The Life-Cycle Profile of Time Spent on Job Search

By Mark Aguiar, Erik Hurst and Loukas Karabarbounis*

How do unemployed individuals allocate their time spent on job search over their life-cycle? While a vast literature has considered the life-cycle dynamics of economic variables correlated with well-being, such as consumption, housing, and labor supply, there is limited evidence on how individuals adjust their job search behavior over time in response to unemployment shocks. This omission reflects the lack of data that can be used to consistently measure the input of time in the production of job opportunities for individuals. A notable exception is Krueger and Mueller (2012) who document how the level of job search time varies across countries and discuss some age effects on job search.

In this paper we document more systematically the allocation of time spent on job search over the life-cycle using time use survey data from the U.S. and other countries. Using the American Time Use Survey (ATUS), we find a striking hump-shaped profile of U.S. time spent on job search. The unemployed between the ages 21 and 25 spend roughly 2.2 hours per week searching for a job. Job search time increases sharply over the life-cycle and reaches a maximum of roughly 6.6 hours per week for the unemployed between the ages 46 and 50. Even unemployed between the ages 56

and 65 seem to spend more time searching for jobs relative to the young. We also document that most of the variation in life-cycle job search time is accounted for by the extensive margin, that is the decision to participate in job search activities. These life-cycle patterns are relatively stable across demographic groups. However, the life-cycle profiles of job search time look very different in other countries. Using data from the Multinational Time Use Survey (MTUS), we show that for most countries other than the U.S. the profile of job search time is decreasing over the life-cycle.

Finally, we discuss the implications of life-cycle theory for the intertemporal allocation of job search time. In standard life-cycle models with incomplete markets, an increasing profile of assets over the life-cycle implies a declining job search time. This is because unemployed with accumulated assets have the option to run down their assets and insure themselves against unemployment shocks rather than search for a new job. The more assets unemployed have accumulated, the lower is their propensity to search for a job. If older unemployed have accumulated more assets relative to younger unemployed, their job search time will be lower. Therefore, the hump-shaped profile of job search time observed in the U.S. is difficult to rationalize within standard life-cycle models. We conclude by discussing other factors which can explain the hump-shaped profile of job search time.

I. Data

We obtain time use data from two sources. First, we pool the 2003-2011 waves of the ATUS. The ATUS is conducted by the U.S. Bureau of Labor Statistics (BLS) and individuals in the sample are drawn from the exiting sample of the Current Population Survey (CPS). On average, individuals are sampled approximately 3 months
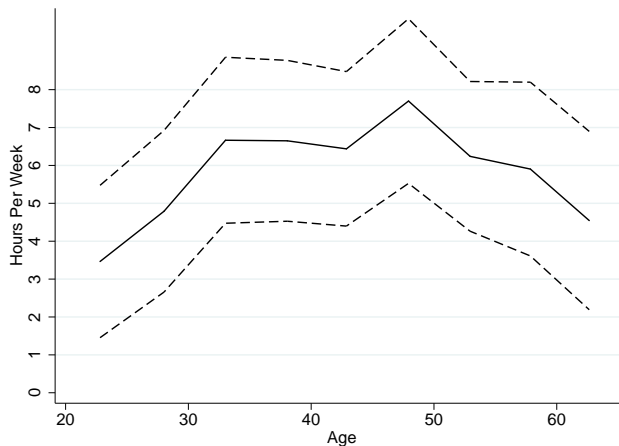
FIGURE 1. LIFE-CYCLE JOB SEARCH TIME (ATUS)

after completion of their final CPS survey. Each wave is based on 24-hour time diaries where respondents report the activities from the previous day in detailed time intervals. For more information on the types of activities that are recorded in the ATUS see Hamermesh, Frazis, and Stewart (2005) and Aguiar, Hurst, and Karabarbounis (forthcoming).

Job search includes all time spent by the individual searching for a job (ATUS code 05-04), including time spent commuting associated with job search (ATUS code 18-05-04). Job search includes, among others, activities such as sending out resumes, going on job interviews, researching details about a job, asking about job openings, or looking for jobs in the paper or the Internet.

Our second source of time use data is the MTUS. The MTUS is a cross-nationally harmonized dataset of time use surveys composed of identically recoded variables for various countries and years. We use the W58 version of the MTUS with the 69 time use activities which allows us to separate job search time from market work time. We define job search time as time spent on category MAIN14 ("Look for job," which includes "Job search activities," "Attend interview," and "Activities related to claiming unemployment benefits or welfare."). For the unemployed we also add any time spent on category MAIN63 ("Travel to or from work," which includes "Commuting,

including travel to or from job interview or job search").[1]

II. Life-Cycle Profiles of Job Search

We pool all waves of the ATUS dataset in a single cross section. The sample consists of 4,444 unemployed individuals between the ages 21 and 65 (inclusive). Our benchmark method to estimating life-cycle profiles is to split the population in five-year age bins $a = 1, ..., 9$ and to regress:

$$(1) \qquad Y_{ia} = \sum_{a=1}^{9} \beta_a D_{ia} + \epsilon_{ia},$$

where Y_{ia} is some outcome variable of individual i belonging to age group a, and D_{ia} is a dummy variable that takes a value of one if individual i belongs to age group a and zero otherwise. We use the sample weights provided by the ATUS to estimate this regression. We run the regression without a constant, so the estimated coefficients $\widehat{\beta_a}$ denote the weighted sample averages of the outcome variable by age group.

We start with the aggregate life-cycle pro-

[1] Earlier versions of the MTUS use 41 categories in which job search activities cannot be separated from market work time because they are included in category AV2 ("Paid work at home," including "Job seeking paperwork at home" and "(Other) Job search activities," but also time spent on "Work brought home," "Other home-working," and paid "Childminding").

TABLE 1—LIFE-CYCLE ESTIMATES OF JOB SEARCH (ATUS)

Coefficients	Baseline		Demographics		Demographics & FE	
	Difference	p-value	Difference	p-value	Difference	p-value
	(1)	(2)	(3)	(4)	(5)	(6)
$\beta_{26-30} - \beta_{21-25}$	1.191	0.096	1.439	0.051	1.326	0.072
$\beta_{31-35} - \beta_{21-25}$	2.800	0.001	3.279	0.000	3.199	0.000
$\beta_{36-40} - \beta_{21-25}$	2.814	0.002	3.208	0.000	3.185	0.001
$\beta_{41-45} - \beta_{21-25}$	2.518	0.001	2.971	0.000	2.972	0.000
$\beta_{46-50} - \beta_{21-25}$	4.193	0.000	4.284	0.000	4.234	0.000
$\beta_{51-55} - \beta_{21-25}$	3.049	0.000	2.869	0.001	2.774	0.002
$\beta_{56-60} - \beta_{21-25}$	2.569	0.006	2.481	0.016	2.439	0.019
$\beta_{61-65} - \beta_{21-25}$	1.304	0.222	1.170	0.291	1.079	0.327

Note: The table presents point estimates and p-values of the difference between the estimated coefficients $\widehat{\beta_a}$ and $\widehat{\beta_1}$ from regression (1). Column 1 is the baseline regression. Column 3 includes demographic controls in the regression. Column 5 includes demographic controls and year fixed effects in the regression.

file of time spent on job search for the unemployed (so the outcome variable in equation (1) is time spent on job search activities). In Figure 1 we present the estimates of job search hours per week by age group and ten percent upper and lower bounds of these estimates based on robust standard errors of the coefficient estimates. We find a striking increase of time spent on job search from roughly 2.2 hours per week for the unemployed between the ages 21 and 25 to roughly 6.6 hours per week for the unemployed between the ages 46 and 50. After that, job search time is declining in age. However, older unemployed still appear to spend more time on job search relative to the youngest unemployed.

Table 1 summarizes our estimates. The first column shows the difference between the estimated coefficient for age group a, $\widehat{\beta_a}$, and the estimated coefficient for the youngest age group, $\widehat{\beta_1}$. The second column shows the p-value associated with the null hypothesis that the difference of the estimated coefficients is zero. As the table shows, the unemployed between the ages 56 and 60 spend roughly 2.6 additional hours per week on job search relative to the unemployed between the ages 21 and 25 (p-value 0.006). Even the unemployed between the ages 61 and 65 spend more time searching for a job relative to the youngest unemployed, although the 1.3 hours difference is significant only at the 22 percent level.

To examine what fraction of these life-cycle differences can be accounted for by demographics, we repeat regression (1) for time spent on job search controlling for various demographic variables. Specifically, we include in the regression four educational dummies, a gender dummy, a dummy for African-Americans, a dummy for being married, and a dummy for having children in the household. The third column of Table 1 shows the difference between the estimated coefficient for age group a, $\widehat{\beta_a}$, and the estimated coefficient for the youngest age group, $\widehat{\beta_1}$, in a regression that includes these demographic controls. The fourth column shows the p-value associated with the null hypothesis that the difference of the estimated coefficients is zero. As the table shows, the age profile of job search time conditional on demographics is similar to the age profile we estimated without controlling for demographics. As columns five and six show, controlling additionally for year fixed effects does not change our conclusions.

To estimate the life-cycle profile of job search time in various sub-populations, we use a more parsimonious specification than the one in equation (1). Our sample size is 4,444 unemployed, divided in nine age bins. Therefore, splitting this sample in various sub-populations lowers significantly the number of individuals per age bin and makes our estimates noisy. To overcome
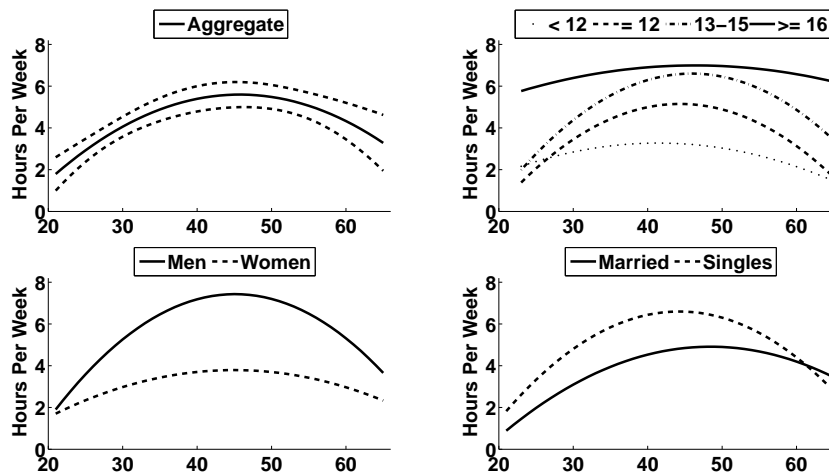
FIGURE 2. LIFE-CYCLE JOB SEARCH TIME BY DEMOGRAPHIC GROUP (ATUS)

this difficulty, we regress the outcome variable on orthogonalized age polynomials:

$$(2) \qquad Y_{ia} = \sum_{p=1}^{P} \beta_p A_{ip} + \epsilon_{ia},$$

where A_{ip} denotes the pth orthogonal polynomial. We add polynomials until the coefficient on the polynomial of degree $P+1$ becomes statistically insignificant. In practice, this means that we use only $P = 2$ polynomials in our regressions.

In Figure 2 we show predicted values of time spent on job search from regression (2). In the upper left panel we show predicted values of job search time for the aggregate sample. Similarly to the finding using the age groups, we find a strong hump-shaped profile of job search over the life-cycle. In the other panels we show predicted values of job search time for different demographic groups. The robust feature of the data we wish to stress is that the young spend significantly less time on job search relative to the middle aged, for most demographic groups.

There are, however, some interesting differences of job search levels and dynamics across demographics groups. First, the level of job search time is increasing in education. For instance, the least educated unemployed (less than 12 years of educa-

tion) spend roughly 3.4 hours per week less on job search relative to the most educated unemployed (completed college or more), with a p-value of less than 0.001. The age dynamics of job search time, however, are mostly driven by the two middle groups (completed high school and attended some college). Second, on average unemployed men spend roughly 2.3 additional hours on job search relative to women (p-value less than 0.001). In addition, men exhibit a stronger hump-shaped profile of job search time than women. Finally, both married and singles appear to have hump-shaped profiles of job search time. Singles appear to search more intensively than married on average across the life-cycle.

We have also examined the intensive and extensive margins of job search. Specifically, the intensive margin is captured by predicted values of job search time from regression (2) conditional on job search time being positive. The extensive margin is captured by predicted values of participating in job search activities for the unemployed (so the outcome variable is a dummy taking a value of one if job search time is positive and zero otherwise). Our estimates show that the extensive margin accounts for a large fraction of the life-cycle dynamics of job search. Specifically, participation increases from roughly 11 percent for the youngest unemployed to roughly 27 percent
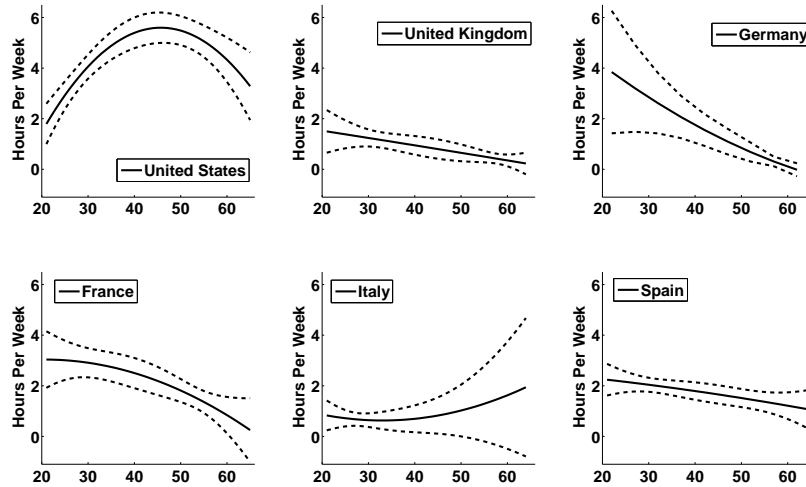
FIGURE 3. LIFE-CYCLE JOB SEARCH TIME (MTUS)

for the unemployed between the ages 46 and 50. Job search time conditional on participating also appears to follow a hump-shaped profile over the life-cycle. However, the magnitude of the increase is modest, and our estimates have larger standard errors for the very young and the very old.

Finally, we explore life-cycle profiles of job search time in countries other than the U.S. using data from the MTUS. There are some small classification differences between the MTUS and the ATUS related to how time spent commuting is treated and the selection of the sample. However, classification differences do not seem to be important for our results. This is because the estimated life-cycle profile of job search time in the U.S. using data from the MTUS is quite similar to that in the U.S. using data from the ATUS.

We do not attempt to estimate the life-cycle profiles separately for each country using age bins. This is because in most countries the number of unemployed per age group is very small (less than 50 respondents) to be able to draw meaningful inferences. Instead, we estimate separately regression (2) with polynomials for each country. Figure 3 reveals some interesting differences between the U.S. and other countries. First, job search time of unemployed

is significantly higher in the U.S. relative to other countries, irrespective of age. Second, job search time does not appear to be hump-shaped in other countries. While job search time for unemployed between the ages 21 and 25 is roughly similar between non-U.S. countries and the U.S., job search time is typically decreasing over the life-cycle in other countries.

III. Discussion

In Aguiar, Hurst, and Karabarbounis (2013) we develop a life-cycle model to explore the implications of life-cycle dynamics for job search time.[2] The first result that we stress is that the standard life-cycle theory cannot easily rationalize a hump-shaped profile of job search time over the life-cycle.

In the simplest economy that we consider, a worker of age t starts with assets a_t and is either employed or unemployed. Employed workers earn a wage w_t and unemployed receive a benefit b_t that expires after a period.

[2]Menzio, Telyukova, and Visschers (2012) develop a life-cycle model with directed search to explain life-cycle transitions between employment and unemployment. Relative to their paper, we model the endogenous supply of time in finding jobs and we stress the importance of wealth dynamics over the life-cycle for job search behavior.

Unemployed decide whether to search for a job. Denoting by s_t the job search time of the unemployed at time t, unemployed find a job with probability $p_t(s_t)$ and incur a utility cost of $v_t(s_t)$. We assume that $p' > 0$, $p'' \leq 0$, $v' > 0$, and $v'' \geq 0$. Workers face an exogenous separation probability θ in each period.

To understand the key trade-off that determines optimal job search time over the life-cycle, let V_t^E be the value of employment and V_t^U be the value of unemployment for a worker of age t. In any interior solution, optimal job search satisfies:

$$(3) \quad v_t'(s_t) = \beta p_t'(s_t) \left(E_t V_{t+1}^E - E_t V_{t+1}^U \right),$$

where $\beta > 0$ denotes the discount factor. The value functions depend on some state vector ω_t which includes, among other states, individual accumulated assets.

The first determinant of job search effort over the life-cycle is the marginal productivity of job search effort in terms of increasing the job finding probability p_t' relative to the marginal cost of job search effort v_t'. If this ratio does not vary over the life-cycle for given level of job search time s_t, then the profile of job search time is determined solely by the expected gains from employment, $E_t V_{t+1}^E(\omega_{t+1}) - E_t V_{t+1}^U(\omega_{t+1})$. In particular, job search time decreases when expected gains from employment decrease.

The expected gains of employment depend both on assets a_t and explicitly on time t (holding constant assets) because of life-cycle dynamics in wages and discounting. Expected gains from employment decrease in accumulated assets a_t, as workers can finance their consumption c_t by running down their assets instead of working. The strength of this wealth effect depends on the curvature of the utility function $u(c_t)$. The effect of time on the expected gains from employment (holding constant assets) is expected to be hump-shaped. The fact that wages increase in the first part of the life-cycle tends to make the expected gains increasing in early ages. For workers closer to retirement, however, expected gains from employment are lower because, even when wages are high, there are only few periods during which workers can work.

Holding constant the marginal product relative to the marginal cost of job search at given job search time s_t, in Aguiar, Hurst, and Karabarbounis (2013) we show that, for reasonable parameter values, job search time is decreasing over the life-cycle. When the coefficient of relative risk aversion is not too low (roughly greater than 0.5 to 1), the wealth effect on job search time dominates the time horizon effect. With uninsurable separation shocks and assuming that workers are not too impatient or that they face borrowing constraints when young, the profile of assets a_t is increasing over the life-cycle. As wealth a_t increases over the life-cycle, job search time for the unemployed s_t decreases over the life-cycle.

These results suggest that the marginal product relative to the marginal cost of job search may not be constant over the life-cycle. Further work is needed to reconcile the patterns within the U.S. and explain why the patterns differ between the U.S. and Europe.

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