Monopsony in a Two-Sided Matching Market

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1 Extended Abstract

1.1 Motivation, Approach, and Contributions

Recent evidence suggests that labor market concentration is a significant source of employer market power (Azar et al., 2022). While the literature has extensively documented wage markdowns due to worker heterogeneity in preferences (Card et al., 2018), less is known about how firms' wage-setting power interacts with two-sided heterogeneity in matching markets (Naidu et al., 2018).

In labor markets, matching occurs when there is a double coincidence of wants between workers and firms, limiting the size of the relevant market and affecting the degree of labor market power. We develop a model of wage posting under *two-sided* preference heterogeneity and characterize the equilibrium wage and markdown, emphasizing the role of firms' screening of workers. Our simulations show that when worker preferences and productivity values are more correlated, the probability of acceptance conditional on application is higher, and the wage markdown is larger. We apply the model to activity-level data from a Japanese freelancing platform, which allows us to observe workers' applications and rejections by firms. Our identification strategy utilizes workers' website access history as an instrument that shifts application behavior without affecting match productivity.

Overall, our analysis contributes to the literature on labor market power by demonstrating that two-sided preference heterogeneity can be a significant source of monopsony power in online labor markets and aligns well with the conference's core interests. First, our research leverages detailed activity-level data from an online intermediary platform to analyze how workers and firms engage in job search and hiring processes. Our empirical strategy utilizing job seekers' website access history offers novel insights into online job search behavior. Additionally, by analyzing monopsony power and wage markdowns using data from a freelancing platform, we address a key research question of employer market power in labor economics. Furthermore, our theoretical contribution on the interaction between two-sided preference heterogeneity and wage-setting power deepens understanding

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of labor market matching processes and contributes to discussions on optimal platform design. Our analytical framework also reveals market segmentation through skill network structures, providing insights for improving matching efficiency and fairness in online labor markets.

1.2 Theoretical Framework

We develop a model of a labor market with unit mass of workers and a finite number of jobs. The interaction unfolds in three stages: first, jobs post wages to maximize expected profit; second, workers observe posted wages and apply to jobs that maximize their utility; and third, jobs decide which applicants to accept based on productivity.

A worker i derives utility $u_{ij} = w_j + v_{ij}$ from job j, where w_j is the wage and v_{ij} represents preference heterogeneity. The productivity of worker i at job j is denoted by q_{ij}, measured in monetary units. Importantly, both v_{ij} and q_{ij} are modeled as match-specific shocks, which are potentially correlated across workers and jobs.

The matching set M_j represents workers who both apply to and are accepted by job j:

$$M_j(w) = A_j(w) \cap E_j(w_j)$$

where $A_j(w)$ is the set of applicants and $E_j(w_j) = \{i \mid q_{ij} > w_j\}$ is the set of employable workers. This represents the double coincidence of wants between workers and jobs in the sense that workers and jobs are matched if workers apply to jobs and are accepted by the job that they apply to.

Under this setup, the concept of job's labor supply elasticity $\epsilon_j(w)$ and marginal revenue product of labor $\text{MRPL}_j(w)$ is more nuanced than the traditional setup because the set of employed workers $M_j(w)$ depends not only on worker's application decision but also job's acceptance decision under the environment with match productivity heterogeneity. We define $\epsilon_j(w)$ as the elasticity of job j's employment size with respect to the own posted wage, *fixing j's hiring decision*, and define $\text{MRPL}_j(w)$ as the average productivity of workers who are induced into the job by a marginal change in the own posted wage, fixing j's hiring decision. Using these definitions, we can derive a Lerner's formula for the equilibrium wage similarly to how it is written in the literature:

$$w_j = \frac{\text{MRPL}_j(w)}{1 + \frac{1}{\epsilon_j(w)}},$$

from which we can derive the markdown as in the standard monopsony literature.

Our theoretical analysis yields several key insights. When match-specific productivity variance increases, jobs screen workers more aggressively to exploit high-productivity workers, pushing up wages but also increasing markdowns. When cross-job productivity correlation increases (i.e., skills become more general), competition intensifies and markdowns decrease. When within-job correlation between productivity and preference is higher (i.e., productive workers tend to like that job), jobs can more easily hire productive workers at lower wages.

Table 1 illustrates the last point: how the within-job correlation between productivity (q) and

preference (v) affects both average revenue productivity of labor (ARPL) and marginal revenue product of labor (MRPL). When this correlation is higher, jobs can more effectively attract high-productivity workers who also have strong preferences for their jobs, leading to higher ARPL. However, this also results in lower MRPL as the marginal worker becomes less productive, affecting the optimal wage-setting strategy.

Table 1: Simulation Results for the Relationship between Correlation and Wage Markdown

(a) ρ_q	(b) σ_q	(c) ρ_{qv}	(d) Avg Wage	(e) Avg LS	(f) ARPL	(g) MRPL	(h) Mkdn (g)-(d)	(i) Relative Mkdn (h)/(g)
0.5	1	0	1.74	214.65	3.48	3.45	1.70	0.49
0.5	1	0.3	1.61	218.10	3.59	3.27	1.66	0.50
0.5	1	0.7	1.64	224.93	3.78	3.20	1.56	0.48
0.5	1	1	1.54	228.36	3.99	2.92	1.38	0.47

Note: The table shows the results of a simulation study where we vary the within-job correlation between productivity (q) and preference (v) while holding other parameters (cross-firm correlation of productivity, column a, and within-firm variance of productivity, column b) constant. The simulation results illustrate how changes in the correlation between productivity and preference (column c) affect the average wage (column d), average labor supply (column e), average revenue productivity of labor (ARPL, column f), marginal revenue productivity of labor (MRPL, column g), and the absolute and relative wage markdowns (columns h and i). The results are based on 500 simulated workers and 2 jobs.

1.3 Data and Empirical Strategy

Our data come from a major Japanese freelancing platform that connects freelancers with project-based jobs. We leverage detailed activity-level log data that allow us to observe complete application histories for each posted job, worker acceptances and rejections, programming skills possessed by workers and required by jobs, and website login history to proxy worker activity on the platform.

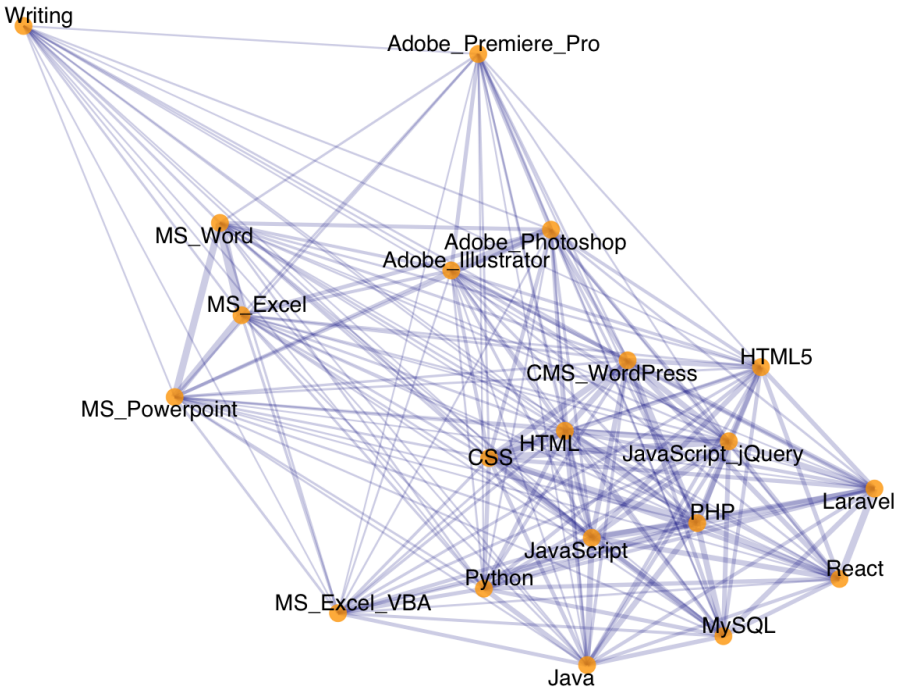
Our primary focus is on development jobs and job seekers. We parameterize worker utility and productivity as functions of observables, with correlated unobservables:

$$u_{ij} = \beta_w^u w_j + \beta_x^u x_{ij} + \beta_z^u z_{ij}^{ap,u} + \xi_j + \epsilon_{ij}^u$$
$$q_{ij} = \beta_x^q x_{ij} + \epsilon_{ij}^q$$

We estimate this model using a combination of simulated maximum likelihood and GMM. Our identification strategy relies on several instrumental variables, including website login history as a shifter of application behavior and BLP-style instruments for wages (Berry et al., 1995). Critically, we use an exclusion restriction where website access behavior affects application decisions but not match-specific productivity, helping identify the correlation between preference and productivity.

Our network analysis of skill similarity reveals clear, but continuous, market segmentation in the freelance labor market. Figure 1 visualizes the clustering of skills based on co-occurrence in worker profiles and job requirements. We find distinct clusters, such as basic office skills (Ex-

Figure 1: Network Graph for Skill Similarity



Note: The network graph summarizes the cosine similarity matrices for any pairs of the top 20 popular skill indicators across the sample of workers for the development jobs. Edges indicate skills, and nodes indicate similarity; The thicker the node, the more similar the two skills the node connects.

cel/PowerPoint/Word) forming one community and programming skills (Python/Java) forming another. The network structure suggests that labor market power may vary across these skill clusters, as workers' ability to substitute between jobs is limited by the boundaries of their skill communities. This segmentation is further supported by our finding that the distance between worker and job skill sets strongly predicts match probability—workers with skills distant from job requirements are significantly less likely to be contracted, bolstering our two-sided preference framework.

However, Figure 1 also shows that markets are not completely segmented, as some workers possess skills that span multiple clusters. This implies that the labor market segmentation is more nuanced than a traditional setup with multiple discretely segmented labor markets, which our model is appropriate to capture through the continuous match-specific productivity that are heterogeneous across workers.

1.4 Preliminary Findings and Future Work

Descriptive evidence from our data supports key model assumptions. Contract amounts are strongly predicted by job fixed effects but not by worker characteristics conditional on job fixed effects, supporting our assumption of uniform wage posting. Jobs have observable opening periods typically

shorter than one week, justifying our static model structure.

Our research makes several contributions to the literature on labor market power. It develops a tractable model of monopsony with two-sided preference heterogeneity, derives implications for wage markdown that account for both worker preference and firm screening, and leverages detailed data from an online labor platform to quantify these effects.

Our ongoing work focuses on completing the structural estimation and conducting counterfactual analyses to: (1) evaluate the relative contributions of worker and firm preference heterogeneity to wage markdowns, (2) analyze heterogeneous effects across skill clusters and job types, and (3) examine the impact of alternative matching protocols on wages and welfare.

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