joining the labor force into unemployment, and therefore, an added-worker effect.

Both added-worker effects shown are for a fixed productivity level for both spouses and a fixed aggregate state of the economy. The size of the added-worker effect in the model will crucially depend on the number of households which are close to the wife's thresholds between employment and not in the labor force and between unemployment and not in the labor force as well as on

the size of the husband's job loss probability. One would expect that during recessions, times in which husbands experience a higher job loss probability, would feature more wives making the aforementioned transitions conditional on being close to the threshold since more husbands are being laid off.

Precautionary labor supply by the wife

While the added-worker effect features a labor supply response by the wife in response to *actual* job loss and is present in both normal and recessionary times, households in the model are furthermore, going to respond to the higher *threat* of job loss during recessions. The following figures illustrate the mechanism and emphasize that married women will respond differently when facing actual job loss of their husband or a higher threat of job loss.

Figure 10 illustrates the joint labor market state policy functions for different types of households, fixing the productivity level for both spouses, in non-recessionary times. During normal times the job finding probability is high and the job loss probability is low. All labor market state policy functions are functions of the household's asset level. The top line shows the policy function for a household in which both spouses have a job offer (JJ), for the middle line only the husband has a job offer and the wife is jobless (JL), and lastly in the bottom case both spouses are jobless (LL). Similar to the figures in the added-worker effect section the thresholds between different labor market states are a result of the wealth effect.

By construction of the model, the husband will be always employed if he has a job offer and be always searching, i.e. unemployed, when he is without a job offer. The wife, on the other hand, will be employed if she has a job offer and the household only has little assets and be not in the labor force if the household is asset-rich although she has a job offer. If she is jobless, she will actively search if the household is asset-poor and be out of the labor force if the household has more assets.

Figure 10 shows that it is never optimal for the household to choose unemployment for the wife if she has a job offer. This is due to the job hoarding behavior by married women in this model. Job hoarding occurs in models of labor supply decisions which feature labor market frictions, such as exogenous job loss and/or job finding probabilities. Similar to Mankart and Oikonomou (2016a) this model features job hoarding for the wife. In general, job hoarding implies that agents in a dynamic model choose to be employed for higher asset levels than it would be statically optimal⁴. If employed agents are deciding whether to remain employed or quit in the current period, they also

⁴This behavior occurs in both single and dual earner households

take into consideration that once they quit, they cannot re-enter into employment right away since there is a probability that they do not receive a job offer. Thus, they remain employed either until lose their job exogenously or until they accumulated enough assets and then leave the labor force altogether. But they would not choose to quit into unemployment since then they are facing the cost of searching. For two-person households there is an additional uncertainty, not only do they know that if they quit there is the possibility that they cannot find a job but also there is a chance that their spouse loses their job if they are employed. Hence, married women in this framework will choose to remain employed even if it was not statically optimal and if they quit, they will leave the labor force. This feature will be a crucial mechanism in creating precautionary labor force and drive their observed transitions in the data.

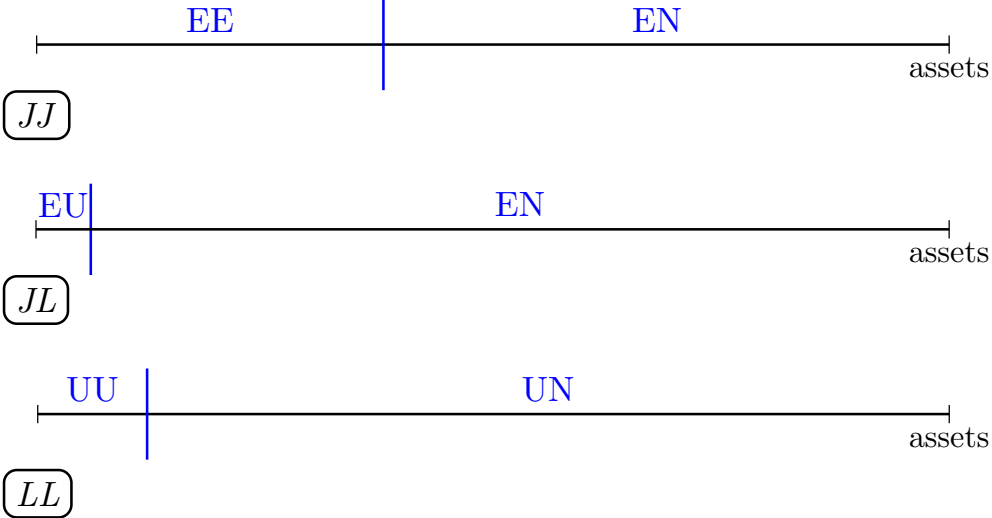


Figure 10: Precautionary labor supply

Figure 11 now illustrates how this job hoarding behavior in response to own job finding probability and husband’s job loss probability translates into a precautionary labor supply response for the wife. In this figure, the productivity level for both spouses is unchanged but now it shows the policy functions for recessionary periods. Recessions, which are defined as periods of high job loss probabilities and low job finding probabilities in my model, result in a shift of the thresholds to the right. So now married women will quit from employment or unemployment into not in the labor force for higher asset levels than in non-recessionary times. This means for JJ households within the shifted it will now be optimal for the wife to be employed rather than leave the labor force. Thus, although her husband has not actually lost his job, she will choose to remain employed as a precaution against the higher threat of her husband’s job loss. Similarly, if the wife does not

have a job offer (JL or LL households), she will now choose to remain unemployed and keep actively searching as a precaution in the event of job loss of her husband.

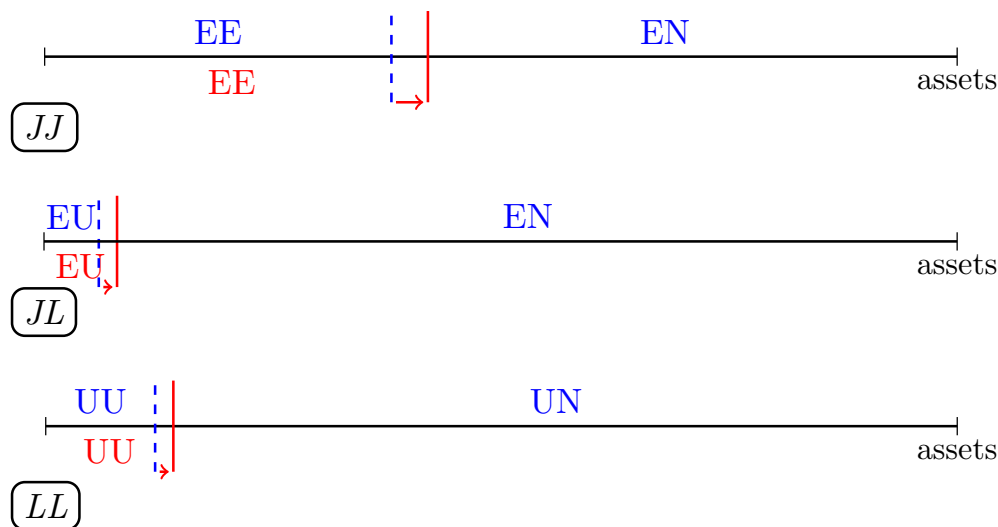


Figure 11: Precautionary labor supply

The size of this precautionary labor supply response depends crucially on the number of households that are just right of the thresholds in normal times. In my calibration I will show that this is a non-negligible fraction of households. Furthermore, since job hoarding behavior of married women stems from lower own job finding probability and higher husband's job loss probability, I conduct a numerical exercise to quantify how much of the precautionary labor supply behavior is a result of the two different reasons.

5.3 Main quantitative results

This section shows my main quantitative results and relates it to the empirical findings and stylized facts from previous sections.

Levels

Before looking at the flow rates and their cyclical, I start by analyzing the stocks my model generates. I compare all my model generated statistics to monthly, seasonally-adjusted and de-trended data from the Current Population Survey (CPS) for the prime-age population (individuals between 25 and 54 years old).

Table 5 shows the model generated stocks and their data counterparts for married women in the top panel and both married women and married men in the bottom panel. Since my model

only has married households, Aggregate refers to married households only in both the model and the data. In my calibration I targeted both the employment-population ratio and unemployment

Stock	Data	Model
Married women		
Employment-Population ratio	71.70%	71.67%
Unemployment rate	3.48%	3.54%
Labor force participation rate	74.29%	74.30%
Aggregate		
Employment-Population ratio	80.82%	82.84%
Unemployment rate	3.36%	5.07%
Labor force participation rate	83.63%	87.26%

Table 5: Comparison of model generated and data stocks

rate for married women, and implicitly the labor force participation rate as well, and table 5 shows I match the levels well. The bottom panel includes married men as well and we can see that my model overstates all three stocks. This overstatement is due to my assumption that married men only make exogenous transitions between employment and unemployment. Since married men can never leave the labor force in my model both their employment population ratio and labor force participation rate is higher than in the data. Similarly the unemployment rate is higher since married men always have to actively search and cannot opt out of paying the search cost. However, the model overstates each statistic by only about 3 percentage points, indicating that the simplifying assumption is not too far off from the data.

Table 6 shows the average transition rates over good and bad times generated in my model and for the U.S. economy between 1995 and 2015. In general my model does a good job in matching the transition rates out of employment rates. The model slightly understates the transition rate

	Data			Model		
	$E(t)$	$U(t)$	$N(t)$	$E(t)$	$U(t)$	$N(t)$
$E(t-1)$	0.9623	0.0077	0.0298	0.9770	0.0054	0.0176
$U(t-1)$	0.2489	0.4871	0.2647	0.2687	0.7184	0.0129
$N(t-1)$	0.0397	0.0145	0.9457	0.0367	0.0139	0.9494

Table 6: Model and data levels of transition rates for married women

from employment to not in the labor force and the reason for this is that in reality there are many reasons why someone chooses to leave the labor force, e.g. child care, education, etc., however, in

Stock	Data	Model
Married women		
Employment-Population ratio	-0.1408	0.0075
Unemployment rate	0.5352	0.5360
Labor force participation rate	0.0888	0.2885
Aggregate		
Employment-Population ratio	-0.8829	-0.6869
Unemployment rate	1.0000	0.8512
Labor force participation rate	-0.0806	0.2885

Table 7: Cyclicity of labor market stocks

my model, movement between employment and not in the labor force is mainly due to a wealth effect. The model does well in matching the flows from not in the labor force into all three labor market states. This finding suggest that whether to actively search or start working is primarily driven by the wealth effect. Lastly, with regards to transitions from unemployment, the model severely understates the U-to-N transition rates and by accounting also overstates the U-to-U rate. Again in my model an individual would make a U-to-N transition only if the wealth effect was strong enough, however, there are numerous reasons in the real world which would induce individuals to move between unemployment and not in the labor force. However, overall, my model does a good job in matching the transition rates for married women while only targeting labor market stocks.

Cyclicity

The next step is to evaluate the cyclicity of the labor market stocks in my model and compare them to the data.

Table 7 compares the cyclicity of the employment-population ratio, unemployment rate, and labor force participation rate generated in the model to the data counterpart. In the data, cyclicity is measured as the correlation between each HP-filtered labor market series and the HP-filtered unemployment rate. Since my model does not produce a measure of productivity, cyclicity of my model generated stocks is measured as the correlation between each labor market series and the state of the economy (1 = good, 2 = bad). Thus, the values are not comparable, only the signs are. The top panel shows married women only and the bottom panel both married women and married men.

Same as in the data, the unemployment rate is highly countercyclical for married women

and the labor force participation is mildly countercyclical as well. However, while the employment population ratio is mildly procyclical in the data, it is acyclical in my model. When considering both married men and married women, the model produces a highly procyclical employment-population ratio and highly countercyclical unemployment rate as in the data. However, while the labor force participation rate is procyclical in the data, it is countercyclical in the model. The reason is that only married women, not married men, can move in and out of the labor force. Therefore, all of the cyclicity of the labor force participation rate stems from transitions by married women, which we can see in the top panel lead to a countercyclical labor force participation rate.

In general, the model does well in also capturing the volatility of labor market stocks for married women.

Cyclicity of transition rates

Table 8 displays my main results, the cyclicity of the model generated transition rates as well as the cyclicity of the transition rates from the data.

I compute cyclicity in both the data and my model by regressing the log transition rate on the log (in the data detrended) unemployment rate and the reported cyclicity measure is the regression coefficient from this regression.

The first thing to notice is that my model matches the direction of cyclicity for all transition rates. In particular, it is able to generate an acyclical E-to-E transition rate for married women as well as the procyclical E-to-N transition rate. In terms of magnitude, the model generated E-to-E rate matches the data well and the E-to-N rate overstates the data rate slightly. Therefore, if married men and women are identical except in their wages and cyclicity of risks, it already explains a significant part of married women's observed transition rates. This finding suggest that a portion of the cyclicity of employment and hours displayed by married women stems from the precautionary labor supply behavior in response to risk faced by her husband. In particular, married women are relatively less likely to leave the labor force in recessions and are more likely to be attached to employment as a result of higher income risk during recessions faced by their spouse. Thus, this relatively simple mechanism of precautionary labor supply seems to explain a significant part of married women's hours and employment volatility.

The next sections explore this in more detail by providing a counterfactual analysis and decomposes the cyclicity in transition rates into how much is due to labor market risk faced by their husbands and how much is due to their own labor market risk.

Married women		
Transition rate	Data	Model
E-to-E	0.0038*** (0.0003)	0.0007 (0.0015)
E-to-U	0.2701*** (0.0306)	0.6880*** (0.1231)
E-to-N	-0.1971*** (0.0153)	-0.2482*** (0.0776)
U-to-E	-0.7632*** (0.0267)	-0.3047*** (0.0872)
N-to-E	-0.2707*** (0.0196)	-0.2285*** (0.0800)
U-to-U	0.4925*** (0.0140)	0.1015*** (0.0313)
U-to-N	-0.2606*** (0.0212)	-0.1764 (0.1771)
N-to-U	0.5567*** (0.0233)	0.1693 (0.1382)
N-to-N	0.0023* (0.0009)	0.0067* (0.0037)

Table 8: Cyclicalty of transition rates

The other transition rates are in line with data as well. Similar to the data the E-to-U transition rate is countercyclical, however, my model overstates the cyclicalty significantly. Most of the cyclicalty of the E-to-U rate is driven by the exogenous increase in the job loss probability during recessions. Similarly, much of the cyclicalty in the U-to-E and N-to-E transition rates is due to the exogenous decline in the job finding probabilities during recessions. These three rates fluctuate mostly because of the exogenous change in labor market frictions.

Lastly, similar to the data my model generates a procyclical U-to-N and countercyclical N-to-U transition rate, however, understating both in magnitude. The U-to-N rate is procyclical in my model due to precautionary labor supply and the added-worker effect. If their spouse is employed and they are unemployed, they are more likely to remain unemployed in recession and less likely to leave the labor force since their husbands face a higher risk of job loss now. The N-to-U rate is countercyclical due to a wealth effect. In recession it is more costly for the household to have the wife be out of the labor force and she will look actively for work.

6 Conclusion

In this paper I document that married women have a lower cyclical in hours and employment than married men and single individuals. I find empirically that married women are more attached to employment and less likely to leave the labor force in recessions relative to both normal times and married men and single individuals. Furthermore, I show that men have a substantially higher cyclical in their job loss probabilities than women. I build a quantitative model to analyze to what degree the different job market risk men and women face relates to the attachment of married women to employment in recessions and their lower cyclical of hours. The model identifies two important channels: the added-worker effect, i.e. wives join the labor force in response to actual job loss by the husband; and precautionary labor supply, i.e. households anticipate the higher job loss probability for the husband and the wife responds to this higher threat of job loss faced by the husband during recessions. The quantitative analysis shows that precautionary labor supply behavior of wives due to the countercyclical of job loss probabilities accounts for part of the observed transition rates for married women. In particular, married women are less likely to leave the labor force in recessions and are more likely to stay employed.

References

- ALBANESI, S. (2017): “Changing Business Cycles: The Role of Women’s Employment,” .
- ALBANESI, S., AND A. SAHIN (2018): “The gender unemployment gap,” *Review of Economic Dynamics*, 30, 47–67.
- ATTANASIO, O., H. LOW, AND V. SANCHEZ-MARCOS (2005): “Female labor supply as insurance against idiosyncratic risk,” *Journal of the European Economic Association*, 3(2-3), 755–764.
- (2008): “Explaining changes in female labor supply in a life-cycle model,” *American Economic Review*, 98(4), 1517–1552.
- BLUNDELL, R., L. PISTAFERRI, AND I. SAPORTA-EKSTEN (2016): “Consumption Inequality and Family Labor Supply,” *American Economic Review*, 106(2), 387–435.
- BORELLA, M., M. D. NARDI, AND F. YANG (2018): “The aggregate implications of gender and marriage,” *The Journal of the Economics of Ageing*, 11, 6–26.
- CHANG, Y. (2006): “From Individual to Aggregate Labor Supply: A Quantitative Analysis based on a Heterogeneous Agent Macroeconomy,” *International Economic Review*, 47(1), 1–27.
- CHOI, S., AND A. VALLADARES-ESTEBAN (2016): “On Households and Unemployment Insurance,” .
- (2017): “The Marriage Unemployment Gap,” *The B.E. Journal of Macroeconomics*, 18(1).
- DOEPKE, M., AND M. TERTILT (2016): “Families in Macroeconomics,” *chapter in Handbook of Macroeconomics*, 2, 1789–1891.
- ELSBY, M., B. HOBIJN, AND A. ŞAHIN (2015): “On the Importance of the Participation Margin for Labor Market Fluctuations,” *Journal of Monetary Economics*, 72, 64–82.
- FLOOD, S., AND J. PACAS (2016): “Using the Annual Social and Economic Supplement with Current Population Survey Panels,” *Minnesota Population Center Working Paper Series*, 2016-4.
- FUKUI, M., E. NAKAMURA, AND J. STEINSSON (2018): “Women, Wealth Effects, and Slow Recoveries,” .

- GARIBALDI, P., AND E. WASMER (2005): “Equilibrium Search Unemployment, Endogenous Participation, and Labor Market Flows,” *Journal of the European Economic Association*, 3(4), 851–882.
- GORBACHEV, O. (2016): “Has the Increased Attachment of Women to the Labor Market Changed a Family’s Ability to Smooth Income Shocks,” *American Economic Review: Papers & Proceedings*, 106(5), 247–251.
- GULER, B., F. GUVENEN, AND G. L. VIOLANTE (2012): “Joint-search theory: New opportunities and new frictions,” *Journal of Monetary Economics*, 59, 352–369.
- GUNER, N., R. KAYGUSUZ, AND G. VENTURA (2011): “Taxation and household labor supply,” *Review of Economic Studies*, 79(3), 1113–1149.
- GUNER, N., Y. KULIKOVA, AND A. VALLADARES-ESTEBAN (2015): “Labor Market Dynamics of Married Couples,” .
- HANSEN, G. D. (1985): “Indivisible Labor and the Business Cycle,” *Journal of Monetary Economics*, 16(3), 309–327.
- HRYSHKO, D., C. JUHN, AND K. MCCUE (2014): “Trends in Earnings Inequality and Earnings Instability among U.S. Couples: How Important is Assortative Mating?,” *IZA Discussion Paper No. 8729*.
- JAIMOVICH, N., H. SIU, AND S. PRUITT (2013): “The Demand for Youth: Explaining Age Differences in the Volatility of Hours,” *American Economic Review*, 103(7), 3022–3044.
- JAIMOVICH, N., AND H. E. SIU (2009): “The Young, the Old, and the Restless: Demographics and Business Cycle Volatility,” *American Economic Review*, 99(3), 804–826.
- JONES, L. E., R. E. MANUELLI, AND E. R. MCGRATTAN (2015): “Why are Married Women Working So Much?,” *Journal of Demographic Economics*, 81, 75–114.
- JUHN, C., AND S. POTTER (2007): “Is There Still an Added-Worker Effect?,” *Federal Reserve Bank of New York Staff Report*, 310.
- KRUEGER, A. B. (2017): “The Evolution of Rotation Group Bias: Will the Real Unemployment Rate Please Stand Up?,” *The Review of Economics and Statistics*, 99(2), 258–264.

- KRUSELL, P., T. MUKOYAMA, R. ROGERSON, AND A. SAHIN (2018): “Gross Worker Flows over the Business Cycle,” *American Economic Review*, Forthcoming.
- LUNDBERG, S. (1985): “The Added Worker Effect,” *Journal of Labor Economics*, 3(1), 11–37.
- MADRIAN, B. C., AND L. J. LEFGREN (1999): “An Approach to Longitudinally Matching the Current Population Survey,” *NBER Technical Working Paper No. 247*.
- MANKART, J., AND R. OIKONOMOU (2016a): “Household Search and the Aggregate Labour Market,” *Review of Economic Studies*, 84(4), 1735–1788.
- (2016b): “The rise of the added worker effect,” *Economics Letters*, 143, 48–51.
- SAHIN, A., J. SONG, AND B. HOBIJN (2010): “The Unemployment Gender Gap during the 2007 Recession,” *Current Issues in Economics and Finance*, 16(2).
- SHIMER, R. (2012): “Reassessing the ins and outs of unemployment,” *Review of Economic Dynamics*, 15, 127–147.
- STARR, M. A. (2014): “Gender, Added-Worker Effects, and the 2007 - 2009 Recession: Looking within the Household,” *Review of Economics of the Household*, 12, 209–235.
- STEPHENS, M. (2002): “Worker Displacement and the Added Worker Effect,” *Journal of Labor Economics*, 20(3), 504–537.
- WANG, H. (2018): “Intra-Household Risk Sharing and Job Search over the Business Cycle,” .