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## The added worker effect of married women in Greece during the Great Depression

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### Abstract

This paper investigates the wife's labour supply responses to their husband's job loss during the economic crisis in Greece. Using data from the Labour Force Survey (2007-2014) we explicitly identify the labour market transitions of both spouses within the household. We found that women whose husbands involuntarily separated from their jobs have increased their participation into the labour market, confirming the theoretical predictions of the added worker effect. However, this result is not accompanied by higher employment rates. In fact, those women entering the labour market as a reaction to husband's joblessness become unemployed. These findings intensify as crisis deepens. Our results have significant policy implications for the shadow wages of married women in Greece.

**Keywords:** Added worker effect, Labour force participation, Women, Greece

**JEL Codes:** J22, D13, C21

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## 1. Introduction

In the aftermath of the 2008 global economic crisis and the 2010 Greek debt crisis the performance of Greek economy was dramatically deteriorated as the real GDP cumulatively reduced by 25% in the period 2008-2014. The negative consequences of this downturn are reflected in the labour market and more specifically in the skyrocketing unemployment rate (increased from 7.25% in May 2008 to 27.95% in September 2013 and remained at around 26.5% during 2014). Despite the increased joblessness rates, the labour force participation rates during the period 2008-2014 stand at an annual rate of 67% (individuals aged between 15-64). At the same time, substantial gender disparities appear. For example, the aggregate labour force participation rates, during the period 2008-2014, reduced by 3.8% in the case of males and increased by 7.3% in the case of females. These numbers are slightly higher for married individuals (5.0% and 9.0%, respectively). In addition, the duration of job search for 12 months or more has been extended. For instance, the percentage of long-term unemployed married males have been increased from 42.0% in 2007 to 67.0% in 2013 while in the case of married unemployed females, it increased from 61.0% to 73.0%, respectively. In addition, the transition probability for a married male, of moving from the employment state to the unemployment one, in 2007 was 0.73% and increased to 2.76% in 2014. Thus, married males seem to be exposed more to the economic crisis in Greece in terms of higher unemployment, lower employment, longer periods of job search and increased probability of moving directly from employment to unemployment.

Undoubtedly, these developments affected the labour supply decisions of couples within the household. In a family utility maximisation framework it is expected that in order to compensate the income losses arising from the partners' job loss, individuals may choose to increase their own labour supply ('added workers'). Thus, rising unemployment rates may be responsible for the added worker effect (AWE)<sup>1</sup>. According to the AWE, married women whose husbands lost their jobs, intensify their

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<sup>1</sup> Of course, during a recession, the AWE may co-exist with the "discouraged worker effect" which assumes that workers cease their search for employment as they perceive jobs to be unavailable and therefore withdraw from the labour force. However, since the labour force participation of married women in Greece is increasing during the recession we focus solely on the analysis of the AWE.

efforts to enter the labour market and generate wages so that they can contribute to maintain the living standards of the household. The theoretical framework for studying the labour supply responses of married women to the changing labour market conditions of their husbands is based on a life-time labour supply model under uncertainty (Stephens, 2002). In this context, the AWE depends on the magnitude of the income loss arising from husband's unemployment duration periods, the family wealth and from the size of the short-term labour supply income elasticity. When the labour market is efficient (increased labour market flows) and the duration of unemployment spells is limited, it is not expected to observe significant responses regarding wife's labour supply decisions due to the ability of smoothing the income losses across life-time. In this framework, additional issues are taken into consideration e.g., imperfect capital markets (Lundberg, 1985), household's consumption (Chetty and Szeidl, 2007), the provision of social benefits related to unemployment (Blundell and MaCurdy, 1999) and the generosity of unemployment benefits (Cullen and Gruber, 2000; Cobb-Clark and Crossley, 2004).

The empirical literature on the AWE is quite divergent and depends on the adopted analytical framework. For example, while the early cross-sectional studies provide evidence towards the existence of only a marginal impact of husband's job loss on wife's labour supply decisions (Mincer, 1962; Heckman and MaCurdy, 1982) more recent related studies which utilize micro-data on husband's labour market transitions found substantial evidence in favour of the existence of the AWE in wife's labour market outcomes (Stephens, 2002; Morissette and Ostrovsky, 2009; Gong, 2011). In addition, Lee and Parasnis (2014) utilizing a panel data approach found that the identified AWE in several developing countries leads to an increase in labour force participation rate during periods of rising unemployment. Analogously, Bredtmann et al. (2014) using longitudinal data from the European Union Statistics on Income and Living Conditions (EU-SILC) for 28 European countries (period 2004-2011) confirm the existence of the AWE, both at the extensive and at the intensive margin of women's labor supply. Prieto-Rodriguez and Rodriguez-Gutierrez (2003) using short-panel data (European Community Household Panel-EHCP) for 11 European countries during the period 1994-1996 found that the AWE is non-existent in Greece but for only in a few other European countries (Italy, Germany, Netherlands, Portugal and Spain).

A large number of time series studies on the inter-related dynamics between the female labour supply and the aggregate unemployment focus on the role of business cycle (Darby et al. 2001; Bhalotra and Umana-Aponte, 2010). The added-worker effects were observed in the US recession of 2007-2009 (Starr, 2014). Parker and Skoufias (2004) provide evidence of a significant AWE for women in Mexico and its magnitude, during the crisis period, is found to be twice as large as that observed one during the period of economic prosperity. Congregado et al. (2011) investigated the AWE in Spain using aggregate data for a long period 1970-2009 and they found that the AWE is non-linear in business cycle since it is substantial only when the unemployment rate is low (below 11.7%). Ayhan (2015) using Turkish longitudinal data investigated the AWE during the global economic crisis of 2008. She found that the AWE exists, it is stronger among the more financially constrained couples and confirm the comparative evidence from other Mediterranean countries where female labor force participation is relatively low (Bredtmann et al. 2014).

The above findings has significant repercussions for the Greek case because the female labour force participation is low, the evidence on the AWE is non-existent and the economic crisis is sizeable. In addition, and from a methodological point of view, the deeper and long-lasting economic downturn resulted in higher job losses for married males, a fact that makes easier the identification of the AWE. Thus, the objective of this study is to investigate for the first time in Greece the wife's labour supply decisions in a collective analytical framework. We note that the determinants of female labour supply in Greece has been studied extensively both in a static and a dynamic analytical environment but mostly in a unitary labour supply framework (e.g., Meghir et al. 1989; Daouli et al. 2004, 2006; Nicolitas, 2006; Demoussis and Giannakopoulos, 2007).

For estimation purposes we utilize micro-data from the Greek Labour Force Survey (LFS) covering the period 2007-2014. In order to identify the labour market transitions we exploit two relevant questions for both husband and wife regarding (a) the current employment status and (b) the recalled employment status (12 months before). These variables will allow us to investigate how the wife's probabilities of labour force participation and employment entry are affected by husband's job loss. In addition, we will analyze how the probability of husband's job loss will affect the

full set of wife's annual labour market transition probabilities. Furthermore, we are able to distinguish the reasons of job loss and thus to consider cases of expected (e.g., retirement and family reasons) and unexpected job losses (e.g., firing and health reasons). This decomposition is important for two reasons. Firstly, if the husband's job loss is fully anticipated then we do not expect to find out any change in wife's labour supply responses because these decisions, as future outcomes, have been discounted in current decisions. Secondly, the AWE is affected by the magnitude of household's income loss resulted from husband's job loss. In this case, when the husband retires (expected event) the income loss is limited (usually pensions consists of a substantial portion of salary earnings) while when the husband loses his job for health reasons (unexpected event) then income loss is substantial (as a portion of salary earnings). Additionally, during a deep economic crisis the identification of the AWE becomes more straightforward compared to normal periods of time. For instance, the transition from unemployment to employment is considered to be more random during crisis periods compared to normal situations where job loss is more likely to be observed for workers of low productivity. In addition, during economic crisis the magnitude of income losses is higher due to the extended periods of unemployment duration.

According to our results, the wife's decisions regarding labour market entry and employability are significantly affected by husband's job loss. In particular, the likelihood of being employed during a year is increasing by 3.4 percentage points when the husband lost his job. Analogously, the probability of entering the labour market increases by 6.7 percentage points. More importantly, both wife's responses (participation and employment) to husband's job loss resulted from health-specific reasons are significant and stand up to 11.0 percentage points. The results from the estimated transition probability matrices indicate that the existence of a positive assortative mating in couples' labour market outcomes within households. That is, males with higher education who participate in the labour market and exert a low risk of becoming unemployed are more likely to be married with females with higher education and thus higher employment rates. We have also found that the labour supply of married mothers is negatively affected by the number of children within the household. Furthermore, our results indicate that the AWE is more pronounced in the case of the labour force participation decisions since the probability of moving from

the unemployment state to the inactivity one is significantly lower when the husband loses his job.

The structure of the paper is the following. In the next section we present the data sources and basic descriptive statistics on the outcomes of interest. Section 4 includes the empirical strategy and the relevant econometric techniques. In section 5 we present the econometric results regarding the AWE and the labour market transition probability matrices. Section 6 concludes.

## **2. Data and preliminary evidence**

The utilized micro-data are drawn from the Greek Labour Force Survey (LFS) provided by the Hellenic Statistical Authority (EL.STAT). Responses are collected on a weekly basis and refer to all household members aged 15 or more. The sample size corresponds to almost 35 thousands of households and to nearly 75 thousands of individuals per quarter. For analytical purposes our data cover the period 2007-2014 and they allow us to provide representative aggregates for the entire economy since they are adjusted by the LFS sampling weights. The LFS database includes information on several individual-specific characteristics such as gender, age, years of education, marital status, nationality, region, degree of urbanization, labour market status, economic activity, duration of job search, reasons for becoming unemployed and other elements. In order to derive worker flows at the individual level, we rely on the ILO definition of the current labour market status and on the recall question regarding last year's labour market status ("Situation with regard to activity one year before survey").<sup>2</sup> We are thus able to designate individuals as employed (E), unemployed (U) or inactive (I) in the current year ( $t+1$ ) and at one year before the survey ( $t$ ). In addition, the LFS data allows us to identify the extensive margin of wife's labour supply responses to husband's job loss. Unfortunately, the intensive margin cannot be analysed because LFS does not contain information on the working hours 12 months before. Given, that our analysis focuses in the labour supply of married women we

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<sup>2</sup> The recall status allows us to identify individuals as employed, unemployed and inactive. The latter category includes students or apprentices, retired, permanently disabled, housewives, military service personnel, etc.

restrict our working sample in married individuals which counts to 561.423 couples (in the age bracket of 15-64).

Interestingly our sample cover a period during which an enormous economic crisis took place. The negative labour market consequences are not only shown in the aggregate unemployment rate but are also portrayed in the evolution of the annual transition probability from employment to unemployment in the case of married males. As shown in Figure 1 this probability have been doubled between 2007 and 2014 (0.7% and 2.8%, respectively) indicating that the breadwinner-type household in Greece suffers from significant income losses after the beginning of the 2010 sovereign debt crisis. This fact motivates our analysis regarding the investigation of the impact of the AWE in wife's labour market behaviour.

--Insert Figure 1 about here --

Table 1 presents summary statistics on variables pertaining to wife's specific labour market outcomes (employment, unemployment inactivity) and other individual-specific attributes (age, education, family structure and residence) by the husband's labour market outcomes (employment, unemployment inactivity). There is strong indication for the existence of the positive assortative mating hypothesis implying that marriage between people is not random. More specifically, we have found that the percentage of wives considered to be employed stand at 55.66% when the husband is employed, 42.48% when the husband is unemployed and 25.12% when the husband is inactive. Analogously, the percentage of wives who are unemployed stand at 29.15% when the husband is unemployed, 9.50% when the husband is employed and 3.82% when the husband is inactive. Thus, couples are institutions within which the labour market decisions of spouses are interrelated. In other words, a wife with an employed husband has a higher probability to found herself in employment compared to those wives whose husbands are either unemployed or inactive.

We observe that the percentage of women who have completed a post-secondary or higher education degree and are married to employed husbands is 39.44%, to unemployed husbands is 28.80% and to inactive husbands is 16.02%. We also observe that the percentage of women who have completed a secondary education degree and are married to employed husbands is 45.76%, to unemployed



husbands is 51.49% and to inactive husbands is 36.60%. Lastly, the percentage of women who have completed primary education and are married to employed husbands is 19.24%, to unemployed husbands is 23.71% and to inactive husbands is 47.38%. Thus, the higher the wife's education the higher is the probability that her husband is being employed.

With regard to the age distribution of married women a non-linear relation (inverted U-shaped) is observed in the cases where the husband is either employed or unemployed. The percentage of wives with employed or unemployed husbands is getting higher up to the age 44 and then drops. However, when the husband is inactive we observe that the majority of wives (68.17%) concentrate in the age group 55-64. These findings reflect the positive correlation between the age structure of spouses within the household.

With regard to the family structure we observe that when the husband is either employed or unemployed the average number of the household members is 3.43 while this number stand at 2.77 when the husband is out of the labour force. In addition, when the husband is employed or unemployed half of their wives have children in the age group of 0-14. These numbers are much lower (around 20%) for the household with children in the age group of 15-19. With regard to the birthplace we observe that when the husband is unemployed the percentage of foreign-born wives is quite higher than the cases where the husband is either employed or inactive. It is quite interesting that wives in households with unemployed husbands are concentrated in the cities of Athens and Salonica implying that the labour supply decisions are differentiated with the regions of residence. Indeed, most wives with unemployed husbands live in urban areas.

--Insert Table 1 about here --

### **3. Empirical strategy and econometric techniques**

As a rule, the AWE is identified in two ways. Firstly, the AWE can be defined by the increase in the probability of moving from the state of "non-employment" to the state of "employment" for those wives whose husbands have recently lost their jobs. Secondly, the AWE can be defined as an increase in the probability of labour force participation (moving from the state of "non-participation" to the state of "labour force participation") for those wives whose husband have recently lost their jobs.

Husband's job loss is defined by the transition from the "employment" state to the "unemployment" one. It should be noticed that the first measurement is affected by the demand for labour which in recessionary periods is downward sloping. Thus, not only the risk of becoming unemployed is higher but also the employment opportunities are rare. In contrast, the transition for the state of "not in labour force" to the state "in labour force" is less dependent on the labour demand conditions. This is true even in the case of the "discouraged worker effect" according to which the wife's labour supply is less responsive to husband's job loss.

Given our ability to identify the labour market transitions of both spouses, we will also estimate the impact of husband's job loss on the estimated probabilities of wife's labour market transitions. This will help us to construct a scenario which will present the case of what will have happened in the estimated transition probabilities if the husband did not lose his job. If the observed situation and the alternative scenario could be detected simultaneously, one could estimate the AWE by the following expression:

$$awe = Pr(E_{it} = 1|L_{it} = 1, E_{it-1} = 0) - Pr(E_{it} = 1|L_{it} = 0, E_{it-1} = 0) \quad (1)$$

where,  $E_{it}$  is a dummy indicator that takes the value of 1 when the wife  $i$  is employed at time  $t$  and 0 otherwise, while the  $L_{it}$  is also a dummy indicator taking the value of 1 when the husband has lost his job during the time  $t$  and 12 months before ( $t - 1$ ) and 0 otherwise. Thus, the endogenous variable  $awe$  is considered to be a good approximation of the AWE since it calculates the difference between the transition probability of the employment state "out of labour force" to the state "in labour force" either in the case of husband's job loss or not.

However, equation 1 can be observed only in theoretically since in reality the same person cannot be found simultaneously in both situations. Thus, in order to empirically estimate the AWE, we utilize the sample of wives whose husbands did not lose their jobs (counterfactual sample). In this context, we assume that the differences between the two samples of wives can be attributed to a set of observed characteristics,  $X$ . Under this assumption the differences are cancelled out and thus the estimated AWE is expected to be unbiased. Thus, equation (1) takes the following form:

$$awe = Pr(E_{it} = 1|L_{it} = 1, E_{it-1} = 0, X_i) - Pr(E_{it} = 1|L_{it} = 0, E_{it-1} = 0, X_j) \quad (2)$$

where, the subscript  $i$  ( $i \in T$ ) denotes the woman who belongs to the sample of wives whose husband has lost his job (treatment group) and the subscript  $j$  ( $j \in C$ ) refers to women that belong to the sample of wives whose husbands did not lost his job (control group).

For analytical purposes we adopt a logit model in order to empirical estimate the wife's transition probability and the empirical model specification is:

$$Z_{it} = \alpha + L_{it}\beta + X_i^w\theta^w + X_i^h\theta^h + \lambda_i + \mu_i + \varepsilon_i \quad (3)$$

where, the variables  $X_i^w$  and  $X_i^h$  represent the wife's and husband's characteristics, respectively. The terms  $\lambda_i$  and  $\mu_i$  represent a set of dummy variables that correspond to regional and time fixed effects. Also, the term  $\varepsilon_i$  is the error term of equation (3). Lastly, the term  $L_i$  is a set of dummy variables indicating whether the husband lost his job and the corresponding set of estimated parameters  $\beta$  can be interpreted as the AWE. Standard errors are corrected for clustering at the regional level (Moulton, 1986).

It is expected that the AWE will become higher as the household's income loss is increasing. Also, the magnitude of the AWE depends on whether husband's job loss is considered to be an unpredicted event. More specifically, when the husband's transition from "employment" to "non-employment" is scheduled we expect that the wife's labour supply will be less responsive because the adjustment has been carried out before the husband's job loss. Thus, we utilize a wide range of reasons for those husbands that are not being employed at the time of the survey but were employed 12 months before the survey. The first reason refers to the impact of husband's job loss due to firing/contract termination. The second reason corresponds to the impact of husband's job loss due to health problems, the third pertains to job loss due to retirement decisions and the forth reason to the case of resigning due to other reasons (family, education, military service, other reasons). We are interested in comparing the case of husband's involuntary separation (firing/contract termination) with the case of voluntary separation and in particular we a scheduled job separation event (retirement). We expect that the wife's labour supply responsiveness will be higher in the case of an unexpected event (involuntary separation).

Given the estimation of the AWE due to husband's job loss we are also interested in identifying this effect on the estimated probability of any of the wife's

labour market transitions. In order to do this we will estimate the full matrix of transition probabilities regarding all possible labour market statuses (employment, unemployment and inactivity) for those wives whose husbands have either or not experience a job loss. On methodological grounds we will proceed with the empirical transition probability matrix assuming that this dynamic behaviour is approximated by a first order Markov procedure. Any element of this matrix will be estimated by a multinomial logit model by restricting the sample, each time, to one of the three labour market statuses regarding the original state ( $t - 1$ ). For instance, in order to estimate the transition from the employment state at  $t - 1$  to any one of the other states (unemployment or inactivity) at  $t$  we have restricted our sample to those wives that are employed at  $t - 1$ . Analogously, the transition from the unemployment state or from the inactivity one we restrict our sample to wives that are found themselves in the corresponding statuses in  $t - 1$ .

In order to isolate the AWE from other factors that are related to individual specific effects we compare the estimated matrices from the treated and the control groups. More specifically, we first evaluate the marginal effects using the sample means for the whole sample for each initial state. Then, we calculate the value of each element of the two transition matrices using the sample means of wives with voluntarily separated husbands for both groups. We sum the estimated marginal effect of (evaluated at the mean) to each element of the transition matrix referred to women whose husband lost his job. Therefore, the difference between the transition matrices of the two groups of wives is entirely attributable to the estimated AWE.

#### **4. Empirical results**

Table 2 presents the estimated results for the AWE (equation 3) and in particular the determinants of the transitions from the non-employment state to the employment one ( $NE \rightarrow E$ ) and from the out-of-labour-force state to the in-labour-force one ( $I \rightarrow A$ ). The sample consists the entire cross-sectional data of the period 2007-2014 and in particular the wives whose husbands were employed in  $t - 1$  and in  $t$  are classified as employed (E), unemployed (U) or inactive (I). We observe that the probability of moving from the non-employment state to the employment one ( $NE \rightarrow E$ ) is 2.8 percentage points higher for those women that are married to husbands that move

from employment to unemployment ( $E \rightarrow U$ ) compared to the case where their husbands continue to be employed ( $E \rightarrow E$ ). Analogously, the transition probability ( $NE \rightarrow E$ ) is found to be 2.0 percentage points higher when the husband made the transition ( $E \rightarrow I$ ).

Regarding the impact of education we observe that the transition probability ( $NE \rightarrow E$ ) is higher for highly educated wives compared to less educated ones. For example, a wife with a PhD/MSc degree has 4.3 percentage points higher probability of becoming employed ( $NE \rightarrow E$ ) compared to a wife with primary education. In addition, the relationship between wife's age and the probability of becoming employed is negative. For instance, a wife in the age bracket of 15-24 has 6.1 percentage points higher probability of employment ( $NE \rightarrow E$ ) compared to a wife in the age range of 55-64. This probability is reduced as age increases implying that the employment probability is higher, as expected, for younger women. With regard to husband's educational level we observe that only in the case where the husband has a PhD/MSc degree, the wife's probability of moving into employment is statistically significant and 1.3 percentage points higher than in the case where the husband holds a primary education degree. Furthermore, the relationship between the wife's transition  $NE \rightarrow E$  and the husband's age is negative indicating that as the husband is getting older the wife's probability of becoming employed is reduced. For example, when the husband's age is between 15 and 24 the wife's transition probability  $NE \rightarrow E$  is higher by 3.5 percentage points and this estimate stand to 1.4 percentage points when the husband belong to the age group of 45-54 (compared to husbands in the age group 55-64). With regard to the impact of the presence of children within the household we observe that the wife's probability of employment entry ( $NE \rightarrow E$ ) is lower in households with children in the age group 0-14 while this probability is higher in households with children in the age group 15-19. Finally, the wife's employment entry probability is higher in the case where the husband if foreign-born (vs. native-born).

The above results appear to be differentiated with regard to the transition from the inactivity to activity ( $I \rightarrow A$ ). For instance, when the husband moves from the transition from the employment to unemployment ( $E \rightarrow U$ ) the wife's probability to enter the labour market ( $I \rightarrow A$ ) is higher by 8.00 percentage points (compares to the

case where the husband continues to be employed). In addition, the effect of education is larger in the case of labour force participation (in comparison with the case of employment entry) and in particular when the wife holds a PhD/MSc degree. This also applies with regard to the wife's age group of 14-34. Education, the presence of children and the birthplace do not seem to affect the wife's transition into the labour force market.

-- Insert table 2 bout here --

Table 3 presents the econometric results regarding the AWE for different time periods (2007-2008, 2009-2010, 2011-2012 and 2013-2014). This exercise will shed light on the evolution of the impact of husband's labour market transitions on wife's transitions into employment ( $NE \rightarrow E$ ) and the labour market ( $I \rightarrow A$ ). The specification of the econometric model include the variables that have been utilized in the estimation of the models presented on Table 2. We observe that the impact of husband's job loss ( $E \rightarrow U$ ) in the period 2007-2008 is 4.8, in the period 2009-2011 is 3.2, in the period 2012-2013 is 2.5 and in the period 2013-2014 is 1.7. Thus, in the course of time the AWE in the case of employment entry becomes weaker. This implies that as the macroeconomic environment worsens, the transition into employment becomes harder for those women with husbands that lost their jobs. However, in the case of labour market entry ( $I \rightarrow A$ ) these results follow opposing paths. In particular, we observe that the estimated impact of husband's transition from employment to unemployment ( $E \rightarrow U$ ) for the period 2007-2008 is 5.7, for the period 2009-2011 is 7.2, for the period 2012-2013 is 8.2 and for the period 2013-2014 is 10.9. Thus, over time, the impact of the AWE in the case of labour market entry becomes higher. This finding implies that as the economy slows down, the need for a stronger labour market attachment for those women with husbands who lost their jobs is more pronounced. Nevertheless, this need cannot be transformed into employment because of the prolonged economic crisis and the subsequent low job-finding rate (Daouli, et al. 2015). Thus, the pool of unemployed gets larger.

--Insert Table 3 about here --

Table 4 presents the estimation results for the AWE which now refers to the reason of husband's job loss. Again two labour market transition are analyzed  $NE \rightarrow E$  and  $I \rightarrow A$ . Our results seem to be in line with the theoretical predictions since

whenever the husband's transition from the employment state to the non-employment one is considered to be low, then the AWE is practically non-existent. More specifically, the wife's labour supply responsiveness regarding the transition  $NE \rightarrow E$  is low when the husband is retired. Analogously, when the husband is getting out of employment for family-related reasons, the estimated AWE is small and stands at 1.8 percentage points. In contrast, when the husband lost his job due to firing or contract termination we observe that the wife's transition probability of moving from the non-employment state to the unemployment one becomes larger. In particular, the estimated marginal effect indicates that women with laid-off husbands between the time period  $t-1$  and  $t$  have 3.4 percentage points higher probability to become employed during the same time period. Of course, when the husband is leaving voluntarily the employment state due to health reasons, the wife's probability of becoming employed increases by 10.7 percentage points. It should be noted that this marginal effect is much higher than the case where the husband has lost his job involuntarily (laid-off/contract termination). Assuming that the income loss due to health reasons is higher than the corresponding loss due to work-related involuntary separation reasons, the above findings imply that the wife's labour supply responsiveness is increasing with the magnitude of the scheduled income loss at the household level. With regard to the effects of the remaining variables we do not observe any substantial differences than those presented in Table 2. From this point of view the estimated AWE is considered to be quite robust.

Regarding the transition from the inactivity state to the in-labour-force one ( $I \rightarrow A$ ) we observe that the estimated results are identical in terms of the direction of the effects with those results pertaining to the transition  $NE \rightarrow E$ . However, they differ with regard to the magnitude of the estimated effect. More specifically, we observe that when the husband has lost his job during the period  $t - 1$  and  $t$ , the wife's probability to enter the labour market is 11.1 percentage points higher than the case where the husband continues to be employed during that period. The same holds when the husband is resign due to family reasons (9.3 percentage points) and when the husband has lost his job due to firing or contract termination reasons.

--Insert Table 4 about here --

Table 5 presents the estimation results by slicing the dataset into sub-sample of a two-year period in order to find out how the AWE evolves over the crisis in Greece. Focusing only on the impact of the AWE we observe that the effect of husband's transition from the employment state to the non-employment one on wife's transition NE→E becomes lower over time. For instance, the estimated marginal effect is 5.2 for the period 2007-2008, 3.7 for the period 2009-2010, 2.4 for the period 2011-2012 and 1.9 for the period 2013-2014. At the same time the effects of husband's job loss due to health/disability reasons follow a path with enormous variations (6.6 for the period 2007-2008, 14.6 for the period 2009-2010, 8.0 for the period 2011-2012 and for 12.1 for the period 2013-2014). Thus, the wife's labour supply responsiveness to the income loss arising from husband's job loss due to health/disability reasons seems to be substantial but it does not follow a specific time path. However, the wife's labour supply responsiveness to the income loss arising from husband's job loss due to firing/contract termination reasons seems to be significant but it follows a rather negative trend over time. Thus, as the economic crisis intensifies the AWE becomes weaker.

--Insert Table 5 about here --

Table 6 presents the estimation results of the wife's conditional transition probability matrices during the period  $t - 1$  and  $t$ . Panel A of Table 6 refer to the estimated effects of labour supply responsiveness of women with husbands who continue to be employed during the period  $t - 1$  and  $t$ , while Panel B of Table 6 refer to the corresponding effects for those women with husbands lost their job due to firing/contract termination. The only difference between the estimated probabilities between the two Panels is the dummy indicator denoting whether the husband has lost his job, while the rest if independent variables are the same. However, we impose in the group of women with husbands who lost their jobs the mean values of the independent variables derived from the sub-sample of women with husbands that continue to be employed. This exercise, allows us to isolate the AWE from the effect of other independent variables. For example, highly educated women with highly educated husbands who are continuously employed also have increased probability of being employed.



According to the estimated results, employed women in  $t - 1$  have a higher probability of being employed in  $t$  when their husbands continue to be employed during this period. In addition, the transition probability from employment to unemployment is higher when the husband is involuntarily separated from their job (fired/contract termination) and thus the probability of exiting the labour market becomes smaller. In other words, an unemployed woman with an employed husband exerts a lower probability of exiting the labour market compared to a woman with a husband who lost his job due to involuntary separation. In this case, the unemployed woman faces an increasing risk of remaining unemployed for a prolonged period due to the low job-finding rate that characterize the Greek labour market in the post-2010 period. It is worth mentioning that the flows from the unemployment state to the employment one are of the same magnitude for both groups of women. With regard to the transition from the inactivity state in  $t - 1$  to the employment, unemployment or inactivity in  $t$  we found that that women with involuntarily separated husbands have the same transition probability as those women with continuously employed husbands.

--Insert table 6 about here --

Table 7 presents the estimation results of the wife's conditional transition probability matrices between  $t - 1$  and  $t$  for a two-year period. Again these probabilities have been estimated for the two alternative scenarios presented in Table 6. This exercise attempts to analyze the evolution of the "net" AWE over the course of the Greek economic crisis. We observe that women with husbands who involuntarily separated from their jobs face a lower probability of remaining in the employment state but an increasing probability of becoming unemployed (compared to women with continuously employed husbands). With regard to the wife's transition from unemployment to employment we observe that this probability decreases over time and this is more pronounced when the husband is employed. Furthermore, we observe that unemployed women with unemployed husbands have increased probability of remaining unemployed for the entire period. However, this result follows an increasing time-path for the sub-sample of women with continuously employed husbands. Thus, unemployed women in households that experience significant income losses due to husband job loss continue to search for a job even when the

probability of finding a job decreases substantially. This will have significant implications in the determination of the shadow wage and thus on the willingness to accept job offers with lower wage rates. This conclusion is reinforced by the results referring to the transition from the inactivity state to the activity one. In particular, we observe that the wife's labour force participation is related to the unemployment state and not to the employment one. Women out of labour force with husbands who lost their jobs seem to face increased probabilities over time regarding the transition into unemployment (compared to those women with continuously employed husbands). This results in the decreasing persistence in the inactivity state.

-- Insert table 7 about here --

## **5. Conclusions**

The present study investigates the wife's labour supply responsiveness to the husband's job loss during the period 2007-2014 in Greece. For analytical purposes micro-data from the Labour Force Survey have been utilized. In order to examine the interrelated labour supply decisions of couples we exploited information on both spouses regarding labour market outcomes in the current period and in the period of 12 months before the survey. In this context, we were able to directly estimate that short-term response of wife's labour supply to household's income loss arising from the husband's job loss. It has been documented extensively that involuntary job loss has a substantial negative effect on the individual labor market outcomes. This is of special importance since the labour market outcomes in Greece are severely deteriorated due to the economic downturn that has been demonstrated after the 2008 global economic crisis and the subsequent sovereign debt crisis. These developments exerted a negative impact on the employment dynamics of the Greek economy and thus at the aggregate level then unemployment rate increase considerably. At the same time the probability of moving from the employment state to the unemployment one has been also increased and in the case of married men it has doubled between 2007 and 2014 (0.7% and 2.8%, respectively).

Our results confirm the prediction of the theoretical framework of the AWE since the wife's labour supply behaviour responds to husband's job loss. We note that the AWE is clearly identified in the case of wife's labour market entry rather in the case of employment entry. In addition, the AEW with regard to labour force

participation becomes larger as the economic crisis deepens. However, this is not true for the case of employment entry where the AWE becomes practically insignificant. The above results are confirmed when the conditional transition probability matrices are estimated for every labour market transition and for women with and without husbands who lost their jobs. We also found that the increased rate of wife's labour force participation due to husband's job loss is not directly converted into increased employment rates. Instead, it converted directly into higher unemployment rates, a finding that intensifies as the employment conditions deteriorate. The above findings constitute strong indication for downward pressures in the determination of the shadow wage rate for married women in Greece.

The economic policy implications of these findings are worth mentioning. There is an increasing scope for public policy to facilitate employment creation in order to minimize the period of household's income loss due to husband's job loss and to reduce the wife's probability of entering the labour market as long-term unemployed. Of course this is a challenging policy for Greece due to the government's limited fiscal capacity and the uncertainty in the business investment environment. In addition, it is required to develop a safety network regarding the health and nutritional needs for those individuals with long unemployment spells. Furthermore, the creation of nursery and childcare programs is expected to provide women with more time to devote to the efficient search in the labor market.

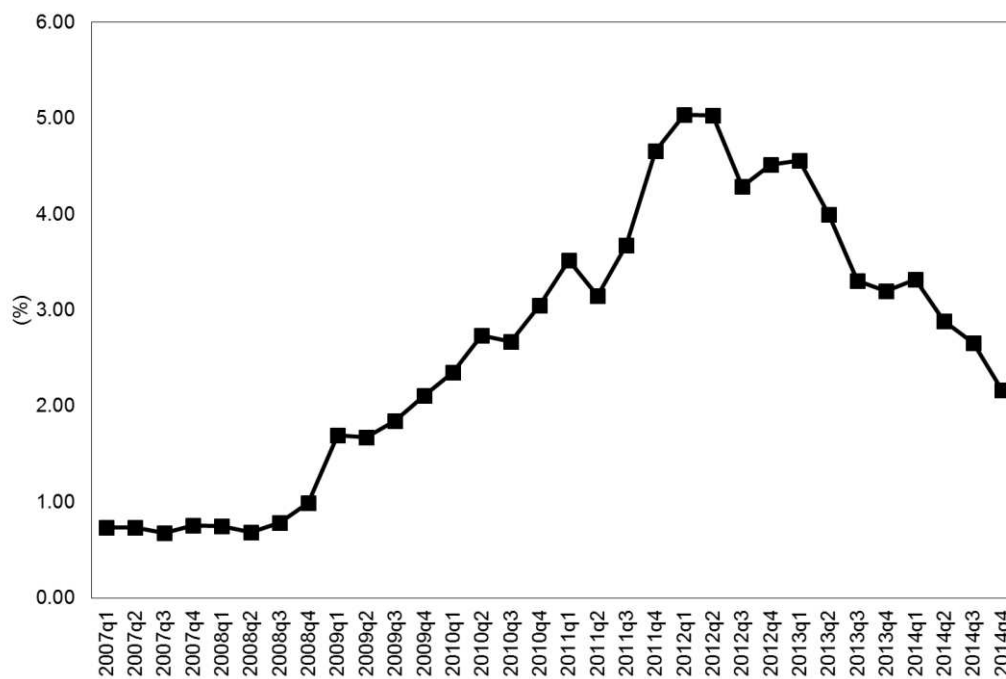
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## Figures

**Figure 1.** Unconditional probability of annual transition from employment to unemployment of married males in Greece (2007-2014)



Source: Labour Force Survey (LFS), Hellenic Statistical Authority (EL.STAT.).

Note: Not seasonally adjusted. Married males aged between 15-64. Results are weighted by the sampling weights provided by the EL.STAT.

Tables

**Table 1.** Means of wife's characteristics by husband's employment status

Wife's characteristics	Husband's employment status		
	Employment	Unemployment	Out of labour force
Employment status			
Employment	56.66	42.48	25.12
Unemployment	9.05	29.15	3.82
Out of labour force	34.24	28.38	71.05
Education			
PhD-MSc	1.68	1.00	0.32
Tertiary	22.84	14.70	10.65
Post-secondary	10.47	9.10	5.05
Secondary	45.76	51.49	36.60
Primary	19.24	23.71	47.38
Age groups			
15-24	1.34	2.09	0.06
25-34	20.59	21.98	0.74
35-44	38.51	35.85	4.51
45-54	29.77	31.10	26.52
55-64	9.79	8.99	68.17
Family structure			
Family size	3.43	3.50	2.77
Children in the age [0-14]	51.05	49.15	5.26
Children in the age [5-19]	20.37	20.72	6.27
Birthplace			
Greece	88.61	73.49	96.43
Foreign-born	11.39	26.51	3.57
Region of Residence			
Eastern Macedonia and Thrace	5.58	6.75	5.31
Central Macedonia (greater area)	9.17	8.67	9.52
Western Macedonia	2.38	2.75	2.99
Epirus	3.07	2.51	3.54
Thessaly	6.72	4.88	6.76
Ionian Islands	2.14	1.44	1.91
Western Greece	6.19	5.51	6.25
East and Central Greece	5.00	4.09	5.62
Attica (greater area)	4.85	5.30	5.06
Peloponnese	5.36	3.16	5.11
Northern Aegean	1.78	1.15	1.99
Southern Aegean	2.95	2.97	2.73
Crete	5.79	5.01	4.92
Attica (Athens)	30.68	35.09	30.27
Central Macedonia (Salonica)	8.35	10.72	8.02
Degree of urbanization (residence area)			
Urban	66.41	73.76	64.48
Semi-urban	13.79	12.48	14.11
Rural	19.80	13.76	21.41
Source: Labour Force Survey, 2007-2014, Hellenic Statistical Authority (EL.STAT).			
Note: Wives aged between 15-64. Results are weighted by the sampling weights provided by the EL.STAT.			

**Table 2.** The impact of the AWE on wife's transitions into employment and the labour market

	Transition into employment NE→E			Transition into labour market I→A		
	E.C.	S.E	M.E.	E.C.	S.E	M.E.
Husband's transitions						
E→U	.784***	.267	.028	1.211***	.132	.080
E→I	.613***	.178	.020	.364**	.171	.016
E→E	Reference group					
Wife's education						
PhD/MSc	1.031***	.232	.043	1.087*	.604	.069
Tertiary	.966***	.125	.035	.811***	.210	.042
Post-secondary	.764***	.178	.026	.568***	.074	.027
Secondary	.162*	.087	.004	.174**	.075	.006
Primary	Reference group					
Husband's education						
PhD/MSc	.420**	.183	.013	.200	.162	.008
Tertiary	-.227***	.066	-.006	-.154	.149	-.005
Post-secondary	-.139	.148	-.003	-.052	.083	-.002
Secondary	-.164*	.089	-.004	-.017	.096	-.001
Primary	Reference group					
Wife's age						
15-24	1.302***	.282	.061	1.411***	.1666	.102
25-34	1.617***	.149	.067	1.421***	.181	.084
35-44	1.532***	.164	.052	1.217***	.207	.060
45-54	.990***	.136	.031	.840***	.228	.038
55-64	Reference group					
Husband's age						
15-24	.910***	.311	.035	1.308***	.244	.093
25-34	.902***	.255	.032	.658***	.206	.032
35-44	.855***	.143	.026	.674***	.156	.030
45-54	.493***	.097	.014	.438***	.128	.019
55-64	Reference group					
Presence of children						
Age group 0-14	-.139**	.057	-.003	-.023	.122	-.001
Age group 15-19	.230***	.035	.006	.090	.114	.003
Wife's birthplace						
Foreign-born	-.037	.158	-.001	.027	.132	.001
husband's birthplace						
Foreign-born	.133**	.059	.003	.116	.157	.005
Observations	129628			103779		

Source: Labour Force Survey, 2007-2014, Hellenic Statistical Authority (EL.STAT).  
Notes: E.C. Estimated Coefficient. S.E. Standard Error. M.E. Marginal Effect. The sample corresponds to wives aged between 15-64. All specifications include controls for region, degree of urbanization, year and quarter. Results are weighted by the sampling weights provided by the EL.STAT. Standard errors are corrected for clustering at the regional level. Asterisks \*\*\*, \*\* and \* indicate statistical significance at the 10%, 5% and 1%, respectively.



**Table 3.** The impact of the AWE on wife’s transitions into employment and the labour market for different time periods

	Transition into employment NE→E			Transition into labour market I→A		
	E.C.	S.E	M.E.	E.C.	S.E	M.E.
2007-2008						
E→U	1.092***	.378	.048	1.075***	.409	.057
E→I	.471	.373	.015	.162	.368	.005
2009-2010						
E→U	.811**	.328	.032	1.179***	.133	.072
E→I	.774**	.311	.030	.734***	.231	.036
2011-2012						
E→U	.822***	.317	.025	1.241***	.151	.082
E→I	.368	.387	.009	.081	.266	.003
2013-2014						
E→U	.588***	.213	.017	1.358***	.206	.109
E→I	.683	.494	.020	.370	.257	.019

Source: Labour Force Survey, 2007-2014, Hellenic Statistical Authority (EL.STAT).  
Notes: E.C. Estimated Coefficient. S.E. Standard Error. M.E. Marginal Effect. The sample corresponds to wives aged between 15-64. All specifications include the same variables as those presented in Table 2. Results are weighted by the sampling weights provided by the EL.STAT. Standard errors are corrected for clustering at the regional level. Asterisks \*\*\*, \*\* and \* indicate statistical significance at the 10%, 5% and 1%, respectively.

**Table 4.** The impact of the AWE on wife’s transitions into employment and the labour market by reason of husband’s job loss

	Transition into employment NE→E			Transition into labour market I→A		
	E.C.	S.E.	M.E.	E.C.	S.E.	M.E.
Husband’s job loss due to						
Firing/contract termination	.825***	.271	.034	1.077***	.182	.067
Health/disability	1.705***	.388	.107	1.455***	.379	.111
Retirement	.259	.217	.007	.327	.230	.014
Other reasons	.559***	.144	.018	1.311***	.199	.093
E→E	Reference group					
Wife’s education						
PhD/MSc	1.042***	.229	.043	1.088*	.606	.069
Tertiary	.968***	.125	.035	.812***	.210	.042
Post-secondary	.769***	.178	.026	.568***	.074	.027
Secondary	.165*	.087	.004	.177**	.075	.006
Primary	Reference group					
Husband’s education						
PhD/MSc	.424**	.180	.013	.204	.162	.008
Tertiary	-.222***	.066	-.006	-.152	.149	-.005
Post-secondary	-.133	.148	-.003	-.056	.083	-.002
Secondary	-.161*	.089	-.004	-.017	.096	-.001
Primary	Reference group					
Wife’s age						
15-24	1.284***	.278	.061	1.417***	.1666	.102
25-34	1.598***	.154	.067	1.422***	.181	.084
35-44	1.532***	.166	.052	1.215***	.207	.060
45-54	.971***	.135	.031	.835***	.217	.038
55-64	Reference group					
Husband’s age						
15-24	.884***	.311	.035	1.325***	.244	.093
25-34	.876***	.259	.032	.666***	.193	.032
35-44	.829***	.146	.026	.680***	.143	.030
45-54	.466***	.099	.014	.441***	.119	.019
55-64	Reference group					
Presence of children						
Age group 0-14	-.141**	.057	-.003	-.024	.123	-.001
Age group 15-19	.228***	.035	.006	.092	.112	.003
Wife’s birthplace						
Foreign-born	-.039	.156	-.001	.028	.134	.001
Husband’s birthplace						
Foreign-born	.131**	.061	.003	.122	.154	.005
Observations	129628			103779		

Source: Labour Force Survey, 2007-2014, Hellenic Statistical Authority (EL.STAT).  
Notes: E.C. Estimated Coefficient. S.E. Standard Error. M.E. Marginal Effect. The sample corresponds to wives aged between 15-64. All specifications include controls for region, degree of urbanization, year and quarter. Results are weighted by the sampling weights provided by the EL.STAT. Standard errors are corrected for clustering at the regional level. Asterisks \*\*\*, \*\* and \* indicate statistical significance at the 10%, 5% and 1%, respectively.

**Table 5.** The impact of the AWE on wife’s transitions into employment and the labour market by reason of husband’s job loss and time period

	Transition into employment NE→E			Transition into labour market I→A		
	E.Σ.	T.Σ.	O.E.	E.Σ.	T.Σ.	O.E.
2007-2008						
Firing/contract termination	1.146***	.324	.052	1.000**	.391	.051
Health/disability	1.320**	.657	.066	2.103**	.811	.181
Retirement	.141	.596	.003	-.322	.554	-.008
Other reasons	.398	.386	.012	.075	.537	.002
2009-2010						
Firing/contract termination	.890**	.408	.037	1.107***	.166	.065
Health/disability	1.992***	.589	.146	1.042**	.509	.061
Retirement	.212	.246	.006	.631**	.299	.029
Other reasons	.509	.455	.018	1.353***	.287	.092
2011-2012						
Firing/contract termination	.811***	.304	.024	1.068***	.272	.065
Health/disability	1.643***	.503	.080	.560	.895	.028
Retirement	.365	.453	.009	.437	.415	.020
Other reasons	.520	.381	.014	1.361***	.292	.098
2013-2014						
Firing/contract termination	.063***	.218	.019	1.188***	.286	.089
Health/disability	1.977**	.971	.121	1.551***	.386	.140
Retirement	.137	.581	.003	.245	.343	.012
Other reasons	.664***	.244	.020	1.638***	.297	.151

Source: Labour Force Survey, 2007-2014, Hellenic Statistical Authority (EL.STAT).  
Notes: E.C. Estimated Coefficient. S.E. Standard Error. M.E. Marginal Effect. The sample corresponds to wives aged between 15-64. All specifications include the same variables as those presented in Table 4. Results are weighted by the sampling weights provided by the EL.STAT. Standard errors are corrected for clustering at the regional level. Asterisks \*\*\*, \*\* and \* indicate statistical significance at the 10%, 5% and 1%, respectively.

**Table 6.** Estimated transition probabilities by economic activity statuses for women with employed husbands and husbands who lost their jobs due to involuntary separation

	Employed (t)	Unemployed (t)	Out of labour force (t)
Panel A: The husband continues to be employed			
Employed (t-1)	.969	.017	.014
Unemployed (t-1)	.098	.729	.173
Out of labour force (t-1)	.010	.027	.963
Panel B: The husband lost his job due to involuntary separation (firing/contract termination)			
Employed (t-1)	.924	.062	.014
Unemployed (t-1)	.092	.804	.104
Out of labour force (t-1)	.008	.044	.948
Source: Labour Force Survey, 2007-2014, Hellenic Statistical Authority (EL.STAT).			
Notes: Notes: E.C. Estimated Coefficient. S.E. Standard Error. M.E. Marginal Effect. The sample corresponds to wives aged between 15-64. The results are based on 3 multinomial logit models (1 for each of the 3 original employment statuses). The estimated transition probabilities have been calculated at the mean of the independent variables that correspond to the sample of women with continuously employed husbands.			

**Table 7.** Estimated transition probabilities by economic activity statuses for women with employed husbands and husbands who lost their jobs due to involuntary separation for different time periods

	Employed (t)	Unemployed (t)	Out of labour force (t)
2007-2008			
Panel A: The husband continues to be employed			
Employed (t-1)	.976	.010	.014
Unemployed (t-1)	.172	.652	.176
Out of labour force (t-1)	.013	.023	.964
Panel B: The husband lost his job due to involuntary separation (firing/contract termination)			
Employed (t-1)	.960	.037	.003
Unemployed (t-1)	.103	.797	.100
Out of labour force (t-1)	.001	.006	.993
2009-2010			
Panel A: The husband continues to be employed			
Employed (t-1)	.968	.018	.014
Unemployed (t-1)	.151	.706	.143
Out of labour force (t-1)	.014	.027	.959
Panel B: The husband lost his job due to involuntary separation (firing/contract termination)			
Employed (t-1)	.922	.058	.002
Unemployed (t-1)	.104	.826	.070
Out of labour force (t-1)	.006	.056	.938
2011-2012			
Panel A: The husband continues to be employed			
Employed (t-1)	.956	.030	.014
Unemployed (t-1)	.074	.749	.177
Out of labour force (t-1)	.006	.036	.958
Panel B: The husband lost his job due to involuntary separation (firing/contract termination)			
Employed (t-1)	.922	.076	.002
Unemployed (t-1)	.079	.827	.094
Out of labour force (t-1)	.015	.113	.872
2013-2014			
Panel A: The husband continues to be employed			
Employed (t-1)	.964	.020	.016
Unemployed (t-1)	.066	.756	.178
Out of labour force (t-1)	.007	.036	.957
Panel B: The husband lost his job due to involuntary separation (firing/contract termination)			
Employed (t-1)	.926	.066	.008
Unemployed (t-1)	.072	.822	.106
Out of labour force (t-1)	.001	.120	.879
Source: Labour Force Survey, 2007-2014, Hellenic Statistical Authority (EL.STAT).			
Notes: Notes: E.C. Estimated Coefficient. S.E. Standard Error. M.E. Marginal Effect. The sample corresponds to wives aged between 15-64. The results are based on 3 multinomial logit models (1 for each of the 3 original employment statuses). The estimated transition probabilities have been calculated at the mean of the independent variables that correspond to the sample of women with continuously employed husbands.			