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Discouraging Workers: Estimating the Impacts of Macroeconomic Shocks on the Search Intensity of the Unemployed

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Abstract

Abstract: Discouraged and marginally attached workers have received increased attention from policy makers over the past several years. Theoretically, periods of recessions and high unemployment should directly influence individual's decisions whether or not to search for employment, creating more discouraged workers. Since 2003, there have been a number of large macroeconomic shocks (e.g. housing bubble, credit crunch, mass layoffs, etc.) which should affect job search intensity. To date, the relative magnitude of these shocks on the search intensity of the unemployed (but currently undiscouraged workers) has not been established in the literature. Using daily time use dairies from the American Time Use Survey 2003-2009 allow us to proxy search intensity directly by aggregating time spent in minutes on several job search activities: time spent sending out resumes, contacting employers, interviewing, reading ads on the internet and so forth. Results from Tobit estimation indicate the existence of significant negative wealth effects on search intensity through changes in the stock market and housing values that help explain the apparent acyclicality of search intensity observed in the data.

JEL Codes: J2, J6, J1, E24, E32

Keywords: search intensity, macroeconomic shocks, discouraged workers, business cycles

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As of February 2011, over 1 million potential workers in the United States were identified as "discouraged," a more than 250 percent increase from three years earlier (Bureau of Labor Statistics 2011).[1] Given the rapidly deteriorating labor market conditions brought on by the start of the Great Recession, this fact is not terribly surprising. Though these potential workers would accept a full-time job if offered, they have given up searching because the cost of their job search outweighs the expected payoff. Logically, during deep and prolonged recessions, the expected payoff from finding a job match declines, leading to substantial increases in the number of discouraged workers. Moreover, this kind of pro-cyclicality of search intensity associated with the discouraged worker effect is likely to have propagating effects on the business cycle. As search intensity decreases, the probability of a successful job match also decreases, resulting in longer duration of low levels of employment (Krause and Lubik 2011). Given the potential costs of this drop in search intensity both to individuals as well as the economy as a whole, it is surprising labor economists know so little about the determinants of search intensity of the unemployed.[2]

In general, there is a dearth of empirical evidence regarding the extent to which search intensity varies over the business cycle. The limited evidence that does exist suggests that search intensity may be acyclical. Shimer (2004) finds that, after controlling for former industry, occupation, and duration, search intensity among active searchers did not appear to change significantly during the 2001 recession.[3] The finding that search intensity appears to be acyclical is somewhat puzzling in light of the evidence that many other features of the labor market (e.g., total hours worked, unemployment rate, vacancy rate, job destruction rate, job opening rate) are strongly correlated with the business cycle. It is also at odds with the common acceptance of the discouraged worker effect.

One possible reason for our inability to reconcile the apparent acyclicality of search intensity with the existence of discouraged workers may be a function of how search intensity is measured. This problem is potentially solved by exploiting the American Time Use Survey's (Bureau of Labor Statistics 2010a) multi-year dataset. To date, Krueger and Mueller (2010) is the only known study to use the American Time Use survey (ATUS) to look at the search intensity of unemployed workers. In their paper, Krueger and Mueller estimate the impact of unemployment insurance (UI) benefits on search intensity. As predicted by Mortensen (1977), their findings imply that as UI benefits increase search intensity declines. However, due to their relatively brief sample period (2003 - 2007) and the scope of their paper, their findings say nothing about the behavior of search intensity over the business cycle.

Understanding the behavior of search intensity over the business cycle is also important because of its implications for modern search theory. In recent years, much of this literature has focused on the inability of existing models (e.g., Mortensen and Pissarides 1994) to account for the variation in the vacancy to unemployment (VU) ratio over the business cycle (Hall 2005, Shimer 2005, Hagedorn 2008, Pissarides 2009). Understanding the behavior of the VU ratio is necessary to understanding the duration of business cycles. Ultimately, time-varying search intensity presents a challenge to search models that seek to understand the excess volatility of the VU ratio relative to average labor productivity (Shimer 2005).

The purpose of this paper is to help fill this void in the literature. Using the data from the ATUS 2003-2009, we estimate the effects of idio- and non-idiosyncratic macroeconomic shocks on the search intensity of unemployed workers. Our econometric specification is couched in terms of a random search model where intensity is determined by the three standard components of the canonical search model: the cost of search, the likelihood an offer is obtained from a given amount of search, and the expected payoff conditional on an offer (Mortensen,

1986). Due to the natural variation in the data over this sample period and the differences in the level of aggregation of several key series, we are able to identify a number of correlated, but distinct shocks that have competing effects on the search intensity of individuals. These include announcements of mass layoffs by state, changes in stock prices, and changes in regional housing values. Overall, the paper makes a number of important contributions to the empirical literature on the determination of search intensity. Most importantly, our results offer an explanation for the apparent acyclicality of search intensity. In addition, because the data reveal significant variation in search intensity over time, the results have important implications for the modern search theorists in their ongoing effort to accurately account for the excess variation in the VU ratio.

II. Econometric Model

Based on the standard search model, a generalized model of search intensity (*S*) for the *i*th individual at time *t* can be written as

(1) $$S_{it} = \alpha + \beta(c, l_{it}) + \lambda\theta_{it} + \gamma E[w]_{it}$$

This represents the agents' decision *a la* Mortensen and Pissarides (1994). β represents the disutility, or costs, of search and depends on two sets of factors: the direct costs of search, *c*, and an the opportunity costs, *l*. Together, $\lambda\theta$ is the likelihood of obtaining an offer given a unit of search time, where λ is the arrival rate of offers conditional on search and θ is a measure of labor market tightness. γ is the responsiveness of search intensity to changes in the expected wage, *E[w]*.

Theoretically, the disutility from search encompasses both an individual's direct costs of search and the opportunity cost of all non-paid work. We interpret the former as the disutility of effort associated with a unit of time spent searching for employment. For direct search costs to play a significant role in determining search intensity, they must vary either by individual workers

or across the business cycle. At the individual level, it is reasonable to imagine that these costs vary across workers. However, such differences will largely depend on factors such as worker education, industry, and experience. Since these factors all affect the expected wage, it is not possible to model these idiosyncratic differences as pure direct search costs.

Non-idiosyncratic shocks to direct search costs will ultimately be driven by changes in search technology. While job search technology has undoubtedly changed in the last decade, these are arguably long-term change unlikely to vary across the business cycle. Since there is little reason to believe that direct search costs vary across the business cycle, it is also unlikely to be correlated with variation in search intensity due to macroeconomic conditions, which is the focus of our study. As a result, the lack of suitable proxies for direct search costs in the econometric model should cause no problems with our fundamental inferences.

The opportunity costs associated with search plays a more instrumental role. Not only does this vary substantially across workers, but there is good reason to believe that it varies over the business cycle as well. First, we address those idiosyncratic factors that affect opportunity costs. One way of thinking about this is in terms of each worker's value of household production. For example, the presence of children in the household will increase the value of household production and increase the disutility of searching. Thus, the presence of children, especially for women, is expected to decrease search intensity. Similarly, because they can more easily (i.e., with less opportunity costs) substitute their time between paid work to housework, unemployed workers who are married may search less intensively than their unmarried counterparts. In addition, the reason for one's unemployment (e.g., on temporary layoff, voluntary job leaver, re- or new entrants into the labor market, or job loser) will serve as a proxy for unobserved personal preferences. For example, if someone has voluntarily left a job it could be the result of family preferences, health issues, etc. These would reveal a preference for leisure over work. Finally,

age could proxy disutility from search as younger workers may value leisure relatively more than middle aged workers. For example, younger workers are more likely to view additional education as an option during times of high unemployment than older workers. At the other end of the spectrum, workers close to retirement may find searching for a job just a few years before planned retirement to be relatively more costly.

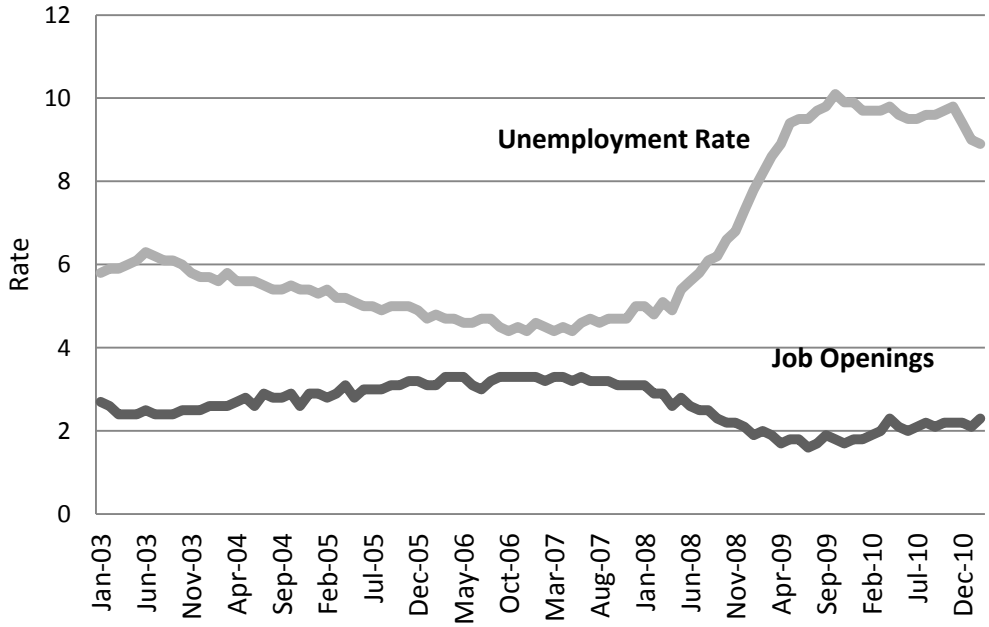
In addition to opportunity costs varying across workers, they also vary across time. The primary means of this variability is through the wealth effect. Wealth directly affects the marginal utility of leisure. Recall, the wealth effect is the effect due to changes in wealth while holding the real wage constant. By focusing on the unemployed, we have a natural experiment from which to test the wealth effect. If wages are sticky then the expected wage tends not to vary much over the business cycle.[4] While one's expected wage will likely remain stable, wealth levels vary greatly over the business cycle. The Great Depression has also been referred to as the "Great Compression" due to the massive loss of wealth (Goldin and Margo 1992). The recent business cycle shows striking similarities in many ways, with the S&P 500 losing over 50 percent of its value from November 1, 2008 to April 13, 2009. Of course, the decline in wealth has not been limited to stocks but has included other assets as well, including housing. From 2001-2007, there was wide-spread appreciation in housing prices. Large decreases in the price of housing starting in late 2007 caused record defaults and record low housing starts. The variation of wealth across individuals and time will related to these two factors provides substantial variation in the value of leisure across workers.

In addition to stock and housing assets, the availability of unemployment insurance (UI) benefits represents another important source of wealth for the unemployed. Mortenson (1977) develops a model that endogenizes the decision to search as well as the amount of time spent searching. In his model, unemployment benefits directly affect search intensity. In general, he

finds the effect of an increase of UI benefits on search intensity to be ambiguous depending on state unemployment benefit structure. However, recent evidence by Krueger and Mueller (2010) suggests that unemployed workers who are eligible for UI benefits actually respond to an increase in UI benefits by searching less.

The second component of the job search model is the probability of an offer conditional on search. As the probability of receiving an offer conditional on search decreases, search intensity should fall. Labor market tightness is the key to determining the arrival rate of job offers, conditional on search.[5] Macroeconomic shocks to the labor market perturb the equilibrium employment level. As a result, tightness in the labor market varies widely across the business cycle (Blanchard and Diamond 1989). A common measurement of labor market tightness, the VU ratio, is shown in Figure 1. During recessions there are increasing separations and fewer vacancies created. Of course, such conditions are likely to vary significantly by location. Naturally, these shocks have large effects on the arrival rate of jobs, and thus search intensity.

Figure 1: Labor Market Conditions over the Business Cycle



The third and final component of the standard search model given in equation 1 is the expected wage offer conditional on search. As expected wages increase, the intensity of search will as well. Hall and Milgrom (2008) find strong evidence of wage rigidity driven by a wage bargaining process restricted to "credible" threats. Their work implies job creation and job destruction are much more sensitive to changes in productivity than wages. If wages are rigid, then expected wages should remain relatively stable over the business cycle. The higher the predicted wage, the more incentive there is for each unemployed worker to search intensively.

III. Data

To estimate the model given in equation 1, data are pooled from several sources. Data representing macroeconomic shocks come from the Bureau of Labor Statistics (2010c) and Standard and Poor's (2011a) and (2011b). All data on individual workers come from the American Time Use Survey (ATUS) 2003-09 (Bureau of Labor Statistics 2010a); this is a multi-year dataset is a pooled cross-section of its annual surveys.

The ATUS is a sub-sample of the Current Population Survey (CPS) (Bureau of Labor Statistics 2010b). Individuals selected for the CPS are interviewed monthly for 8 months. Following that, a sub-sample is selected for the ATUS. The ATUS interviews are conducted 2-5 months following the final CPS monthly survey. Each respondent is randomly assigned one day (diary day) in which to record their activities. Respondents record activities starting at starting at 4 a.m. the interview day and end at 4 a.m. on the following day. In addition to the nature of the activity, respondents are asked where the activity took place, who was present during the activity, and, duration of the activity.

We restrict the sample to unemployed workers between the ages of 20 and 65 who are not enrolled full-time in school. This restriction allows us to abstract from complications due to retiree benefits as well as parental benefits provided to teenagers and college students. While our sample of unemployed workers is defined in the same way as Krueger and Mueller (2010), we also include data from the first two years of the Great Recession. This sample provides a great deal of variation in employment status and macroeconomic shocks that are likely to affect the search intensity of workers.

III.A. Search Intensity

The data used to construct search intensity come from the ATUS. Because the ATUS provides detailed data on time use, we are able to measure the time each worker spends searching during their diary day. In the 2003-09 multi-year dataset from the ATUS, activities related to job search include job search activities (t050481), job interviewing (t050403), waiting associated with job interviews (t050404), security procedures associated with search or interviews (t050405), and other job search activities not otherwise specified (t050499).

Estimated search intensity for unemployed workers over the sample period is given in Figure 2. We report two measures of intensity: average search time and average search time for those participating in search activities during their diary day (i.e., mean search | search > 0). The most interesting fact in this graph is the dramatic rise in search intensity at the beginning of the recession in 2008, followed by an equally dramatic decline. In addition, there is no obvious relationship between search intensity and the unemployment rate. This is consistent with Shimer's (2004) argument that search intensity appears acyclical. However, the percent of unemployed engaged on any given day in job search activities appears to be counter-cyclical (see Figure 3) as the percent searching rises with the unemployment rate. This is particularly

interesting because it is consistent neither to Shimer's argument nor our common understanding of the discouraged worker effect.

Figure 2: Search Intensity (average minutes per day, weighted)[6]

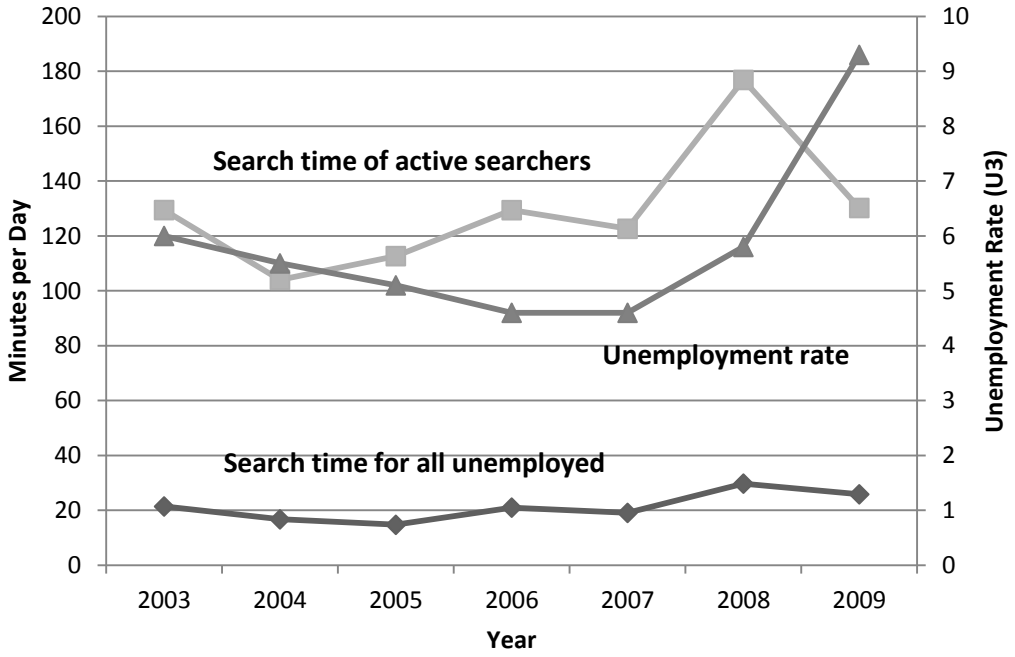
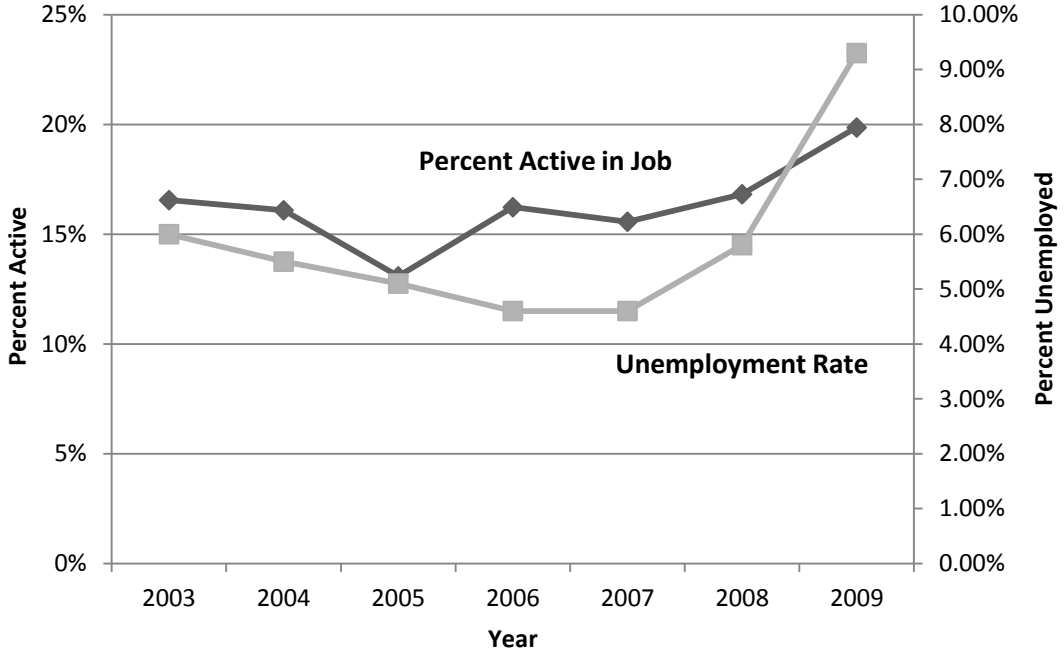


Figure 3: Percent of Unemployed Participating in Job Search Activities (weighted)



III.B. Idiosyncratic factors that affect the opportunity costs of search

Unemployed workers are classified into four groups: job losers, workers on temporary layoff (expecting to be recalled by employer), job leavers, and re- and new entrants. These classifications are constructed from information in the CPS and ATUS. Since the ATUS interview occurs 2-5 months following the CPS interview, it is not possible to rely solely on the classifications in the CPS. The CPS variable (pruntype) that contains this information asks all unemployed workers the reason for their unemployment. Job leavers are those who have voluntarily left their jobs (pruntype=4). The remaining categories, job losers, those on temporary layoff, and re- and new entrants require additional information from the ATUS interview. Re- and new entrants include those who have not recently been in the labor force but are currently seeking employment (pruntype=5,6) in the CPS. It also includes workers who were not in the labor force in their CPS interview (pemlr=5,6,7) but consider themselves unemployed in the ATUS interview (telfs=4). To determine if an unemployed worker is on temporary layoff, we use information from the ATUS on whether they have been given any indication that they will be recalled to work within the next 6 months (tulay6m) and whether they have been given a date for their return (tulaydt). Job losers include those who do not expect to be recalled or whose temporary job ended (pruntype=2,3). We also have a number of workers who have lost their jobs between the time they did the last CPS interview and the time they do the ATUS interview. These workers are those who were working in the CPS (pemlr=1,2) but who are unemployed in the ATUS (telfs=3,4).

As outlined previously, individuals vary in their opportunity costs of search time. Because we have no way to proxy personality differences, we are forced to rely on basic demographic characteristics that are likely to be related to these preferences and proxy the individual's returns to household production. To account for these, we use basic information from the ATUS

regarding factors such as sex, marital status, age, and the presence of children in the household. Because we expect large differences across sex, we use a number of interactions between sex and marital status and the presence of children. For age, we include age and age^2 because we expect the youngest and the oldest unemployed workers to search less intensively than middle-aged workers.

III.C. Non-idiosyncratic factors that affect the opportunity cost of search (wealth effects)

In addition to idiosyncratic differences across workers, the opportunity cost of search is also affected by macroeconomic conditions and policies that generate wealth effects. The macroeconomic shocks relevant here are stock and housing market fluctuations. The relevant policies that generate wealth effects have to do with the level and availability of unemployment insurance benefits across states.

Changes in stock and housing prices over the sample period are shown in Figures 4 and 5. Econometrically, it is important to be able to identify separate wealth effects for each of these factors. This is accomplished in two ways. First, the stock market represents aggregate changes in stock wealth at the national level. On the contrary, we are able to construct regional housing values using the Case-Shiller housing market data. As we see in Figure 5, there are tremendous differences both in level and variation across the four census regions. In addition, housing prices started falling in most regions in late 2006. The stock market did not crash until a year later. Furthermore, the stock market rebounded sharply in 2009 while housing values increased only modestly. As a result of these differences, we feel confident that the model is able to uniquely identify separate wealth effects due to changes in stock and housing values.

Figure 4: S&P 500 from 2003 to 2009

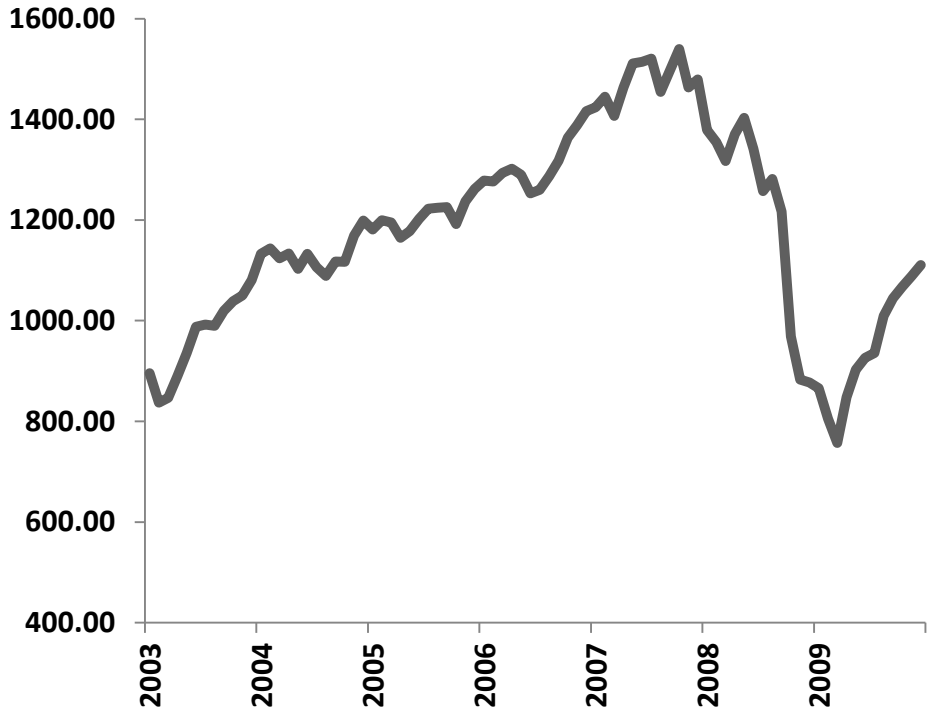
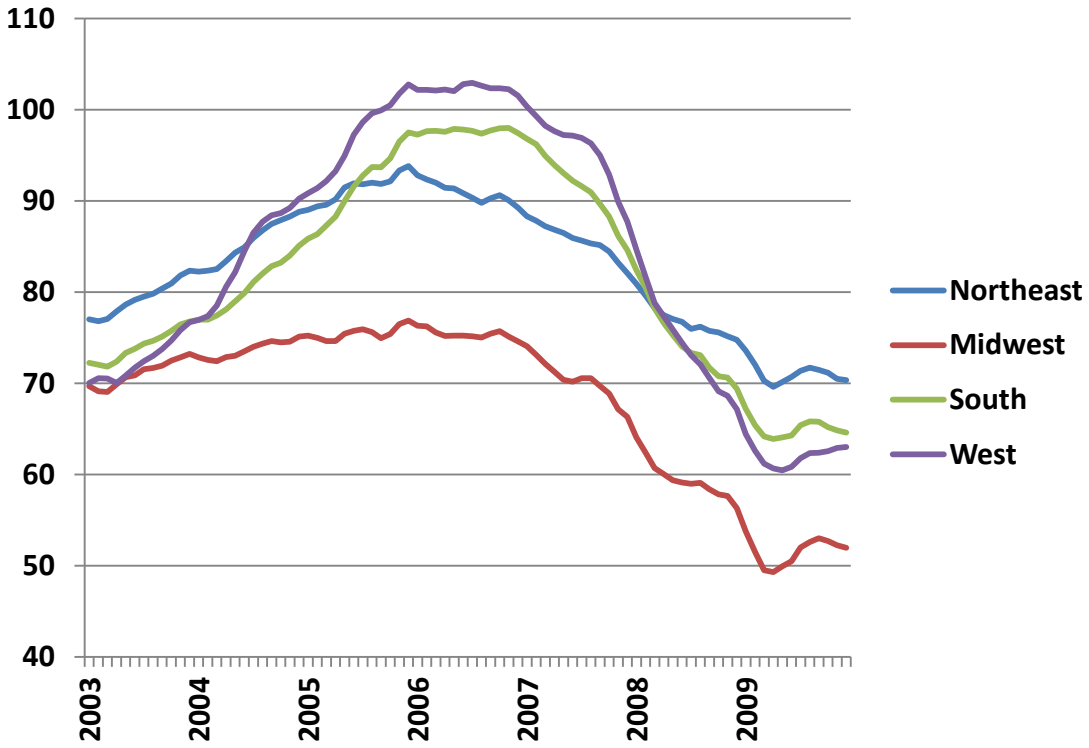


Figure 5: Case-Shiller Regional Housing Price Indices 2003 to 2009



Wealth effects are also generated from the availability of UI benefits. In general, these vary by state of residence and by individuals, since UI benefits depends on one's previous earnings. Unfortunately, because we do not know from the ATUS data what the individual's earnings were previous to becoming unemployed, there is no way to estimate individual UI benefits. As a result, we follow Krueger and Mueller (2010) and use the maximum weekly benefits allowed by each worker's state of residence to proxy unemployment benefits for those eligible (Department of Labor 2010).

To proxy the wealth effects related to the availability of UI benefits, it is necessary to be able to determine which workers are eligible. Consistent with the literature, we define UI eligible individuals as those who have lost their job as well as those on layoffs. However, not all states provide benefits to part-time workers. Thus, we only include part-time workers in the sub-sample of those eligible for benefits if their home state provides such benefits (Department of labor 2010). For the period 2003-07, workers unemployed for more than 26 weeks are considered not eligible. Of course, after 2008 the federal government passed two extension laws, the Emergency Unemployment Compensation act of 2008 (UEC08) and the Extended Benefits (EB) act of 2009. The 2008 legislation, passed in multiple supplemental bills, provided for four tiers of extended benefits. Tier 1 provided for 20 additional weeks, Tier 2 additional 14 weeks, Tier 3 13 additional weeks and Tier 4 6 additional weeks, for a total of 53 additional weeks. The EB act of 2009 provided for up to 20 additional weeks on top of that. To complicate matters, extended benefits in each state (and each tier) have different effective dates. Using the information provided by the Department of Labor (2010), we are able to determine how many weeks of unemployment benefits for which each unemployed worker is eligible. This information is used to measure with some degree of certainty whether an individual is eligible for benefits at any given time.

III.D. Labor Market Tightness

Ideally, job vacancies would be the best measure to proxy the effects of local labor market conditions. Unfortunately, job vacancies are not available at the state or local levels. However, the Bureau of Labor Statistics (2010c) collects unemployment claims resulting from mass layoffs is available by state and month. This measure has another benefit as it is not constructed from the unemployment rate. The problem, of course, with the unemployment rate is that it is endogenous to the search habits of unemployed workers. Thus, we use mass layoffs to serve as our proxy for tightness in the labor market. As mass layoffs increase, the probability of receiving a job offer decline. As a result, search intensity should decrease.

III.E. Expected Wage

Finally, for each unemployed worker we estimate a predicted real wage to proxy their expected offer conditional on search. This is simply a predicted wage for each worker conditional on their human capital and geographic location. To estimate the predicted wage, we run separate regressions for all men and women who are employed full time using data from the CPS outgoing interview file for the period 2003-2009. This resulted in 99,495 men and 96,456 women between the ages of 20 and 65 who reported earnings and were not full-time students. Regressors included age, age squared, dummies for the level of education, and dummies for the state of residence to control for variation in the cost of living across states. In addition, we also ran separate regressions for each sample year to generate the predicted wage for each worker. This allows for potential changes in the marginal returns to experience and education that may vary over time. It also controls for time-varying cost-of-living changes that will affect the market wage.

IV. Tobit Results

Because minutes spent searching as constructed from the ATUS data is censored at zero, the model cannot be estimated consistently via OLS. Instead, Tobit estimation must be used. The results of our estimation of equation 1, using the empirical proxies discussed in the previous section, are summarized in Table 1. Note that the Tobit coefficients reported in Table 1 represent $\partial E(y^*|x)/\partial x$ where y^* is the latent variable. It is common, however, to interpret the marginal effects in terms of their effect on the observed variable, *Y*. This also facilitates comparisons to coefficients obtained from OLS regressions. Thus, the marginal effect $\partial E(y|x)/\partial x = \beta_j \Phi x\beta/\sigma$ where $\Phi(\cdot)$ is the standard normal cdf. $\Phi x\beta/\sigma$ represents the adjustment factor that must be multiplied by each coefficient in order to interpret the marginal effects. We evaluate the adjustment factor at the means for all x_j. This adjustment factor is reported in Table 1.

Overall, the results support the general model. In particular, search intensity is negatively related to the likelihood of obtaining a job offer as proxied by announcements of mass layoffs. For every 10,000 workers laid off in a state, daily search decreases by about 6.2 percent ($\partial E(y|x)/\partial x = \beta_j \Phi x\beta/\sigma$ =-10.469*0.150=-1.547/25.991=6.1%), or about 11 minutes per week. This suggests there is a significant "discouraging" effect of large layoffs during times of deep recessions. At first blush the size of this effect appears small. However, layoffs of 10,000 workers in a given state and month is only slightly above the average for this period (8,594). In early 2009, for example, some states experienced monthly layoffs in the neighborhood of well in excess of 20,000 workers. Moreover, the induced decrease in search intensity does not account for cumulative effects.

Table 1: Tobit Regression Results

Dependent Variable: Search Time	*Mean=25.991*	*Adjustment Factor=0.150*	
Independent Variables	**Mean**	**Coeff.**	**Std. error**
Mass layoffs/10000	8,594	-10.469***	3.481
ln(S&P 500)	6.327	-85.843**	35.556
ln(Case-Shiller index)*homeowner	2.459	-7.647**	3.497
ln(Predicted wage)	11.010	133.757***	29.641
ln(Max weekly benefits)*UI eligible	2.800	3.272	4.112
On temporary layoff	0.152	-204.692***	29.233
Job leaver	0.027	27.656	45.846
Re- new entrant	0.363	-62.510**	25.018
Female	0.420	-14.459	23.491
Married	0.445	-76.844***	19.813
Female*Married	0.187	98.360***	28.558
Female*Children	0.185	23.265	35.714
Children	0.576	-23.994	24.646
Age	39.974	1.435	4.279
Age2/100	17.374	-2.486	5.224
Sigma		222.370***	10.390
Pseudo R^2		*0.045*	
Obs		*3129*	

Notes:
, **, and * denote significance at the 0.10, 0.05, and 0.01 levels, respectively.*
Both models also include controls for day of the week, month and whether it was a holiday.
Standard errors are constructed using the ATUS weights and are clustered by state of residence.

There is strong evidence that stock and housing prices alter search intensity. A decrease in stock prices (S&P 500) of 5 percent would increase search time by over 4 minutes a week. This translates into an elasticity of -0.50. While this appears small, recall that the stock market fell by about 50 percent in the first half of 2009. There is also evidence that unemployed home owners increase their search time if local housing prices fall. However, this effect is quite small with an estimated elasticity about one-tenth that of stock prices (-0.044). There are a couple of reasons why workers would respond relatively more to changes in stock versus housing prices. One, changes in stock prices are more evident to workers. Unlike the stock market, housing markets are far more localized, and current market information is difficult to ascertain. Two, even if

housing price information was as readily available to the public as stock market prices, homeowners likely would not respond quickly to changes in housing prices because real estate wealth is relatively illiquid. If unemployed workers intend to smooth consumption during unemployment periods by drawing down their wealth, then it makes sense that they would be relatively responsive to changes in stocks prices, but not housing prices.

There is also evidence that search intensity varies with changes in the expected returns to work. First, search is strongly related to one's expected wage offer. The elasticity with respect to increases in expected wage is 0.77. This is largely related to education, sex and experience. Surprisingly, search intensity is not significantly affected by the availability of unemployment benefits. Of course, theoretically, higher benefits should reduce search intensity.

Interestingly, the evidence that those with a higher opportunity costs of searching (higher marginal utility from leisure or household production) have lower levels of search intensity is somewhat mixed. Being married and the presence of children has essentially no effect on women's search time. Married men, however, search significantly less than unmarried men. The fact that married men are less likely to search than married women appears surprising at first. However, this result is consistent with recent findings by Gough and Killewald (2010). They find that unemployed men were more likely to shift their time to household production than unemployed women. This explanation is also consistent with recent work by Burda and Hamermesh (2009) on the effects of cyclical unemployment on housework. They found that in areas with high cyclical unemployment, the unemployed shifted more towards household production than to leisure.

While household characteristics have only mixed effects on search intensity, the reason one is unemployed strongly affects search. The omitted category consists of job losers who do not expected to be recalled to their previous job. Those who do expected to be recalled search

significantly less than these workers, about 30 minutes less per day. Given the mean search for the sample, these unemployed workers are essentially not searching, all else equal. Re- and new entrants into the labor market also search significantly less than job losers or job leavers. This group searches about one hour less a week on average. This result is not unexpected as these workers have already proven to be relatively less attached to the labor force than those who previously had a job. Finally, there is no evidence age plays a role in search intensity decisions. While age and age-squared had the expected signs, they are statistically insignificant. Nevertheless, it is somewhat surprising that there is little evidence those close to retirement are not decreasing their search intensity relatively more than younger counterparts. However, this does not account for decisions to merely retire early, and thus leave the ranks of the unemployed. Similarly, younger workers might be deciding to become full-time students in response to being unemployed during the recession.

IV. Sensitivity Analysis and Discussion

IV.A. Are Stock and Housing Prices Indicators of Wealth Effects or Supply Shocks?

The negative effects of stock and housing values on search intensity theoretically could represent either wealth effects or indicators of broader macroeconomic stability. As wealth effects, they would show that an individual's level of wealth acts to decrease search intensity in much the same way as unemployment insurance benefits. However, if a drop in the stock market is more of a signal of general macroeconomic conditions (or maybe expectations), then search intensity would decrease due to the expectation of a decreased likelihood of finding a job.

In order to sort out the true interpretation of these two factors, housing and stock prices, we estimate how the marginal effects on search intensity vary across the distribution of workers' wealth. Theoretically, wealth effects should have larger marginal impact on those with more

wealth. That is, a fall in stock market prices should have little or no effect on those with less wealth. On the contrary, those workers with large assets should be much more responsive to such effects. If changes in the stock market indicate general macroeconomic conditions, workers with lower expected wages should respond more negatively to such news because the demand for their skills is more likely to decrease, leading to fewer vacancies than those with higher skills. In other words, those with higher predicted wages (more wealth) should respond less to changing labor market conditions, but more to a precipitous loss in their personal or household wealth.

As a simple test for this, we generate the marginal effects of changes in housing prices and stock prices at different levels of predicted wages. These results are summarized in Table 2. As we see, increases in both stock and housing wealth affect workers with higher predicted wages relatively more than those at the lower end of the distributions. The results are consistent across the percentiles and both explanatory variables. Together, these results are strongly supportive of the "wealth effect" interpretation. That is, as stock and housing prices fall, wealth falls, increasing the time devoted to job search. Thus, it appears that these variables are not merely proxying changes in labor market conditions that affect the probability of receiving a job offer. Those effects are captured uniquely by the announcements of mass layoffs (see Table 1).

Table 2: Marginal effects by expected wage on the search time

	Percentiles based on the individual's predicted wage				
***dy/dx* with respect to:**	**10**	**25**	**50**	**75**	**90**
ln(S&P 500)	-11.787**	-15.217**	-19.062**	-23.241**	-28.839**
ln(Case-Shiller Index)	-1.050**	-1.355**	-1.698**	-2.070**	-2.391**

Notes:
, **, and * denote significance at the 0.10, 0.05, and 0.01 levels, respectively.*

IV.B. Implications for the Cyclicality of Search Intensity

One of the most interesting puzzles in the recent search literature is the acyclicality of search intensity observed by Shimer (2004) (see Figure 2). The results above help to uncover at least one possible explanation for this. Taken together, the combination of increasing layoffs that decrease search intensity, and falling wealth which increases search, counteract each other. The large increases in housing and stock wealth leading up to 2008 led to a decrease in search intensity, even given the relatively steady job market. After the start of the financial crisis in 2008, there were unprecedented drops in wealth. The housing market and stock markets stabilized in 2009, while the job market worsened. The dramatic increase in layoffs, then, resulted in a decrease in search intensity, even while the percent of the unemployed actively searching increased.[7]

V. Conclusion

In this paper we have investigated the search intensity of searching unemployed. Using data from recent time-use surveys, we are the first to document the variation in search intensity in response to a number of recent, large-scale macroeconomic events including stock and housing market collapses, and mass layoffs. In the process, the paper makes a number of contributions to the literature on job search intensity of the unemployed.

First, our research establishes how search intensity responds to non-idiosyncratic macroeconomic shocks. We find strong evidence that the searching unemployed decrease their search intensity significantly in response to mass layoffs in their state of residence. We also find evidence of wealth effects. In particular, the unemployed respond rather strongly to changes in stock market values, and weakly to changes in local housing market conditions. As stock values decline, unemployed workers respond by increasing the intensity of their job search, all else

equal. These wealth effects intensify in individuals with a higher expected wage, further supporting the interpretation that these represent true wealth effects rather than indicators of general labor market conditions.

Second, more broadly these results offer insight into the acyclicality of search intensity cited previously by Shimer (2004). The story of wealth and substitution effects that comes from our results is much richer than that of the standard aggregate model typically used in the literature, and may have important implications for policy makers. Searching unemployed appear to respond as expected to decreases in the demand for labor. As mass layoffs increase, searchers decrease their intensity due to the diminished expected probability of obtaining a job offer. This effect in isolation would indicate the pro-cyclicality of job search. However, wealth also varies across the business cycle and search responds to changes in wealth. When stock values fall, search intensity increases. This accounts for the large increase in search intensity observed in 2008 at the beginning of the Great Recession. Thus, the net effect during these months was indicative of a counter-cyclical effect of search intensity. However, as stock values stabilize as the recession progresses, the wealth effect becomes less prominent. On the contrary, layoffs continue to increase, leading to subsequent drops in search intensity.

Finally, this paper can be seen as offering evidence to inform future general equilibrium models of search intensity. Most obviously, search intensity is neither exogenous nor invariant as is assumed in standard labor search models. The fact that search intensity responds to changes in asset prices across the business cycle has implications for the modeling of search intensity in real business cycles models. Incorporating worker heterogeneity should be particularly interesting when considering search intensity in response to changes in policy, such as changes in fiscal policy or tax reform.

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VII. Notes

[1] Calculated using Table A-1 and A-15 from Monthly Employment Situation Report.

[2] There have been a number of papers that model the effects of search intensity over the business cycle on certain labor market outcomes such as the matching function (see Merz 1995, Andolfatto 1996, Gautier 2007, and Shimer 2008).

[3] In his paper, he uses data from the Current Population Survey (CPS) from 1994-2004. However, there are limitations to using the CPS in this regard. The CPS records worker responses regarding the types of search they used. Search intensity is defined somewhat narrowly as the number of search tasks undertaken in efforts to secure employment, such as searching for employment in the newspaper, or interviewing for a job. Moreover, the CPS does not measure the actual time spent on these search activities.

[4] Krueger and Muller (2010) implicitly make this same assumption to estimate effects of UI benefits on search intensity.

[5] Job search technology also affects the probability of obtaining an offer conditional on search. The internet has reduced the cost to post and apply for a particular vacancy. The total amount of help-wanted ad space has decreased during the last 10 years as the unemployed and firms substitute away from the relatively more expensive newspaper ads to electronic ones. The economic recovery from the 2001 recession has virtually no increase in the column square inches of ad space. This is likely due to the increase in internet penetration rates from 1992 recession to the 2001 recession. Internet penetration rates increased from 1.7 percent of Americans with Internet access to 59.8 percent (World Bank 2011). Both of these features support an increasing efficiency of job search over time but not cyclicality over the business cycle. Before 2001, newspapers ads were negatively correlated with business cycles.

[6] All descriptive statistics are weighted using the weights provided by the ATUS 2003-09 (tufnwgtp).

[7] We ran the model under multiple specifications, including one in which the sample only included months in which a state had no mass layoffs reported. The results still indicated strong wealth effects with respect to the S&P 500 and housing values, consistent with our results in Table 1. However, the sample size for this subset was dramatically smaller, and thus not reported.