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## **ABSTRACT**

### **Unemployment, Market Work and Household Production<sup>\*</sup>**

Using time-diary data from four countries we show that the unemployed spend most of the time not working for pay in additional leisure and personal maintenance, not in increased household production. There is no relation between unemployment duration and the split of time between household production and leisure. U.S. data for 2003-2006 show that almost none of the lower amount of market work in areas of long-term high unemployment is offset by additional household production. In contrast, in those areas where unemployment has risen cyclically reduced market work is made up almost entirely by additional time spent in household production.

JEL Classification: E24, J22, D13

Keywords: unemployment, time use, household production, paid work

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## I. Introduction—the Problem

Over the past two decades research in macroeconomics has occasionally gone beyond the dichotomy between market work and all other time (usually called leisure) to consider how the trichotomy—market work, household production and all remaining time—might inform the modeling of macroeconomic fluctuations. Among the leading studies in modeling this problem have been Greenwood and Hercowitz (1991) and Greenwood *et al* (1995); and others (Baxter and Jermann, 1999) have linked it to permanent-income explanations of cyclical fluctuations in consumption. In terms of unemployment policy the very simple question is whether household production is readily substitutable for market production. If this is the case, a cyclical reduction in the latter generates little or no loss in total output, measured broadly to include non-market activities, and would imply small welfare costs of cyclical reductions in market output.<sup>1</sup> This could be true even if the aggregate intertemporal elasticity of labor supply were not very large.

Given the data that were available until recently, the theoretical literature had to rely on very sparse information to draw its conclusions. The bases for the literature and our views on this question have been attempts to estimate substitution elasticities between market and household production. The underlying data have either been from the Panel Study of Income Dynamics (Benhabib *et al*, 1991) or from time-diary surveys (Rupert *et al*, 2000). The former data set only contained information on time spent on child-care and some house-keeping chores. The time diaries in the latter data sets were very few in number. Moreover, no study has examined how unemployment, both long-term differences and cyclical fluctuations, affects the split among market work, household

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<sup>1</sup>While there are claims (Freeman and Schettkat, 2005) using population averages that most differences in the average amount of market work between countries generate offsetting differences in non-market work, more detailed evidence (Burda *et al*, 2008) refutes this.

production and other uses of time in an entire labor market; and even the simpler and not directly relevant question, how the employed and unemployed differ in their use of time, has received little attention.<sup>2</sup>

Our purpose here is take advantage of a new set of data to provide information on this crucial issue that could not heretofore have been considered in this way. While we do offer a brief interpretation of the simple evidence that we provide, our main goal is to present these new facts as a challenge to refine and restrict the scope of models admissible for explaining employment and output over the business cycle.

## **II. The Facts on Time Use and Unemployment**

### *A. Unemployment Levels and the Mix of Work*

Time-diary studies, which have become increasingly widespread, ask the respondent to keep a comprehensive diary of activities showing what s/he was doing at each moment of the previous day. In the diaries used here the individual noted the activity, either begun at a specific time or occurring during a short time interval, which was then classified into a set of categories defined by the survey agency. Throughout this Section we use 2003-2006 data from the United States, which offers the only frequently collected set of time diaries in its American Time Use Survey (ATUS) (see Hamermesh *et al*, 2005). Because this data set is very large and contains detailed geographic information, it allows us to go beyond an examination of the differences in time use between employed and unemployed individuals to study how differences in long-term unemployment across labor markets, and cyclical shocks to labor markets, affect time use. In the initial examination, of differences in time use of the employed and unemployed, we also use

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<sup>2</sup>See, however, Ahn *et al* (2005), using time-diary data for Spain, and Gronau (2006), using recall data for Russia, for evidence related to this last question.

data from: Australia, 1992 (Australian Bureau of Statistics, 1993); Italy, 2002 (ISTAT, 2005); and Germany, 2001/02 (Bundesministerium für Familie, Senioren, Frauen und Jugend, 2005). The Australian and German studies obtained data from individuals on two or more days, so that potential problems induced by observing people on atypical days are reduced.

To begin examining these data we define the concepts market work and household production. Because we use data sets from four different countries in the first part of the analysis, the definition cannot be uniform—each country classifies activities somewhat differently. Indeed, that is the best justification for using several countries' data: The idiosyncrasies of each country's choices about how to classify time use and the need for aggregation of what are in each case over 200 individual types of activities require where at all possible that we use many data sets if we are to claim that we have demonstrated a general fact.<sup>3</sup> In general we follow standard practice and define market work as time spent for pay (or in unpaid household production for the market). We count as household production those activities that satisfy the third-party rule (Reid, 1934) that substituting market goods and services for one's own time is possible. Such activities have the common characteristics that we could pay somebody to perform them for us and that we are not paid for performing them for ourselves. The Appendix lists the choices we have made in categorizing activities in each data set.

As a first cut at the question of how unemployment alters the mix of market work and household production, Table 1 presents the average time spent on these two aggregates of

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<sup>3</sup>An alternative when using only one country's data, as in Aguiar and Hurst (2007), is to experiment with a wide variety of definitions of the important aggregates.

activities for each of the four countries.<sup>4</sup> The means and their standard errors are listed for all respondents ages 15 through 59, and separately for men and women. We restrict the analysis to this age range to mitigate effects that may be induced by retirement incentives. The results indicate that each hour of market time not worked by an unemployed individual corresponds to only 16 (60 x 0.27) minutes of additional household production. Even the largest extra household production observed among the unemployed, performed by German women, represents only 52 percent of the difference in time spent in market work between them and those German women who report themselves employed.

One might be concerned that differences in time use between the employed and the unemployed arise from differences in underlying demographic characteristics. To examine this possibility we estimate regressions “explaining” time spent in market work and in household production. For each country and, again, separately by gender, we add controls for age, educational attainment and the numbers of children present, plus other variables as they are available in the individual data sets. Evidently, the conclusions from Table 1 are robust to conditioning on other observables: The parameter estimate on the indicator for unemployment status in the equation describing household production ranges from 12 to 51 percent of its size in the equation describing market work. Even adjusting for personal characteristics it is reasonable to conclude that most of the lesser market work among the unemployed in the data sets that we use is not compensated by increased household production.

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<sup>4</sup>In all tables presented in this section the data are weighted by the sampling weights provided in the data set.

Despite these results it would be premature to conclude that most of the time released from market work due to unemployment is accounted for by leisure—it may be that the unemployed are unobservably different from the employed. Nor do our results address the role of cyclical unemployment on the amount of total work. One cannot use cross-sectional differences between the unemployed and the employed to draw conclusions about the impact of cyclical changes on an entire labor market. Instead, to answer the macroeconomic question one needs to examine how the degree of slack affects all individuals in that market—the unemployed, the employed and non-labor-force participants. Only with the creation and continuation of the ATUS has this become possible.

We use the Current Population Survey (CPS-MORG) for each year 2003-2006 to calculate unemployment rates for use in inferring the impacts of unemployment on time use. In the first column of Table 3 we present the current unemployment rate averaged across all ATUS respondents aged 15-59 and resident in the 107 metropolitan areas in which there were more than 500 respondents in the CPS-MORG in a particular year. As the data show, there is substantial cross-sectional geographic variation in unemployment rates in these data. Column (2) of the Table presents unemployment rates in these same areas averaged over the current and the preceding five years, which might be interpreted as measuring long-run unemployment across labor markets. Not surprisingly, the cross-section variation in these long-run rates is below that in the annual rates of unemployment, although there is still substantial geographic variation. The final column of the Table presents the unemployment shock—the difference between the current year's unemployment rate and the unemployment rate averaged over the previous five



years. We interpret this as the cyclical shock to the labor market in the area; and here too we observe substantial geographic variation.

In Table 4 we examine how time use is related to unemployment in the labor market where the individual resides. As before, we divide total time into market work, household production, and the excluded category, all other uses of time, for all individuals ages 15-59 in the ATUS 2003-06. We linked the records of ATUS respondents to the long-term and current unemployment rates in the metropolitan areas in which they reside. Each regression also includes a wide variety of demographic controls describing the individual. The upper panel of the table shows the results for the long-term (six-year) average unemployment rate. As expected, higher average unemployment in an area is associated with less market work: Each one percentage-point increase in unemployment is associated with the average person working 3.3 fewer minutes per day in the market. Full-time workers work about 300 minutes in the market on the average day, so that this decline is quite consistent with the expected difference that would occur mechanically where unemployment is higher.

As the results in the top panel of Table 4 show, there is almost no response of household production to higher long-term unemployment in a labor market. Indeed, the parameter estimate is unexpectedly negative, implying that where unemployment has been higher for a long time people engage in slightly less household production. Given the size of the effect and its statistical insignificance, the appropriate conclusion here is that the long-term differences in market work generated by long-term differences in unemployment are not accompanied by any offsetting differences in household production. These results corroborate and strengthen the results in Tables 1 and 2 comparing employed and unemployed individuals.

The middle panel presents estimates for the same regressions, but with the current unemployment rate substituted for the long-term unemployment rate.<sup>5</sup> Here we see that, as with long-term unemployment, market-wide increases are associated with reductions in market time for the typical individual, with the effect almost identical to that of differences in long-term unemployment across areas. For household production, however, the results are totally changed: Each one-percentage-point shock to unemployment increases the average adult's household production by 2.5 minutes, an increase that is not significantly different from the negative of the effect on market work. The point estimates suggest that a one-hour decline in market-based production associated with cyclical increases in unemployment is matched by an increase in household production of 46 minutes; and we cannot reject the hypothesis that the offset is one-for-one.

In the bottom panel of the Table we include both the lagged five-year average rate of unemployment in each area and its current value. Our estimates corroborate the inferences drawn above: Higher long-term unemployment is associated with **both** less market work in an area and less household production. Areas of long-term high unemployment are those where the average individual has chosen to spend more time on personal activities and in leisure. When unemployment is temporarily higher, however, the resulting reduction in market work at the individual level is associated with increased household production, with no increase in personal activities or leisure. Evidently, permanent and temporary differences in local employment conditions evoke strikingly different responses in household behavior.

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<sup>5</sup>We could just as easily have included the shock to unemployment, since it is calculated as the difference between current and long-term unemployment. The conclusions from equations using any two of the three measures would be the same as those based on the results in Table 4.

### *B. Time Use and the Duration of Unemployment*

We can shed additional light on the relationship between unemployment and patterns of household production by examining patterns of time use among the unemployed distinguished by the duration of their spells of unemployment. We stress that we are unable to hold constant those unobservable characteristics likely to affect the duration dependence of spells of unemployment (Katz and Meyer, 1990); all we can do is ask whether workers with longer spells of unemployment use time differently from those with shorter spells. One possibility is that individuals engaged in market work accumulate a stock of unfinished home projects that cannot be completed on weekends or during off-work hours. Early in a spell of unemployment the unemployed worker would use the extra time to engage in the household production that was postponed while working for pay, but that as an unemployment spell lengthens more non-market time would be used as (unwanted) leisure. This would suggest that the burden of unemployment rises with the duration of unemployment spell (as argued by Hurd, 1980). Alternatively, individual households evidence non-separability of the utility of leisure over time, as proposed by Kydland and Prescott (1982). People would then use short periods of unemployment to relax from the stresses of any kind of work, and only later begin to substitute household production for the market work in which they are no longer engaged.

To examine this issue we take all the individuals in the ATUS who report being unemployed on the diary day. We assume that those who stated that they were unemployed and who reported unemployment in the eighth (their final) month in the CPS (two to five months before the diary day) have unemployment duration equal to the duration reported in the CPS plus the interval between that eighth month and the diary

day. For those unemployed ATUS respondents who were not unemployed in their eighth CPS month, we make two polar assumptions: 1) Maximum duration—all became unemployed immediately after they were interviewed in their eighth CPS month, so that their unemployment duration equals the interval between that interview and the ATUS diary day; and 2) Minimum duration—all became unemployed on the diary day and have an unemployment duration of zero.

Table 5 shows the means of time use among the ATUS unemployed distinguished by their duration of unemployment. There is no monotonic relationship between household production and unemployment duration, although it is true (at least under the assumption of maximum duration) that the long-term unemployed spend significantly more time in household production than all those currently less far into their unemployment spells. A similar conclusion can be drawn when comparing the long-term unemployed to those ATUS respondents who became unemployed after their eighth CPS month (those with minimum duration of 0-4 weeks).

Even these small differences disappear when we estimate regressions of household production on a large number of covariates and indicators of the duration of unemployment, as shown in Table 6. None of the parameters on the duration indicators has a t-statistic greater than one, and all are tiny in absolute value. A reasonable conclusion is that the time-diary data provide no evidence that the split of non-market time use between household production and all other unpaid activities varies with unemployment duration. Theories of labor supply based on non-separability of utility over leisure across time periods appear of little use in explaining the intertemporal behavior of leisure and household production. Similarly, the absence of any dependence

of household production on unemployment duration negates an “unfinished projects” approach at the individual level.

### **III. An Interpretation**

We have demonstrated that the employed do not spend much less time in household production than do observationally identical unemployed workers, so that the unemployed engage in much less total work. Similarly, in geographic areas where unemployment is consistently higher, the average individual spends less time in market work and no more time in household production than counterparts in areas where unemployment is consistently lower. In areas where unemployment has suddenly risen, however, the average resident spends less time in market work, but offsets most of this decline by an increase in time spent in household production rather than leisure or personal maintenance.

How can we rationalize the apparent absence of any effect of long-term differences in unemployment on time spent in household production with the nearly complete offset of lost market work by increased household production that occurs when an entire labor market experiences a negative shock, presumably associated with a cyclical downturn? One possibility is that they arise in a world in which there is easy short-run substitution between market work and home production, yet where social norms about preferences for work (market and household) and leisure differ geographically, possibly in ways which are dependent on the past history of unemployment. No doubt a number of other theories can also rationalize these quite surprising facts. The next step would be to test these theories on the increasingly available and appropriate data that would allow distinguishing among them.

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**Table 1. Time Use by Employment Status and Gender, U.S., 2003-06, Italy 2002, Australia 1992, Germany, 2001.02, Ages 15-59\***

	<b>Market Work</b>	<b>Household Production</b>	<b>Market Work</b>	<b>Household Production</b>
<b>All</b>		<b>U.S.</b>		<b>AUSTRALIA</b>
Employed	343.13 (1.50)	191.27 (0.98)	328.64 (3.25)	181.90 (2.01)
Unemployed	35.58 (2.08)	249.82 (4.44)	37.6 (3.53)	230.3 (5.82)
<b>Male</b>				
Employed	377.87 (2.22)	153.25 (1.29)	393.07 (4.54)	123.90 (2.17)
Unemployed	44.40 (3.50)	202.79 (5.08)	52.15 (5.42)	182.1 (5.43)
<b>Female</b>				
Employed	303.62 (1.98)	234.53 (1.44)	253.67 (4.33)	249.30 (3.20)
Unemployed	26.31 (2.35)	299.30 (6.06)	20.12 (4.10)	288.10 (9.04)
<b>All</b>		<b>ITALY</b>		<b>GERMANY</b>
Employed	370.17 (1.87)	156.02 (1.19)	268.85 (1.91)	214.66 (1.27)
Unemployed	31.27 (2.29)	244.69 (5.04)	48.37 (2.82)	315.01 (4.26)
<b>Male</b>				
Employed	413.95 (2.46)	87.05 (1.06)	323.90 (2.85)	158.52 (1.61)
Unemployed	52.00 (4.54)	100.28 (4.69)	58.93 (5.29)	242.65 (6.62)
<b>Female</b>				
Employed	305.98 (2.71)	257.12 (2.02)	212.86 (2.42)	271.75 (1.80)
Unemployed	17.50 (2.22)	340.60 (6.44)	41.81 (3.16)	359.94 (5.15)

\*Standard errors of the means in parentheses. All observations are weighted to account for sampling distributions across days of the week here and in Tables 2-6.



**Table 2. Effect of Unemployment Status on Time Use, Average and by Gender, U.S. 2003-06, Italy 2002, Australia 1992, Germany, 2001.02, Ages 15-59\***

	<b>Market Work</b>	<b>Household Production</b>	<b>Market Work</b>	<b>Household Production</b>
	<b>U.S.</b>		<b>AUSTRALIA</b>	
<b>All</b>	-272.46 (9.69)	94.11 (6.49)	-293.54 (9.36)	84.51 (5.06)
R <sup>2</sup>	0.109	0.151	0.158	0.252
<b>Male</b>	-292.52 (14.92)	92.39 (9.13)	-336.29 (13.31)	82.93 (12.38)
R <sup>2</sup>	0.096	0.065	0.135	0.072
<b>Female</b>	-252.66 (12.64)	91.08 (9.17)	-234.38 (12.75)	78.61 (8.63)
R <sup>2</sup>	0.088	0.150	0.122	0.276
	<b>ITALY</b>		<b>GERMANY</b>	
<b>All</b>	-321.42 (6.07)	90.52 (3.38)	-222.58 (6.03)	95.73 (3.96)
R <sup>2</sup>	0.169	0.385	0.115	0.166
<b>Male</b>	-356.88 (9.86)	41.26 (4.26)	-276.63 (10.47)	93.24 (6.15)
R <sup>2</sup>	0.113	0.072	0.080	0.033
<b>Female</b>	-296.02 (7.34)	124.7 (5.00)	-185.68 (6.95)	94.79 (5.18)
R <sup>2</sup>	0.172	0.334	0.083	0.124

\*Standard errors in parentheses. Also included in the regressions are:

For the United States, vectors of indicators for educational attainment and the number and ages of resident children; indicators of gender and marital status, and their interaction; indicators of race, immigrant status; and age, here and in Tables 4 and 6.

For Italy, all the same vectors and indicators are included, except immigrant status and race.

For Australia, all the same vectors are included, except only number of resident children is included, and race is not included.

For Germany, age, ages and number of children, and marital status are included.

**Table 3. Metropolitan Area Unemployment Rates, 2003-2006, N = 107\***

Year	Actual	Six-year Average	Shock
2003	5.94 (1.41) [2.15, 10.97]	4.69 (0.97) [2.66, 8.80]	1.49 (1.02) [ -1.27, 4.72]
2004	5.54 (1.54) [1.93, 9.16]	4.95 (0.88) [3.08, 6.86]	0.72 (1.25) [ 2.26, 5.02]
2005	4.89 (1.15) [2.22, 9.08]	5.12 (1.03) [2.65, 10.06]	-0.27 (1.07) [ -2.66, 2.85]
2006	4.40 (1.09) [1.95, 8.89]	5.32 (0.97) [3.03, 9.62]	-1.10 (1.15) [ -4.78, 2.43]
2003-2006	5.29 (1.44) [1.94, 10.97]	4.98 (0.99) [2.65, 10.06]	0.00 (1.43) [ -4.78, 5.02]

\*Standard deviations in parentheses, minima and maxima in brackets. Calculated from the CPS-MORG linked to ATUS respondents of all ages.

**Table 4. Effects of a One-Percentage-Point Increase in the MSA Unemployment Rate on Time Use (in minutes/day), U.S. 2003-06, Ages 15-59, N = 21,867\***

	<b>Market Work</b>	<b>Household Production</b>
<b>Unemployment Rate:</b>		
<b>Average t-1...t-5</b>	-3.32 (2.75)	-1.33 (1.65)
R <sup>2</sup>	0.102	0.201
<b>Current</b>	-3.26 (1.71)	2.50 (1.10)
R <sup>2</sup>	0.103	0.202
<b>Average t-1...t-5</b>	-2.02 (2.74)	-2.85 (1.77)
<b>Current</b>	-2.75 (1.70)	3.22 (1.18)
R <sup>2</sup>	0.103	0.202

\*Standard errors, robust to clustering on MSA, are in parentheses.

**Table 5. Time Use by Duration of Unemployment, U.S., 2003-2006, N=2589\***

<b>Weeks of Unemployment</b>	<b>Market Work</b>	<b>Household Production</b>	<b>Market Work</b>	<b>Household Production</b>
	<b>Maximum</b>	<b>Duration</b>	<b>Minimum</b>	<b>Duration</b>
0-4	---	---	26.87 (2.05)	268.66 (5.12)
5-14	27.75 (2.26)	271.12 (5.64)	22.81 (8.34)	260.70 (25.95)
15-26	28.61 (3.50)	266.42 (8.20)	36.76 (5.89)	278.54 (12.19)
>26	41.54 (5.93)	293.36 (12.12)	41.54 (5.93)	296.36 (12.12)

**Table 6. Effect of Unemployment Duration on Time Use, U.S., 2003-2006, N=2589\***

Weeks of Unemployment	Market Work	Household Production	Market Work	Household Production
	Maximum	Duration	Minimum	Duration
5-14	---	---	-16.65 (12.18)	9.55 (23.43)
15-26	-3.95 (4.40)	7.34 (8.45)	9.26 (6.19)	3.06 (11.91)
>26	-7.62 (6.76)	2.67 (13.00)	-5.58 (6.67)	1.00 (12.84)
R <sup>2</sup>	0.047	0.235	0.048	0.235

\*Standard errors in parentheses. See footnote to Table 2 for list of covariates.

## **APPENDIX. Broad Categorizations of Activities into Market Work and Household Production**

### **United States:**

**Market work:** market work and work-related activities; travel related to work.

**Household production:** All household activities; caring for and helping household members; consumer purchases; professional and personal care services; household services; government services; travel related to these.

### **Australia:**

**Market work** and travel related to it.

**Household production:** Cleaning and cooking; family and child care; shopping; and travel associated with these.

### **Germany:**

**Market work:** market work; employment and job search.

**Household production:** home work activities; handicraft/gardening; care and sitting.

### **Italy:**

**Market work:** market work; professional activities; training.

**Household production:** domestic activities; family care; purchasing goods and services.