Does Husband's Job Loss Lead Wife's Labor Market Entry? Added Worker Effect during the Great Recession

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Research Article

Keywords: added worker effect, female labor supply, Great Recession, unemployment

Posted Date: May 12th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1433330/v1

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Abstract

This study uses a logit model to examine the response of women's labor supply to husbands' job loss in the United States using monthly labor force measures from the Survey of Income and Program Participation (SIPP). While previous studies have investigated such "added worker effects," few of them have looked at recessionary periods. SIPP longitudinal data allow for application of a dynamic model that considers wives' responses over an extended period. The analysis shows that, during the Great Recession, the odds that a wife enters the labor force are 1.4 times greater if her husband is unemployed in the prior month. This effect is not dependent on the husband's duration of unemployment. The estimate is robust to a variety of alternative models. In comparing our estimates of the added worker effect with those of other studies, I find our numbers are generally smaller than those in less developed countries but are similar to those in the United States.

Keywords added worker effect; female labor supply; Great Recession; unemployment

JEL codes J21, J22, J64

Introduction

Individuals' decisions to participate in the labor market depend on their social and physical environment, including their family characteristics, and their family's social and economic circumstances. Traditionally, wives are responsible for household activities and child-rearing, and husbands are primarily responsible for providing financial support. A married woman's choice of whether to work in the labor market is generally considered a joint decision of the family and, in many cases, to serve a risk-sharing function for the family. A married woman is often assumed to be more likely to work or to join the labor force if her husband becomes unemployed, depending on her prior labor force status (Cullen & Gruber, 2000).

Woytinsky (1940) may be the first author referencing the "added worker effect" in the labor economics literature. For him, the idea of an added worker was identical with the term "forced entrant." Additional workers were the persons who entered the labor market because the usual breadwinner in the family was unemployed; otherwise, the person would not be seeking employment. I define the added workers as wives who enter the labor force due to their husbands' job loss. The wife's labor market entry may be for a short or a long period. A household may accommodate to loss of income in several ways, and the wife's labor market entry is only one of them (Lundberg, 1985).

Historically, women's labor force participation was relatively low. In 1940 it began a strong and steady increase (Blau & Winkler, 2017). Only 28% of women were in the labor force in 1940 and this rose to 57.5% by 1990. Many scholars report that in World War II women had to join the labor force to fill the vacant positions of men who left their civilian jobs (Blau & Winkler, 2017). A shift in policy focusing on work requirements contributed to growing work motivation among welfare recipients—most of them women—in the 1970s and the 1980s. Women's labor force participation may have responded to two major legislative efforts in the 1990s (Cotter et al., 2004). First, the Family and Medical Leave Act of 1993 allowed women to move temporarily out of the labor force for qualified family reasons and medical leave with a guarantee their job would remain available (Department of Labor, n.d.). Second, the Personal Opportunity and Work Reconciliation Act of 1996 mandated a set of rules for the welfare system that required work in exchange of limited-time assistance (Department of Health & Human Services, 2015).

The Supplemental Nutrition Assistance Program (SNAP) is a food support program which grew substantially in the 1990s, and it is now among the largest program supporting poor families in the US. Studies of the effect of food stamps on labor supply have found mixed results; labor supply increased or decreased (Bredtmann et al., 2013; Currie, 2003; Hoynes & Schanzenbach, 2012). To be eligible for SNAP benefits individuals must meet some work

requirements that include registration for work, prohibition on job quits, requirements to take a job if offered, and participation in a job training program if offered (USDA-FNS, n.d.). However, the eligibility conditions vary depending on personal characteristics and the economic environment. For example, during the Great Recession, the benefits of SNAP were increased and the eligibility conditions were relaxed (Moffitt, 2015).

While previous studies have investigated "added worker effects," few of them have looked at recessionary periods. Most studies have found an added worker effect, although the magnitude of the effect varies greatly. Studies have defined the added worker effect as occurring when wives enter the labor force due to their husbands' job loss (Cullen & Gruber, 2000; Fernandes & Felício, 2005). In the present paper, I examine the added worker effect during the Great Recession. Of existing studies, only Mattingly & Smith (2010) focused on the Great Recession. They used the CPS to look at women's employment changes over the two periods 2004-2005 and 2008-2009; their study is hampered by the failure of the CPS to follow households that change address.

Using Survey of Income and Program Participation (SIPP) data, the current analysis will give us the ability to look at monthly transitions of wives' labor market participation using a representative sample that follows movers. Our analysis allows us to provide a valuable update and extension of our knowledge of the added worker effect during the largest economic downturn of the early twenty-first century. The current analysis finds an added worker effect during the Great Recession and this is statistically significant. I also find significant effects of husbands' age and education, wives' education, their ages, and race and ethnicity on wives' labor supply. Number of children is also a good predictor of wives' labor force participation as is local economic activity as captured by the state unemployment rate.

Background and Existing Literature

A large number of studies have analyzed the effects of different factors on women's labor supply choice. Women's choice to participate in the labor market depends on various factors, including family characteristics, her own background, economic environment, and social policies. Cullen and Gruber (2000) listed at least three reasons for wives to enter the labor market in a situation where husbands become unemployed. First, husbands and wives may substitute their leisure through home production. Second, families face liquidity constraints when husbands are jobless and need to maintain fixed consumption commitments (Lundberg, 1985; Mincer, 1962). Third, in a dynamic life cycle model, couples are responsive to a spouse's unemployment and reemployment even in the presence of a perfect capital

market because their decisions are contingent to their lifetime prospects, which are influenced by these events (Dynarski & Sheffrin, 1987).

Estimates of the added worker effect vary greatly in prior studies. Generally, estimates of added worker effect are higher for developing economies relative to developed economies. In the results section of this paper I discuss the variations of added worker effects and compare the estimates to the current study's findings. Two papers that used the recession-prosperity comparison found that the added worker effect is larger during economic downturns relative to periods of economic prosperity (Mattingly & Smith, 2010; Parker & Skoufias, 2004). Two studies found that, during economic downturns, women were more responsive to job loss of the male partner but less responsive to a reduction of his earnings (Ghignoni & Verashchagina, 2016; Kohara, 2010). Two papers also found added worker effects during a high unemployment period (Lundberg, 1985; Spletzer, 1997).

The presence of young children is a strong negative predictor of wives' labor supply. Wives' are less likely to work in families with young children, consistent with the standard models of allocation time in the household (Cullen & Gruber, 2000; García-Pérez & Rendon, 2020; Lundberg, 1985; Mankart & Oikonomou, 2016; Mattingly & Smith, 2010).

Women endowed with higher human capital due to higher schooling levels will achieve higher earnings and will therefore be more likely to work. In fact, labor supply increases with the education level of the wife (Cullen & Gruber, 2000; Mankart & Oikonomou, 2016; Mattingly & Smith, 2010; Smith & Mattingly, 2014; Spletzer, 1997). Greater wife's education leads to a higher likelihood of transition from inactivity to activity (Fernandes & Felício, 2005). Smith and Mattingly (2014) found that in three different recessionary periods wives with greater education were more likely to enter the labor force. In many cases, the husband's education is also a good predictor for wife's choice of labor market participation. Wives' of more educated husbands' have higher labor market participation due to their marriage preference (Cullen & Gruber, 2000).

The two papers that used the recession-prosperity comparison obtained similar findings that the added worker effect is larger during economic crises relative to periods of economic prosperity (Mattingly & Smith, 2010; Parker & Skoufias, 2004). Mattingly and Smith (2010) found a larger added worker effect during a recessionary period (2008–09) compared to a period of prosperity (2004-05) using logistic regression predicting wives' movement into the labor force with CPS data. In addition, Mattingly and Smith (2010) found in both periods that wives who were working part

time were more likely to increase their working hours when their husbands lost jobs. However, they also found evidence that wives were seeking jobs but failed due to poor prospects in the recession.

Starr (2014) saw significant increases of women's employment when husbands' lost jobs during the recessionary period of 2007-2009, based on a difference-in-difference model using American Community Survey data. Over that period, the likelihood of employment for women with non-employed and employed husbands increased by 4.4 and 0.4 percentage points, respectively.

Most studies find that the coefficients for age and age squared indicate a standard inverted U predicting the chance of wife's transition from inactivity to activity with wife's age (Cullen & Gruber, 2000; but see Parker & Skoufias, 2004). However, increasing age may also have a negative effect on wives' likelihood of joining the labor force in response to husbands' transition from employment to unemployment (Spletzer, 1997).

Mankart and Oikonomou (2016) found that the likelihood of joining the labor force is higher for black wives than for white wives. Cullen and Gruber (2000) also found that white wives' likelihood of labor market participation is lower relative to that of black wives. Compared to white wives, non-white wives have a 5.3% higher chance of joining the labor force when a husband loses his job (Spletzer, 1997). Wives in black families were more likely to seek a job during the recession than white wives but it was more difficult for black wives to get jobs during the Great Recession (Mattingly & Smith, 2010).

While previous studies have investigated how the labor supply of women responds to husbands' job loss, few of them explicitly looked at recessionary periods. Within the papers that investigated recessions, they did not consider monthly transitions of wives' labor force status. The Survey of Income and Program Participation data give us the ability to look at the monthly transitions of wives' employment. To our knowledge, however, both the theoretical and empirical studies have ignored the potentially important role of the added worker effect during the Great Recession. By examining monthly data, it can be helpful in addressing the transitions of couples' during the recessionary period and may help us to think about policy impacts in a period of economic slowdown (Spletzer, 1997).

Data and Descriptive Statistics

The source of data used in this study is the 2008 Survey of Income and Program Participation conducted by the US Census Bureau.[1] SIPP is a household-based survey designed as a continuous series of national panels which provides interviews of the civilian noninstitutionalized population living in the United States starting in 1983 (US Census Bureau, n.d.). The SIPP is based on a nationally representative sample followed for approximately four years. It provides data on basic demographic and social characteristics for each member of the household during the survey period. These include age, sex, race, ethnic origin, marital status, relationship within the household, education, and veteran status. SIPP collects information for assistance received either directly as money or indirectly as in-kind benefits.

The structure of the data file is "person-month" and makes available all the data on individuals and households on a monthly basis. The current analysis considers wave 1 to wave 7 of the 2008 SIPP dataset. This paper focuses on the Great Recession, which lasts eighteen months, from December 2007 to May 2009 (NBER, 2010). However, the initial impact of the Great Recession was quite modest, and the negative effects continue after its official end date. Keeping this fact in mind, I consider the time period from May 2008 to August 2010.

SIPP provides information on labor force status and allows us to track individuals' monthly employment status. Although the SIPP is subject to differential attrition, using sample weights for the estimates reduces the resulting bias (Czajka et al., 2008). Additionally, SIPP oversampled low-income people, and using sample weights adjusts for this issue (SIPP 2008, n.d.). Sample weights must be used to produce a nationally representative sample (Cameron & Trivedi, 2010). In the current paper, all analyses use the household weights. The household weights are important as my analysis is looking at the household level and particularly at husband and wife.

The benefits of using the SIPP data are many. First, it has a shorter recall period than the Current Population Survey (CPS). Households need to remember information in only the prior four months, whereas the CPS requires respondents to remember 12 months of information. Second, SIPP tracks movers and the CPS does not track movers (Mattingly & Smith, 2010). Third, the SIPP weighted sample is representative of the US population, but households from high poverty areas are oversampled, improving the power of analyses, like ours, that focus on the effects of

[1] This study downloaded 2008 SIPP data from the National Bureau of Economic Research (NBER) website where NBER provides STATA data definition files for the convenience of researchers. The NBER website is http://www.nber.org/data/survey-of-income-and-program-participation-sipp-data.html.

unemployment. Fourth, the SIPP survey is particularly focused on obtaining information regarding participation in government welfare programs.

I have applied some restrictions on the data for my analysis. In the first step, I consider a sample in which husbands and wives were both between 25 and 54 years of age. This allows me to remove most students and people who are retired (Cullen & Gruber, 2000).[2] In the next step, I limit my sample to married couples who are living together, those classified as "family household married couple."[3] To define employment, unemployment and labor force status, I use the definitions specified by the Survey of Income and Program Participation.

In the case of wives, I define two broader classes of wives, those in the labor force and those not in the labor force. Wives who are in the labor force consist of both employed and unemployed wives. There is a small sample of unemployed wives, about 5% of the observation. The transition from not in the labor force to the labor force is central to my analysis. In contrast, I retain three categories for husbands' labor force status, employed, unemployed, and not in the labor force.

[Table 1 near here]

Table 1 presents summary statistics for the sample that satisfies the sample restrictions described above for the first seven waves of the 2008 SIPP. There are two groups of wives, wives whose husbands are employed, in first column, and wives whose husbands are not employed, in second column. Husbands not employed include unemployed husbands and husbands not in the labor force. On average, wives of husbands who are not employed work in 74.6% of the months in the SIPP data. Wives of husbands who are employed work 74.2% of the months. Several other characteristics are similar for wives with employed husbands and husbands who are not employed. These include husband's age, wife's age, wife's race and ethnicity, number of children under 18, residence and ownership of the house.

[2] There is no consensus about how to limit ages in studies of the added worker effect. For couples, Fernandes and Felício (2005) use ages 25 to 60, Gong (2011) uses ages 22 to 59, Mattingly and Smith (2010) use ages 18 to 65, Parker and Skoufias (2004) use ages 20 to 65, Karaoglan and Okten (2015) use ages 20 to 54, Mankart and Oikonomou (2016) use ages 25 to 55, and Guner et al. (2020) use ages 25 to 54.

[3] Possible household types in the SIPP dataset are family hh-married couple, family hh-male householder, family hh-female householder, nonfamily hh-male householder, nonfamily hh-female householder (*SIPP 2008*, n.d.).

Empirical Strategy

The empirical analysis is based on logistic regression using the sample of wives who were out of the labor force for at least one month over the full 25 months of the survey (Parker & Skoufias, 2004). I use the following model:

$$y_{it}^{f} = f(\alpha + \beta_1 u_{i(t-1)}^{h} + \beta_2 NLF_{i(t-1)}^{h} + \delta_i \boldsymbol{X}_{it} + \varepsilon_{it}) \ldots\ldots\ldots\ldots (1)$$

where the dependent variable y_{it}^{f} is the wife's likelihood of being in the labor force in month *t*. The independent variable $u_{i(t-1)}^{h}$ is a binary variable set equal to 1 if the husband is unemployed at (*t*-1) and 0 if he is not. Another binary variable $NLF_{i(t-1)}^{h}$ equals 1 if husband is not in the labor force at (*t*-1) and 0 otherwise. Here, husband's labor force status is a categorical variable for the prior month *(t*-1*)* identifying whether the husband was employed (*E*), unemployed (*U*), or not in the labor force (*NLF*) in the prior month. This is our key predictor in the analysis. I consider the category "husband is employed in prior month (*t*-1)" as a reference or base category. By definition, for an added worker effect I am interested in looking at wife's labor force choice in the current month (*t*) as a function of her husband's unemployment in the prior month (*t*-1).

Wife's choice of labor force participation also depends on other factors (covariates). $\boldsymbol{X}_{it}$ is a vector of individual and household characteristics. In this analysis, in some models, I also include husband's unemployment for the prior two months (*t*-1) and (*t*-2). The vector $\boldsymbol{X}_{it}$ includes husband's age and his highest level of schooling completed, wife's years of schooling, her age and age squared, and her race and ethnicity. Family variables are also included in the vector $\boldsymbol{X}_{it}$. This includes the number of children under 18 years of age, and whether the house is rented or owned. To represent local economic activity, I include the state unemployment rate. ε_{it} is a random component summarizing the influence of unobservables, and $\alpha, \beta,$ and γ are parameters to be estimated. The parameter β_1 is an estimate of the added worker effect, identifying the effect of the husband's unemployment on the labor force participation of his wife.

The advantage of this logit specification is that it allows us to establish a causal relation of exact timing of the wife's labor supply response to her husband's labor market status. Logit estimates of the odds ratio or marginal effects allow us to measure wives' likelihood of being in the labor force. In this paper, most of the results are presented in terms of odds ratios. I also present some results in terms of marginal effects for convenience in the appendix table A2.

In the regression exercise, using equation 1, I estimate five different models. In the first model, the wife is in the labor force in the prior month (*t*-1). In the second model, wife is not in the labor force in the prior month (*t*-1). The second model is particularly important in this research as it captures the essence of the added worker effect. In the third model, wife's prior labor force status is not controlled. Here, I combine wives who are in the labor force and not

in the labor force in prior month (t-1), providing an overall measure of wife's decision without controlling wife's prior labor force status. The third model has more observations than the others, and so provides more precise estimates, but it assumes that effects on the likelihood that a wife enters the labor force (when out of the labor force) are similar to those on the likelihood that she remains in the labor force (if she is in the labor force). In the fourth model, the structure is the same as in model one (wife is in the labor force in the prior month) except that I have an additional control identifying if husbands are unemployed in both prior months (t-1) and (t-2). This will give us a sense of whether duration of unemployment influences the wife's work decision. The fifth model is based on model four with the only difference being that I consider wives who were not in the labor force in prior month (t-1). This paper analyzes the monthly survey data separately by year and with all years together. I cluster errors by the individual.

We also consider a logistic regression that includes household fixed effects. The benefit of using a fixed effect model is that it controls for time-invariant unobservable factors that may bias the analysis. In our context, the household fixed effects capture all unobservable, time-constant factors that affect wife's labor force status. For example, some wives may be highly motivated to get a job compared to other wives, and if such wives were more likely to have unemployed husbands, this would bias results.

$$y_{it}^{f} = f(\alpha + \beta_1 u_{i(t-1)}^{h} + \beta_2 NLF_{i(t-1)}^{h} + a_i + \delta_i \boldsymbol{X}_{it} + \varepsilon_{it}) \ldots\ldots\ldots\ldots (2)$$

Here a_i captures unobserved heterogeneity between households. The household fixed effects represents all factors affecting wife's labor force status that do not change over time. The vector $\boldsymbol{X}$ include husband's prior labor force status, wife's age, age squared, and the state unemployment rate. Other variables, like race or ownership status of house, are dropped as they display no or very little variation over time.

Results

The Added Worker Effect

The added worker effect is addressed by looking at wife's labor supply response to her husband's unemployment. In the first step of my analysis, I estimate models separately for each month. The estimated ratios predict the odds of wives' labor force participation at time t as a function of husbands' labor force status in the prior month (t-1). As noted above, the model is estimated on three samples: 1) wives who were in the labor force at (t-1), 2) wives who were not in the labor force at (t-1), and 3) wives in either prior labor force status, but controlling for the direct effect of that status. For example, the analysis predicts wives' likelihood of labor force participation in August 2008 as a function

of husbands' labor force status in July 2008. The estimated odds ratios are reported in figure 1 (wife in the labor force in prior month) and figure 2 (wife not in the labor force in prior month) with the 95% confidence interval.

[Figure 1 near here]

I report results for twenty-five months based on surveys from August 2008 to August 2010. I have data starting from May 2008, but since I use data from prior months, the first month in which wife's labor force status is predicted is shifted forward. In those analyses using information only from one prior month, the first month for wife's labor force is June 2008; where three prior months are used, the first month is August 2008.

Figure 1 shows monthly odds ratios for wives' likelihood of labor force participation in the current month (t) as function of whether their husbands were unemployed, out of the labor force, or employed in the prior month (t-1). Wives were in the labor force in the prior month (t-1). The graph shows how wives' likelihood of staying in the labor force responds to their husbands' unemployment. If the ratio is over 1, wives' likelihood increases; if the ratio is under 1, wives' likelihood decreases. Although some estimates are large and positive, estimates in nearly three-quarters of the months are negative, and none of the estimates is statistically significant at conventional levels.

[Figure 2 near here]

In contrast, in figure 2, for wives who were not in the labor force in the prior month (t-1), for nearly two thirds of the months, the likelihood of being in the labor force increases in the current month (t) if a husband was unemployed. I find that the effect is statistically significant in four of the months. Husbands' job loss may be a key deciding factor for wives in deciding whether to join the labor force. For example, in figure 2, the odds ratios for April 2009 is 3.3 and this is statistically significant at $p<0.05$. It mean that among wives not in the labor force in the prior month (t-1), the odds of being in the labor force in current month when the husband is unemployed are 3.3 times as great as those when the husband is employed. Comparison of figures 1 and 2 suggests that wives respond more strongly to husband's unemployment when they were not in the labor force in the prior month. Such a response is the essence of the added worker effect.

In these monthly results, the estimates are not very precise given that I have a small number of observations for each month. Number of observations will be increased if I work with annual data, combining months. In the next step we move to the analysis based on annual data.

The annual analysis is based on equation 1, and I present results in table 2 for three different years, 2008, 2009 and 2010. In this analysis, data for all months are combined for each year. In 2008, we have eight months of data from May 2008 to December 2008. In 2009, we have twelve months of data, and in 2010 we have eight months of data from January 2010 to August 2010. I present results for all three years separately. In the combined analysis, we find a statistically significant added worker effect for 2009 but not for 2008. Perhaps the fact that wives have observed the economy since the beginning of the Great Recession causes them to respond more aggressively in 2009. Also, we have more power, because of the greater sample size, in 2009 relative to the years 2008 and 2010, so estimates for 2008 and 2010 are less precise.

[Table 2 near here]

In the next step, I moved to the combined sample. This combines all available monthly data from May 2008 to August 2010. Combined monthly data allows us to get more precise estimates, but differences in the effects by years are ignored. The results from combined data are in table 3.[4]

[Table 3 near here]

The combined results in table 3 show that the odds that a wife enters the labor force are 1.4 times greater if her husband is unemployment rather than employed in the prior month (t-1), which is statistically significant at $p<0.01$. On the other hand, wives who were in the labor force in the prior month are less likely to be in the labor force if their husbands were unemployed. If we don't control wives' prior labor force status then we find that the odds of wives being in the labor force are 1.2 times greater if their husbands are unemployment in the prior month. The right two columns present estimates that examine the impact of more than one month of unemployment. We see that if the

[4] I also looked at the average partial effect from the logistic regression for convenience and presented in appendix table A2. I find statistically significant added worker effects in this model of combined data. This estimate of average partial effect tells us that wife has 1.5 percentage point higher chance of joining in the labor force if her husband is unemployed in the prior month.

husband has been unemployed for at least two months, the odds of the wife entering the labor force is 1.068 greater than if he is out of labor force for just a single month, a difference that is not statistically significantly different from 1.0. We conclude that a wife's chance of entering the labor force neither increases nor decreases in subsequent months of her husband's unemployment.

The controls for the logistic regression include husband's characteristics, wife's characteristics, family variables, residential status and state unemployment. Husbands' educational attainment has a significant effect on wives' labor force entry decisions. Husbands' higher educational attainment reduces the likelihood of wives' entry into the labor market. Families may have savings or a higher and more reliable income flow if husbands are highly educated. Husband's age does not affect wife's labor force choice, as we see it is not statistically significant in any model. Wife's education plays an important role in her labor force entry choice. More educated wives are more likely to be in the labor force.

Wife's age has a significant effect to the labor force entry decision. The effect of wife's age on entry is captured by a quadratic equation. The coefficient on age squared is negative, and I observe that age is associated with an increase in the chance of labor market participation early on, reaching a peak, and then becomes negative. The wife's choice of labor force participation increases with age up until about age 42, and then decreases.

Race and ethnicity also influence wives' labor force entry choice. If the wife is black, then the odds ratio of her entering the labor market is 1.46 times greater compared to a white wife, when wife was not in the labor force in prior month. However, if the wife is an Asian, then she has lower probability of entering the labor force. In the second section of this paper, I also discussed the fact that Asians have relatively better positions in terms of job security and are less likely to be affected by the Great Recession. Asian wives are more likely to come from more affluent families.

Number of children plays an important role in wives' labor market entry decisions. In this analysis, I consider children who are under 18 years old. This age group is important as wives often take care of young children instead of engaging in labor force activities. The analysis shows that wives with more children are less likely to choose labor market entry.

Residence in a metropolitan area does not significantly influence the wife's labor force participation. Local economic activity as captured by the state's unemployment rate also plays an important role for wife's labor supply. The higher the unemployment, the lower the wife's likelihood of joining the labor force. During the Great Recession, job availability decreased particularly for low skilled workers, so getting a job was harder than in other periods.

In the next step, I consider the logistic regression that controls for household fixed effects, as indicated in equation 2. I combine all the observations from 2008 to 2010. I use husband's labor force status, wife's age, number of children under age 18 and state unemployment as predictors in the fixed effects model. I dropped variables from this fixed effects model if they had little or no change over time. The results are presented in table 4. I grouped the data by household; the household fixed effects capture variation between households in labor force participation; if unmeasured household differences are associated with unemployment, estimates above may be biased. In the table, results are presented in terms of odds ratios.

[Table 4 near here]

The fixed effect model shows that the odds of being in the labor force for wives with unemployed husbands are 1.14 times as great as those with an employed husband, but this is not statistically significantly different from 1.0. This estimate is also substantially smaller than the estimate in table 3 (1.421), which is statistically significant. It is worth nothing, however, that the estimate in column 3 of table 4, is very similar to the comparable estimate in table 3 and is statistically significant. Overall, although the fixed effects estimates suggest the possibility that there may be unmeasured household factors that cause wives with unemployed husbands to enter the labor market, they do not reject the possibility of added worker effects. In fact, estimates are within two standard deviations of one another, and so differences in estimated effects are not large relative to sampling error.

Robustness of Main Estimates

I also considered models that use interaction terms to identify differences in wives' responses based on their prior labor force status. This model allows us to control for household characteristics in a more parsimonious way than the separate models by wife's labor market status based on model 1 that are reported above. The main estimates obtain by this approach confirm the presence of added worker effect and support our reported findings.

Appendix table A1 presents separate results three different years of 2008, 2009 and 2010. Table 3 shows added worker effect when all three years are combined. However, estimates based on separate models do not confirm the presence of an added worker effect in all years. Only 2009 shows a statistical significant added worker effect.

In order to examine the robustness of our separate results by month, we fitted monthly dummies and their interactions with the measure of husbands' unemployment. In this analysis, I have results from two different models. The first model includes month and interaction terms, and the second model includes month and interaction terms and with other controls. Based on these alternative results, the main substantive conclusions of our earlier results remain valid.

I also considered a model that looked at husbands' duration of unemployment. I looked at wife's likelihood of labor force participation as a function of the length of the husband's unemployment. I considered unemployment duration for zero to seven months or more. These additional measures did not contribute to the explanation of wife's labor force choice. The nature of the unemployment spells is that most are for short periods of time, so relatively few individuals were unemployed for six months or more. I couldn't find significant changes in effects by duration of months. Once I consider durations of unemployment for six months or more, we see very few observations remaining for analysis. In the aggregated data set for seven waves of SIPP 2008, unemployed husbands constitute only 6.32% of the observations, and only 5.70% of husbands are not in the labor force.

Comparison of Study Estimates

In this section, I compare estimates of the added worker effect across studies. I attempt to explain differences in results in terms of period of analysis, dataset, method of analysis, and economic environment.

Mankart and Oikonomou (2016) find an increase in the likelihood that a wife enters the labor force in response to her husband's unemployment of between 4.7 and 8.3 percentage points, depending on the period, for the 1980s to the 2000s, using a CPS data and a linear probability model.. The husband is identified as entering unemployment based on his labor force status between months t and t+1, and it appears that the wife's entry into the labor force is based on the same comparison. The added worker effect in their study that may corresponds to this current study is 7.8 percentage points for 2006-2009, and this is higher than what I find in my study of 1.5 percentage point for the Great Recession, 2008-2010. There may be an error in their specification, as they did not allow wife's entry to vary by time period, and, as a result, there is very likely an bias of the added worker effect.

Mattingly and Smith (2010) define their principal independent variable as a husband who was employed at t and becomes unemployed or is not in the labor force at t+1. In the current study, the husband is coded separately as either unemployed or not in the labor force. Regarding the wife's labor force status, in their CPS dataset, 14.2% of wives

who were not in the labor force in the prior month entered into the labor force in the current month. In this study, the SIPP data show that only 5% of wives who were not in the labor force in the current month were in the labor force in the current month. They find an odds ratio of 2 for the recessionary period, whereas the present study finds an odds ratio of 1.4.

A classic study by Lundberg (1985) finds a small but significant added worker effect for white families. The study shows that a wife has a 1.8 percentage points greater chance of entering the labor force if her husband is unemployed relative to an employed husband, which is equivalent to a 25% higher chance of entering the labor force in a month. I find a wife has a 1.5 percentage point higher chance of entering the labor force in the current month if her husband was unemployed in the prior month, which is equivalent to about a 40% higher chance. The difference may be due to differences in the datasets. I use a nationally representative sample from the SIPP, and Lundberg uses survey data from the Seattle and Denver Income Maintenance Experiments (SIME/DIME).

Spletzer (1997) estimates an added worker effect of 6 percentage points using CPS data for 1988 through 1991. Conversely, I estimate 1.5 percentage points for the Great Recession. Both of these studies use a similar definition of the added worker effect. However, we see a significant difference in the labor force characteristics of married wives. In Spletzer's CPS data, among married women who are not in the labor force, 8% of them enter the labor force in the following month, whereas, in the SIPP data, only 4% enter the labor force.

Starr (2014) examines the changes in added worker effect for the recessionary period of 2007-2009 using American Community Survey data. The probability of being employed in a given month for women increases by 4.4 percentage points from 2007 to 2009 if her husband is not employed in the prior month. Estimates are not directly comparable to this current study findings since the study does not give us the estimate for the added worker effect.

Using Mexican data, Parker and Skoufias (2004) find that the probability that a wife enters the labor in a given quarter increases by 16.2 percentage points during the economic recession in the 1990s. Although I expect the estimate to be up to three times as great as a monthly estimates, like ours, even after making an adjustment, this estimate of the added worker effect is much higher than the current study. Studies that estimate the added worker effect outside the United States are generally much higher (Fernandes & Felício, 2005). Two facts can explain the overall high added worker effect in other countries. Liquidity constraints are substantially more important for households in these countries, and thus the responsiveness of wives' entry into the labor market to family income shocks is likely. Another

explanation is that the husband's unemployment is more likely to be permanent, and as a result, wives act proactively to the husbands' job loss in these countries.

Gong (2011) estimates that females increase their full-time employment in a given month by 4 percentage points after observing their partner's job loss, based on a period of a mild recession in Australia. However, the measure is not precise, and there is a potential bias in estimates of the added worker effect since the author measures the partner's job loss during the previous 12 months. In contrast, I find an immediate labor force response of a wife where her husband is unemployed in the immediate past month.

Using a measure of wife's participation based on monthly data, Fernandes and Felício (2005) estimate an added worker effect of 10 percentage points for Brazil, stronger than studies from the United States. The study measures wife's transition probability from inactivity to activity, where inactivity includes wives who are both unemployed and not in the labor force. The economic structure of Brazil is different from that of the United States. Wife's labor force participation in Brazil was about 40 percent, and in the United States, the wife's labor force participation was 75 percent. As noted above, responses in less developed economies like Brazil may be stronger because workers face of greater capital constraints.

Using CPS monthly data, Guner et al. (2020) estimated that the level of married women's labor force participation was higher by 2.17 percentage points during the period 1977 to 2017 than it would have been in the absence of the AWE. The study analyzes the transition probabilities using a similar idea of joint transition probabilities as Lundberg (1985) study. Guner et al. study found married women have approximately twice as great a chance of entering the labor force from one quarter to the next if her husband moved from employment to unemployment between the quarters.

Conclusion and Policy Implications

From the current analysis we observe that wives are more likely to participate in the labor force when their husbands suffer a job loss. For a woman who is not in the labor force in the prior month, her chance of participating in the labor force in the next month increases by 1.5 percentage points when her husband is unemployed, an increment of around 50 percent. I also find significant contributions of husbands' age and education, wives' education, husbands' and wives' ages, and race and ethnicity in explaining wives' labor supply. Number of children is also a good predictor of wives' labor force participation. Local economic activity as measured by the state unemployment rate also

contributes to wives' labor force participation. Whether the family is receiving Unemployment Insurance payment also influence her choice of whether to work or not.

The findings of this study contribute to the existing literature on the added worker effect since there are limited studies on the added worker effect for the Great Recession. Using the nationally representative monthly survey data of the SIPP, the findings of this study tells us that wife makes an essential contribution to her family in recession. The treatment effects are generally similar to those in other US studies but smaller than those in less developed countries.

The analysis based on SIPP gives us important findings as it tracks people on a monthly basis for a long period compared to other available national surveys. Due to its four-month recall period, information on labor supply is more reliable than that available in other studies. This paper shows that the added worker effect exists during the Great Recession, although it is of modest size, and may vary across months. The relatively small effect may be due to the fact that women may choose not to search for a job as their families have other income sources, and some women may choose not to enter because of poor employment prospects or family obligations.

Although a husband's employment status does predict wife's choice of labor force entry. On the other hand, a wife's response to her husband's unemployment does not vary with the husband's duration of unemployment—as her chance of entering the labor market remains elevated even after he enters unemployment.

The study findings show important policy implications for families with unemployed husbands. My finding imply that, during the Great Recession, a wife whose husband becomes unemployed increases her likelihood of joining the labor market by more than 50 percent. However, things may be different during the COVID-19 pandemic. Women's jobs are disproportionately affected, given that those jobs are very likely to be in education, healthcare, daycare, and related service sectors. In families where both husband and wife worked, most often the wife has been forced to leave her job to take care of the children. We may find a different estimate of the added worker effect once we get data for this pandemic period. If wives have not been able to serve the same insurance function as observed during the Great Recession, this may justify continued expansions in welfare and social insurance programs (e.g., Unemployment Insurance, SNAP, and Child Tax Credit) in response to the pandemic. Alternatively, perhaps programs to help mothers return to the labor market would be of particular value to families during this period.

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Appendix

[Appendix table A1 near here]

[Appendix table A2 near here]

Figures

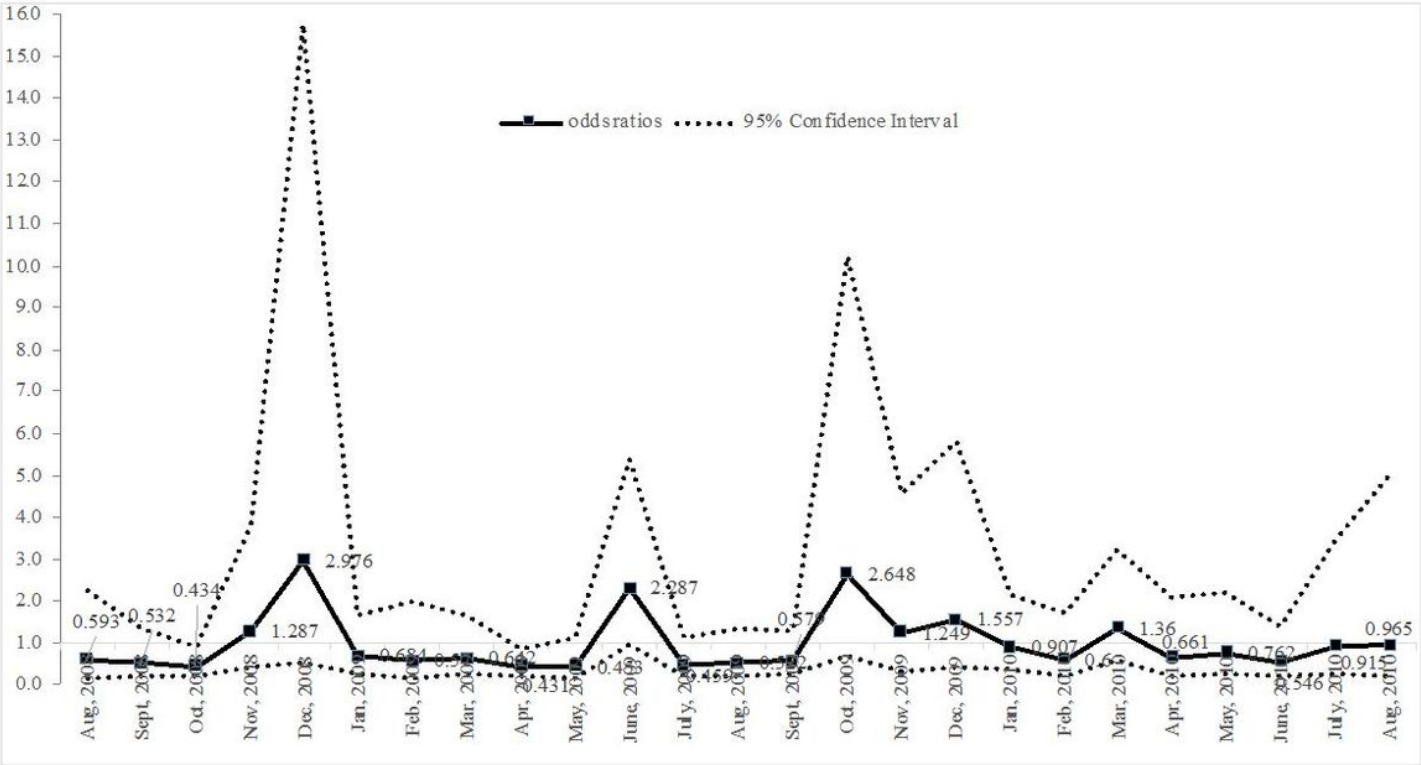

Figure 1

Odds ratios predicting wives' likelihood of labor force participation at *t* as function of husband's labor force status (unemployment) in prior month, (*t*-1): 2008-2010 (wife in the labor force at (*t*-1)).

Notes: Black solid line presents odds ratios indicating the change in wives' odds of labor force participation in response to husbands' unemployment. The dotted lines encompass the 95% confidence interval. Monthly estimates based on equation (1).

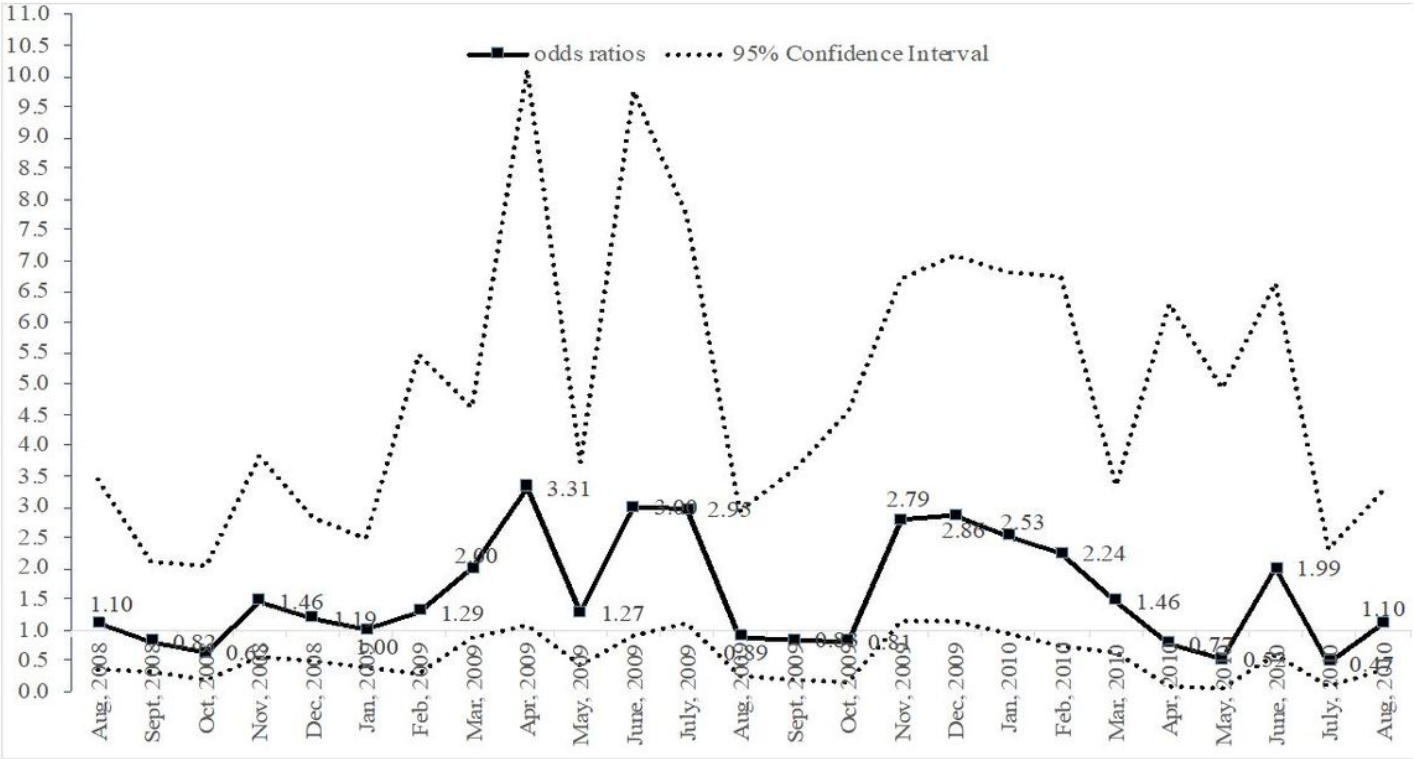

Figure 2

Odds ratios predicting wives' likelihood of labor force participation at *t* as function of husband's labor force status (unemployment) in prior month, (*t*-1): 2008-2010 (wife not in the labor force at (*t*-1)).

Notes: Black solid line presents odds ratios indicating wives' likelihood of labor force participation in response to husbands' unemployment. The grey dotted lines encompass the 95% confidence interval. Monthly estimates based on equation 1.

Supplementary Files

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- TableA1andA2.docx