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REALITY OF ON-THE-JOB SEARCH

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Reality of On-the-Job Search*

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Abstract

This paper provides a set of simple, yet overlooked, facts regarding on-the-job search and job-to-job transitions using the UK Labour Force Survey (LFS). The LFS is unique in that it asks employed workers whether they search on the job and, if so, why. I find that workers search on the job for very different reasons, which lead to different outcomes in both mobility and wage growth. A nontrivial fraction of workers engage in on-the-job search due to a fear of losing their job. This group mimics many known features of unemployed workers, such as wage losses upon finding a job. Workers also search on the job because they are unsatisfied. This group is roughly equally split into those who are unsatisfied with pay and those who are unsatisfied with other aspects of their job. Distinguishing these two groups allows me to highlight the importance of the nonpecuniary value of a job. I further show that the evidence that firms make a counteroffer in response to a worker's outside offer is scarce and that wage outcomes at the time of job-to-job transitions are closely linked to the worker's outside option. The evidence in this paper contributes not only to deepening our understanding of labor reallocation, but it also suggests the fruitful directions of future research in the labor search literature.

JEL codes: J31, J62, J64.
Keywords: On-the-job search, job-to-job transitions.

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1 Introduction

Job-to-job transitions are considered one of the key economic processes whereby labor is reallocated toward more productive uses (Topel and Ward (1992)). Traditional labor search models assume that job search is a distinct activity and thus "unemployment" is the only state in which a worker can look for a job. Researchers have long recognized the limitation of this approach. Recent literature puts more and more emphasis on on-the-job search (OJS) and job-to-job transitions by extending the traditional approach. One reason for this trend is the simple fact that job-to-job transitions account for a majority of labor market transitions. However, one key problem of the literature, in my view, is that it lacks the *direct* empirical assessment of OJS behavior and its relationship to observed job-to-job transitions. This paper fills this important gap by providing a comprehensive picture of OJS and job-to-job transitions using the UK Labour Force Survey (LFS). This data set is unique in the sense that it asks employed workers whether they engage in OJS and, if so, why every quarter.

There is now a relatively rich literature that brings together search models with OJS and the labor market data. This sometimes takes the form of structural estimation, and the estimated model is often used for policy experiments. However, misspecification of the model could result from the lack of knowledge about simple facts on OJS, biasing the parameter estimates, which in turn affects its quantitative (thus policy) implications. This seems to be a legitimate concern, at least a priori, especially because models of OJS sometimes rely on rather stark assumptions. For example, the literature that has evolved from Burdett and Mortensen (1998) often features the equilibrium mechanism, by which poaching is the source of wage growth and differentiation of the same workers.[1] In another branch of the literature (Mortensen (1994) and Pissarides (2000, chap.4)), which is oriented more toward macroeconomic issues, researchers often make the no-recall assumption that when an employed worker receives an outside offer and negotiates with the new employer, the worker's outside option is the value of unemployment (not the value of employment at the current firm). Furthermore, none of the existing papers (as far as I know) consider basic moments such as what fraction of employed workers are looking for a job and what the job finding rates of these workers are. Thus, providing the basic facts regarding OJS, job-to-job transitions, and wage transitions not only contributes to a better understanding of the labor reallocation process but also helps to suggest fruitful directions of future quantitative and theoretical work in the literature.

This paper is related to the empirical literature that analyzes labor market flows.[2] For the US, Fallick and Fleischman (2004) present the first comprehensive results on job-to-job transitions based on the Current Population Survey (CPS). They also present a one-shot picture of the OJS behavior of employed workers, using the CPS's supplemental data. Information the supplemental data covers only a short time window and is quite limited in its contents. Nagypal (2008) measures job-to-job transitions using the Survey of Income and Program Participation (SIPP). She breaks down job-to-job transitions by the different

[1] The literature includes Postel-Vinay and Robin (2002), Cahuc et al. (2006) and Yamaguchi (2010).

[2] The discussion here focuses on the research that pays at least some attention to job-to-job transitions.

reasons for transitions. However, the SIPP does not include information regarding OJS behavior.[3] For the UK, Bell and Smith (2002) and Gomes (2009) also use the LFS and do present some basic facts on OJS and job-to-job transitions observed in the LFS. However, these papers are meant to provide an overview of the UK labor market and thus do not undertake an in-depth analysis. There is another branch of literature that studies OJS in the 80s and early 90s (e.g., Black (1981), Kahn and Low (1984), Holzer (1987), and Parsons (1991) for the US and Pissarides and Wadsworth (1994) for the UK). These studies focus mostly on the determinants of the OJS decision. On the other hand, this paper looks at much broader issues. One of the issues I pay a close attention to is the implications of OJS on workers' wage transitions. This is important for at least two reasons. First, as found by a seminal paper by Topel and Ward (1992), job-to-job transitions explain a significant portion of earnings growth over workers' career. They argue that their finding suggests the importance of search frictions in labor market allocation. Linking OJS behavior with wage transitions allows me to shed further light on this important finding. Second, the wage determination mechanism is an integral part of modern theories of OJS as I alluded to in the previous paragraph.

The next section first presents the basic facts regarding OJS and associated worker transitions after describing the underlying data, the LFS. On average, roughly 4% of the working-age population in the UK engaged in OJS over the period between 2002Q2 and 2009Q1. Among those who search on the job, roughly 12% do so because they are afraid of losing their job; 50% do so because they are unsatisfied with their job.[4] Importantly, this group is further split roughly *equally* into two groups: those who are unsatisfied with pay and those who are unsatisfied with other (nonpecuniary) aspects. Throughout this paper, I emphasize how different the outcomes of OJS are between these different groups of workers. Note also that job-to-job transitions occur without OJS. However, the job-to-job transition rate of those who search is dramatically higher than that without OJS (12.3% vs. 1.5% per quarter). Note that this finding, together with the fact that a relative small fraction of employed workers undertake OJS, suggests that OJS is costly. I also find that the job loss rate (the employment-to-unemployment transition rate) is significantly higher for those who engage in OJS. This is true not only for afraid OJS workers but also for unsatisfied OJS workers.[5]

Section 3 runs multinomial regressions for transition outcomes (job-to-job transitions, stay at the same firm, become unemployed, and drop out of the labor force) using the sample of employed workers, controlling for workers' observable characteristics including their OJS status by reasons. The regressions allow me to estimate how the relationship between the OJS status and mobility pattern differs by these observable characteristics, among which I focus on firm tenure and firm size. It is known that worker separation rates decline with firm tenure (e.g., Anderson and Meyer (1994)). I find the same relationship among on-the-job seekers, but the relationship is much more pronounced. Short-tenure workers who are

[3]Another related paper for the US labor market includes Bjelland et al. (2008).

[4]The remaining fraction corresponds to "other reasons." This paper concentrates on the afraid group and the unsatisfied group.

[5]Note that this last fact, while not surprising, implies some history dependence on the evolution of match quality, which is often neglected in theories of OJS.

engaged in OJS have very low job retaining probabilities: OJS workers with a fear of losing their job have the lowest job retaining probability (e.g., 35% for workers with a tenure of less than 3 months). The same is true for unsatisfied OJS workers. Their job retaining probability is much higher (e.g., 65% for workers with a tenure of less than 3 months) compared with afraid OJS workers but is much lower than that of those who do not search (which is roughly 90% when tenure is less than 3 months). Recent theories of OJS often use differences in firm productivities as a driver of job-to-job transitions. The LFS does not include information on firm productivities. However, it does ask about each worker's firm size. I find only weak evidence that OJS workers at smaller firms have higher separation probabilities.

Section 4 considers how the OJS status itself is related to observable characteristics. Again, the discussion focuses on firm tenure and size. I find a hump-shape pattern in the probabilities of becoming unsatisfied on-the-job seekers; the probability of engaging in OJS slightly increases for the first year and then sharply drops after 2-5 years of tenure. This pattern is consistent with the idea that learning about the match quality takes some time. On the contrary, the probability of becoming afraid on-the-job seekers declines monotonically over firm tenure. This finding, together with the monotonically increasing job retaining probability of these afraid OJS workers, conforms well with the earlier literature that reports the incidence of multiple job losses of short-tenure workers (e.g., Stevens (1997)).

Section 5 moves on to the analysis of wage transitions. My attempt here is to infer some wage implications of OJS not only on job-to-job movers but also on stayers who have a recent history of undertaking an OJS. The analysis of stayers is motivated by some theories of OJS, in which firms can respond to offers made to their workers. In particular, a worker can reject the outside offer, as a result of a pay raise at the current firm. It is not possible for me to directly test this implication, since the LFS does not contain any information regarding job offers. However, I can ask the following question: *Are stayers with a recent history of continuous OJS systematically paid better than stayers without OJS?* First, I find weak evidence supporting this hypothesis. However, when the firm-size effect is incorporated into the regressions, the relationship largely disappears.[6] This confirms the anecdotal evidence that firms tend not to respond to outside offers.

On the other hand, job-to-job movers experience statistically significant larger wage gains (compared with stayers who do not have a recent history of OJS) as found by Topel and Ward (1992). However, I find large heterogeneity between different groups of job-to-job movers. First, job-to-job transitions associated with a fear of job loss result in wage loss, which is consistent with the findings in the literature that looks at the earnings transitions of displaced workers (e.g., Ruhm (1991) and Jacobson et al. (1993)). Second, the wage gains of the two groups within unsatisfied OJS workers differ considerably. Not surprisingly, the workers who are unsatisfied with their pay experience large wage gains. While those unsatisfied with nonpecuniary aspects also experience wage gains, but the size is roughly 40% lower than those of the first group. I also find that wage gains associated with job-to-job transitions without OJS are even smaller. This finding conflicts with a view that talented workers move to high-paying jobs without explicit OJS. These results are robust with respect

[6] In this section, I exclude afraid OJS workers from the analysis and focus on unsatisfied OJS workers.

to the inclusion of the firm effect. The heterogeneity highlighted here suggests that tightly linking job-to-job transitions with wage gains represents an overly simplified view of labor markets. In fact, the literature has shown that models with OJS have difficulties accounting for observed wage losses upon job-to-job transitions (e.g., Postel-Vinay and Robin (2002) and Connolly and Gottschalk (2008)). One explanation offered in the literature is that a worker accepts wage cuts upon job-to-job transition when moving to a more productive firm that offers larger room for future pay increases. The finding here suggests that the simple fact that there are a large number of OJS workers with a fear of losing their job or who are unsatisfied with the nonpecuniary value of their job constitute one of the main reasons for observed wage cuts upon job-to-job transitions.[7] In the main text, I further discuss the implications of these findings. Section 6 concludes the paper by suggesting directions of future research.

2 Data and Basic Facts

Analysis of this paper uses the Labour Force Survey (LFS) for the UK. The LFS polls around 50,000 private households every quarter regarding various socioeconomic and employment issues, including age, ethnicity, gender, employment status, tenure, occupation, industry, and whether and why an individual is looking for a new job. The last two pieces of information are the key ingredients of this paper. The survey is conducted by the Office of National Statistics (ONS). The quarterly survey generally covers a sample of around 120,000 individuals and is used for the UK official monthly labor market statistics such as the unemployment rate.

An important feature of the LFS is that respondents continue to partake in the questionnaire for five consecutive quarters.[8] While the main use of the LFS is to provide monthly labor market statistics for the UK using the cross-sectional information, the ONS recognizes the usefulness of the longitudinal aspect of the survey and thus releases two- and five-quarter linked data sets, on which my results are based. Every cross-sectional data set is matched with the data set one or four quarters ahead using a personal identification variable. The individuals that could not be matched are dropped from the longitudinal data sets. Population weights are calculated separately for each longitudinal data set so that each data set is nationally representative on its own.[9] Each of the two-quarter and five-quarter longitudinal data sets includes roughly 45,000 and 7,500 observations, respectively. Most of the analyses below restrict the sample to males who are 25 years of age or older. Note that earnings are asked only in the incoming and outgoing quarters (i.e., respondents' first and fifth interviews). My analysis in Section 5 uses the five-quarter datas sets since wage transitions are the main focus in that section. The two-quarter data set is used in the rest of the paper.

[7]The importance of the amenity value of a job is also emphasized, for example, by Nosal and Rupert (2007) and Bonhomme and Jolivet (forthcoming)

[8]There are five rotation groups in the survey. Within each rotation group, respondents are distributed uniformly across the three-month period. Each respondent participates in the survey every three months.

[9]Clarke and Tate (1999) discuss various measurement issues in constructing the longitudinal data sets and how the ONS deals with them.

Table 1: Labor Market Status

	Employed		Unemployed	Out of
	No Search	Search		Labor Force
Total	0.705	0.041	0.042	0.212
		(0.055)		
Male, 25 or older	0.789	0.043	0.038	0.136
		(0.050)		

Notes: Expressed as a fraction to the working-age population. Fraction to total employment is in parentheses. Based on two-quarter longitudinal data set of the Labour Force Survey. Sample period: 2002Q2–2009Q1. Sample size: 1,172,930 (all), 501,158 (25+ males).

The sample period starts in 2002Q2 for both data sets, since the consistent information is available from that point on without any breaks in the data. The last observations for the two-quarter and five-quarter longitudinal data sets are for 2009Q1 and 2009Q4, respectively.

2.1 Basic Facts on OJS

In this section, I provide a set of summary statistics. Since the overall picture of worker flows in the UK is already well known (e.g., see Bell and Smith (2002), Gomes (2009), and Smith (2010)), I focus exclusively on transitions relevant to the OJS behavior.

First, Table 1 presents the population weights of the four labor market statuses: searching while employed, employed with no search, unemployed, and out of the labor force. According to the data, roughly 4% of the working-age population in the UK engage in active job search while employed. One way to appreciate the size of this group may be to compare it with the size of the unemployment pool. From this perspective, it is roughly the same size as the unemployment pool. The direct implication of the fact that only a small fraction of workers engage in OJS is that OJS is quite costly. If OJS were not costly, then everybody would always engage in OJS, seeking better opportunities.

As mentioned above, there is no official data source in the US that regularly asks about OJS activities. But the supplements to the February 1997 and February 1999 CPS (Current Population Survey) collected some information regarding OJS behavior. Using the information, Fallick and Fleischman (2004) report that 4.4% of employed workers search on the job. The corresponding share for the UK is 5.5%. Given the differences in the sample periods between the two data sets, the two numbers are largely in line with each other. Also observe in Table 1 that males who are 25 years of age or older have a somewhat smaller share of on-the-job seekers relative to employment. This makes sense in that this group typically has a stronger attachment to their employer.

Next, Table 2 presents the breakdown of OJS by reasons. The on-the-job seekers are split

Table 2: Distribution of Reasons for On-the-Job Search

	Afraid of losing job	Unsatisfied with pay	Unsatisfied with other	Other reasons
Total	0.124	0.210	0.267	0.399
Male, 25 or older	0.132	0.239	0.279	0.349

Notes: The "unsatisfied with other" category includes (i) journey unsatisfactory in present job, and (ii) other aspects of present job unsatisfactory. The "other reasons" category includes (i) present job to fill time before finding another, (ii) wants longer hours than in present job, and (iii) wants shorter hours than in present job. Sample period: 2002Q1–2009Q1. Sample size: 44,512 (all), 19,465 (25+ males).

into four categories, depending the reason for search.[10] There are a couple of interesting facts. First, a nontrivial fraction of workers engage in OJS because they are afraid of losing their job. This reason is economically very different from the other groups of on-the-job seekers. For example, reservation wages of these workers would be lower. This issue will be discussed in Section 5. Existing theories of OJS and job-to-job transitions do not deal with these economically different workers. The omission can be a source of misguidance of any policy implications derived from the model. Another important piece of information in this table is that the group of unsatisfied on-the-job seekers is equally split into those who are unhappy about pay and those who are unhappy about the nonpecuniary aspects of their job. Existing theoretical models of labor turnover typically abstract away from the fact that workers can trade off wages for amenities or vice versa.[11] Throughout this paper, I will elaborate on the heterogeneities between on-the-job seekers and nonseekers and between the different groups of workers within on-the-job seekers.

2.2 OJS and Worker Transitions

Table 3 looks at unconditional transition probabilities. The table reports the quarterly transition rates of each type of workers in each row into the labor market status in each column. The result further illustrates the heterogeneities across different types of worker in terms of the transition outcomes. First, consider the difference between those who search and do not search. The job finding rates for these two groups greatly differ from each other (12.3 % vs. 1.5%). This implies that the search intensity (search vs. no search) matters a lot. Another interesting fact is that the transition rates into unemployment are also higher for those who search on the job. This pattern can be consistent with a situation in which the current match quality (or productivity) evolves over time with history dependence. Suppose that the match quality deteriorates gradually over time and that the worker engages in OJS.

[10] The original choices includes seven reasons. See notes to Table 2 for how I reclassify them.

[11] Of course, it is not that the literature completely ignores the importance of nonpecuniary aspects. I will discuss this later in the paper.

Table 3: Unconditional Transition Rates

Status in t		Outcome in $t+1$: Same Job	New Job	Unemployed	Inactive
Employed	No Search	0.967	0.015	0.008	0.009
	Search	0.816	0.123	0.046	0.015
	Afraid	0.650	0.183	0.137	0.031
	Unsatisfied (pay)	0.861	0.103	0.028	0.008
	Unsatisfied (other)	0.869	0.097	0.025	0.008
	Other Reasons	0.806	0.136	0.040	0.018

Notes: Males, 25 years of age or older. Based on two-quarter longitudinal Labour Force Survey. Sample period: 2002Q1–2009Q1. Transition rates are calculated by dividing each worker flow from one state in t to another state in $t+1$ by the stock of workers in the originating state in t. See notes to Table 2 for more details on reasons for OJS.

In this case, it is possible that before finding a new job, the match quality deteriorates further to the point where separation into unemployment occurs. Note that this type of evolution of match productivity is excluded when match productivity follows the Poisson process, which is often assumed in the literature.

The following four rows in Table3 present transition rates by different reasons. First note that the higher transition rate into unemployment for all on-the-job seekers does not simply result from the higher employment-to-unemployment transition rate of afraid workers. Even among unsatisfied on-the-job seekers, this pattern holds. Next, observe that afraid workers not only have a higher transition rate into unemployment but also a higher transition rate into a new job, compared to the other groups. There are at least two possible explanations for this. First, reservation wages for afraid workers are lower and consequently, new job offers are more likely to be accepted. Another contributing factor could be that search intensity of these workers is higher. Lastly, the two unsatisfied groups, whether in regard to pay or other aspects, are similar with respect to the transition rates. As I will show later, however, these two groups differ significantly with respect to their wage transitions.

Note also that researchers sometimes make loose connections between quitting a job and job-to-job transitions, and between layoffs and employment-to-unemployment transitions. Table 3 highlights the fact that these connections often fail to hold.[12] For example, workers who are afraid of losing their job make job-to-job transitions at a much higher rate than other groups. It is far-fetched to call these transitions "quits." Similarly, those who look for another job while employed have a much higher chance that they separate into unemployment. This flow corresponds to "quits into unemployment." Note that the size of these flows are not trivial and that their omission can be another source of misspecification of the model.

[12]Nagypal (2008) also makes this point based on the reasons for job separations using the SIPP data for the US.

Table 4: Average Predicted Transition Rates: No Search vs. Search

Status in t	Outcome in $t+1$			
	Same Job	New Job	Unemployed	Inactive
Not Searching	0.968	0.016	0.008	0.009
	(0.002)	(0.001)	(0.001)	(0.001)
Searching	0.861	0.092	0.032	0.016
	(0.007)	(0.006)	(0.003)	(0.002)

Notes: Males, 25 years of age or older. Averages of all workers' predicted transition rates in the sample. Standard errors are in parentheses and calculated by the delta method. R^2= 0.103; sample size: 312,438; sample period: 2002Q2 to 2009Q1.

3 Conditional Evidence

I now estimate transition probabilities using the multinomial logit model, controlling for workers' observable characteristics. I then discuss how the transition probabilities vary systematically with some of the important observable characteristics by computing average predicted probabilities. I use the two-quarter longitudinal data set and the sample of males of 25 years of age or older who are employed in the first period t of the two. The dependent variable is the labor market status in $t+1$. Let $s_i \in \{E^s, E^n, U, N\}$ be the labor market state of individual i in $t+1$. Each element represents (i) employed at the same job, (ii) employed at a different job, (iii) unemployed, and (iv) not in the labor force, respectively. I estimate the following multinomial logit model with the four outcomes:

$$p_{ij} = \Pr(s_i = j) = \frac{e^{X_i' \phi_j}}{\sum_{s_i=j} e^{X_i' \phi_j}}. \tag{1}$$

where X_i is a vector of observable characteristics in the first period, including the worker's search status and ϕ_j is a vector of coefficients on X_i for outcome j. The variables in X_i are: time dummies, education dummies (7 categories), firm size (5 categories), firm tenure (8 categories), age, age squared, industry dummies (10 categories), and occupation dummies (9 categories). First, to illustrate the heterogeneity that I pointed out in the previous section, I first estimate the model splitting the employed workers into only two groups, those who engage in OJS and those who do not in t, and then estimate the model where the OJS group is split into three groups: (i) those who are afraid of losing their job, (ii) those who are unsatisfied with their job, and (iii) those who engage in OJS for other reasons. Here, those who are unsatisfied with pay and other aspects are lumped together since there were no noticeable differences between these two groups in terms of average predicted transition probabilities.

Table 5: Predicted Average Transition Rates by Reasons for OJS

Status in t		Outcome in $t+1$: Same Job	New Job	Unemployed	Inactive
Not Searching		0.968	0.016	0.008	0.009
		(0.002)	(0.001)	(0.001)	(0.000)
Search	Afraid	0.714	0.155	0.099	0.032
		(0.015)	(0.012)	(0.009)	(0.004)
	Unsatisfied	0.885	0.085	0.020	0.011
		(0.007)	(0.006)	(0.002)	(0.001)
	Other Reasons	0.879	0.080	0.023	0.019
		(0.007)	(0.006)	(0.004)	(0.002)

Notes: Male, 25 years or older. Averages of all workers' predicted transition rates in the sample. Standard errors are in parentheses and calculated by the delta method. R^2= 0.107; sample size: 312,438; sample period: 2002Q2 to 2009Q1.

3.1 Average Predicted Transition Rates

Table 4 reports the average predicted transition probabilities across all employed workers.[13] Compared with the first two rows in Table 3, conditioning on the observable characteristics does not alter the overall result: transition probabilities differ dramatically, depending on whether or not workers engage in OJS, although the exact figures change significantly (especially for those who search).

Table 5 shows the predicted average transition rates by reasons for OJS. Again, the results are little changed compared with the unconditional results. This rules out the possibility that the unconditional pattern is driven by the correlation between the search status and some other observable characteristics (say, the afraid OJS group is entirely represented by less-educated workers).

3.2 Firm Tenure and Size

Having estimated the multinomial logit model, I now examine how the transition probabilities vary with observable characteristics. I focus on the two variables: firm tenure and firm size. It is well known that the job separation rate declines with firm tenure (Anderson and Meyer (1994)). I further look into how this empirical regularity is related to OJS. Note also that recent theories of OJS emphasize that job-to-job transitions entail that workers move from low productivity firms to high productivity firms (e.g, Postel-Vinay and Robin (2002)). Because the theories often have a tight link between the productivity level and firm size

[13]Note that these are calculated as averages of predicted probabilities of individual workers, which differ from transition probabilities of the average individual because of the nonlinearity of the multinomial logit model.

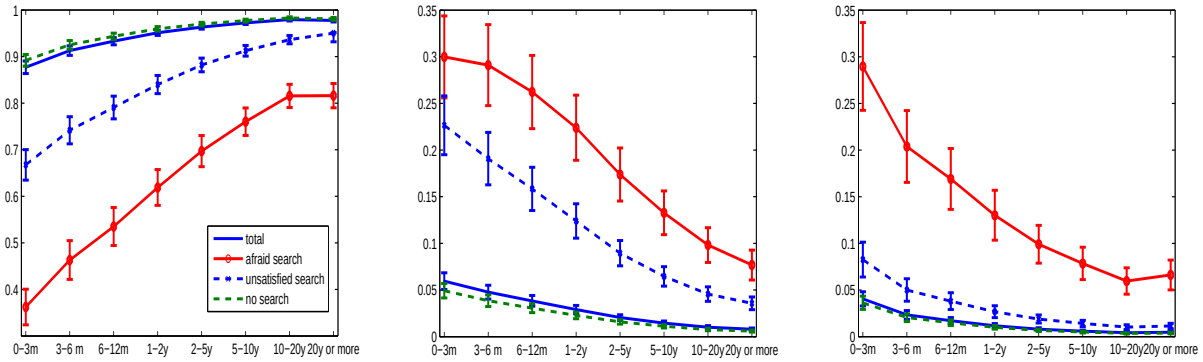


Figure 1: Predicted Transition Rates by Firm Tenure

Notes: Predicted average transition rates for each group of workers. The bars around the lines represent the 95% confidence intervals. Also see notes to Table 5. "Total" refers to all employed workers.

(e.g., Moscarini and Postel-Vinay (2008)), I use the firm-size variable to see how strong the link between firm-size variable and the job-to-job transitions is. The analysis focuses on the following three transition probabilities: (a) stay at the same firm, (b) move to a new job, and (c) become unemployed.

First, Figure 1 presents three transition rates by tenure. Panel (a) shows that the probability of staying at (leaving) the firm increases (declines) almost monotonically, as Anderson and Meyer (1994) report for the US labor market. However, underlying this pattern are large differences between workers who are engaged in OJS and who are not engaged in OJS, and within the group of on-the-job seekers.[14] In particular, short-tenure workers that are afraid of losing their job are retained at very low probabilities. For example, the job retention rate of the afraid workers with tenure of less than 3 months is less than 40%. The same is true for unsatisfied low-tenure workers although the retention rates are higher across all tenure lengths.

The papers that rely on administrative records, including Anderson and Meyer (1994), often do not distinguish between the different types of separations (e.g., job-to-job transitions vs. employment-to-unemployment transitions). Panels (b) and (c) of Figure 1 graph two of the three components of separations: separation into a new job and separation into unemployment. The two panels show that very high separation rates among short-tenure workers who are afraid are divided roughly equally into job-to-job transition rates and employment-to-unemployment transition rates. On the other hand, the separation rates among the unsatisfied OJS workers disproportionately come from job-to-job transition rates.

As a summary of Figure 1, I would like to stress one important point. As I mentioned

[14]In the figure, "total" refers to the average transition rates for all employed workers, including those with and without OJS. In terms of the number of transitions, those associated with workers who are not engaging OJS dominate, and thus "total" is close to "no search."

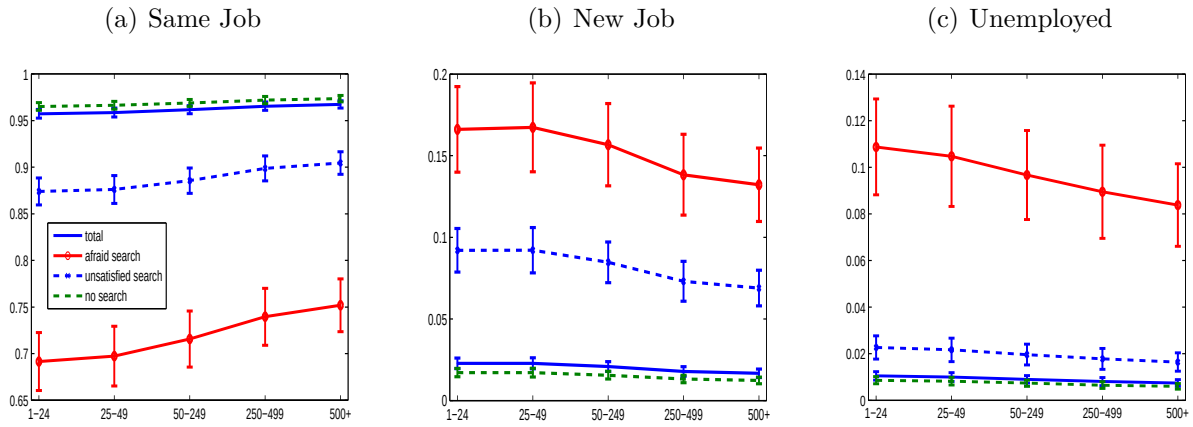


Figure 2: Predicted Transition Rates by Firm Size

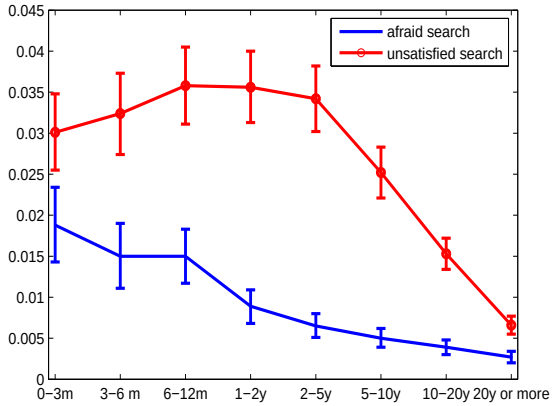
Notes: Predicted average transition rates for each group of workers. The bars around the lines represent the 95% confidence intervals. Also see notes to Table 5.

before, the existing empirical literature has already shown the monotonic increase in the retention rates as job tenure becomes longer. However, the upward trend in the retention rate is much more dramatic among those who search on the job. Observe that the blue solid line, which represents the retention rates for all employed workers, is quite close to the green dashed line, which represents the retention rates for workers who do not search. This implies that, in terms of the size of turnover, separations associated with workers without OJS are dominant. However, if the OJS activity embodies a resource cost necessary for a more efficient labor allocation, worker transitions resulting from OJS would be more economically relevant than those without OJS. In this regard, the dramatic differences in the retention rates among on-the-job seekers across all tenures entails an economically important finding. Furthermore, as I will show in Section 5, the wage transitions of workers with OJS are considerably different from those of workers who are not involved in OJS.

Figure 2 breaks down the transition rates by firm size. Overall, it is clear that the relationship between transition rates and firm size is not tight. Again, workers with OJS (afraid and unsatisfied OJS) are much more likely to separate from their employers. The destination of afraid OJS workers is roughly equally divided into a new job and the unemployment pool, whereas unsatisfied OJS workers are much more likely to land in a new job rather than the unemployment pool. However, there is little discernible pattern in relation to firm size. For example, although there is a slight tendency for retention rates to increase with firm size, statistical significance is quite weak as can be inferred from the wide overlapping error bands.[15]

[15] Anderson and Meyer (1994) also look at the firm-size effect estimating the linear probability models and find that, relative to the largest firm-size category (2,000 workers or more), workers at smaller firms have higher separation rates that are statistically significant. However, within the categories comparable to the size categories available in the LFS, the firm-size effects are quite small. In this sense, the result in this paper is consistent with theirs.

(a) Firm Tenure



(b) Firm Size

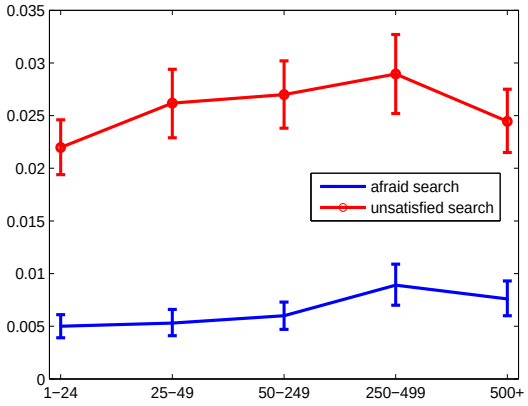


Figure 3: Predicted OJS by Firm Tenure and Size

Notes: Predicted average probabilities for each group of workers. Bars around lines represent the 95% confidence intervals. See also notes to Table 5.

4 Who Looks for Jobs?

In the previous section, I focused on how transition rates are related to the existence of OJS and its reasons. This section analyzes the characteristics of those who engage in OJS. This issue has been studied by several researchers in the 80s and early 90s.[16] The analysis here is, therefore, relatively brief.

Using the same two-quarter longitudinal LFS data, I estimate another multinomial regression, where the multiple OJS statuses (i.e., no OJS, afraid OJS, unsatisfied OJS, and OJS for other reasons) are regressed on observable characteristics that include the same observable variables as in the previous section: time dummies, education dummies, firm size, firm tenure, age, age squared, industry dummies, and occupation dummies.

4.1 Relationship with Firm Tenure and Size

As in the previous section, I focus on the predicted probabilities by firm tenure and size. Figure 3 plots the predicted probabilities of engaging in afraid OJS and unsatisfied OJS. Panel (a) shows that these two groups differ considerably in terms of their relationship with tenure: The probability of afraid OJS is declining almost monotonically in tenure, whereas that of unsatisfied OJS follows a hump-shaped pattern. The pattern of afraid OJS is consistent with the idea of multiple job losses of short-tenure workers (Stevens (1997)) when combined with the result in Figure 1 that afraid workers are much more likely to transit to the unemployment pool or another job. On the other hand, the hump-shaped pattern is

[16]These studies include Black (1981), Kahn and Low (1984), Holzer (1987), and Parsons (1991) for the US and Pissarides and Wadsworth (1994) for the UK. The last paper also uses the LFS, but the authors do not look into the underlying reasons for OJS.

consistent with initial learning about the match quality and selection over time, which is also emphasized by Pissarides and Wadsworth (1994), although they do not distinguish between different reasons for OJS.

Next, panel (b) reports the relationship with firm size. The pattern is not as strong as in the case of tenure. However, the probabilities of OJS show an upward tendency with respect to firm size up to the 250-499 category. The upward tendency is stronger for unsatisfied OJS. Note that this result disagrees, at least within the categories of firm sizes less than 500, with the idea that workers at smaller firms are more likely to search in oder to gain employment at a larger firm.[17] Where is this increasing OJS probabilities with firm size coming from, especially for unsatisfied OJS? To shed more light on this, I reestimate the multinomial logit regression with five (instead of four) outcomes where unsatisfied OJS is further split into those who are unsatisfied with pay and those who are unsatisfied with other aspects of their job.

4.1.1 Unsatisfied with Pay vs. Unsatisfied with Other Aspects

Figure 3 presents predicted OJS probabilities for these two unsatisfied OJS groups by tenure (panel(a)) and by firm size (panel (b)). The former exercise could potentially be revealing if one expects that the learning story, mentioned above, applies more to nonpecuniary aspects of a job (firm culture, colleagues, etc), as mentioned by Pissarides and Wadsworth (1994). The results in the panel are weak along this dimension. It is, however, true that the hump-shape is somewhat more pronounced for the probabilities of being unsatisfied with other aspects, at least at the point estimates.

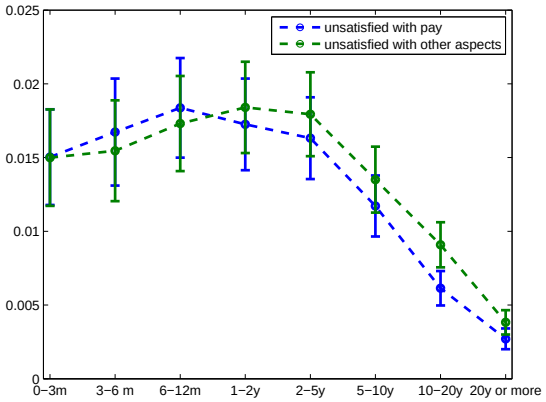
These two OJS outcomes differ somewhat more significantly across the firm-size dimension. In particular, the hump-shape pattern that comes out when the two outcomes are treated as one is entirely accounted for by OJS due to unsatisfied with other aspects. On the other hand, the probability of OJS for pay reasons are flat or downward across firm size. The latter result makes sense if larger firms pay more. The former result also makes sense if there are more workers unsatisfied with their work environment at larger organizations.

5 Implications on Wages

I now turn to the analysis of the implications of OJS on wages. An influential contribution by Topel and Ward (1992) finds the importance of job-to-job transitions in accounting for earnings growth, especially early in workers' career. They also argue that their findings are strongly consistent with labor search models with OJS. In the following analysis, I examine how OJS and associated job-to-job transitions are related to a worker's wage growth. I also attempt to infer the effect of OJS on stayers' wages. I first review some leading theories of OJS that navigate the empirical specifications below.

[17] As mentioned in footnote 15, the firm-size category in the LFS is capped at 500+, thus I cannot determine if OJS probabilities decline sharply when the 500+ category is divided further.

(a) Firm Tenure



(b) Firm Size

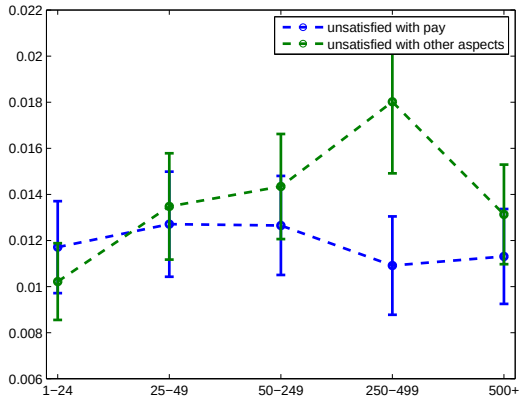


Figure 4: Predicted Unsatisfied OJS by Firm Tenure and Size

Notes: Predicted average probabilities for each group of workers. Bars around lines represent the 95% confidence intervals. See also notes to Table 5.

5.1 Literature Review: OJS Theories

One branch of the recent literature has evolved from Burdett and Mortensen (1998) who develop a random on-the-job search model; in their model, firms post and commit wages ex ante (i.e., before the match is formed) and workers who happen to receive the offer decide whether to accept it or not. The worker makes a job-to-job transition if and only if the offered wage is higher than the wage earned at the present firm. In this model, while a job-to-job transition is directly tied to wage gains, on-the-job search has no consequence on stayers, whether they did not receive an offer or turned down the offer received. Postel-Vinay and Robin (2002) relax this last assumption and develop the so-called sequential auction model. The key extension is that it allows employers to make counteroffers when an employee receives an outside offer. When a worker receives an outside offer, the two employers bid against each other (i.e., Bertrand bidding war), and which employer wins the bid depends on the relative productivity levels of the two employers. The model offers two new insights relative to the original Burdett-Mortensen model that are relevant to this paper. First, it generates job-to-job movers that accept lower wages at a new firm.[18] Second, workers who receive an outside offer that could have resulted in a job-to-job transition without the possibility of a counteroffer may decide to stay with the current employer as a result of the pay raise. One reason for the latter result being important is that it is consistent with an upward-sloping wage-tenure profile. Human capital theory interprets the positively sloped wage-tenure profile as resulting from accumulation of match-specific human capital. However, according to the sequential auction model, it reflects the competitive pressure

[18]This situation arises when an outside offer comes from a firm with higher productivity. The worker may accept the lower pay, counting on future wage increases at the more productive firm, which could result from outside offers received at the new firm.

between the two employers making offers to the worker.[19] Cahuc et al. (2006) modify the wage setting mechanism in the sequential auction model. They consider an environment in which the wage of the worker with an outside offer is determined by the three-party bargaining mechanism instead of the Bertrand competition between the two employers. The two implications discussed above with respect to the wage evolution of movers and stayers continue to hold in this model. Below I use the term "counteroffer model" to refer to this class of models.

Another branch of the OJS literature assumes that wages are determined by continuously renegotiated Nash bargaining without the possibility of commitment to future wages. In this class of models, firms do not respond to outside offers given the lack of commitment. Furthermore, in negotiating with the new firm at the time of receiving an outside offer, the bargaining position of the worker is to become unemployed. Given this environment, job-to-job transitions always result in wage gains. More specifically, Mortensen (1994), Pissarides (2000, chap. 4) and Ramey (2008) assume that new jobs are created at the highest possible level of idiosyncratic job productivity and thus on-the-job seekers always accept any outside offers they receive. Some papers renounce this rather stark assumption. For example, Krause and Lubik (2006) and Tasci (2007) develop models with two types of jobs, good jobs and bad jobs, and only the workers with bad jobs search for employment at a good job. Barlevy (2002) studies a similar but more general and realistic environment with many types of job matches. In his model, workers can reject offers from low paying jobs and move up the ladder of job matches over time as they move to better matches. Qualitatively, the same implication on the wage transition applies to all these models.[20] One implication that arises in this class of models, under the assumption that a worker's search decision is contractible, is that the worker's OJS itself lowers the wage at the current firm. That is because OJS introduces a possibility that the worker leaves the firm, in which case the value of the job is lost.[21] This last implication is directly testable with the data the LFS provides. Below I use the term "bargaining model" to refer to this class of models.

5.2 More on the Data

The analysis in the previous sections relied on the two-quarter longitudinal data of the LFS. However, in the LFS, respondents report earnings only in the first interview and last (fifth) interview. The ONS provides the five-quarter longitudinal data set with population weights calculated for this data set. I therefore use this data set for the analysis in this

[19] Burdett and Coles (2003) and Shi (2009) also extend the Burdett and Mortensen model and derive an upward-sloping wage-tenure profile as an optimal contract. But these papers do not allow firms to make a counteroffer and thus receiving an outside offer per se does not cause a pay raise even when the worker decides to stay at the current firm.

[20] One exception is a paper by Nagypal (2007) who adopts Nash bargaining for the wage determination as well, but in her model, jobs differ only with respect to their amenity values. Making several assumptions regarding the bargaining protocol, she obtains the result that wage is independent of the amenity value and hence is the same for all workers. That is, her model provides no meaningful implications for either the wage transition itself or the trade-off between nonpecuniary and pecuniary aspects of a job.

[21] See Pissarides (2000, chap. 4) for a formal analysis on this point.

section. To avoid changes in hours worked from affecting the results, I use hourly wage as a measure of earnings. I deflate it by the CPI to obtain real hourly wages. My entire data set consists of 26 overlapping panels, each of which starts every quarter between 2002Q2 and 2008Q3 and covers every five-quarter period from each starting quarter.[22] As in the analysis in the previous section, I focus on male workers who are 25 years of age or older. The following regression analysis always uses a first-difference specification, where the dependent variable is the log real wage change. To avoid outliers from affecting the results, I exclude the observations that correspond to the top and bottom 1% of the distribution of log wage changes. All regression results below include time dummies along with other variables, which I discuss below.

5.3 Stayers

This subsection focuses on the workers that are employed at the same firm throughout the five-quarter survey period. The regressions are guided by the theoretical implications discussed above. I start with the following simple Mincer-style wage regression.

$$\ln w_{ijt} = \mu_i + \gamma_j + \theta_{ij} + \alpha_1 x_{ijt} + \alpha_2 x_{ijt}^2 + \alpha_2 x_{ijt}^2 + \beta_1 y_{it} + \beta_2 y_{it}^2 + \varepsilon_{ijt}, \tag{2}$$

where w_{ijt} refers to the real hourly wage of an individual i at a firm j at time t, μ_i represents the time-invariant worker-specific component, γ_{ij} represents the time-invariant firm-specific component, θ_{ij} refers to the match-specific component, α_1 and α_2 measure the effects of firm tenure x_{ijt}, β_1 and β_2 measure the effects of age y_{it}, and ε_{ijt} is the error term.

5.3.1 Bargaining Model

The first specification I consider is motivated by the implication of the OJS models with Nash bargaining. As mentioned above, the theory predicts that the wages of job seekers are lower than those who are not searching. This can be directly addressed by the information in the LFS. Augmenting equation (2) with a dummy variable indicating the worker's search status results in:

$$\ln w_{ijt} = \mu_i + \gamma_j + \theta_{ij} + \alpha_1 x_{ijt} + \alpha_2 x_{ijt}^2 + \alpha_2 x_{ijt}^2 + \beta_1 y_{it} + \beta_2 y_{it}^2 + \delta S_{it} + \varepsilon_{ijt}, \tag{3}$$

where S_{it} is the dummy variable indicating worker's search status (i.e., 1 if engaging in OJS and 0 otherwise). Of course, I could consider several different specifications with respect to reasons of OJS. Specifically, I consider three different reasons of OJS: (i) unsatisfied with pay, (ii) unsatisfied with other aspects, and (iii) for other reasons. I exclude afraid OJS because this situation is outside of the existing theories. First, I estimate the regression, which includes all of the three cases as one dummy variable. Second, I lump together the first two cases as "unsatisfied search" to focus on the group of workers who appear to have clear reasons for OJS. In this second specification, δS_{it} is replaced by $\delta^u S_{it}^u$ where S_{it}^u takes 1 when workers engage in OJS for reasons either (i) or (ii) above. Lastly, the three reasons

[22] The last interview of the last panel is, therefore, conducted in 2009Q4.

Table 6: Wage Regressions: Stayers (Bargaining)

Parameters to estimate	(1)	(2)	(3)	(4)	(5)	(6)
δ	-0.010^{**}			-0.023		
	(0.005)			(0.018)		
δ^u		-0.020^{***}			-0.032	
		(0.006)			(0.024)	
δ^p			-0.021^{**}			-0.029
			(0.010)			(0.040)
δ^{np}			-0.020^{**}			-0.034
			(0.008)			(0.029)
δ^r			0.000			-0.018
			(0.009)			(0.028)
# of Obs.	33,480	33,480	33,480	2,542	2,542	2,542
$\hat{R}^2$	0.008	0.008	0.009	0.019	0.019	0.019

Notes: Results of the regressions expressed by equation (4). Top 1% and bottom 1% of wage growth are excluded. Estimates for the constant term, $\hat{\alpha}$, and $\hat{\beta}$ are suppressed. δs are coefficients on dummies for OJS with various reasons. δ: OJS total (excl. afraid search), δ^u: OJS unsatisfied (pay plus other aspects), δ^p: OJS unsatisfied with pay, δ^{np}: OJS unsatisfied with other aspects, δ^r: OJS other reasons. Columns (4) through (6) restrict the samples to those who report changes in the firm-size categories between the first interview and fifth interview. Robust standard errors are in parentheses. Stars next to point estimates indicate statistical significance at 1% (***), 5% (**), and 10%(*) levels.

enter the regression separately, in which case δS_{it} is replaced by $\delta^p S^p_{it} + \delta^{np} S^{np} + \delta^r S^r$, where superscripts p, np, and r, respectively, represent (i) unsatisfied with pay, (ii) unsatisfied with other aspects, and (iii) other reasons. Taking the first difference of equation (3) conveniently eliminates all time-invariant components, resulting in the following simple expression:

$$\Delta \ln w_{ijt+1} = c + \hat{\alpha} x_{ijt} + \hat{\beta} y_{ijt} + \delta \Delta S_{it+1} + \Delta \varepsilon_{ijt+1} \tag{4}$$

where $c \equiv \alpha_1 + \alpha_2 + \beta_1 + \beta_2$ and $\hat{\alpha} \equiv 2\alpha_2$ and $\hat{\beta} \equiv 2\beta_2$. Note that ΔS_{it+1} takes three possible values $\{-1, 0, 1\}$ depending on the transition in the search status of worker i. Consistently estimating δ requires $E(\Delta S_{it+1} \Delta \varepsilon_{ijt+1}) = 0$, which is unlikely to be is met. I will come back to this issue shortly. But let me first discuss the results from the OLS regressions that are presented in the first three columns of Table 6. Note that Equation (4) attempts to identify δs by using the cross-sectional variations in the changes in OJS status.

First, when one search dummy variable lumping all three reasons together is included in the regression (first column), OJS reduces real hourly wage by 1% relative to the group of workers who never searched during the entire interview period. In the second column where I include one dummy representing unsatisfied OJS, the negative impact is even larger. The

third column, where I split the unsatisfied group into two separate subgroups, shows that there is not much difference in hourly earnings whether the worker is unsatisfied with pay or with nonpecuniary aspects of their job. These results are consistent with the implication of the bargaining model discussed above.

However, one can easily suspect that this result comes from the effect that wage growth causes changes in the search status: higher (lower) wage growth causes workers to stop (start) searching, thus making the error term be correlated with changes in the search status. Of particular importance with respect to this problem are changes in the firm conditions between the two interview dates. In the context of the regressions I estimate, this problem can be traced as an omission of the time-varying firm component in equation (3). Because the LFS is a household survey, it is difficult to control this effect in my regression analysis. However, as I did in the previous sections, I can use the firm-size variable in the LFS for this purpose. In the LFS, however, the firm size is reported as a categorical variable rather than a continuous variable, and the choices specify only somewhat coarse firm-size intervals. This implies that simply adding this information to the regression is unlikely to solve the issue, given that the majority of changes in firm size can be occurring within each interval. Instead, I reestimate the regressions using the subsample, which consists of only workers that report changes in firm-size categories between the two interviews. This allows me to focus on the workers who potentially experience relatively large changes in wages (if the firm size is a good indicator of wages) and then ask if the search status has any additional predictive power on wages. Specifically, for each of the first and fifth survey quarter, I classify the number of employees at each worker's workplace as being in one of the three categories: (i) 1-249, (ii) 250-499, or (iii) 500 or more. Then I estimate the regression, including only the workers who moved from one firm-size class category to another.[23]

The results based on this restricted sample are shown in the third through sixth columns of Table 6. As suspected, all coefficients turn insignificant, although the point estimates still show negative signs. Observe that all of the point estimates are larger (in absolute value) than corresponding estimates from the full sample regressions. These results appear to be consistent with the causality running from wage changes to the search status. For example, a firm facing large declines in demand may reduce its firm size, but to the extent that it is an imperfect measure of the time-varying firm component, the remaining part may be picked up by the changes in the workers' search status.

5.3.2 Counteroffer Model

Next, I try to test the implications of the counteroffer model for the wage growth of stayers. The main challenge is that the LFS does not have the information on whether or not a worker received offers. Nor does it include the information on the offered wage or a worker's

[23] I also consider another categorization (i) 1-24, (ii) 25-49, and (iii) 50 or more. This alternative categorization yields roughly the same results. The original questionnaire in the LFS specifies somewhat more detailed categorical choices with unequal distances between the categories. I reclassify them into three categories so that the first two categories have equal intervals.

reservation wage.[24] In other words, we do not know if those stayers in my sample indeed received offers and rejected them. Despite this weakness, the worker's search status provides a useful piece of information: I can identify the stayers who have a recent history of OJS. Specifically, among the stayers, I select the workers who searched in either the first one, two, or three quarter(s) and then never searched in the subsequent four, three, and two quarters, respectively. The idea is to select the group of workers that stayed after OJS. Remember that the analysis in Section 3 showed that the job-to-job transition rate of the on-the-job seekers is dramatically higher than those without OJS. It is therefore quite likely that the job offer arrival rates for the on-the-job seekers are also higher than for those without OJS. Also note that by selecting those who report continuous OJS and subsequent continuous no search, I exclude those workers who engage in OJS randomly (e.g., a worker who searches in the first and third quarters). Then I ask the following question: *Are stayers with a recent history of continuous OJS activity systematically paid better than those who did not search?* The answer to this question would be "yes" in OJS models with the possibility of counteroffers. I am interested in whether this prediction is strong enough to show up in a representative data set like the LFS. The regressions that I estimate take the following form:

$$\Delta \ln w_{ijt+1} = c + \hat{\alpha} x_{ijt} + \hat{\beta} y_{ijt} + \rho C_{it} + \Delta \varepsilon_{ijt+1}, \tag{5}$$

where the same notation as in equation (4) applies except C_{it}, which is the dummy variable selecting workers with continuous OJS followed by no search, described above. Again, I exclude workers who engage in OJS due to a fear of losing their job. As in equation (4), I consider two other alternative specifications similar to the previous bargaining model: (i) one that includes only unsatisfied OJS workers, identified by C_i^u, and (ii) the other that include the three dummy variables corresponding to the three different reasons for OJS, replacing ρC_{it} with $\rho^p C_{it}^p + \rho^{np} C^{np} + \rho^r C^r$.

The results are presented in Table 7. In the first column, the OJS-to-no-OJS transition is associated with a 1.2% gain in hourly wage on average relative to those who never searched on the job during their interview period. However, this estimate is not statistically significant. In the next regression, presented in the second column, I exclude those who searched for "other reasons" to focus on the unsatisfied group. Excluding this group not only raises the size of the wage gain to 2.3%, but it also makes the point estimate statistically significant at the 5% level. The third column presents the results from a regression that includes dummies for three groups separately. In this case, the point estimates of the first two coefficients ρ^p and ρ^{np} are at levels in line with the previous regression, and the coefficient on "OJS for other reasons" is essentially zero. Interestingly, when the unsatisfied OJS group is split into two subgroups, neither of them are statistically significant.

One concern similar to the one discussed with respect to the bargaining model is that the transition from search to no search may be induced by other factors that result in wage gains. One plausible suspect is, again, changing firm-level conditions. I address this issue by estimating the same regressions using the subsample of workers who report that firm size has

[24] One data source that provides such valuable information is the 1981 panel of the NLSY. See Holzer (1987) for the analysis that uses this data set. But this data set has other limitations for my purposes.

Table 7: Wage Regressions: Stayers (Counteroffer Model)

Parameters to estimate	(1)	(2)	(3)	(4)	(5)	(6)
ρ	0.012			0.022		
	(0.098)			(0.032)		
ρ^u		0.023**			0.031	
		(0.012)			(0.038)	
ρ^p			0.025			−0.041
			(0.020)			(0.047)
ρ^{np}			0.021			0.112**
			(0.014)			(0.055)
ρ^r			−0.008			0.005
			(0.016)			(0.005)
# of Obs.	30,290	30,290	30,290	3,207	3,207	3,207
$\hat{R}^2$	0.008	0.008	0.009	0.050	0.050	0.052

Notes: Results of the regressions expressed by equation (5). Top and bottom 1% of the wage growth distribution are excluded. Estimates for the constant term, $\hat{\alpha}$, and $\hat{\beta}$ are suppressed. ρs are coefficients on dummies for workers who quit searching after OJS. ρ: OJS total (excl. afraid search), ρ^u: OJS unsatisfied (pay plus other aspects), ρ^p: OJS unsatisfied with pay, ρ^{np}: OJS unsatisfied with other aspects, ρ^r: OJS other reasons. Specifications (4) through (6) restrict the samples to those who report that their firm-size category changed to a larger category between the first interview and fifth interview. Robust standard errors are in parentheses. Stars next to point estimates indicate statistical significance at 1% (***), 5% (**), and 10%(*) levels.

increased between the first and fifth interviews. This is done by identifying those who move up the seven firm-size categories.[25] The results with this restricted sample are presented in the third through sixth columns of Table 7. Overall, as expected, the conditioning makes positive relationships statistically weaker. In particular, the statistical significance when I focus on the unsatisfied OJS group goes away when the regression uses the sample of employees at expanding firms. One anomalistic observation is that, when the three OJS groups separately enter in the regression, the coefficient on those who are unsatisfied with nonpecuniary aspects shows a large positive number and becomes statistically significant.

[25]These categories are (i) $1-10$, (ii) $11-19$, (iii) $20-24$, (iv) $25-49$, (v) $50-249$, (vi) $250-499$, and (vii) 500 or more. In the previous section, the conditioning was symmetric in the sense that I consider both increase and decline in the firm size. But for the regressions in this section, the appropriate conditioning is to consider only the increases in firm size.

5.3.3 Summary: Stayers

In sum, the results from the stayers' regressions suggest that the predictions of the theories sketched at the beginning of this section are supported, at best, only weakly. While naive OLS regressions can pick up the correlation that is consistent with the theoretical predictions, the relationships become weaker or vanish when the sample is restricted to control for the time-varying firm effects.

The prediction of the Nash bargaining model is that wages reflect whether or not workers engage in OJS. One can think of many possibilities that invalidate this prediction. For example, some form of wage rigidity makes it difficult for wages to reflect the OJS activity. The observability of the OJS activity that underlies the prediction is also questionable. Similarly, I find little evidence that "offer matching" is a pervasive phenomenon. This finding is consistent with the anecdotal evidence that the "no-response" policy is dominant in the labor market. An often-mentioned theoretical reason of why this is so is that offer matching encourages inefficient rent seeking OJS, as pointed out by a seminal work by Mortensen (1978).[26]

5.4 Job-to-Job Movers

I move on to estimating regressions that include job-to-job movers in the sample. The intention is to measure the effects of a job-to-job transition on wage growth relative to that of stayers. Remember that the previous section analyzed the wage differentials among stayers depending on whether a worker engaged in OJS or not. Here I exclude those who have any experience of OJS during the interview period. The comparison group is, therefore, always those who never engage in OJS during the entire interview period.

5.4.1 Some Specification Issues

I start with the wage equation (2) except that I drop the square terms to simplify the notation. The results below are little affected by omitting the square terms. The log wage change of a job-to-job mover i working at a firm k in $t+1$ is written as:

$$\ln w_{ikt+1} - \ln w_{ijt} = \beta + \gamma_k - \gamma_j + \theta_{ik} - \theta_{ij} - \alpha x_{ijt} + \varepsilon_{ikt+1} - \varepsilon_{ijt}. \quad (6)$$

Combining this with the corresponding wage growth equation for stayers results in:

$$\ln w_{ikt+1} - \ln w_{ijt} = \beta + (\gamma_k - \gamma_j)J_i + (\theta_{ik} - \theta_{ij})J_i + \alpha[1 - J_i(x_{ijt} + 1)] + \varepsilon_{ikt+1} - \varepsilon_{ijt} \quad (7)$$

where J_i is a dummy variable that takes a value 1 when $j \neq k$ and 0 when $j = k$. The first term on the right hand side measures the effect of age on wage growth. The second term

[26] My finding, of course, does not exclude the possibility of offer matching in certain occupations or industries. The evidence presented by Barron et al. (2006) shows that more than 40% of personnel managers and business owners who are surveyed say that they *consider* counteroffers. However, this number is based on the survey to employers (not to employees) and thus represents the possibility of counteroffers to *any employees within a firm.* The number of workers who actually receive counteroffers can be substantially smaller.

$\gamma_k - \gamma_j$ measures the differences in the firm effect. This term is zero when the worker stays in the same firm.[27] Similarly, the third term drops out for stayers and reflects the change in the match-specific component. The last term captures the effect due to the firm tenure reset to zero when a job-to-job transition occurs, otherwise reflects an additional year of firm tenure.

To distinguish between the changes in the firm component and the match-specific component, I approximate the firm effect by the firm-size variable. I can then identify the improvement (or deterioration) of the match quality $\theta_{ik} - \theta_{ij}$ through the incidence of job-to-job transitions. There are seven firm-size categories in the LFS as mentioned above. Let f_{lt} be a dummy variable taking a value 1 when a worker is in the firm-size category l in period t. I can then rewrite equation (7) as:

$$\ln w_{ikt+1} - \ln w_{ijt} = \beta + \sum_{l=2}^{7} \phi_l (f_{lt+1} - f_{lt}) J_i + \lambda J_i + \alpha[1 - J_i(x_{ijt} + 1)] + \varepsilon_{ikt+1} - \varepsilon_{ijt} \quad (8)$$

where $\lambda \equiv \theta_{ik} - \theta_{ij}$. Note that the terms inside the summation identify the firm effect using the information on the changes in firm-size categories before and after the job-to-job transition. For those who stay in the same size category, $f_{lt+1} - f_{lt} = 0$ for all l. The worker who changes the size category has 1 in the category that he moves into, -1 in the category that he moves out from, and 0 in the remaining four categories.

My main interest in this section is in the estimates of λ. As I did in the previous section, I split the movers into several different groups. The first specification distinguishes only those who made a job-to-job transition with and without OJS, whose effects are measured by $\lambda^{ns} S^{ns}$ and $\lambda^{s} S^{s}$, respectively. The second specification splits the OJS group into three subgroups whose effects are summarized by the terms: $\lambda^{a} S^{a}$ (afraid OJS), $\lambda^{u} S^{u}$ (unsatisfied OJS), and $\lambda^{r} S^{s}$ (OJS for other reasons). The third specification further splits the unsatisfied OJS group into those who are unsatisfied with pay and those who are unsatisfied with other aspects of their job, measured by $\lambda^{p} S^{p}$ and $\lambda^{np} S^{ns}$, respectively. Successively splitting the sample into smaller groups allows me to tease out heterogeneity involved in the different types of OJS.

5.4.2 Results

Table 8 presents the results. The first column presents the results when job-to-job transitions are split only into two groups, those with and without OJS. This regression does not include the firm-size variables. First of all, the result confirms the idea that the job-to-job transitions play a role in improving the worker's earnings. The job-to-job transition raises a worker's wage by 4% to 6% (relative to the wage growth of stayers who never search). More specifically, the interpretation in the context of my regression is that the match quality

[27] I mentioned in the regressions for stayers the issue of omitting the time-varying firm effects in the wage equation (2). This assumption is maintained here, and thus this term is zero when the worker stays at the same firm. However, when a job-to-job transition occurs, this term is in general nonzero, reflecting the difference in time-invariant firm effects.

Table 8: Wage Regressions: Movers

Parameters	(1)	(2)	(3)	(4)	(5)	(6)
λ^{ns}	0.044***	0.043***	0.042***	0.041***	0.041***	0.041***
	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)	(0.011)
λ^{s}	0.059***	0.061**				
	(0.013)	(0.014)				
λ^{a}			−0.050*	−0.043*	−0.050*	−0.042
			(0.027)	(0.028)	(0.027)	(0.028)
λ^{u}			0.073***	0.081***		
			(0.017)	(0.019)		
λ^{up}					0.099***	0.100***
					(0.027)	(0.029)
λ^{uo}					0.054***	0.065***
					(0.020)	(0.022)
λ^{r}			0.091***	0.080***	0.091***	0.080***
			(0.022)	(0.023)	(0.022)	(0.023)
ϕ_2		−0.009		−0.008		−0.009
		(0.019)		(0.019)		(0.019)
ϕ_3		0.025		0.023		0.023
		(0.026)		(0.027)		(0.027)
ϕ_4		0.017		0.016		0.016
		(0.019)		(0.020)		(0.020)
ϕ_5		0.064***		0.063***		0.062***
		(0.017)		(0.017)		(0.017)
ϕ_6		0.069***		0.065***		0.065***
		(0.022)		(0.022)		(0.022)
ϕ_7		0.081***		0.079***		0.079***
		(0.023)		(0.023)		(0.023)
β	0.005***	0.005**	0.005***	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
# of Obs.	34,427	31,365	34,427	31,365	34,427	31,365
$\hat{R}^2$	0.008	0.009	0.009	0.010	0.009	0.010

Notes: λ's measure effects of job-to-job transitions relative to job stayers (with no history of OJS). λ^{ns}: no search, λ^{s}: OJS (total), λ^{a}: OJS afraid, λ^{u}: OJS unsatisfied (total), λ^{up}: OJS unsatisfied with pay, λ^{up}: OJS unsatisfied with other aspects, λ^{r}: OJS other reasons. ϕ's measure firm-size fixed effects relative to the smallest size category (1-10 workers) using the changes of firm size associated with job-to-job transitions. ϕ_2: 11−19, ϕ_3: 20−24, ϕ_4: 25−49, ϕ_5: 50−249, ϕ_6: 250−499, and ϕ_7: 500+. β measures the firm-tenure effect. Robust standard errors are in parenthesis. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively.

improves upon the job-to-job transitions, which is consistent with Topel and Ward's (1992) claim. The result indicates that a job-to-job transition with OJS is associated with larger wage gains on average, although the differences are not statistically significant. This finding is interesting for a couple of reasons. First, it is consistent with the idea that OJS is "directed." One can imagine an environment in which OJS is costless but finding a good match involves directing job search into jobs that are suitable for a worker's skills or other characteristics, in which case job-to-job transitions with OJS result in larger wage gains. The second possibility is that OJS is costly (which is logically a plausible presumption). In this case, wage gains associated with OJS job-to-job transitions should reflect this cost. Lastly, the fact that job-to-job transitions without OJS are associated with smaller wage gains may be considered surprising if one views them as resulting from headhunting, where talented workers move to high-paying jobs without explicit OJS. The result here suggests that such anecdotal evidence is not warranted at least in the representative sample such as the LFS. Distinguishing these stories is beyond the scope of this paper but splitting OJS job-to-job transitions into different reasons shed some further light on the point. The second column adds the firm-size variables to the regressions. This is important in that wage gains associated with job-to-job transitions may reflect that workers are moving from smaller firms to larger firms (which pay more). The result indeed indicates the presence of the firm-size effects. In particular, the coefficients on the largest three firm-size categories show statistically significant positive effects. Adding the firm-size variables, however, hardly affects the coefficients on job-to-job transitions, suggesting that the improvement of job-match quality plays an important role in the worker wage profile beyond changes in the firm effect.

The third and fourth columns present the results when OJS workers are split into the three groups, respectively, with and without firm-size information. Large heterogeneity exists between the three groups in terms of the effects of OJS. In particular, OJS caused by to fear of losing a job is accompanied by significant wage losses (5%). Of course, this makes sense given that the outside option for these workers is to become unemployed. There is long-standing literature on the earnings losses of job losers (or displaced workers) pioneered by Ruhm (1991) and Jacobson et al. (1993). The result here collaborates well with this literature.[28] Also note that the existing theoretical literature on OJS has had a difficult time in accounting for wage losses upon job-to-job transitions that exist in the data. For example, one of the key themes of Postel-Vinay and Robin (2002) is to develop a model of OJS that generates earnings losses upon job-to-job transitions. Their model indeed generates wage losses through differences in firm productivity, but this mechanism fails to generate enough "negative" job-to-job transitions observed in their data. A similar idea is also explored by Connolly and Gottschalk (2008). The point of these existing papers is that even though a worker accepts a job that pays less, a present discounted value of earnings from the new job should be higher. This statement does not need to hold for those who make job-to-job transitions as a result of fear of losing their job. Remember that a nontrivial fraction of

[28]The average earnings losses here appear much smaller than those reported in these earlier studies. But this is not surprising. These earlier studies often consider the displaced workers, which represent a more limited group of workers that are most adversely affected by their job losses.

Table 9: Unconditional Wage Growth Distributions

	Percentiles			Mean	Share of
	25%	50%	75%		$\Delta \ln w < 0$
No search	−0.131	0.027	0.199	0.026	0.451
Afraid	−0.271	−0.021	0.117	−0.080	0.535
Unsatisfied (pay)	−0.037	0.126	0.276	0.089	0.305
Unsatisfied (other)	−0.119	0.031	0.221	0.054	0.456
Other reasons	−0.082	0.054	0.239	0.059	0.376

Notes: Based on the sample of 2,511 job-to-job transitions. See Subsection 5.2 for more information about the data.

on-the-job seekers report this as a main reason for OJS, which is clearly one of the reasons for the "negative" job-to-job transitions.

The opposite side of the negative job-to-job transitions is that when workers report that they are unsatisfied with their current jobs, they enjoy larger wage gains, which amount to 7% to 8%, depending on whether the firm-size variables are included or not. The differences from no-search job-to-job movers expand to 3-4 percentage points. It is somewhat puzzling that OJS with "other reasons" results in larger gains than the unsatisfied group. This puzzling result largely disappears as I refine the specification, as I discuss shortly.

The fifth and sixth columns further split the unsatisfied OJS group into the two subgroups. This highlights another important heterogeneity underlying the average wage gains associated with job-to-job transitions. That is, these two groups are associated with considerably different outcomes in terms of wage gains upon job-to-job transitions; when workers are unsatisfied with pay, wage gains amount to 10%, whereas when workers are unhappy with nonpecuniary aspects, earnings gains are reduced to roughly 6%. Again, this result is not surprising, yet important in that it suggests imperfect substitutability between pecuniary and nonpecuniary aspects of labor turnover: workers may accept a lower wage offer as far as overall job satisfaction is expected to improve. Note that the importance of nonpecuniary aspects of a job may be another reason for wage cuts upon job-to-job transitions, which is discussed above.

To see this last issue more explicitly, Table 9 presents the unconditional wage growth distributions as well as the share of those who experience wage losses upon a job-to-job transition. First, note that job-to-job movers with a fear of losing their job suffer the largest wage cuts as expected. The fraction of the incidence of the wage cuts is 53%. The wage growth distribution dramatically improves when workers make job-to-job transitions explicitly for improving their pay. Not only are wage gains larger at all percentiles but also the fraction of the wage cuts is much lower at 31%. Relative to these workers, wage gains are much more muted when workers are unhappy about nonpecuniary aspects. A much larger fraction of workers (46%) accept wage cuts. The labor search literature has put much less emphasis on the importance of nonpecuniary aspects in the job acceptance decision. As

Table 10: Wage Regressions: Movers (with Industry and Occupation Dummies)

Parameters	(1)	(2)	(3)	(4)	(5)	(6)
λ^{ns}	0.040^{***}	0.040^{***}	0.038^{***}	0.038^{***}	0.038^{***}	0.038^{***}
	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)	(0.011)
λ^{s}	0.053^{***}	0.054^{***}				
	(0.013)	(0.014)				
λ^{a}			-0.046^{*}	-0.041	-0.047^{*}	-0.041
			(0.027)	(0.028)	(0.027)	(0.028)
λ^{u}			0.068^{***}	0.076^{***}		
			(0.017)	(0.019)		
λ^{up}					0.097^{***}	0.097^{***}
					(0.028)	(0.030)
λ^{uo}					0.046^{**}	0.058^{***}
					(0.020)	(0.021)
λ^{r}			0.076^{***}	0.067^{***}	0.075^{***}	0.066^{***}
			(0.022)	(0.023)	(0.022)	(0.023)
ϕ_2		-0.011		-0.010		-0.011
		(0.019)		(0.019)		(0.019)
ϕ_3		0.027		0.025		0.025
		(0.026)		(0.026)		(0.026)
ϕ_4		0.018		0.017		0.017
		(0.019)		(0.019)		(0.019)
ϕ_5		0.066^{***}		0.065^{***}		0.064^{***}
		(0.017)		(0.017)		(0.017)
ϕ_6		0.070^{***}		0.067^{***}		0.066^{***}
		(0.022)		(0.022)		(0.022)
ϕ_7		0.086^{***}		0.083^{***}		0.083^{***}
		(0.023)		(0.023)		(0.023)
β	0.005^{***}	0.004^{***}	0.004^{***}	0.004^{***}	0.004^{***}	0.004^{***}
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
# of Obs.	34,397	31,336	34,397	31,336	34,397	31,336
$\hat{R}^2$	0.011	0.012	0.012	0.013	0.012	0.013

Notes: See notes to Table 8. Industries included: agriculture and fishing, energy and water, manufacturing, construction, distribution, hotels and restaurants, transport and communication, banking, finance and insurance, public administration, education and health, and other services. Occupations included: managers and senior officials; professional occupations; associate professional and technical occupations; administrative and secretarial occupations; skilled trades occupations; personal service occupations; sales and customer service occupation; process, plant, and machine operatives; and elementary occupations.

mentioned above, Nagypal (2007) develops a model in which jobs are heterogeneous with respect to their amenity values. However, the particular wage determination mechanism does not allow for the two margins to interact with each other. There are a few notable recent papers that take the nonpecuniary aspects of a job seriously. Nosal and Rupert (2007) develop a model that explicitly includes job amenity in the worker's job acceptance decision. This paper is largely theoretical but presents an interesting piece of empirical evidence based on the PSID: The data do not appear to support the idea that the wage growth of those who accepted wage losses upon job changes increases over the subsequent years, which is a prediction of the theories by Postel-Vinay and Robin (2002) and Connolly and Gottschalk (2008). Nosal and Rupert (2007) argue that their finding implies imperfect substitutability between amenity and wage. A recent paper by Bonhomme and Jolivet (forthcoming) develops and estimates an OJS model in which the value of a job depends on job amenities as well as wages. They find strong influence of job amenities on job-to-job transitions. This paper's findings, along with these existing studies, point to a fruitful direction of future research.

In the regression (7), I did not take into account the fact that different industries and occupations have different levels of wages. A concern similar to the one made with respect to the firm-size effect applies here as well: The pattern of job-to-job transitions may be systematically correlated with interindustry or interoccupation wage differentials. I augment (7) with industry and occupation dummies as I did to control for the firm-size effect in (8).[29]

The same set of six regressions are estimated with industry and occupation dummies. The results, which are presented in Table 10, are largely unaffected by the inclusion of the industry and occupation dummies. One noticeable change is that coefficients on OJS for other reasons, λ^r, are reduced by roughly 1.5 percentage points when compared with corresponding estimates in Table 8. This change makes the overall results more intuitive.

5.5 Some Implications for OJS Theory

Let me close this section by discussing the overall implications of my findings. Note that I find only weak (if any) evidence that OJS influences the wages of stayers, whereas the link between OJS and movers' wage transitions seems to be much tighter. The latter result is clearly related to the fact that workers who engage in OJS for different reasons have different reservation wages; the outside option for afraid on-the-job seekers is to become unemployed, whereas it is plausible that, for those who are unsatisfied, the outside option is to stay with the current employer until he receives an offer that exceeds the continuation value of the present job. Furthermore, the value of the job should be viewed as a bundle of pecuniary and nonpecuniary components. Depending on whether the worker is unhappy about his pay or other aspects, his reservation wage would differ, affecting observed outcomes differently. Generally speaking, the influence of the worker's outside options on the wage outcome goes against the wage determination in the competitive labor market and instead suggests the importance of frictions in labor reallocation.

[29] Each regression includes nine major industries and nine major occupations. See the notes to Table 10 for the list of industries and occupations.

Note, however, that the above results are not necessarily entirely consistent with existing search theories. For example, many macro models discussed in the second paragraph of subsection 5.1 assume that starting wage at the time of the job-to-job transition is determined by the Nash bargaining where the worker's bargaining position is to become unemployed. This last assumption is not consistent with the results for movers. This no-recall assumption is made in order to avoid the three party bargaining in which the current employer, the worker, and the prospective employer are involved in the bargaining process. As mentioned before, Cahuc et al. (2006) have developed such a model. The problem of this route is that the evidence on counteroffers in the data is weak. The results for stayers suggest some form of rigidity in the existing employment relationship in responding to the changes in the workers' outside option. This may result from firms' no matching policy to avoid rent-seeking activities of its workers or from firms' belief that making counteroffers to selected workers may cause negative externalities to other workers, hurting the firm's overall productivity.

6 Conclusion

Many competing theoretical models of OJS have been developed in recent years. This paper is motivated by the fact that there is nevertheless little empirical work on OJS that provides a set of easily comprehensible stylized facts. This paper has shown many new stylized facts on OJS and job-to-job transitions, but there are several findings that appear worth mentioning here again. The first is the heterogeneity between different groups of workers that engage in OJS. In particular, I have emphasized the importance of distinction between workers who are unsatisfied with pay and those who are unsatisfied with nonpecuniary aspects of a job. Second, the evidence that firms respond to the outside offer that their employee receives is weak. Third, wages set upon job-to-job transitions have a tighter link with the worker's outside options. The latter two findings appear to suggest that wage setting is more flexible at the extensive margin than within the same firm and that search frictions involved in job-to-job transitions make the bargaining element relevant. These findings call for reexamination of the wage setting mechanism in the existing literature.

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