

# Fluctuations in the unemployment rate and intra-household allocation of time

(Preliminary draft. Please do not cite)

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June 1, 2011

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## **Abstract**

This study investigates whether shifts in the unemployment rate affect the time allocation of households. Fluctuations in the unemployment rate can affect the expected future income of the household. Changing macroeconomic conditions can also influence the threat points of the couples in a relationship, which can have an impact on the intra-household time allocation. I find that in response to rising unemployment rate, the households reduce the time devoted to housework including the time spent on child care. In the case of cohabiting couples, there is evidence that partners also increase their labor market hours in response to a rise in the female unemployment rate. The results of this study suggest that bargaining does not play an important role on the allocation of time within the household.

Keywords: Intra-household time allocation, Unemployment rate, Australia

JEL classifications: J22, E24

# 1 Introduction

Stress over time can become particularly acute during periods of high unemployment rate as couples are gripped with the fear of losing jobs. If changing macroeconomic conditions induce a permanent fall in the life time wealth of the household, then households might respond by increasing the labor market participation of secondary wage earners (See McCurdy, 1981; Melvin, 2002; Gong, 2011). On the other hand, if the change in the unemployment rate is unanticipated but transitory, then we might not observe a persistent change in the allocation of time within the household. Labor supply of couples is also influenced by their relative bargaining power within the household which depends on one's outside options (Chiappori, Fortin and Lacroix, 2002). This suggests that movements in the unemployment rate can also influence the intra-household time allocation through a worsening/ improvement of one's outside options. This in turn can potentially affect the gains from marriage relative to singlehood and thereby affect marriage and divorce.

Economic theory suggests that the time devoted to market work and housework is guided by one's wages and productivity at doing household tasks (See Gronau, 1977; Solberg and Wong, 1992). Other papers such as Miller and Mulvey (2000) have found that in the case of women, education also influences the time devoted for childcare with more educated women spending more time with their children. Friedberg and Webb (2006) have analyzed the role of one's bargaining power within the household as measured by the ratio of his/her hourly wages to his/her spouse in the allocation of household chores and leisure time. Their findings suggest that bargaining power has only a moderate effect on intra-household time allocation.

This paper considers the effect of shifts in the unemployment rate on the intra-household time allocation of dual earner couples in Australia. A rise in the unemployment rate can result in the loss of jobs and/or a fall in the wages across the industries. This can influence the distribution of hours devoted to doing housework via an income effect. Another hypothesis is that changing macroeconomic conditions affect the threat points of couples in a marital/cohabitation relationship and hence fluctuations in the unemployment rate can

have an impact on the allocation of time within the household through the bargaining power effect. To identify the coefficient of interest, I utilize the state-industry-time variation in the movement of the unemployment rate using the first seven waves of the HILDA survey. This is of interest for at least two reasons. Previous papers have considered the role of actual relative wages of the husband to his wife in the allocation of time within the household; however, actual wages are potentially endogenous. Secondly, the economic theory suggests that one's threat point is a function of not one's actual wage but potential wage (Aizer, 2010). The husband's and wife's sectoral unemployment rate are a good measure of one's potential wage.

The economic theory of divorce suggests that couples opt for a divorce when the net surplus from marriage falls short of net surplus from singlehood. The marital surplus potentially depends on one's access to consumption of leisure time and money within the household. In a companion paper, Roy (forthcoming) finds that a rise in the unemployment rate is associated with a rise in the separation probability in the case of cohabiting couples but not for married couples. This study uses the same exogenous variation in the unemployment rate and hence another contribution of this study is that it informs us whether the would be separated and unseparated couples had allocated time differently between the husband and the wife.

I find that for both married couples and cohabiting couples, in response to a rise in the sectoral unemployment rate, the husbands and the wives reduce the time allocated for housework without a concurrent increase in the hours devoted to market work. However, in the case of married couples there is no significant rise in the time devoted for market work whereas the partners in a de facto marriage increase their hours of market work in response to a rise in the female unemployment rate. Even though most of this time reallocation is concentrated in the period immediately following the unanticipated rise in the unemployment rate, they have implications for household welfare due to the size of effects as well as due to fact that they reduce the parental time devoted to child care. For instance, the results

suggest that on average, in response to a 10% rise in the female unemployment rate, the childcare time declines by around 10 minutes. Figure 4(a) illustrates that in the year 2001 the unemployment rate surged by over 40% compared to its average in the year 2000 and that it has consistently declined ever since. This suggests that in response to this unexpected rise in the unemployment rate there was plausibly a big fall, albeit transitory in the time devoted to caring for children. Overall, the results of this study corroborate the findings of previous studies, Friedberg and Webb (2006) for instance, that bargaining power does not play an important role in the allocation of time within the household.

The article is structured as follows. Section 2 presents the empirical specification. The data and variables are describes in Section 3. The results are discussed in Section 4. The paper concludes in Section 5.

## 2 Empirical Specification

Since my primary interest in this study is to evaluate the effect of unemployment rate on the time allocation of dual earner couples, I focus on estimating equations for time spent by husband and wife in doing various activities. I employ the linear household fixed effect specification. This specification accounts for time invariant omitted variables. This is important since unobserved productivity influences one time allocation. The right hand side variable includes unemployment rates for the husband and wife's sector ( $u_{jt}$ ), health status dummy( $H_{j,t}$ ), and a time trend (wave). While unemployment rates influence time allocation via the potential change in the income of the household or a potential change in the threat points of the husband and the wife, time allocation also depends on the actual income of the household. To control for the total income of the household, following Friedberg and Webb (2006), I introduce the sum of the imputed wage of the husband and the wife ( $\omega_{Husband} + \omega_{Wife}$ ). I also include the relative wage ratio ( $\frac{1+\omega_{Husband}}{1+\omega_{Wife}}$ ) as an additional regressor.<sup>1</sup> These

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<sup>1</sup>These wages were imputed by the HILDA team based on one's income earning potential.

are included in  $(X_{it})$ .

$$Y_{it} = \alpha_0 + \alpha_H u_H + \alpha_W u_W + \sum \alpha_{1,i} H_{jt} + \alpha_t \text{wave} + \alpha_O X_{it} + \epsilon_{it}, \text{ where } j \in H, W \quad (1)$$

### 3 Data and Variables

This study uses the first seven waves of HILDA (Household Income and Labor Dynamics in Australia) dataset. My sample comprises of couples (legally married and cohabiting/de facto) who were employed in the first round. Since shifts in the unemployment rate potentially affects divorce, I restrict the sample to that used in Roy (forthcoming). In that paper, a divorce is defined as a separation in the upcoming two period. Hence, the couples are followed until wave 5 of the survey. I use the same sample in this study since one of the objectives of this study is examine whether the would be separated and unseparated couples respond differently to shifts in the unemployment rate.

**Time allocation:** The dependent variable in this study consists of time spent in the labor market, time devoted to doing household chores, time spent on commuting and on leisure time. The time devoted to market work is defined as hours per week usually worked in all jobs (the variable *jbhru* in the HILDA survey). The time recorded for household errands includes activities such as shopping, banking, paying bills, and keeping financial records. Household tasks comprises of time devoted to preparing meals, washing dishes, cleaning house, washing clothes, ironing and sewing while outdoor tasks include home maintenance (repairs, improvements, painting etc.), car maintenance or repairs and gardening. The time spent on caring for children includes playing with children, helping them with personal care, teaching, coaching or actively supervising them, or getting them to child care, school and other activities. Caring for members of household includes time for a disabled spouse or disabled adult relative, or caring for elderly parents or parents-in-law. Household chores is defined to be the total time devoted to household errands, indoor household tasks, outdoor

tasks, caring for children, and caring for other members of the family. Leisure time is defined to be the time left after market work, commuting and household chores.

**B: Unemployment rate ( $r_{i,t}$ ) construction** In this paragraph, I describe the construction of a state-industry-time varying measure of unemployment rate that is representative of the job opportunities facing an individual. I start by identifying the primary industry of employment for each individual. In this study, the primary sector is defined to be the industry where the person is employed in a majority of the survey rounds.<sup>2</sup> Next, I matched each individual with the unemployment rate in his/her sector of employment. According to the 2 digit ANZSIC (Australia New Zealand Standard Industrial Classification) 1993 codes, all the industries have been divided into seventeen categories. HILDA not only asks each individual to report his industry of employment but also uses his/her response to assign him/her the 2 digit ANZSIC 1993 codes corresponding to his/her industry.

I record the primary industry/sector of a person in terms of 2 digit ANZSIC (Australia New Zealand Standard Industrial Classification) 1993 codes.<sup>3</sup> Next, I use the time-series on aggregate labor force and unemployed persons provided by the Australian Bureau of Statistics to arrive at a measure of unemployment rate for each of the seventeen industrial sectors, and for each of the states and territories.

$$\text{unemployment rate proxy in, state } s, \text{ sector } i, \text{ year } t = \frac{\text{unemployed persons}_{s,i,t}}{\text{employed persons}_{s,i,2001}} \quad (2)$$

Finally, I match the set of unemployment series to individuals in the HILDA survey using the identifiers for their primary sector of employment. The construction of this variable and the data sources is described in detail in the data appendix. Before proceeding further, I

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<sup>2</sup>Alternatively, one could treat the primary industry to be the one, where he/she is employment in the first wave of the survey. I do this as a part of robustness check.

<sup>3</sup>There was a finer classification of the codes in 2006, which affected only wave 7. I used ABS cat no. 1292.0 to reclassify the wave 7 codes according to rules defined in 1993. I club 2006 ANZSIC categories 12, 13, and 14 and treat this as ANZSIC 1993 group 12. The ANZSIC 1993 groups 13, 14, 15, 16 and 17 are same as the ANZSIC 2006 groups 15, 16, 17, 18 and 19 respectively. The ABS cat no. 1292.0 is a publication of Australian Bureau of Statistics and provides detailed description of the old and new classification.

illustrate that this proxy performs well in capturing the movements in the unemployment rate. Figure 1 is available from the Australian Bureau of Statistics. It traces the movement of Australian unemployment rate from 1994-2007. In Figure 2, I plot the movements of four proxies of the Australian unemployment rate. The first of these, ABSrate, is constructed from state level aggregate data. It is defined as the ratio of unemployed persons to labor force as measured by the sum of employed and unemployed persons. The normalized ABS rate is defined as the ratio of unemployed persons to employed persons in the year 2001. I construct two more proxies analogous to the aforementioned variables from disaggregate state-sector level data but after excluding the long term unemployed. These are denoted by rate\_s and rate respectively. Note that all the four proxies mimic the movement of Australian unemployment rate (compare Figures 1 and 2). For instance, there was a rise in the Australian unemployment rate in the year 2001 and this is captured by all the four measures of unemployment rate.

There are seventeen industrial categories/sectors.<sup>4</sup> Figures 6 and 7 plot the trend in the unemployment rate and real wages respectively in a subset of the industrial sectors. The figures suggest that even though the boom is associated with general fall in the unemployment rate and a rise in the real wages in all the sectors, there is variation across the sectors. For instance that the mining and the construction sectors have performed better than the electricity, gas and water sector and the agricultural sector.

For the purpose of estimation, I club three sectors-(a) Mining (b) Manufacturing (c) Construction into one sector. Agriculture, Electricity, Gas, Water and Waste Services, Wholesale Trade are categorized into another sector and finally the Information Media and Telecommunication sectors are again clubbed together. This is to ensure that there are enough observations corresponding to each of the industrial sectors.

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<sup>4</sup>The industrial categories are (1) Agriculture (2) Mining (3) Manufacturing (4) Electricity Gas and Water Supply (5) Construction (6) Wholesale Trade (7) Retail Trade (8) Accommodation, Cafes and Restaurant (9) Transport and Storage (10) Communication Service (11) Finance and Insurance (12) Property and Business Services (13) Government Administration and Defense (14) Education (15) Health and Community Services (16) Cultural and Recreational Services (17) Personal and other services.



**C: Other controls** The health status of an individual is a time varying covariate, which could influence intra-household time allocation. I include indicator variables for the good health (=1, if one can do vigorous activities with ease, 0 otherwise) of the husband and wife. Among married couples (See Table 1), around 42% of the husbands and 40% of wives can do vigorous activities with ease. The corresponding numbers for the sample of cohabiting couples is 53% and 50%. The descriptive statistics suggest that on average cohabiting couples earn more than married couples. The gap between male and female wages is higher in the case of married couples than in the case of cohabiting couples. The scope of specialization is plausibly higher under marriage than under cohabitation. However, for both types of couples women seem to be employed in industries such as health and education that face a lower unemployment rate than sectors such as construction and mining, which are traditionally dominated by men.

Figure 3 and Figure 4 plot the movement of the unemployment rate, the movement of imputed wages, and the time devoted by husband and wife to market work and the combined category of housework and commuting. Real wages seem to have risen during this period. The graphs suggest that there was a transitory rise in the unemployment rate in the year 2001 (which corresponds to wave 1 of the survey), that the unemployment rates have consistently fallen since then. In response to the transitory rise in the unemployment rate in 2001, in the immediately following period, the wives reduced the time devoted for the combined category of housework and commuting. Figures 5 compares the movement of the relative wage ratio and the relative leisure time during this period. The unemployment rate in the husband's sector seem to have declined more than that for the wife's sector. The relative leisure ratio of the husband to wife seems to have risen as expected although the size of this effect is small.

## 4 Results

In this section, I present estimates corresponding to Equation 1. However, I introduce only one partner's sectoral unemployment rate in the regression model to reduce concerns about multicollinearity. The right hand side controls include the time trend and the health dummies. Table 2 reports the results of regressing husband and wife's demand for time on one period lagged unemployment rate. Panels A and B consider the effect on husband's activities of changes in the husband's and wife's sectoral unemployment rate respectively. Panels C and D focus on wife's allocation of time. The coefficients are estimated separately for the sample of married (Columns 2-4) and cohabiting couples (Columns 5-7). Let us first consider the impact of changes in the husband's unemployment rate. A unit rise in the log of husband's sectoral unemployment rate is associated with a decline in husband's housework and travel by 1.15 hours per week in the case of married couples and a reduction of wife's housework and travel by 3.95 hours per week in case of cohabiting couples. This opens up 1.61 hours of leisure time for the husband in the married sample and 3.87 hours of leisure time for the wife in the cohabiting sample. In response to a unit change in the log of wife's sectoral unemployment rate both husbands and wives in a cohabiting relationship increase their weekly hours of market work by 1.74 and 2.20 units respectively. This is achieved by a reduction in the couple's hours devoted to housework and work related travel. In the sample of married couples, an unit increase in log of wife's sectoral unemployment rate is associated with a decline of housework and travel by -1.40 hours for the husband and -1.72 hours for the wife. Wives also tend to increase their hours of market work slightly by 0.7 hours, although it is not significant. Overall, the results suggest that a change in the female unemployment rate induces a bigger reallocation of time within the household than a similar change in the male unemployment rate. Secondly, a rise in the unemployment rate is associated with a decline in the hours devoted to housework and commuting.

If the shift in the unemployment rate is transitory, then it will not induce a long term response from the household. In Table 3, I enquire whether the long term movement of the

unemployment rate as measured by the moving average of one period, two period and three period lagged unemployment rate (MAR1) influences the time allocation within the household. The results suggest that a unit rise in the log of moving average of male unemployment rate did not have a significant effect on husband's time allocation. Women's labor market hours seem to have risen in response to an increase in the unemployment rate, although the effect is not significant. The results suggest that macro economic conditions in the year 2001, had a transitory effect on the the time allocation of households in the immediately following period.

According to the intra-household bargaining literature, a change in the unemployment rate which influences one's outside options can also affect marital stability. In response to changing macroeconomic conditions, couples might have to renegotiate the sharing of time and money within household to keep marriage intact. In a recent paper, Aizer (2010) provides evidence that a rise in the wages of female dominated industries relative to male dominated industries is associated with a decline in domestic abuse of women in the US. The intra-household bargaining over time is complicated by the fact that it is guided not only by one's relative bargaining strength within the household but also by efficiency considerations. For instance if the relative wage ratio ( $\frac{\omega_H}{\omega_W}$ ) of the husband to the wife is used as an environmental factor, the bargaining effect predicts that the relative leisure ratio should be increasing in  $\frac{\omega_H}{\omega_W}$  but efficiency consideration suggest that the higher paid spouse should work longer in the labor market so that relative leisure ratio should be falling in  $\frac{\omega_H}{\omega_W}$ . In a companion paper, I find that a rise in the unemployment rate is associated with rise in the separation probability of a cohabitation-type relationship but shifts in the unemployment rate does not influence the probability of divorce among married couples.

In this set of regressions, I disaggregate the sample on the basis of whether the relationship ended in the upcoming two periods (Tables 4 and 5). This would inform us whether time allocation of would-be separated couples responded differently than the non-separated couples in response to changes in the unemployment rate. The results suggest that for the

sample of unseparated married couples, a unit rise in the log of wife's and husband's sectoral unemployment rate is associated with a rise in leisure time of the husband by 1.69 and 1.97 weekly hours respectively. Changes in the unemployment rate do not influence the time allocation of wives in a significant way in the sample of unseparated married couples. In the case of would-be separated married couples and couples in a cohabiting relationship, there is no significant effect of unemployment rate change on intra-household time allocation. According to the bargaining effect hypothesis, holding all else equal increases in husband's unemployment should increase wife's relative (to husband) leisure time. In Table 5, I estimate Equation 1, after introducing both husband and wife's unemployment rate in the regression. In the sample of married (cohabiting) couples, a rise in the log of husband's sectoral unemployment rate is associated with a rise (decline) in both husband and wife's leisure, although the effect is not always significant. A rise in the husband's unemployment rate is associated with increases in the leisure time of both the partners in the case of cohabiting couples. These results suggest income effect considerations plausibly dominate the bargaining effect, if any in the allocation of time within the household.

**Estimation results: specific activities** The regression results presented so far suggest that couples respond to a rise in the unemployment rate by reducing the time allocated to household chores and work related travel. Table 1 disaggregates the combined housework category to individual categories of household chores and commuting time. The right side controls are same as that in Table 2.

Let us focus first on the sample of married couples. An unit rise in the log of wife's sectoral unemployment rate is associated with a decline of 1.12 and 0.50 weekly hours of wife's and husband's time devoted to childcare. This suggests that in response to a 10% rise in the female unemployment rate (from say the mean level in the sample 2.82 to 3.10), the childcare time declines by around 10 minutes. Husbands also reduce their indoor chores by 3.42 weekly minutes in response to a 10% rise in female unemployment rate.

Cohabiting couples respond slightly differently to changes in the unemployment rate. A rise in either the male or female unemployment rate is associated with a decline in commuting time for husbands like that in the case of married couples but unlike married women, cohabiting female partner's commuting change does not respond significantly to changes in the unemployment rate. On the other hand, wives in a cohabiting relationship hand reduce the time devoted to household chores such as errands, indoor and outdoor tasks when faced with a rise in the unemployment rate. Since cohabiting couples have fewer children compared to married couples, most of the reallocation of time comes through a reduction in the time devoted for chores other than caring for children (a 10 % rise in wife's sectoral unemployment rate is associated with decline of 3.12 minutes of husband's errands time and 3.9 minutes of wife's outdoor tasks time per week). In response to a 10% rise in husband's sectoral unemployment rate, wives reduce their errands time by 6.66 minutes per week.

**Estimation results: specific subsamples** The married couples are older and have more children relative to the cohabiting couples. For the results reported in Table 8, I restrict the sample to households where the wife's age is less than thirty to compare the differences in the time response of married and cohabiting couples, who are similar in terms of age and number of children. In the case of cohabiting female partners, a rise in own and spousal unemployment rate is associated with a decline in the time devoted to household errands. In response to husband's sectoral unemployment rate, the wives under a de facto marriage increase their time spent on children. For married couples, there is no significant effect of unemployment rate on household chores. This suggests that in the case of married couples, most of the readjustment of time within the household takes place in households with kids.

Previous studies suggest that educated women devote more time to childcare. In Table 9, I enquire whether households with a highly educated wife (with at least a high school certificate) respond differently to changing macroeconomic conditions than households where wives have fewer years of schooling. I focus on the sample of married couples only. The

results suggest that the reallocation of time is higher in households with educated wives. A unit rise in log of wife’s sectoral unemployment rate is associated with a decline of 0.53 and 1.65 weekly hours (See Panel A) of wife’s time devoted errands and in caring for children respectively. Husbands respond to a rise in the wife’s unemployment rate by reducing the time devoted to caring for children and for indoor tasks. In the case of households where the wife has fewer years of schooling, a rise in the sectoral unemployment rate is associated with a decline in the time spent on commuting.

The results presented thus far do not control for the total income of the household. Wealthy households and the less wealthy household may not respond in the same way to a rise in the unemployment rate. To control for this, I introduce  $(\omega_{Husband} + \omega_{Wife})$  in the regression model of Table 2. I also introduce  $(\frac{1+\omega_{Husband}}{1+\omega_{Wife}})$  to allow for the possibility that relative wages influence the bargaining power within the household. The results are presented in Table 10. The results are qualitatively similar to that presented in Table 2 although the coefficient estimates are slightly smaller.

## 5 Conclusion

This study considers the role of shifts in the unemployment rate facing the husband and the wife and intra-household time allocation. Exogenous variations in the unemployment rate potentially change the threat points of people in a marital/cohabitation relationship. While the literature has considered the role of relative wages, the state-industry and time variation in the unemployment provide an alternate source of variation in the couple’s threat point. This can influence marital stability as well as the allocation of time within marriage. Shifts in the unemployment rate can also influence time allocation through the income effect channel.

The results of this study suggest that shifts in one period lagged unemployment rate are associated with a reduction in the time devoted to household chores (this also includes

spent in caring for children) and for commuting for both married and cohabiting couples, although this does not persist over time. In the case of cohabiting couples, a rise in the wife's sectoral unemployment rate is also associated with a rise in the time devoted for market work. However, the sign of the coefficients on the husband and the wife's sectoral unemployment rate suggests that bargaining does not play a key role in the allocation of time within the household. Couples anticipate a fall in their household income when the unemployment rate rises unexpectedly and this plausibly reduces the consumption of household chores within the household. The results also suggest that in the case of married couples, the reallocation of time in response to changes in unemployment rate is higher in households where the wife has at least a high school degree.

In the future, I want to consider the effect of the unemployment rate on the consumption of female and male clothing using wave 6 and 7 of the survey. This would help us interpret the findings of this study, for instance whether the bargaining effect is absent or whether it is dominated by efficiency considerations in the allocation of time. If I find evidence of a bargaining effect in the allocation of individual consumption expenditure, then it would imply that bargaining power does matter in intra-household allocation. I also want to provide a theoretical framework that explains the decline in the consumption of household chores in response to anticipate fall in household income.

## 6 Data appendix

**Unemployment rate construction** To arrive at a measure of unemployment rate, which varies across states and industrial sectors, I utilize the time series on aggregate labor force and unemployed persons in '000s in each of these industries for each of the six states and 2 territories: series UQ2\_aug94, and UQ2\_may01 available from ABS website. For time series information on the number of employed persons by state and industry, I refer to catalogue number 6291.0.55.003, again freely downloadable from ABS website. The Australian Bureau

of Statistics compiles these statistics from Labour Force Surveys which are conducted each month throughout Australia as a part of its household survey program. The Labour Force Survey is targeted at the civilian population aged 15 years and over and is designed to provide estimates of employment and unemployment for the whole of Australia as well as for each state and territory. The unemployment statistics are based on a survey question that asked unemployed persons to report the industry corresponding to their last job. I do not have measures of labor force at the industrial sector level. To overcome this problem, I construct a proxy for unemployment rate, which is defined as:

$$\text{unemployment rate proxy in, state } s, \text{ sector } i, \text{ year } t = \frac{\text{unemployed persons}_{s,i,t}}{\text{employed persons}_{s,i,2001}}$$

**Why are unemployment rates based on this proxy much lower than those reported by ABS?** The category of unemployed persons that goes into the construction of a region's unemployment rate consists of both people who are temporarily unemployed as well as those who have been unemployed for a long time. The unemployment proxy, which I use in my study excludes the long time unemployed. To offer some evidence in favor of this assertion, I construct a proxy for Australia's unemployment rate from disaggregated data as well as aggregate data (both are readily available from ABS, for aggregate data refer to catalogue number 6291.0.55.001).

$$\text{unemployment rate proxy}_{\text{from aggregate data}}^{\text{Australia}} = \frac{\text{unemployed persons}_{\text{Australia}}}{\text{employed persons}_{\text{Australia},2001}}$$

Let us call the former variable ABSrate. This variable uses labor force data for various years as opposed to employment in the year 2001. Next, I construct an unemployment rate proxy based on the above formula. Lets call it normalized ABSrate. Finally, I reconstruct these variables after excluding the long time unemployed. Let us label these variables as rate<sub>s</sub> and rate respectively. I compare the movement of the three variables between 1998



and 2007 in Figure 2. Note that all the proxies mimic the movement of Australian unemployment rate quite well (compare Figure 1 and Figure 2). All the figures capture the rise in unemployment rate in the year 2001 and the subsequent decline. This gives me confidence that the proxy measures will capture the movement of unemployment rate in the desired fashion.

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Figure 1: Unemployment rate: constructed by ABS

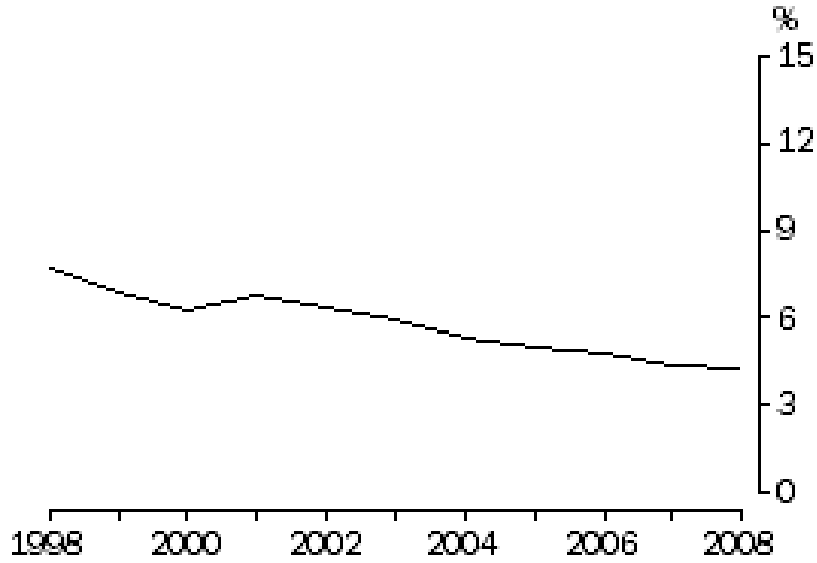
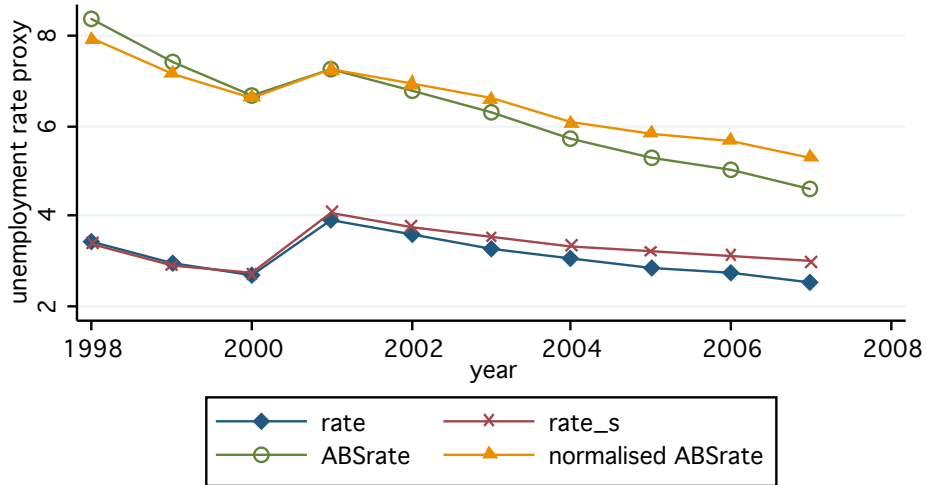
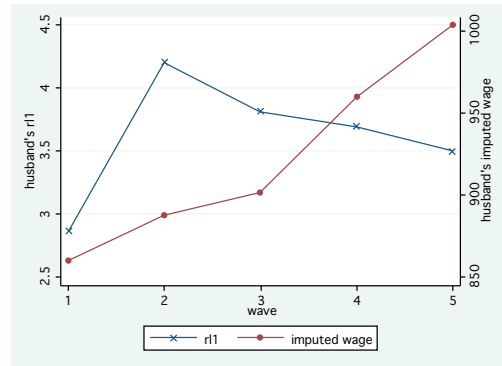
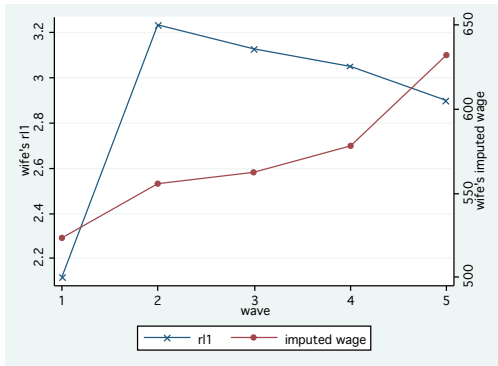


Figure 2: Unemployment rate: constructed from ABS data

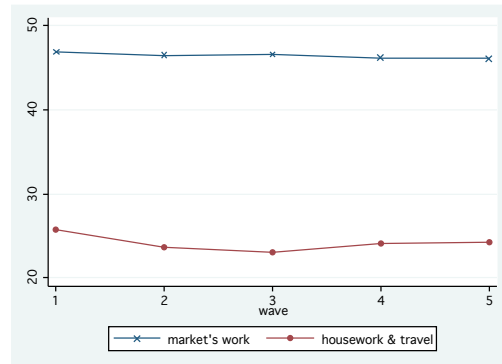
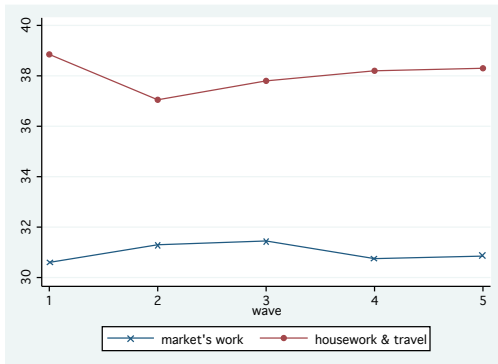


Definition:  
 $rate = (\text{short time unemployed persons} / \text{employed persons in 2001})$   
 $rate\_s = (\text{short time unemployed persons} / (\text{employed} + \text{short time unemployed}))$   
 $ABSRate = (\text{all unemployed persons} / (\text{employed} + \text{all unemployed}))$   
 $normalised\ ABSRate = (\text{all unemployed persons} / (\text{employed persons in 2001}))$   
 Notes: rate, rate\_s constructed from disaggregated sector level data  
 ABS rates constructed from aggregate state data

Figure 3: Time allocation in married sample.



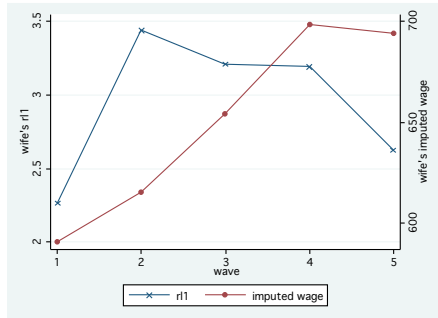
(a) wife's unemployment rate and imputed wage (b) husband's unemployment rate and imputed wage



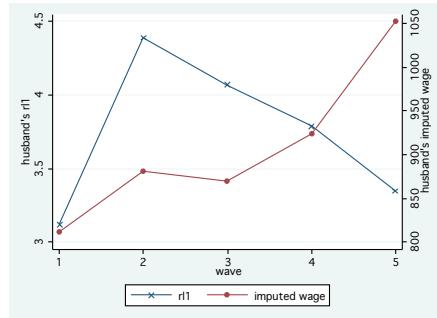
(c) wife's time allocation

(d) husband's time allocation

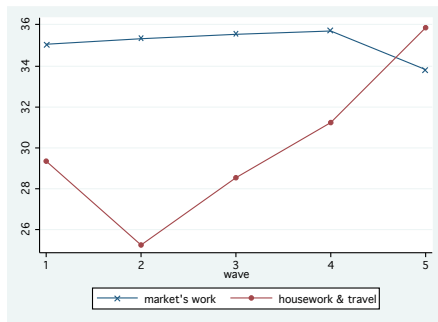
Figure 4: Time allocation in cohabiting sample



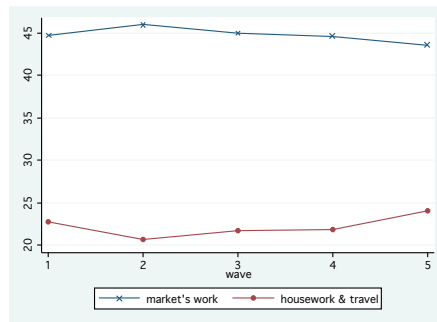
(a) wife's unemployment rate and im-



(b) husband's unemployment rate and imputed wage

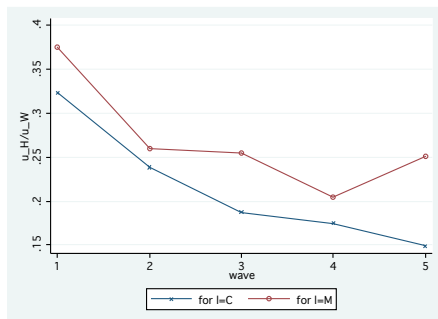


(c) wife's time allocation

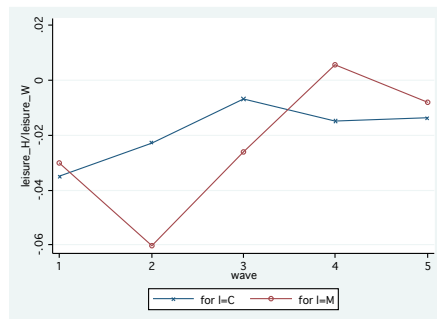


(d) husband's time allocation

Figure 5: relative time allocation

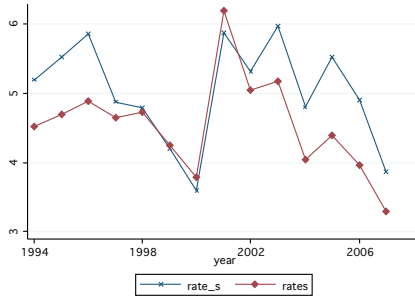


(a) relative unemployment rate

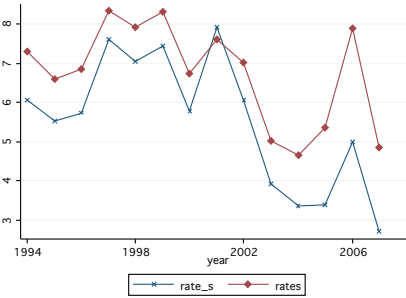


(b) relative leisure time

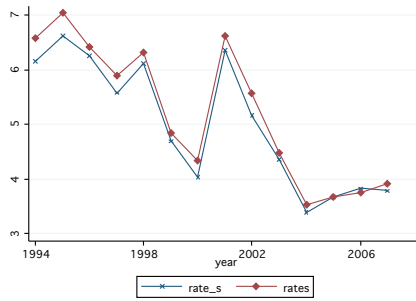
Figure 6: Movement of unemployment rates sectors 1-8



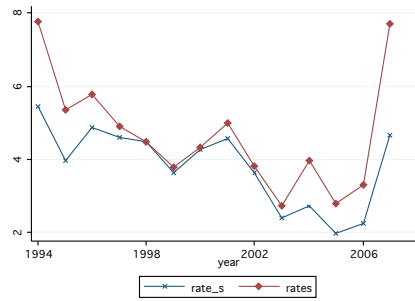
(a) Agriculture



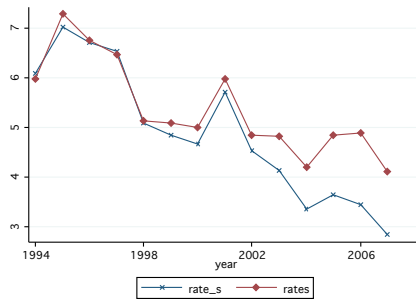
(b) Mining



(c) Manufacturing



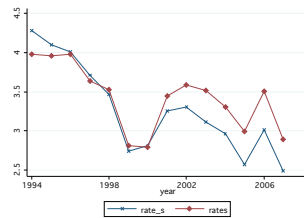
(d) Electricity Gas & Water



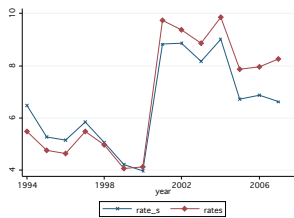
(e) Construction



(f) Wholesale trade

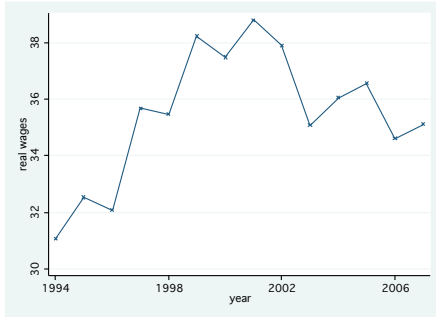


(g) Retail trade

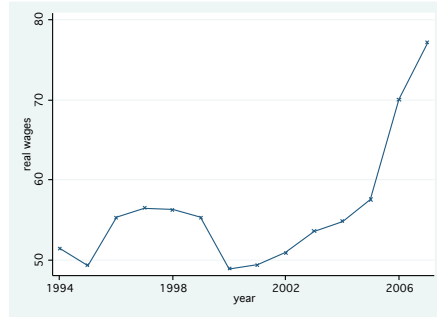


(h) Accommodation & Food services

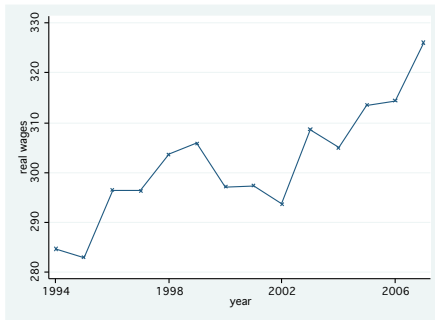
Figure 7: Movement of real wages sectors 1-8



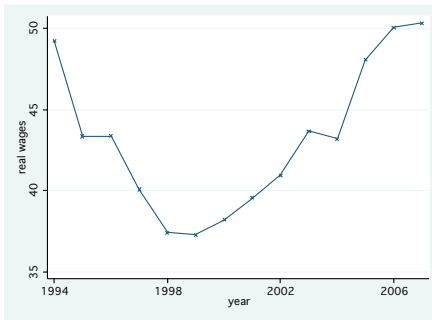
(a) Agriculture



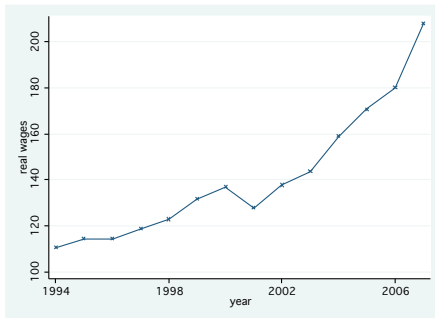
(b) Mining



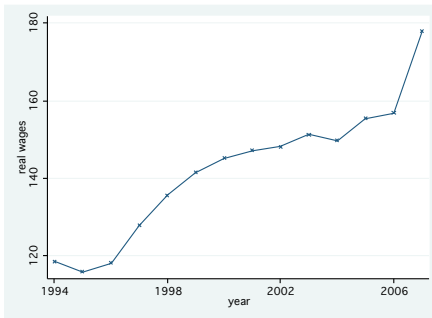
(c) Manufacturing



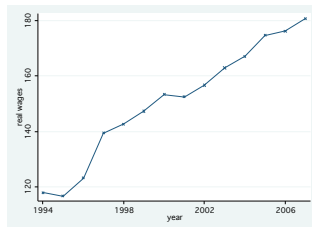
(d) Electricity Gas & Water



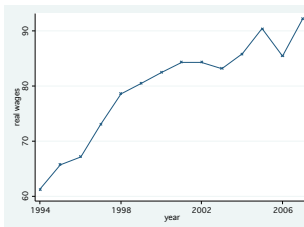
(e) Construction



(f) Wholesale trade



(g) Retail trade



(h) Accommodation & Food services

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Mean	Std. Dev.
Married Sample					
		Husband		Wife	
Leisure time	5478	97.21	18.02	98.92	20.22
Housework & Commuting	5478	24.26	15.12	38.11	19.61
Market work	5478	46.52	11.63	30.98	14.12
r11	5478	3.56	1.73	2.82	1.71
MAr11	5478				
1 if good health, 0 otherwise	5478	0.42	0.49	0.40	0.49
$(\omega_{Husband} + \omega_{Wife})$	5478	1477.70	908.78		
Median $\frac{(1 + \omega_{Husband})}{(1 + \omega_{Wife})}$	5478	1.47			
Cohabiting Sample					
Variable	Obs	Mean	Std. Dev.	Mean	Std. Dev.
Leisure time	916	100.95	18.15	103.51	20.11
Housework & Commuting	916	22.14	14.31	29.32	19.67
Market work	916	44.91	11.66	35.16	12.45
r11	916	3.69	1.83	2.87	1.88
1 if good health, 0 otherwise	916	0.53	0.50	0.50	0.50
$(\omega_{Husband} + \omega_{Wife})$	916	1515.93	850.33		
$\frac{(1 + Wage_{Husband})}{(1 + Wage_{Wife})}$	916	1.23			



Table 2: Effect of unemployment rate on time allocation of couples

Y=	Married sample			Cohabitation sample		
	Leisure (2)	Market work (3)	Housework & travel time (4)	Leisure (5)	Market work (6)	Housework & travel time (7)
Panel A: Husband's activity						
log(husrl1)	1.61*** [0.66]	-0.47 [0.35]	-1.15** [0.58]	1.45 [1.50]	0.58 [0.98]	-2.03* [1.17]
	5478	5478	5478	916	916	916
	1612	1612	1612	333	333	333
Panel B: Husband's activity						
log(wiferl1)	1.85*** [0.60]	-0.45 [0.35]	-1.40*** [0.54]	0.16 [1.33]	1.74** [0.82]	-1.90* [0.99]
	5478	5478	5478	916	916	916
	1612	1612	1612	333	333	333
Panel C: Wife's activity						
log(husrl1)	0.44 [0.70]	0.58 [0.42]	-1.02 [0.67]	3.87** [1.80]	0.08 [1.10]	-3.95*** [1.89]
	5478	5478	5478	916	916	916
	1612	1612	1612	333	333	333
Panel D: Wife's activity						
log(wiferl1)	1.02 [0.69]	0.70 [0.45]	-1.72*** [0.64]	0.80 [1.48]	2.20** [0.97]	-3.00** [1.50]
	5478	5478	5478	916	916	916
	1612	1612	1612	333	333	333

Notes: Huber White robust standard errors in brackets; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

The other controls include health dummies and a time trend

All regression for married and cohabiting sample have 5478, and 916 observations respectively

Table 3: Effect of unemployment rate on time allocation of couples using MArl1

Y=	Married sample			Cohabitation sample		
	Leisure	Market work	Housework & travel time	Leisure	Market work	Housework & travel time
Panel A: Husband's activity						
log(husMArl1)	0.49 [1.01] 5478 1612	-0.40 [0.63] 5478 1612	-0.10 [0.87] 5478 1612	2.73 [2.44] 916 333	-0.89 [1.70] 916 333	-1.84 [1.87] 916 333
Panel B: Husband's activity						
log(wifeMArl1)	0.77 [0.95] 5478 1612	0.09 [0.62] 5478 1612	-0.86 [0.91] 5478 1612	-0.66 [2.55] 916 333	1.79 [1.40] 916 333	-1.14 [2.07] 916 333
Panel C: Wife's activity						
Wife's log(husMArl1)	Leisure 0.88 [1.12] 5478 1612	Market work 0.01 [0.76] 5478 1612	Housework -0.89 [1.19] 5478 1612	Leisure 1.89 [2.66] 916 333	Market work -1.38 [2.00] 916 333	Housework -0.51 [3.23] 916 333
Panel D: Wife's activity						
log(wifeMArl1)	0.20 [1.25] 5478 1612	1.01 [0.87] 5478 1612	-1.20 [1.21] 5478 1612	-2.86 [2.06] 916 333	2.87 [2.06] 916 333	-0.01 [2.77] 916 333

Notes: Huber White robust standard errors in brackets; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The other controls include health dummies and a time trend

All regression for married and cohabiting sample have 5478, and 916 observations respectively

Table 4: Effect of unemployment rate on leisure time by would be separation status: Married sample

Y=Wife leisure	Separated	Not separated
log(husrl1)	0.79 [3.96]	0.44 [0.69]
Y=Husband's leisure		
log(husrl1)	-0.85 [3.38]	1.69*** [0.60]
Y=Wife leisure		
log(wiferl1)	-0.22 [3.45]	1.07 [0.66]
Y=Husband's leisure		
log(wiferl1)	-1.69 [3.25]	1.97*** [0.58]
Observations	234	5244
Number of couples	116	1496

Table 5: Effect of unemployment rate on leisure time by would be separation status: Co-habitation sample

Y=Wife leisure	Separated	Not separated
log(husrl1)	4.62 [3.28]	3.05 [2.11]
Y=Husband's leisure		
log(husrl1)	-1.92 [2.40]	2.74 [1.85]
Y=Wife leisure		
log(wiferl1)	4.46 [3.43]	-1.23 [1.61]
Y=Husband's leisure		
log(wiferl1)	-0.68 [2.39]	-0.44 [1.65]
Observations	293	623
Number of couples	127	206

Table 6: Fixed effect estimates of regression of leisure time on unemployment rate

Y=	Married sample		Cohabiting sample	
	Husbands leisure	Wife's leisure	Husbands leisure	Wife's leisure
log(wiferl1)	1.03 [0.71]	1.46** [0.63]	-0.92 [1.63]	-0.52 [1.48]
log(husrl1)	-0.02 [0.75]	0.96 [0.66]	4.34** [1.86]	1.71 [1.69]

Table 7: Effect of unemployment rate on chores disaggregated by type

Panel A: Married sample													
Y=Wife's time in log(wifer1)	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time	Y=Husband's time in log(wifer1)	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time
	-0.27	-0.54	0.07	-1.12*	-0.07	-0.31***		[0.18]	[0.43]	[0.15]	[0.58]	[0.10]	[0.12]
	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time		Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time
	-0.09	-0.57***	-0.09	-0.50	0.00	-0.29*		[0.12]	[0.20]	[0.21]	[0.34]	[0.10]	[0.16]
	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time		Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time
	-0.20	-0.12	0.05	-0.7	0.07	-0.24**		[0.18]	[0.44]	[0.16]	[0.57]	[0.09]	[0.11]
	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time		Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time
	-0.14	0.00	-0.33	-0.27	-0.08	-0.36**		[0.13]	[0.21]	[0.22]	[0.34]	[0.11]	[0.15]
	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time		4.82	17.65	3.08	11.79	0.58	2.81
	$\overline{Y}_{wife}$							2.85	5.35	5.51	6.31	0.26	4.24
	$\overline{Y}_{husband}$							$\overline{wifer1,husr1}=2.82,3.56$					
Panel B: Cohabitation sample													
Y=Wife's time in log(wifer1)	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time	Y=Husband's time in log(wifer1)	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time
	-0.68*	-1.11	-0.65*	-0.62	-0.35	-0.22		[0.40]	[0.75]	[0.39]	[1.60]	[0.25]	[0.35]
	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time		Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time
	-0.52**	-0.24	-0.43	0.03	0.03	-0.65*		[0.24]	[0.53]	[0.42]	[0.52]	[0.07]	[0.34]
	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time		-1.11**	-2.00**	-0.69	-2.46	-0.08	-0.42
	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time		[0.46]	[0.96]	[0.54]	[2.34]	[0.20]	[0.43]
	Y=Husband's time in log(husr1)	Errands	Household tasks	Outdoor task	Care for disabled	Travel time		-0.41	-0.3	0.03	-0.33	0.01	-0.88**
	Errands	Household tasks	Outdoor task	Play with child	Care for disabled	Travel time		[0.30]	[0.64]	[0.51]	[0.57]	[0.07]	[0.39]
	$\overline{Y}_{wife}$							4.14	12.45	2.93	8.34	0.52	3.53
	$\overline{Y}_{husband}$							3.21	6.06	4.96	3.72	0.13	4.26
	$\overline{wifer1,husr1}=2.87,3.69$												

Table 8: Effect of unemployment rate on chores disaggregated by type and age (wife's age  $\leq 30$ )

Panel A: Married sample										
	Errands	Indoor tasks	Outdoor tasks	Playchild	Sick care	Travel				
Y=Husband's log(husr11)	0.06 [0.49]	-0.11 [0.84]	0.07 [0.50]	0.23 [1.32]	1.07 [1.17]	0.71 [0.51]				
Y=Wife's log(husr11)	0.42 [0.38]	-0.93 [1.61]	0.02 [0.28]	1.67 [2.19]	0.02 [0.04]	-0.66* [0.35]				
Y=Husband's log(wifer11)	Errands -0.30 [0.30]	Indoor tasks -1.45 [0.90]	Outdoor tasks 0.01 [0.64]	Playchild 1.28 [1.95]	Sick care 0.18 [0.27]	Travel -0.21 [0.42]				
Y=Wife's log(wifer11)	Errands -0.27 [0.46]	Indoor tasks -0.64 [1.08]	Outdoor tasks 0.53 [0.48]	Playchild 1.38 [2.15]	Sick care -0.12 [0.10]	Travel 0.00 [0.38]				
Observations	384	384	384	384	384	384				384
Number of couples	176	176	176	176	176	176				176
Panel B: Cohabiting sample										
	Errands	Indoor tasks	Outdoor tasks	Playchild	Sick care	Travel				
Y=Husband's log(husr11)	-0.31 [0.47]	0.41 [0.99]	0.14 [0.72]	0.77 [0.69]	0.02 [0.08]	-1.19 [0.80]				
Y=Wife's log(husr11)	Errands -0.86* [0.36]	Indoor tasks -1.91 [1.36]	Outdoor tasks -0.59 [0.51]	Playchild 2.80* [1.57]	Sick care -0.05 [0.11]	Travel -1.07* [0.91]				
Y=Husband's log(wifer11)	Errands -0.16 [0.32]	Indoor tasks 0.40 [0.84]	Outdoor tasks -0.04 [0.62]	Playchild -0.22 [0.90]	Sick care -0.16* [0.09]	Travel -0.85 [0.70]				
Y=Wife's log(wifer11)	Errands -0.53** [0.25]	Indoor tasks -0.97 [0.96]	Outdoor tasks -0.74 [0.51]	Playchild -0.5 [1.48]	Sick care 0.03 [0.12]	Travel -0.68 [0.65]				
Observations	360	360	360	360	360	360				360
Number of couples	142	142	142	142	142	142				142

Notes: Huber White robust standard error reported in []

Table 9: Effect of unemployment rate on chores disaggregated by type and education: married sample

Panel A: Wife has at least a high school education									
	Errands	Indoor tasks	Outdoor tasks	Playchild	Sick care	Travel			
Y=Wife's log(wifer1)	-0.53*** [0.19]	-0.36 [0.51]	0.1 [0.17]	-1.65** [0.80]	-0.11 [0.12]	-0.25* [0.16]			
Y=Wife's log(husr1)	Errands -0.21 [0.20]	Indoor tasks -0.07 [0.47]	Outdoor tasks -0.08 [0.19]	Playchild -1.07 [0.77]	Sick care 0.13 [0.12]	Travel -0.18 [0.14]			
Y=Husband's log(wifer1)	Errands -0.24* [0.15]	Indoor tasks -0.95*** [0.26]	Outdoor tasks -0.17 [0.24]	Playchild -0.69 [0.44]	Sick care -0.14 [0.12]	Travel -0.32 [0.20]			
Y=Husband's log(husr1)	Errands -0.20 [0.15]	Indoor tasks -0.15 [0.28]	Outdoor tasks -0.34 [0.27]	Playchild -0.66 [0.41]	Sick care -0.08 [0.17]	Travel -0.26 [0.20]			
Observations	3050	3050	3050	3050	3050	3050			3050
Number of couple	852	852	852	852	852	852			852
Panel B: Wife has less than a high school education									
	Errands	Indoor tasks	Outdoor tasks	Playchild	Sick care	Travel			
Y=Wife's log(wifer1)	0.16 [0.34]	-0.96 [0.78]	0 [0.29]	-0.38 [0.83]	-0.02 [0.17]	-0.41** [0.18]			
Y=Husband's log(wifer1)	Errands 0.11 [0.22]	Indoor tasks 0.09 [0.32]	Outdoor tasks -0.01 [0.39]	Playchild -0.23 [0.54]	Sick care 0.19 [0.17]	Travel -0.26 [0.26]			
Y=Wife's log(husr1)	Errands -0.18 [0.33]	Indoor tasks -0.23 [0.86]	Outdoor tasks 0.26 [0.28]	Playchild -0.14 [0.82]	Sick care -0.02 [0.14]	Travel -0.34* [0.18]			
Y=Husband's log(husr1)	Errands -0.04 [0.25]	Indoor tasks 0.27 [0.33]	Outdoor tasks -0.32 [0.39]	Playchild 0.36 [0.58]	Sick care -0.08 [0.10]	Travel -0.52** [0.25]			
Observations	2428	2428	2428	2428	2428	2428			2428
Number of couples	760	760	760	760	760	760			760

Notes: Huber White robust standard error reported in []

Table 10: Effect of unemployment rate on chores disaggregated by type and additional regressors

Panel A: Married sample									
	Errands	Indoor tasks	Outdoor tasks	Playchild	Sick care	Travel			
Y=Wife's									
log(wifer1)	-0.26 [0.18]	-0.51 [0.43]	0.08 [0.15]	-1.09* [0.58]	-0.07 [0.10]	-0.32*** [0.12]			
Y=Husband's									
log(wifer1)	-0.09 [0.12]	-0.58*** [0.20]	-0.10 [0.21]	-0.51 [0.34]	0 [0.10]	-0.27* [0.16]			
Y=Wife's									
log(husr1)	-0.20 [0.18]	-0.12 [0.44]	0.05 [0.16]	-0.7 [0.57]	0.07 [0.09]	-0.24** [0.11]			
Y=Husband's									
log(husr1)	-0.14 [0.13]	0 [0.21]	-0.33 [0.22]	-0.27 [0.34]	-0.08 [0.11]	-0.36** [0.15]			
Panel B: Cohabiting sample									
	Errands	Indoor tasks	Outdoor tasks	Playchild	Sick care	Travel			
Y=Wife's									
log(wifer1)	-0.65 [0.40]	-0.99 [0.75]	-0.65* [0.39]	-0.24 [1.55]	-0.34 [0.24]	-0.24 [0.35]			
Y=Husband's									
log(wifer1)	-0.54** [0.24]	-0.20 [0.52]	-0.37 [0.42]	0.10 [0.51]	0.01 [0.06]	-0.66** [0.34]			
Y=Wife's									
log(husr1)	-1.06** [0.44]	-1.84** [0.94]	-0.69 [0.54]	-1.92 [2.32]	-0.06 [0.21]	-0.45 [0.42]			
Y=Husband's									
log(husr1)	-0.43 [0.30]	-0.25 [0.64]	0.12 [0.52]	-0.23 [0.58]	-0.01 [0.07]	-0.90** [0.39]			

Notes: Huber White robust standard error reported in []