Rank Matters: On-the-Job Search Model with Social Comparison Behavior

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Abstract

This paper studies how workers' ordinal wage-rank concerns affect individual search behavior and labor-market outcomes. Using the National Longitudinal Survey of Youth 1997, I show that among similar workers, a 10 percentage point deterioration in wage rank requires approximately a 13 percent wage increase to keep predicted job satisfaction unchanged. I extend an on-the-job search model with endogenous search effort to study the aggregate implications of this comparison behavior. In the model, stronger rank concerns make low-wage jobs less attractive while increasing the option value of search across wages. As a result, rank concerns raise reservation wages and strengthen search incentives. In equilibrium, however, the higher reservation threshold reduces the set of acceptable offers, lowers aggregate job mobility, increases unemployment, compresses accepted-wage dispersion, and reduces social welfare. In a counterfactual exercise where the offer wage dispersion becomes more unequal while the mean offer wage is preserved, rank concerns partially mitigate the adverse mobility effects for low-wage workers by raising the lower bound of accepted wages, while amplifying the welfare gains from a thicker upper tail.

1 Introduction

Individuals often evaluate their outcomes by comparing themselves with similar others. This comparison behavior helps explain why economic choices and subjective well-being may differ from what would be predicted by absolute outcomes alone. Duesenberry (1949) emphasizes the role of relative income in consumption and saving decisions, while Di Tella et al. (2010) finds strong evidence of adaptation to income but little evidence of adaptation to relative status in self-reported life satisfaction. This mechanism also provides a foundation

for the Easterlin paradox, in which increases in average income over time do not necessarily translate into sustained increases in average happiness (Easterlin, 1974).

In the labor market, social comparison is usually measured by relative income or relative pay. Extensive empirical evidence shows that relative pay affects job satisfaction, job mobility, productivity, and other labor-market outcomes, often through behavioral concepts such as loss aversion, aspirations, adaptation, or reference dependence (Clark and Oswald, 1996; Card et al., 2012; Dube et al., 2019; Breza et al., 2018). Economic decisions, however, reflect an optimization process in which feasible alternatives are compared and ranked according to preferences. From this perspective, ordinal rank itself is economically meaningful.[1] Despite important exceptions such as Brown et al. (2008), relatively few studies directly examine the role of ordinal wage rank in labor-market behavior.

More broadly, the existing literature on workers' comparison behavior is predominantly in reduced form. To my knowledge, structural work that embeds comparison concerns into a labor-market model to study their equilibrium consequences remains scarce. This distinction matters because comparison concerns may alter reservation wages, search effort, job mobility, thereby shaping the distribution of accepted wages. Through these channels, comparison behavior can affect unemployment, wage dispersion, and social welfare, and may further condition how labor-market outcomes respond to policies or shocks that change the distribution of wage offers.

This paper addresses this gap by using ordinal wage rank as a tractable and empirically disciplined measure of comparison concerns. I embed rank-dependent utility into an on-the-job search model with endogenous search effort, where workers are ex ante homogeneous. It is well established that similar workers are often paid differently, even within narrowly defined labor markets (Abowd and Kramarz, 1999; Mortensen, 2003). Search frictions provide an important explanation for such wage dispersion, and its underlying sources have received substantial attention (Hornstein et al., 2011; Burdett et al., 2011; Masters, 2016; Ortego-Marti, 2016). At the same time, the resulting wage dispersion may also itself serve as a reference environment in which workers compare themselves to their peers. I use workers' ordinal position within this distribution to capture these comparison concerns. The model is calibrated. Then, I conduct counterfactual analysis to study how the strength of workers' rank concerns affect non-market activity and labor-market outcomes, and how it interacts

[1] In heterogeneous environments, ordinal rank can serve as a heuristic that conveys information about latent quality or future opportunities, influences resource allocation, and shape individuals' confidence, self-perceptions, and subsequent choices (Ursu, 2018; Murphy and Weinhardt, 2020; Chun and Larrick, 2022). In labor markets, rank may also reflect workplace status and relative standing (Frank, 1984a,b). Among homogeneous worker groups, wage rank more directly reflects recognition, status, and perceived fairness. This paper studies ordinal wage rank in this latter sense.

with changes in offer wage dispersion. The key insight is that rank concerns render low-wage jobs relatively less attractive while raising the value of climbing the job ladder, thereby increasing both the reservation wage and search efforts. Because rank concerns directly enter utility through the endogenously determined paid-wage distribution, these individual responses feed back into the entire system.

The analysis proceeds in three steps. First, I estimate the strength of rank concerns using the National Longitudinal Survey of Youth 1997 (NLSY97). To compare workers with similar observable characteristics, I construct a residual wage distribution from a Mincer wage regression. I measure ordinal wage rank using rank-from-top, defined as the fraction of comparable workers earning more than the worker within an occupation-by-month reference group. I then estimate the relationship between this wage rank and self-reported job satisfaction. The individual fixed effects model implies that a 10pp deterioration in rank requires approximately a 13 percent wage increase to leave predicted job satisfaction unchanged.

Second, I use this estimate to discipline the rank-concern parameter in a partial equilibrium on-the-job search model with endogenous search effort and rank-dependent disutility. Workers are either unemployed or employed, choose search intensity, and receive job offers through a frictional search process. Unemployed workers accept or reject offers according to a reservation wage rule, while employed workers search on the job and move to higher-paying jobs when they arrive. Employed workers derive utility not only from their wage but also from their ordinal position within the endogenous paid-wage distribution, with lower-ranked workers experiencing greater comparison disutility. I then calibrate the benchmark model to match labor market transition rates and wage distribution moments from the NLSY97.

The calibrated model matches the targeted moments well and generates a non-targeted unemployment rate of 5.97%, close to its empirical counterpart. It implies that unemployed workers search nearly twice as intensively as employed workers at the reservation wage, and that employed search effort declines monotonically with wages. The calibration also implies a low value of non-market activity, consistent with the tension emphasized by (Hornstein et al., 2011): search models that generate substantial wage dispersion often require a low value of being unemployed. In the benchmark economy, only 37.06% of offers exceed the reservation wage, and social welfare is 411.48.

Third, I use the calibrated model to conduct counterfactual analyses. I begin by comparing the benchmark economy with a recalibrated economy in which the rank-concern parameter is set to zero. Although rank concern increases the option value of search and induces greater search effort, it substantially lowers the implied value of non-market activity and social welfare. Following the logic of the mean-min ratio in (Hornstein et al., 2011), I also show theoretically that rank concerns reduce the range of wage dispersion that can be

supported by the model.

Next, I study how the equilibrium outcomes vary with the strength of rank concerns. The quantitative results show that these effects are economically significant. Moving from no rank concern to the empirically estimated value raises the reservation wage by more than four dollars and reduces the job acceptance rate by nearly 38pp. It also lowers the job finding rate for unemployed workers and the average job-to-job transition rate for employed workers by 56pp and 33pp, respectively. As a result, the unemployment rate rises from 2.7 to 6.0 percent while the social welfare falls by nearly 29 percent.

Finally, I study how rank concerns interact with changes in offer wage dispersion while the mean offer wage is preserved. It is well known in the labor market that wider wage(offer) dispersion can have uneven effects across workers. A thicker upper tail benefits workers who receive high wage offers, whereas a thicker lower tail can have adverse effects for relatively low-wage workers by reducing the probability that they receive offers that allow them to climb the job ladder (Van den Berg, 1995). The counterfactual analysis captures this feature. More importantly, the model shows that workers' comparison behavior changes how this dispersion is transmitted through the labor market. Since rank concern raises the reservation wage, it shifts the lower bound of the accepted wage distribution away from the region where workers are most negatively affected by the fall in acceptable offer probabilities. In this sense, rank concerns can mitigate the adverse mobility effects of wider offer dispersion at the lower end of the wage distribution. At the same time, rank concerns amplify the value of upper tail offers because they improve both absolute wages and relative position. Thus, stronger comparison behavior amplifies the effects of wage offer dispersion on reservation wages, accepted wages, and social welfare.

This paper contributes to three strands of literature. First, it complements the literature on job satisfaction, comparison behavior, and relative deprivation by showing that ordinal wage rank within a reference group itself matters for workers' subjective well-being. Workers respond not only to their absolute wage level but also to their relative position in the wage distribution. Second, the paper develops a tractable search-theoretic framework that incorporates workers' comparison behavior into reservation wage and search intensity decisions, allowing the analysis of its equilibrium effects on aggregate job mobility, wage dispersion, unemployment, and social welfare. Third, the paper shows that comparison behavior changes how offer wage dispersion affects labor market outcomes. By raising reservation wages, stronger rank concerns partially mitigate the adverse effects of greater wage dispersion on low-wage workers while amplifying its effects on reservation wage, option value, job mobility, and social welfare. Although rank concerns reduce welfare overall, they increase the welfare gain associated with wider offer dispersion.

The remainder of the paper is organized as follows. Section 2 describes the NLSY97 data and estimates the relationship between wage rank and job satisfaction. Section 3 lays out the on-the-job search model with rank-dependent disutility. Section 4 describes the calibration strategy and model fit. Section 5 examines the implications of rank concerns for non-market value, equilibrium, labor market outcomes, and the transmission of changes in offer wage dispersion. Section 6 concludes.

2 Data and Empirical Regularities

I begin by quantifying workers' rank concerns using self-reported satisfaction as an empirical proxy for utility. The main data source is the National Longitudinal Survey of Youth 1997 (NLSY97), which follows a cohort of U.S. youth born between 1980-1984. The baseline sample contains 8,984 respondents who were 12-17 years old at the first interview in 1997. The interviews are conducted annually through 2011 and biennially thereafter. The NLSY97 job-history modules record respondents' employers using a unique identification number and report the start and end weeks of each job, together with detailed job characteristics, including hours worked, hourly pay, industry, occupation, job type, and union status. Using these histories, I reconstruct an employer-linked weekly panel that tracks employment states, job spells, and job transitions over time.

In addition to rich information on job histories and wages, the NLSY97 elicits job satisfaction for each employer held between interviews. In each survey round, respondents evaluate how they feel about each job using the following item:

> "Which of the following best describes how you [feel/felt] about your job [as/with] [this employer]?"

Responses are recorded on a five-point scale ranging from 1 (Like it very much) to 5 (Dislike it very much). "Refused" and "Don't know" responses are recorded separately and treated as missing data. For ease of interpretation, the original scale is reversed so that higher values correspond to higher satisfaction (5 = Like it very much).

Now I turn to the construction of the employer-linked weekly panel, where the main challenge is that the raw job-history records contain substantial survey noise in both employment spells and implied transition rates. In particular, the data contain short-leave cases in which a worker temporarily leaves a job and then returns to the same employer within a few weeks. Treating these as true separations would inflate job-destruction and job-finding transitions. Therefore, these short-leave cases are treated as a single continuous spell if the gap is less than or equal to two weeks, and the job-specific characteristics are filled using the

worker's most recently reported information for that employer. A second challenge is that reported job start/end weeks are often missing or inconsistent, especially once interviews become biennial, and retrospective backfilling becomes more common. Therefore, weekly employment histories are reconstructed using the NLSY97-assigned weekly employment status, which records labor-force status each week and provides a unique employer ID when the respondent is employed. Because the employer roster is sorted by job end date with the current or most recent job listed first, it also helps resolve overlaps between employers. Finally, a valid employer ID serves as the crosswalk that links weekly employment records with the corresponding job-level characteristics.

Data are restricted from January 2011 to December 2019 to capture recent labor-market conditions. Self-employed workers and workers in the armed forces or public sector are excluded. Following the CPS classification, employment status is not defined by weekly hours worked. Instead, hours worked are controlled for both empirical analysis and model calibration, as labor supply is not the main focus of this paper. The weekly labor-market status is coded as employed, unemployed, or not in the labor force. The general weekly unemployment rate, later converted to the monthly rate, is constructed based on these three states. Because the model abstracts from labor-force participation decisions, I focus on the employed and non-employed margin when constructing transition hazards from the weekly panel (details in the calibration strategy section). For the job satisfaction empirical analysis, I further restrict to employed workers with valid employer identifiers and associated job characteristics (job satisfaction, occupation and industry codes, fringe benefits, establishment size, union status). To reconcile with the monthly frequency in the calibration, I collapse the weekly employer-linked panel to one observation per individual per month by retaining the worker's most recent observed week in that month. Wages are measured as the log of real hourly pay, excluding overtime, tips, and bonuses.

Because the interest of this paper is to study how a worker's ordinal wage rank among observationally similar workers within a salient reference group affects labor market outcomes, I first construct the wage distribution for homogeneous workers and then assign each worker a wage rank within the corresponding reference group based on the worker's position in that distribution. The ideal setting would be matched employer–employee establishment data containing the wages and characteristics of all coworkers in the same workplace so that the rank can be measured within. However, although NLSY97 provides unique employer identifiers for respondents, the identifiers are not internally linked across workers and therefore do not permit the identification of common employers or establishments. Following the standard approach in the frictional wage-dispersion literature, I isolate the residual wages by estimating a Mincer-type regression on the monthly panel. The specification controls

for observed worker characteristics—including gender, race, age(and its square), tenure with the current employer, highest degree attained, urban residence, and metropolitan status.[2] Specifically, I estimate

$$\begin{aligned}\ln(w_{it}) = \alpha_0 &+ \alpha_1 \,\text{Gender}_i + \alpha_2 \,\text{Race}_i + \alpha_3 \,\text{Age}_{it} + \alpha_4 \,\text{Age}_{it}^2 \\ &+ \alpha_5 \,\text{Tenure}_{it} + \alpha_6 \,\text{Edu}_i + \alpha_7 \,\text{Urban}_{it} + \alpha_8 \,\text{Metro}_{it} + m_t + \varepsilon_{it}.\end{aligned} \tag{2.1}$$

where m_t denotes monthly fixed effects and ε_{it} is the residual log wage. The distribution of ε_{it} is used as the wage distribution for ex-ante homogeneous workers.

Reference groups are defined by occupation.[3] Specifically, I use the Bureau of Labor Statistics (BLS) Census 2002 occupation codes to construct occupational reference groups. To ensure adequate cell sizes, I aggregate the two-digit occupation codes into five broad categories: (i) Management, Professional, and Related Occupations; (ii) Service Occupations; (iii) Sales and Office Occupations; (iv) Construction and Maintenance Occupations; and (v) Production, Transportation, and Material Moving Occupations. Then the estimated residual log wage, $\hat{\varepsilon}_{it}$, is used to assign each worker an ordinal wage rank within the corresponding occupation-by-month reference group.

As workers value both absolute pay and their ordinal position within their reference group, the gap between a worker's rank and the top of the distribution summarizes how far the worker is from the best-paid comparable jobs. I interpret this distance as a measure of relative deprivation among observationally similar workers. In the model, this rank-based disutility arises endogenously from comparison concerns interacting with the accepted wage distribution in a frictional labor market. Motivated by this interpretation, I define rank-from-top (RFT) as

$$RFT_{it} = 1 - G_{gt}(\hat{\varepsilon}_{it}), \tag{2.2}$$

where $G_{gt}(\hat{\varepsilon}_{it}) \in [0, 1]$ denotes homogeneous worker i's percentile rank in the paid-wage distribution within occupation group g at time t.

While job satisfaction is used as an empirical proxy for workers' utility, the conventional concept of utility is ordinal in the economic sense—defined only up to a monotone trans-

[2]The Mincer regression nets out only observed worker characteristics because the standard literature on frictional wage dispersion assumes that workers are ex ante homogeneous. Hence, the distribution of residual wage represents the relevant source of dispersion among otherwise comparable workers.

[3]The labor markets are segmented by occupational categories in which workers compare themselves to others. Accordingly, the ordinal wage rank is constructed within occupation-based reference groups. In practice, workers may also compare their relative standing across different labor markets, and switches in occupations are observed in the data. Frank (1985) studies the impacts of status on labor market decision and mobility, which are beyond the scope of the present analysis.

formation and therefore representing a ranking of indifference curves rather than a cardinal measure. Accordingly, self-reported job satisfaction, typically recorded on an ordered scale, is commonly modeled using an ordered probit or logit model, depending on the assumed distribution of the latent error term (Maddala (1983)). A key empirical concern, however, is that unobserved time-invariant individual traits—such as innate ability or personality—may be correlated with wages and other observed variables, leading to omitted-variable bias in pooled specifications. Incorporating individual fixed effects directly into ordered probit model leads to inconsistent estimates. One workaround is the conditional fixed-effects logit model introduced by Chamberlain (1980), but it requires collapsing the outcome to a binary indicator and drops individuals without within-person variation, which can substantially reduce the sample size and discard information contained in intermediate satisfaction categories. An alternative is the correlated random effects specification proposed by Mundlak (1978), which includes individual-specific averages of all time-varying covariates to account for potential correlation between the unobserved individual effect and the regressors. This approach preserves the ordered structure of the dependent variable without reducing the sample size. In addition, one may estimate ordered probit models with random individual effects under the maintained exogeneity assumptions. Finally, Van Praag and Ferrer-i Carbonell (2004) propose the probit-adapted OLS (POLS) method, which rescales the ordinal outcome using the cumulative frequencies of reported categories under a standard normal latent error so that linear panel methods, including fixed- and random-effects estimators, can be applied. The assumptions, implementation details, and empirical applications of these approaches are reviewed extensively in Van Praag and Ferrer-i Carbonell (2004). Guided by this literature, I examine how workers' absolute pay and rank concerns relate to job satisfaction using the following two-way fixed-effects specification:

$$SAT_{it} = \beta_0 + \beta_1 \ln(w_{it}) + \beta_2 RFT_{it} + x'_{it}\Gamma + f_i + m_t + \xi_{it}, \tag{2.3}$$

where SAT_{it} denotes self-reported job satisfaction for individual i at time t, $\ln(w_{it})$ is the log of real hourly pay, and RFT_{it} captures the worker's rank concern within the relevant reference group. The vector x_{it} contains a set of controls.[4] Individual fixed effects f_i absorb time-invariant characteristics, and m_t denotes monthly time fixed effects.

Table 1 reports the estimation results from the pooled ordered probit model, the random-effects ordered probit model, and the transformed pooled linear specifications with random

[4]The control variables include log hours worked, age and age squared, race, highest educational attainment, marital status, number of children, health status, industry dummies, the number of fringe benefits available to the worker, job tenure, establishment size, metropolitan and urban/rural status, enrollment status, and union status.

Table 1
Job Satisfaction, Absolute Pay, and Rank Concerns.

	Ordered probit		Probit-adapted OLS (POLS)		
	(1) Pooled	(2) RE	(3) Pooled	(4) RE	(5) FE
ln(real hourly pay)	0.116	0.291**	0.0834	0.146**	0.146**
	(0.0737)	(0.119)	(0.0596)	(0.0635)	(0.0651)
RFT	-0.237**	-0.338**	-0.203**	-0.194**	-0.191**
	(0.106)	(0.167)	(0.0869)	(0.0914)	(0.0933)
ln(hours)	-0.107***	-0.218***	-0.0825***	-0.113***	-0.115***
	(0.0333)	(0.0511)	(0.0257)	(0.0274)	(0.0279)
Controls	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Individual FE	No	No	No	No	Yes
Number of Observations	314,392	314,392	314,392	314,392	314,392
R^2			0.072		0.053

Notes:
(1) Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors (clustered at the individual level) are reported in parentheses.
(2) All specifications include the full set of controls described in the text.

and fixed effects. Standard errors are reported in parentheses. For brevity, coefficients on the full set of control variables are omitted, but they are available upon request.

Across specifications, the signs on absolute pay, rank concern, and hours worked align with the expectation that workers derive positive utility from higher absolute wages, while job satisfaction decreases with lower relative position and with longer hours worked. The coefficient on RFT is negative and statistically significant in all models. This finding is consistent with Brown et al. (2008) and Bryson et al. (2012), who use linked employer-employee data for Britain and show that a worker's wage rank within the workplace, conditional on absolute pay, is positively associated with job satisfaction, particularly pay satisfaction. Moreover, absolute pay is statistically insignificant in the pooled specifications but becomes significant at the 5% level once individual heterogeneity is accounted for through random- or fixed-effects models. The smaller wage coefficients in the pooled models relative to the random- and fixed-effects estimates suggest downward omitted-variable bias: unobserved job or worker attributes that are positively correlated with wages may be negatively associated with job satisfaction. For example, Bryson et al. (2012) shows that higher wages often come with higher required efforts, which increase job anxiety and reduce job satisfaction. Masters (2016) shows that allowing firms to endogenously choose wage-effort pairs is essential for

translating firm productivity heterogeneity into substantial wage dispersion in a frictional labor market. Although the random-effects and fixed-effects estimates are quantitatively similar, the Hausman test rejects the random-effects orthogonality restriction, suggesting that unobserved individual heterogeneity is correlated with the regressors.[5] Therefore, I adopt the fixed-effects estimates as the preferred specification.

Because real wages enter in logarithmic form while the rank-from-top measure enters in levels, the implied trade-off has a semi-elasticity interpretation. In the transformed linear fixed-effects model, the coefficient on rank from top is -0.191, whereas the coefficient on log wages is 0.146. The implied ratio is therefore $-0.191/0.146 = -1.308$. This means that, holding other covariates fixed, a 10-percentage-point deterioration in a worker's rank position requires a 13.08 percent increase in wages to leave predicted job satisfaction unchanged. Such a decline in relative rank may arise when the wages of peers increase more rapidly than a worker's own wage. The resulting loss of relative standing may lower workers' job satisfaction and affect subsequent labor market behavior. For example, Card et al. (2012) show that workers who learn they are paid less than their peers report lower job satisfaction and higher intention to search for another job. Similarly, Dube et al. (2019) shows the perception of pay fairness can influence workplace productivity. This interpretation is also closely related to Frank's status-based view of wage determination, in which workers who value higher within-firm rank may be willing to accept lower pay in exchange for better relative standing (Frank, 1984b,a).

Motivated by these empirical regularities, I next study how rank concerns shape workers' search behavior and the resulting labor-market equilibrium. To do so, I develop a partial equilibrium on-the-job search model with rank concern and endogenous search effort, mainly following Burdett (1978) and Christensen et al. (2005).

3 Model

3.1 Environment and preferences

Time is continuous with an infinite horizon. There is a unit mass of ex-ante identical, infinitely lived workers who maximize the expected discounted sum of utility at a rate r, in a stationary environment. At each point in time, each worker is either unemployed (state 0) or employed (state 1). Workers choose search effort endogenously: in state $i \in \{0, 1\}$, job offers arrive rate is $\lambda_i s_i$, where s_i denotes search effort in state i and λ_i denotes the

[5] A Hausman test was conducted to choose between fixed and random effects. The null hypothesis was rejected ($\chi^2(27) = 100.33$ with $p < 0.001$), supporting the use of fixed effects model.

state-contingent search efficiency in a Poisson process. Search effort entails cost $c(s_i)$, where $c(.)$ is twice differentiable, strictly increasing, and strictly convex, with $c(0) = c'(0) = 0$ and $\lim_{s\to\infty} c'(s) = \infty$. Employed workers face an exogenous job destruction rate δ.

In both states, workers draw wage offers from a common exogenous offer distribution $F(\cdot)$ on support $[0, \bar{w}]$. An unemployed worker accepts an offer whenever the value of employment at the offered wage exceeds the value of remaining unemployed, while an employed worker currently earning wage w accepts an offer only if the offered wage exceeds his current wage. The distribution of paid wages, denoted by $G(w)$, is endogenously determined in steady state. Workers have information on offer distribution $F(\cdot)$ and steady-state paid-wage distribution $G(\cdot)$, but they cannot direct search towards specific jobs; search is therefore random. Upon accepting an offer, the realized wage reveals the worker's rank in the paid-wage distribution, and the model allows workers to respond to this rank information. Since workers are ex ante identical, they evaluate their position relative to other employed workers in $G(\cdot)$. The status disutility is captured through the upper-tail mass $1 - G(w)$, which measures the fraction of workers earning more than w. A common parameter v governs the strength of this rank-based disutility. Therefore, employed workers derive utility from consumption in the form of wage and disutility from their status comparison and search effort, and the flow utility is

$$u(w) = \log(w) - v[1 - G(w)] - c(s_1).$$

Unemployed workers do not experience status disutility, so their flow utility is

$$u_0 = \log(b) - c(s_0).$$

where b denotes the value of non-market activities. I adopt a logarithmic form so that the consumption component is scale-invariant and naturally comparable to the unit-free rank term $1 - G(w)$, consistent with the empirical specification in Section 2.

3.2 Value functions

Let $V(w)$ denote the present discounted value of being employed at wage w, it solves the Bellman equation

$$rV(w) = \max_{s_1 \geq 0} \Bigg\{ \log(w) - v[1 - G(w)] - c(s_1) + \lambda_1 s_1 \int [\max(V(x) - V(w), 0)] dF(x) + \delta[U - V(w)] \Bigg\}. \quad (3.1)$$

where U is the value of being unemployed.

At each instant, an employed worker chooses search effort s_1 optimally. The first part on the right-hand side is the instantaneous payoff from holding a job that pays w: utility from consumption net of status disutility and search costs. The second term is the expected value gain from on-the-job search. Job offers arrive at rate $\lambda_1 s_1$, and the worker accepts an offer only when it increases lifetime value, i.e., when $V(x) > V(w)$. The final term captures the expected value loss due to job destruction. With hazard rate δ, the worker transitions from employment value $V(w)$ to unemployment value U.

Similarly, the value of unemployment solves

$$rU = \max_{s_0 \geq 0} \left\{ \log(b) - c(s_0) + \lambda_0 s_0 \int [\max(V(x) - U), 0] dF(x) \right\}. \tag{3.2}$$

Although workers care about their rank, the employment value $V(w)$ remains strictly increasing in the wage. By the envelope theorem, evaluating the Bellman equation of an employed worker at the optimal search policy $s_1(w)$ yields

$$V'(w) = \frac{1/w + vg(w)}{r + \delta + \lambda_1 s_1(w)[1 - F(w)]} > 0. \tag{3.3}$$

So higher wages strictly raise the value of employment despite the presence of status concern, and there exists a reservation wage, R, such that an unemployed worker is indifferent between accepting a job that pays R and remaining unemployed. Hence, R satisfies

$$V(R) = U. \tag{3.4}$$

Employed and unemployed workers choose search effort to maximize the net return of search. For an employed worker currently earning w, optimal on-the-job search effort solves

$$s_1(w) \;=\; \underset{s_1 \geq 0}{\operatorname{argmax}} \left\{ \lambda_1 s_1 \int_w^{\bar{w}} [V(x) - V(w)] dF(x) - c(s_1) \right\}. \tag{3.5}$$

Similarly, an unemployed worker's optimal search effort solves

$$s_0 \;=\; \underset{s_0 \geq 0}{\operatorname{argmax}} \left\{ \lambda_0 s_0 \int_R^{\bar{w}} [V(x) - U] dF(x) - c(s_0) \right\}. \tag{3.6}$$

The first-order necessary conditions for optimal search effort when employed and unem-

ployed are

$$c'(s_1(w)) = \lambda_1 \int_w^{\bar{w}} [V(x) - V(w)]dF(x) \tag{3.7}$$

$$c'(s_0) = \lambda_0 \int_R^{\bar{w}} [V(x) - U]dF(x). \tag{3.8}$$

These conditions equate the marginal cost of search effort to its marginal benefit. Since the search cost function is convex, the search effort is strictly decreasing in w.

Using Equation 3.1, Equation 3.2, and Equation 3.4 evaluated at the optimal search intensities, and imposing that in steady state the paid-wage distribution has support $[R, \bar{w}]$ so that no worker accepts offers below the reservation wage, implying $G(w) = 0$, the reservation wage (see Appendix A.1) can be written as

$$\log(R) = \log(b) + v + (\lambda_0 s_0 - \lambda_1 s_1(R)) \int_R^{\bar{w}} [V(x) - U]dF(x) - (c(s_0) - c(s_1(R))). \tag{3.9}$$

Integrating Equation 3.9 by parts yields

$$\log(R) = \log(b) + v + (\lambda_0 s_0 - \lambda_1 s_1(R)) \int_R^{\bar{w}} \frac{[1/x + vg(x)][1 - F(x)]}{r + \delta + \lambda_1 s(x)[1 - F(x)]} dx - (c(s_0) - c(s_1(R))). \tag{3.10}$$

Note that if search efficiency is the same for employed and unemployed workers (i.e., $\lambda_1 = \lambda_0$), then Equation 3.7 and Equation 3.8 imply that an employed worker earning the reservation wage and an unemployed worker choose the same search intensity, $s_1(R) = s_0$. In this case, the reservation wage is pinned down by the value of non-market activities and the strength of rank concerns. In general, empirical evidence suggests that job arrival rates are higher in unemployment than in employment, implying $\lambda_1 < \lambda_0$. As a result, unemployed workers have a higher marginal benefit of search and therefore choose higher search intensity than an employed worker at the reservation wage, $s_0 > s_1(R)$, and the reservation wage is endogenously determined in the model.

3.3 Steady-State Relationships

In the model, δ denotes the exogenous job destruction rate that transitions workers from employment to unemployment. Unemployed workers accept any offer above the reservation wage R. With search intensity s_0, offers arrive according to a Poisson process with rate

$\lambda_0 s_0$, and the acceptance probability is $1 - F(R)$. Hence, the job-finding hazard out of unemployment is $\lambda_0 s_0[1 - F(R)]$. In steady state, flow balance implies

$$(1-u)\delta \;=\; u\,\lambda_0 s_0[1-F(R)] \tag{3.11}$$

where u is the unemployment rate. Equivalently,

$$u \;=\; \frac{\delta}{\delta + \lambda_0 s_0[1-F(R)]} \quad \text{and} \quad \frac{u}{1-u} \;=\; \frac{\delta}{\lambda_0 s_0[1-F(R)]}. \tag{3.12}$$

Next, I characterize the steady-state distribution of paid wages. Let $G(w)$ denote the fraction of employed workers earning a wage less than or equal to w. The gross inflow into the set of jobs paying w or less is the flow from unemployment into such jobs. The outflow consists of job destruction from these jobs and job-to-job transitions from wages less than w to wages greater than w. Equating inflows and outflows yields the steady-state relationship between the offer-wage distribution $F(\cdot)$ and the paid-wage distribution $G(\cdot)$,

$$(1-u)\left[\delta G(w) + \lambda_1\big(1-F(w)\big)\int_R^w s_1(x)\,dG(x)\right] \;=\; u\,\lambda_0 s_0\big(F(w)-F(R)\big), \quad w \in [R,\bar{w}]. \tag{3.13}$$

Equation 3.13 implicitly defines a mapping from the exogenous offer distribution $F(\cdot)$ to the endogenous paid-wage distribution $G(\cdot)$.

Substituting Equation 3.12 into Equation 3.13 gives

$$G(w) + \frac{\lambda_1}{\delta}\big(1-F(w)\big)\int_R^w s_1(x)\,dG(x) \;=\; \frac{F(w)-F(R)}{1-F(R)}, \quad w \in [R,\bar{w}]. \tag{3.14}$$

Differentiating Equation 3.14 with respect to w, the density of the steady-state paid-wage distribution $g(w)$ (see Appendix A.2) satisfies

$$g(w) \;=\; \frac{\frac{\delta}{1-F(R)}\,f(w) + \lambda_1 f(w)\int_R^w s_1(x)g(x)\,dx}{\delta + \lambda_1 s_1(w)\big(1-F(w)\big)}, \quad w \in [R,\bar{w}]. \tag{3.15}$$

where $f(w)$ is the density of the offer-wage distribution.

3.4 (Partial) Equilibrium

Definition 1 *A stationary equilibrium with comparison behavior and endogenous search intensity is a tuple $(R, s_0, s_1(\cdot), u, G)$ such that:*

- *Given $G(\cdot)$ and R, the optimal search intensities s_0 and $s_1(w)$ solve Equation 3.5 and Equation 3.6.*
- *Given R, the steady-state paid-wage distribution $G : [R, \bar{w}] \to [0, 1]$ satisfies Equation 3.14.*
- *The reservation wage R is given by Equation 3.10.*
- *The steady-state unemployment rate u is implied by Equation 3.12.*

For a given offer-wage distribution $F(\cdot)$ on $[0, \bar{w}]$, the following two lemmas characterize the conditional search-density system used to construct a stationary partial equilibrium.

Lemma 1 (Conditional characterization of employed search) *For a given reservation wage $R \in (0, \bar{w})$ and a paid-wage density $g(\cdot; R)$, the optimal on-the-job search policy $s_1(\cdot; R)$ is characterized by*

$$s_1'(w; R) = -\frac{\lambda_1}{c''(s_1(w; R))} \frac{[1/w + vg(w; R)][1 - F(w)]}{r + \delta + \lambda_1 s_1(w; R)[1 - F(w)]} < 0 \tag{3.16}$$

with boundary condition $s_1(\bar{w}) = 0$.

Proof. See Appendix A.3.

Lemma 2 (Conditional paid-wage density) *For a given reservation wage $R \in (0, \bar{w})$ and an employed search policy $s_1(\cdot; R)$. The steady-state paid-wage density $g(\cdot; R)$ satisfies the Volterra integral equation. This equation can be reduced to a first-order linear ODE with a closed-form solution*

$$g(w; R) = \frac{\delta}{[1 - F(R)]} \frac{f(w)}{\delta + \lambda_1 s_1(w)\big[1 - F(w)\big]} \exp\left\{\lambda_1 \int_R^w \frac{s_1(x) f(x)}{\delta + \lambda_1 s_1(x)\big[1 - F(x)\big]}\, dx\right\}, \quad w \in [R, \bar{w}]. \tag{3.17}$$

Proof. See Appendix A.3.

Together, Lemmas 1 and 2 characterize the conditional objects $\big(s_1(\cdot; R), g(\cdot; R), G(\cdot; R)\big)$ for each candidate reservation wage R.

Proposition 1 (Existence of a stationary partial equilibrium) *Suppose that, for each candidate reservation wage $R \in (0, \bar{w})$, the conditional search-density system characterized in Lemmas 1 and 2 admits a solution $\big(s_1(\cdot; R), g(\cdot; R), G(\cdot; R)\big)$. Assume $\lambda_0 > \lambda_1$, $b > 0$, and $v \geq 0$. If $-\infty < \log b + v < \log \bar{w}$, then there exists at least one stationary partial equilibrium.*

Proof. See Appendix A.4.

3.5 Social Welfare

In the stationary equilibrium, social welfare is measured as the expected lifetime value of workers in the economy. Thus

$$W \;=\; u\,U \;+\; (1-u)\int_{R}^{\bar{w}} V(w)\,dG(w), \tag{3.18}$$

where u is the steady-state unemployment rate and $G(w)$ is the stationary paid-wage distribution.

In the stationary equilibrium with optimal search effort, based on the Equation 3.1 and Equation 3.2, the value functions for an employed worker earning wage w and for an unemployed worker, respectively, are

$$V(w) = \frac{\log(w) - v[1-G(w)] - c(s_1(w)) + \lambda_1 s_1(w)\int_w^{\bar{w}}[V(x)-V(w)]dF(x) + \delta U}{r+\delta}$$

and

$$U = \frac{\log(b) - c(s_0) + \lambda_0 s_0 \int_R^{\bar{w}}[V(x)-U]dF(x)}{r}.$$

4 Calibration

I calibrate the model to match key labor market moments of the NLSY97 cohort over the period 2010-2019 in four steps. First, I construct the wage distribution for homogeneous workers and describe the data moments used in the calibration. Second, I introduce the preset parameters and remaining functional forms in Section 4.2. Third, I describe the moment selection and the calibration strategy in Section 4.3. Next, I present the calibrated parameters and model fit in Section 4.4. Finally, I discuss the non-targeted validation in Section 4.5.

4.1 Empirical Wage Distribution and Data

I begin by constructing the empirical wage distribution for homogeneous workers. Using the monthly NLSY97 panel described in Section 2, the distribution of $\hat{\varepsilon}_{it}$ from the Mincer regression in Equation 2.1 is treated as the residual wage dispersion among similar workers. Because the model is parameterized in wage levels rather than logarithmic wages, I convert

this residual distribution into dollars. Specifically, I first compute the weighted sample mean of fitted logarithmic wages, $\widehat{m} = \mathbb{E}_w[x_{it}\hat{\beta}]$, where the NLSY sampling weights are used. Then the level of homogeneous worker wage is constructed using $w_{it}^H = \exp(\widehat{m})\exp(\hat{\varepsilon}_{it})$. This transformation preserves the residual wage dispersion while placing the distribution on an empirically relevant dollar scale.

Table 2
Summary Statistics of the Homogeneous Wage Distribution.

Statistic	Value
Min. wage (5th percentile)	8.79
10th percentile	11.04
Median	17.03
Mean	19.17
90th percentile	29.75
Max. wage (99th percentile)	49.35
Observations	298,672

Notes: The table reports summary statistics for the homogeneous wage distribution constructed from residual wage variation among observationally similar workers. The minimum wage is set at the 5th percentile, while the upper support bound, maximum wage, is set at the 99th percentile.

The model period is one month. Since unemployment-to-employment (UE) and the average employment-to-employment (EE) transition rates are targeted moments (see Section 4.3 for the moment selection), both are constructed from the weekly employment histories in the NLSY97 and converted to monthly rates to match the model's time unit. For transition-rate measurement, unemployment is defined broadly to include both unemployed workers and individuals out of the labor force, while the unemployment rate itself is identified separately using reported labor force status. For average EE transitions, all job-to-job moves are included, without conditioning on whether the worker experiences a wage gain.

4.2 Preset Parameters and Functional Forms

This section describes the functional forms used in the calibration and distinguishes between externally calibrated parameters, preset parameters, and parameters estimated by generalized method of moments.

I assume the offer wage distribution $F(\cdot)$ is taken to be exogenous and log-normal with parameters μ and σ. The search-cost function takes the isoelastic form

$$c(s_i) = \frac{c_0 s_i^{1+1/\alpha}}{1+1/\alpha}. \tag{4.1}$$

where $c_0 > 0$ is a scale parameter and $\alpha > 0$ governs the curvature of search costs.

Since the reservation wage, search intensities for unemployed and employed workers, and paid wage distribution are endogenously determined, there are 12 parameters to be calibrated. Although the reservation wage is endogenous, since the value of non-job market value, b, is not directly observed and the value functions are measured on the support $[R, \bar{w}]$, I choose to externally calibrate the parameters with direct empirical interpretation $(R, \bar{w}, \delta)$, and then preset the parameters (r, c_0, α) using standard values from the literature and normalization. The rank concern parameter, v, is externally identified from the empirical specification in Section 2. The non-market value, b, is then recovered as a residual from the reservation wage Equation 3.10, and used for non-targeted validation. Finally, I use generalized method of moments to calibrate the remaining parameters $(\lambda_0, \lambda_1, \mu, \sigma)$ in Section 4.3.

I set R and $\bar{w}$ to be \$8.79 and \$49.35, respectively, based on the minimum and maximum wages observed from the reconstructed homogeneous wage distribution in Table 2. The job destruction rate, δ, is set to be 1.58%, corresponding to the monthly employment-to-unemployment (EU) rate measured from the NLSY97. The common discount rate r is set to be 0.0041, corresponding to an annual risk-free interest rate of approximately 5%. Christensen et al. (2005) estimate α to be close to 1 using Danish data, implying a quadratic cost function. Accordingly, I set α to be 1 with a normalized c_0. Turning to the rank-concern parameter, v, I use the wage-rank trade-off ratio of 1.308 identified in the job satisfaction regression based on the transformed Probit-OLS with fixed effects model in Section 2. I present the values of the parameters in Table 4.

4.3 Calibration Strategy

This section describes the moments selected for estimating the remaining model parameters and then outlines the numerical approximation and calibration procedure. The parameters to be estimated are the search efficiency parameters for unemployed and employed workers, (λ_0, λ_1), together with the two parameters (μ, σ) governing the offer wage distribution.

In the model, the job finding rate for unemployed workers and the job-to-job transition rate for employed workers are given by $\lambda_0 s_0[1 - F(R)]$ and $\lambda_1 s_1(w)[1 - F(w)]$, respectively. The search intensities $s_0(R)$ and $s_1(w)$ are also positively related to their corresponding search efficiency, as shown in Equation 3.7 and Equation 3.8. A higher search efficiency therefore raises the meeting rate between workers and employers at any given wage, translating directly into higher transition rates. Accordingly, I target the UE rate and the average

EE rate to discipline the first two parameters. In the data, the monthly UE rate for unemployed worker and the average EE rate for employed workers are 24.88% and 0.95%, respectively.

I use the constructed homogeneous wage distribution as accepted paid wage distribution to identify μ and σ in the offer wage distribution because $G(\cdot)$ is directly mapped from $F(\cdot)$ in steady state. An increase in μ shifts the offer distribution to the right, while an increase in σ reallocates the probability mass from the center of the distribution toward the tails.[6] These changes affect both the level and dispersion of accepted wage distribution. Thus, I choose the sample mean of hourly wage and the $\log(Q_{90}) - \log(Q_{10})$ wage differential to pin down the location and dispersion of the offer wage distribution. In the data, the mean hourly wage is \$19.17, while the $\log(Q_{90}) - \log(Q_{10})$ is 0.9913. I also use the average monthly unemployment rate of 5.89% as a non-targeted moment for assessing model fit.

The calibration proceeds as follows. For any candidate parameter vector θ, I solve for the model-implied stationary equilibrium on the wage support $[R, \bar{w}]$. The calibration therefore takes the form of a nested iteration: an outer optimization routine searches over θ, while, for each candidate θ, an inner fixed-point algorithm solves for the equilibrium objects $\big(s_1(\cdot), g(\cdot)\big)$ on a wage grid. Because search intensity is unobserved, state dependent, and continuous over the wage support for employed workers, each evaluation of the GMM objective requires this inner equilibrium solve.

Within the inner loop, I begin with an initial guess for the paid wage density $g(\cdot)$.[7] Conditional on this guess, the employed search effort $s_1(\cdot)$ is approximated using a backward Euler recursion. Given the updated search policy, I then update the paid wage density $g(\cdot)$, renormalize it, and repeat these alternating updates until

$$\max\left\{\|s_1^{k+1} - s_1^k\|_\infty, \|g^{k+1} - g^k\|_\infty\right\} \leq \texttt{tol}.$$

where $\texttt{tol} = 10^{-10}$. The inner solver returns the converged equilibrium pair $\big(s_1(\cdot), g(\cdot)\big)$ associated with the candidate parameter vector θ. I then use these equilibrium objects to compute the model-implied moments. The outer GMM routine compares these model moments with their empirical counterparts and constructs the moment-residual vector used in the objective function.

After obtaining the converged equilibrium, the unemployment rate u is pinned down by

[6] Of course, changes in μ and σ also impact other equilibrium objects, which feed back in the system. The effects of the change in the mean-preserving spread and its interaction with the rank concern term are studied in Section 5.3,

[7] For the initial guess, I evaluate the paid wage distribution at the reservation wage. Equation 3.15 yields $g(R) = \frac{\delta}{[1-F(R)]} \frac{f(R)}{\delta + \lambda_1 s_1(R)[1-F(R)]}$.

Equation 3.12. The implied value of non-market activity, b, is recovered from the reservation wage equation in Equation 3.10, following the exercise suggested by Hornstein et al. (2011). Social welfare is computed using Equation 3.18.

4.4 Calibration Parameters and Model Fit

I first present the model fit in Table 3. The model matches the four targeted moments exactly.

Table 3
Model Fit.

	Data	Model
UE transition rate	0.2475	0.2475
Average EE transition rate	0.0095	0.0095
$E[w]$	19.17	19.17
$\log(Q_{90}) - \log(Q_{10})$	0.9913	0.9913

I then present the estimated and external parameters in Table 4, and the implied equilibrium objects in Table 5.

Table 4
Parameter Values.

	Symbol	Values	Comment
Unemp. search efficiency	λ_0	0.3084	Estimated
Emp. Search efficiency	λ_1	0.1419	Estimated
Mean of offer wage dist.	μ	1.9459	Estimated
Std. of offer wage dist.	σ	0.7009	Estimated
Reservation wage	R	8.79	Data
Max. wage	$\bar{w}$	49.35	Data
Destruction rate	δ	0.0158	Data
Discount rate	r	0.0041	Annual 5%
Search cost scale param.	c_0	1.3161	Implied
$\varepsilon_{c,s}$	α	1	Christensen et al. (2005)
Rank Concern	v	1.308	Job-sat. Reg.
Non-market activity	b	0.2045	Implied

First, the estimate $\lambda_1 < \lambda_0$ indicates that employed workers search less efficiently than unemployed workers. This implies a lower return to search on the job than in unemployment,

Table 5
Implied Equilibrium Objects.

	Objects	Values
Unemp. search effort	s_0	2.1742
Emp. search effort at R	$s_1(R)$	1
Acceptance Prob. at R	$1 - F(R)$	0.3710
UE transition rate	$\lambda_0 s_0[1 - F(R)]$	0.2488
EE transition rate at R	$\lambda_1 s_1(R)[1 - F(R)]$	0.0526
Unemployment rate	u	0.0597
Non-market activity	b	0.2045
Social Welfare	W	411.39

consistent with the assumption used in the partial equilibrium analysis. The implied search efforts move proportionately with search efficiency: the search effort of an employed worker at the reservation wage, $s_1(R)$, is less than half of unemployed search effort, s_0. Figure 1 shows that the employed search effort, $s_1(w)$, decreases monotonically with the wages.

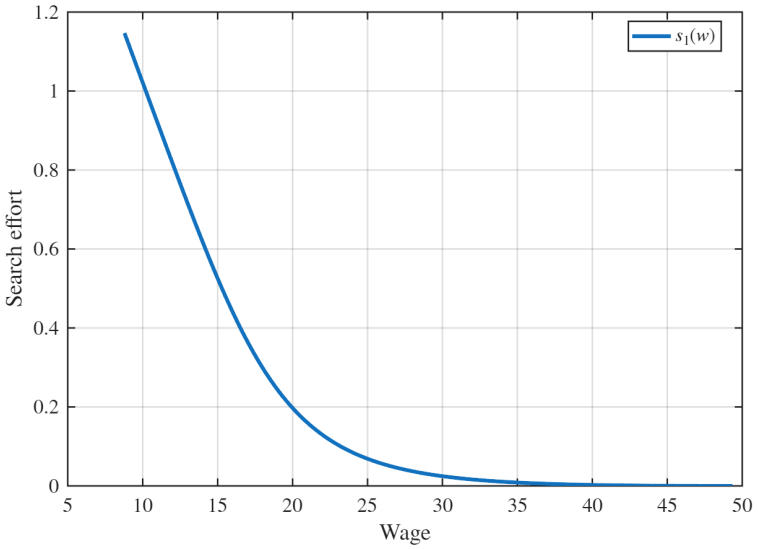


Figure 1: Benchmark On-the-Job Search Effort

The model implied job finding rates for unemployed workers, $\lambda_0 s_0$, and employed workers earning reservation wage, $\lambda_1 s_1(R)$, are 0.67 and 0.14, respectively. The job finding rate for unemployed workers is high relative to the estimate of 0.43 reported by Shimer (2012). By contrast, the implied job finding rate for employed workers at the reservation wage is lower than the value of 0.27 used by Hornstein et al. (2011). Their value is based on the assumption that the employed job finding rate is 64% of the unemployed job finding rate, using the estimates of Rosholm and Svarer (2004) from Danish data.

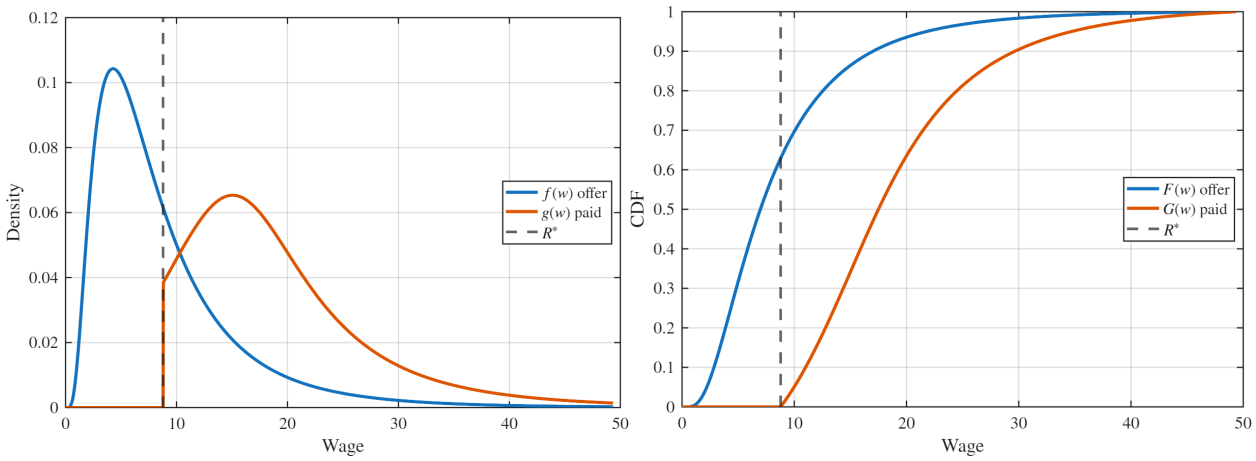
These model implied outcomes reflect both the data source and the assumed support of the offer wage distribution. Since I target the UE transition rate and the average EE transition rate from the NLSY97, the calibration results reflect the relatively low mobility rates observed for this cohort. In addition, because firms draw wage offers from a distribution with support starting at zero, a sizable fraction of offers fall below the reservation wage and are rejected. As a result, only 37% of offers are accepted at the reservation wage. This mechanism helps explain why the EE transition rate for workers earning the reservation wage is only 5.27%. Taken together, these results imply that unemployed workers move into employment much more rapidly than low-paid employed workers move up the job ladder.

Second, the calibrated offer wage distribution has mean log offer of $\mu = 1.9451$, corresponding to a median offer of approximately $\exp(\mu) \approx \$6.99$, and a standard deviation of log offers of $\sigma = 0.7012$. Compared to Hall and Mueller (2018), the calibrated offer distribution is centered at a lower level while exhibiting a greater dispersion. Hall and Mueller report a mean log offered wage of about 2.75, a standard deviation of observed log offered wage of about 0.525, and an acceptance probability at the reservation wage of roughly 78%. Their estimates are based on survey data from unemployed job seekers receiving unemployment insurance benefits in New Jersey in 2009, whereas my calibration is based on the reconstructed homogeneous wage distribution from the NLSY97.

The difference arises because the model must jointly match a mean paid wage of \$19.17, a $\log(Q_{90}) - \log(Q_{10})$ differential of 0.99, and a reservation wage fixed at \$8.79. With a relatively low reservation wage, the model requires many offers below the acceptance threshold while still generating a sufficiently high mean among accepted wages. This is achieved by an offer distribution that is centered lower, but has a relatively thicker upper tail with a greater standard deviation. Figure 2 shows that the paid wage distribution is substantially shifted to the right of the offer wage distribution and first-order stochastically dominates it.

4.5 Non-targeted Validation

Finally, the model implied unemployment rate is 5.97%, which is very close to the data counterpart of 5.84%. The implied social welfare is 411.48. And the implied value of non-market activity is $b = 0.2049$, which is recovered as the residual from Equation 3.10. Although this value is small relative to accepted wages, such a low non-market value is common in search models that are calibrated to match substantial wage dispersion. I discuss this issue in more detail in Section 5.1 below.



(a) Offer and paid wage PDF

(b) Offer and paid wage CDF

Figure 2: Benchmark Offer and Paid Wage Distributions

5 Results

This section uses counterfactual experiments to study the impact of workers' rank concern on labor market outcomes. Section 5.1 examines the implied value of non-market activity and its relationship to rank concerns. Section 5.2 studies how the strength of workers' rank concerns affects equilibrium outcomes. Section 5.3 analyzes how changes in the offer wage dispersion interact with rank concerns to shape job mobility and social welfare.

5.1 Non-market Values

In the benchmark calibration, the reservation wage equation implies a low value of non-market activity, $b = 0.20$. At the same time, unemployed workers choose a relatively high level of search effort, generating a search cost of $c(s_0) = 3.11$. Thus, the net instantaneous utility for an unemployed worker is low, even negative. This finding is consistent with the tension emphasized by Hornstein et al. (2011): search models that seek to generate substantial wage dispersion often imply a low value of non-market activity.

To clarify how rank concern contributes to this result, I recalibrate the model by setting $v = 0$, holding the same empirical targets fixed. As shown in Table 6, the implied value of non-market activity rises to 2.55, while the corresponding search cost falls to 1.59. Hence, the net value associated with unemployment is substantially lower in the economy with rank concern than in the economy without it. When workers care about rank, low-wage jobs become less attractive because they imply both low pay and a low relative position. At the same time, the option value of waiting rises because a better future offer improves both the wage level and the worker's position in the paid-wage distribution. As a result, workers

require greater compensation to accept low-ranked jobs. The higher option value also raises workers' search effort, which increases search costs. Because the transition-rate moments are held fixed in the calibration, the search-efficiency parameters adjust endogenously across specifications to match the same targets.

Table 6
Recalibrated Model Outcomes With and Without Rank Concern.

v	λ_0	λ_1	μ	σ	$I(R)$	b	$c(s_0)$	W
1.308	0.308	0.142	1.946	0.701	9.278	0.205	1.316	411.39
0	0.319	0.150	1.939	0.704	4.700	2.551	0.707	636.34

Notes:
(1) $I(R)$ is the option value for unemployed workers and employed workers earning the reservation wage measured by $\int_R^{\bar{w}}[V(x)-U]dF(x)$.
(2) The value of nonmarket activity, b, is recovered from the reservation wage equation. Since $\alpha = 1$ and $c_0 = 1$ by preset, the search-cost function reduces to $c(s_i) = s_i^2/2$.

It is worth noting that the implied social welfare is substantially lower in the economy with rank concern: $W = 411.48$ when $v = 1.308$, compared with $W = 636.39$ when $v = 0$. This difference reflects several forces. First, rank concern directly lowers the flow utility of employed workers through the term $v[1 - G(w)]$. Second, the implied value of non-market activity is much lower when rank concern is present. This directly reduces the value of unemployment and indirectly lowers the value of employment through the separation margin. Third, higher search efforts raise search costs. Hence, although rank concern increases the option values of waiting for a better paid job for unemployed and transiting to a better paid job for employed workers, this effect is more than offset by the direct comparison disutility, the lower implied outside option, and higher search costs.

This comparison connects the role of rank concern to the broader question of frictional wage dispersion among otherwise identical workers. A standard diagnostic in this literature is the mean-min ratio, Mm, introduced by Hornstein et al. (2011). In the model, as rank concern lowers the flow utility of employment, remaining unemployed while waiting for a better offer becomes relatively more attractive. This mechanism truncates the wage dispersion and results in a lower Mm ratio.[8] To facilitate comparison with the HKV framework, Appendix A.6 considers the linear-utility analogue of the baseline model and derives lower

[8]Several mechanisms have been proposed to generate substantial wage dispersion among otherwise similar workers. As discussed above, Masters (2016) emphasizes the role of firm-side components of wage dispersion. Other mechanisms operate by lowering the value of unemployment or raising the value of employment. For example, Ortego-Marti (2016) combines match-specific productivity with skill depreciation during unemployment to generate realistic wage dispersion as measured by the Mm ratio. Burdett et al. (2011) shows that learning by doing and job-related human-capital accumulation can generate similar effects. Relatedly, Masters and You (2022) and Griffy et al. (2025) show that finite-duration unemployment insurance and re-entitlement effects can generate job polarization and sizable wage dispersion.

and upper bounds for the Mm ratio. The bounds show that stronger rank concern shifts the admissible interval for Mm downward.

5.2 Comparative Statics

I now study how the strength of rank concern shapes equilibrium search behavior, wage outcomes, unemployment, and social welfare. To examine these effects, I vary the comparison parameter v while endogenizing the reservation wage R, holding all the estimated and external parameters fixed. Specifically, I consider $v \in \{0, 1.308, 2\}$. The case $v = 1.308$ is the benchmark, whereas setting $v = 0$ reduces the model to the standard partial-equilibrium on-the-job search model with endogenous search effort.

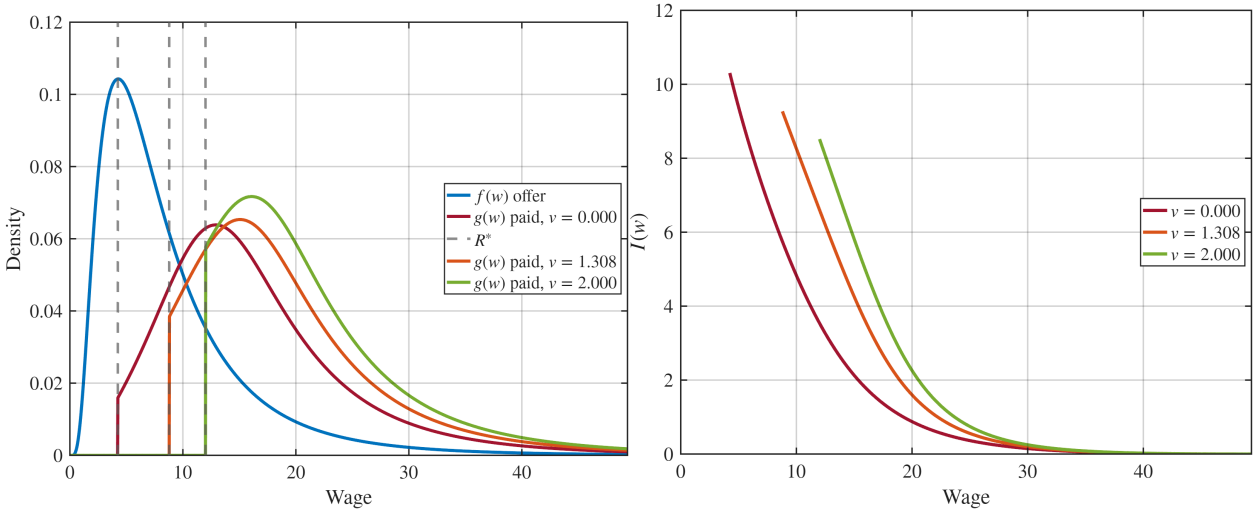
Table 7
Benchmark Fitted Equilibrium Outcomes Across Rank Concerns v

v	R	$1 - F(R)$	s_0	$s(R)$	h_{UE}	h_{EE}^{avg}	Mean wage	$\log(Q_{90}/Q_{10})$	u	W
0	4.2427	0.7614	2.7735	1.2740	0.5683	0.0142	16.4013	1.2276	0.0271	577.17
1.308	8.7900	0.3706	2.4942	1.1467	0.2488	0.0095	19.1700	0.9913	0.0597	411.48
2.000	12.0008	0.2186	2.2924	1.0538	0.1349	0.0061	21.2367	0.8409	0.1049	302.80

Table 7 reports the equilibrium outcomes for different values of the rank-concern parameter v. As v rises from 0 to 2, the reservation wage increases from 4.24 to 12.00, while the job acceptance rate at the reservation wage, $1 - F(R)$, falls from 76.14 to 21.86 percent. Search efforts decline for both unemployed and employed workers, with s_0 falling from 2.77 to 2.29 and $s_1(R)$ from 1.27 to 1.05. As a result, the UE transition rate declines from 56.83 to 13.49 percent, and the average EE transition rate falls from 1.42 to 0.61 percent. Meanwhile, the mean accepted wage rises from 16.40 to 21.24, whereas wage dispersion, measured by $\log(Q_{90}/Q_{10})$, narrows from 1.2276 to 0.8409. Overall, the unemployment rate increases from 2.71 to 10.49 percent, and steady-state social welfare declines by 47.54 percent from 577.17 to 302.80.

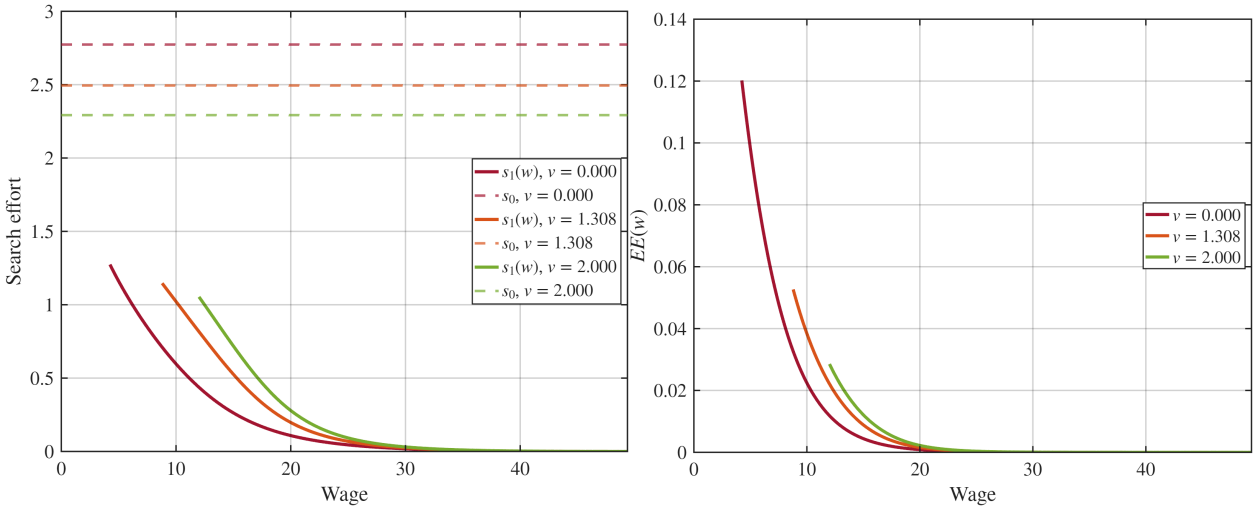
Figure 3 illustrates the equilibrium mechanism underlying these comparative-static results. Panel (a) shows that higher rank concern v raises the reservation wage and shifts the accepted wage distribution to the right, making its upper tail heavier. At an admissible fixed wage, this rightward shift raises the marginal return to upward rank mobility through two reinforcing channels. First, a higher value of v increases the contribution of rank improvements directly through the term $vg(x)$ in the numerator of Equation 3.10. Second, by raising the reservation wage R, stronger rank concern shifts the accepted wage distribution to the right and increases $g(w)$ in the relevant upper region, creating a positive feedback

that further strengthens the return to upward mobility. As a result, the option value, $I(w)$, rises at a given wage, which in turn induces employed workers to search more. Consistent with this mechanism, panels (b) to (d) show that, at a fixed wage, higher v raises the option value, search effort $s(w)$, and the implied on-the-job mobility rate $EE(w)$. Although higher search effort feeds back negatively into the option value through the denominator in Equation 3.10, this adverse spillover is quantitatively smaller than the positive effect operating through stronger rank incentives at a given wage.



(a) Offer and paid wage PDFs

(b) Option values



(c) Search effort s_0 and $s_1(w)$

(d) On-the-job mobility EE(w)

Figure 3: Benchmark Fitted Equilibrium Outcomes across v

The equilibrium effect at the acceptance margin is different. Because stronger rank concern raises the reservation wage, the range over which future wage improvements matter becomes smaller, lowering the option value evaluated at the reservation wage, and in turn

reducing search effort at the margin. At the same time, because the offer wage distribution is held fixed, the higher reservation wage lowers the probability of receiving an offer that exceeds the acceptance threshold relative to the low reservation case. As a result, on-the-job mobility falls in equilibrium even when search effort is similar. This effect is especially strong near the reservation wage. Although employed search effort near the reservation wage is relatively similar, the on-the-job mobility rate is about 12% when $v = 0$, around 5% when $v = 1.308$, and below 3% when $v = 2.0$. Thus, even though on-the-job search is higher at a common wage when v is larger, the average job-to-job mobility across the accepted wage distribution still declines. Hence, stronger comparison concerns raise the return to upward mobility at a given wage, but reduce mobility and welfare through the endogenous increase in the reservation threshold.

Intuitively, for unemployed workers, stronger rank concerns raise the reservation wage and make workers more selective in leaving unemployment. This mechanism is consistent with Fu et al. (2019), who study the effects of social comparisons on job search in a sequential search experiment. They show that job seekers raise their reservation wages after observing a peer search for longer, and that reservation wages decline less after observing a peer accept a high offer.[9] For employed workers, comparison behavior operates through the value of upward mobility. Conditional on a given wage, stronger rank concerns increase the payoff from moving to a higher wage because upward mobility improves both absolute earnings and relative position. As a result, rank concerns strengthen search effort and may increase job-to-job mobility at that wage. This mechanism is consistent with Card et al. (2012), who randomly provide University of California employees with peer-salary information and show that the treatment increases job-search intentions among workers paid below the peer median. It is also related to Dube et al. (2019), who study unequal raises in a large retail firm and find that changes in peers' wages affect workers' quit decisions and productivity, especially when already higher-paid coworkers receive larger raises. Taken together, these studies show that relative pay shapes job satisfaction, reservation wages, job-search intentions, and quits.

This model embeds these comparison motives into a frictional search environment and links individual comparison behavior to aggregate outcomes for unemployment, job-to-job mobility, wage dispersion, and welfare. More broadly, the mechanism is not specific to rank-based comparison alone. The same logic applies to other reference-dependent environments

[9]In the McCall (1970) standard sequential search model, the reservation wage is constant as model is stationary and workers are risk neutral. The lower and declining reservation wages observed in laboratory search experiments are behavioral departures from the benchmark. Possible explanations include risk aversion, loss aversion combined with bounded rationality, the sunk-cost fallacy, and subjective costs of uncertain waiting time.

in which workers evaluate their wages relative to a comparison benchmark. This includes settings where workers compare their wage to the mean wage of a reference group, compare primarily with better-paid peers, or evaluate wages relative to a reference wage under loss aversion, etc. Of course, the equilibrium implications depend on whether comparison concerns reduce or increase the value of employment on average.

As a robustness check, I solve the model on a finer grid for the rank-concern parameter, varying v from 0 to 3 in increments of 0.1, while holding all other calibrated and external parameters fixed. Figure 6 and Figure 7 in Appendix show that the quantitative results remain consistent with this mechanism throughout this range of v.

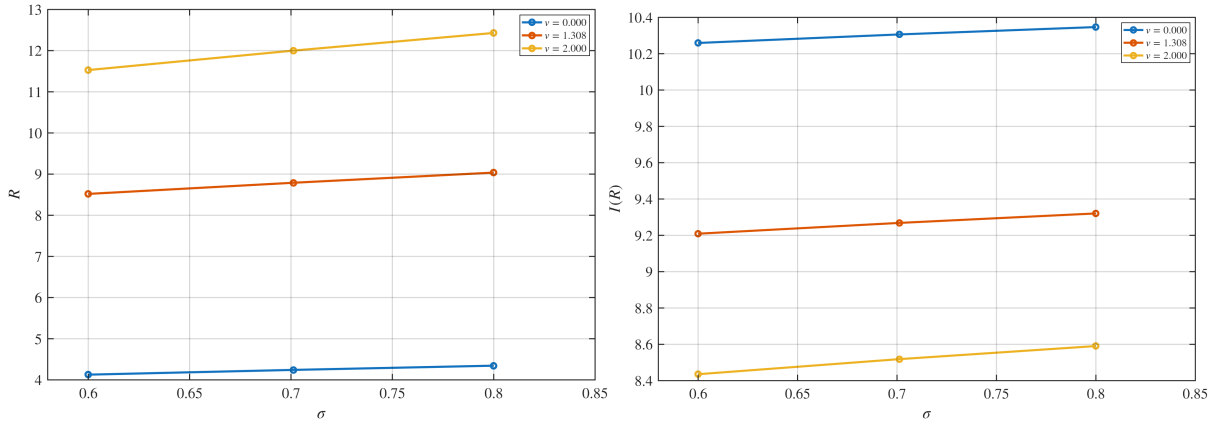
5.3 Counterfactual Changes in Dispersion of Wage Offers

In this section, I study how changes in the inequality of wage offers interact with workers' comparison behavior in shaping equilibrium outcomes. To do this, I consider three values of the dispersion parameter in the offer wage distribution, $\sigma \in \{0.6, 0.7012, 0.8\}$, and study the resulting equilibrium for $v \in \{0, 1.308, 2\}$. The benchmark case is $\sigma = 0.7012$ and $v = 1.308$. Because the average offer wage changes with the standard deviation in a log-normal distribution, I adjust the parameter μ using a mean-preserving method so that the counterfactual exercise isolates the effects of changes in the offer wage inequality alone.

A higher value of σ implies a more unequal offer distribution, with more wage offers concentrated in the lower and upper tails and less mass in the middle. Figure 4 summarizes how mean-preserving changes in offer wage dispersion affect the main equilibrium outcomes across different values of rank concern. The complete numerical results are reported in Appendix Table 8.

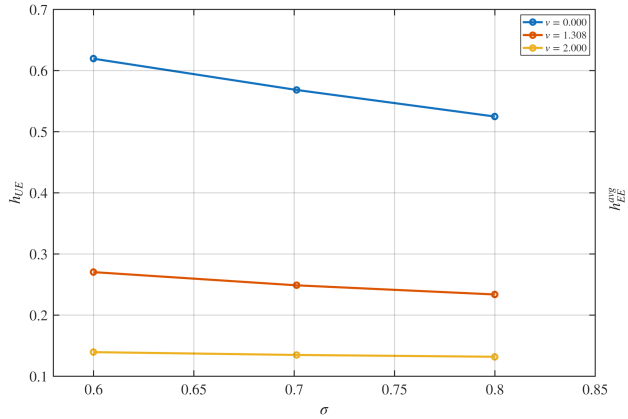
I first focus on the effects of offer wage dispersion while holding v fixed. Across all three values of v, the effects of changes in the mean-preserving spread on equilibrium outcomes are monotone. An increase in σ raises the reservation wage and the option value over the accepted wage interval, while lowering both the UE rate and the average job-to-job transition rate. For example, when $v = 0$, increasing σ from 0.6 to 0.8 raises the reservation wage from 4.13 to 4.35 and the option value at the reservation wage, $I(R)$, from 10.26 to 10.35.[10] Search effort for both unemployed and employed workers also rises in response to the higher option value generated by greater offer-wage dispersion. Over the same range, the UE rate falls from 0.619 to 0.525, the average job-to-job transition rate falls from 0.0146 to 0.0136, and the unemployment rate rises from 2.49% to 2.92%. Nevertheless, steady-state welfare increases from 566.40 to 586.43.

[10]Setting v to zero implies that there is no comparison behavior, and the results reflect the pure effects from the variation in the offer wage dispersion with the preserved mean offer wage.

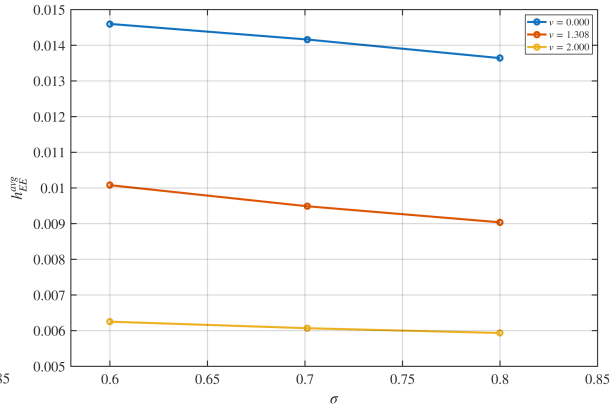


(a) Reservation wage

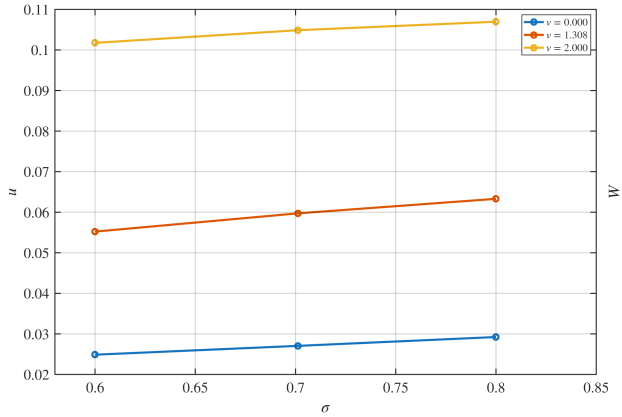
(b) Option values at R



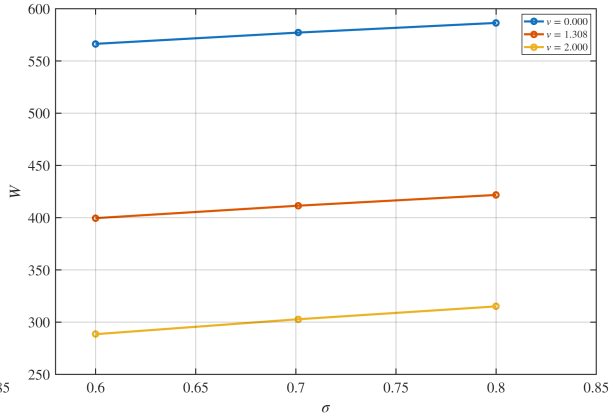
(c) UE hazard



(d) Average EE hazard



(e) Unemployment rate



(f) Social welfare

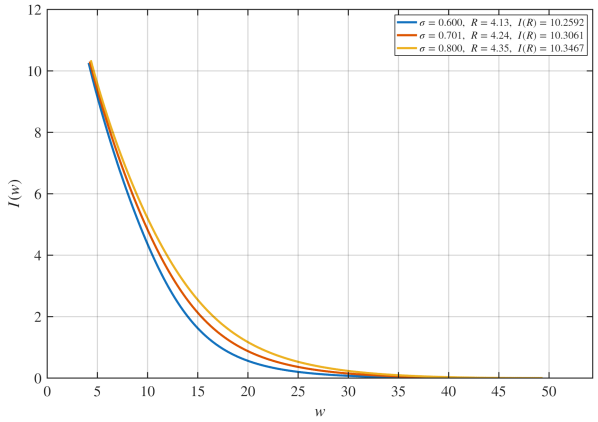
Figure 4: Effects of offer-wage dispersion across different values of rank concern.

The mechanism is that, in the offer wage distribution, as more mass is redistributed away from the middle toward both tails, this wider offer wage distribution propagates to the accepted wage distribution, shifting more mass toward its right tail while truncating it at a higher reservation wage. In the numerical exercise, for the case $v = 0$, Figure 5 panel (a) shows that higher offer wage dispersion raises the option value across the accepted wage support, which in turn induces a higher reservation wage. From Equation 3.10, the integral of option value is affected through three channels: the reservation wage, the gain from future offers in the numerator, and the denominator term, which consists of the discount rate, the job destruction rate, and the endogenous on-the-job mobility hazard. The higher reservation wage raises the lower bound of the integral and therefore creates a negative truncation effect on the option value. However, the increase in $I(w)$ indicates that this truncation effect is dominated by the positive effect of a more valuable upper tail, net of the endogenous mobility response in the denominator.

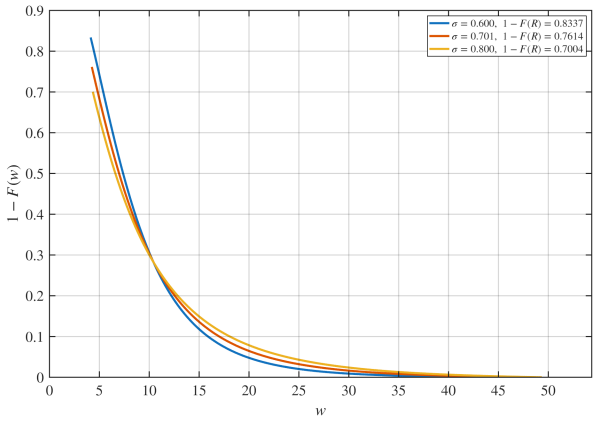
Panel (b) shows that the effect of higher dispersion on the gain from future offers through the acceptance probability $1-F(w;\sigma)$ is not uniform when the mean offer wage is preserved. In the calibrated truncated lognormal distribution, the tail probabilities $1 - F(w;\sigma = 0.6)$ and $1 - F(w;\sigma = 0.8)$ cross at about $w \approx 10.4$.[11] Thus, a higher offer wage dispersion reduces the acceptance probabilities for wages below this cutoff, and vice versa. At the same time, panel (c) shows that although search effort $s_1(w)$ rises in response to higher option values, the mobility hazard $EE(w) = \lambda_1 s_1(w)(1 - F(w))$ broadly follows the pattern of the acceptance probability. The positive effect of higher search effort is therefore only partial, since it is damped by the decline in $1 - F(w)$ over the lower part of the support and scaled by the search-efficiency parameter λ_1. As a result, the option-value integrand may be locally lower in the low-wage region. Nevertheless, panel (a) shows that the option value itself remains higher under greater dispersion, especially over the middle parts of the support. This indicates that the positive value of the thicker upper tail dominates both the negative truncation effect from the higher reservation wage and the local decline in acceptable-offer probabilities. As the current wage approaches the top of the support, the remaining scope for future improvements shrinks, so the difference in option values naturally fades out. Although higher offer wage dispersion raises unemployment through a lower UE rate, steady-state welfare still rises because the upper-tail gains increase the value of search.

This counterfactual exercise is closely related to the search theoretic evidence in Van den Berg (1995), who studies how wage offer dispersion affects job mobility. He shows that the

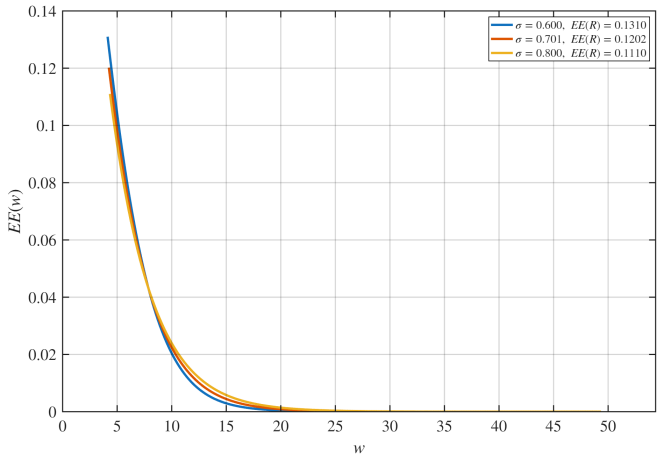
[11] Because the model uses a truncated lognormal offer distribution and adjusts μ numerically to preserve the truncated mean, the relevant cutoff is the numerical crossing point defined by $1-F(w;\sigma_1) = 1-F(w;\sigma_2)$. In the calibration, this crossing occurs at approximately $w = 10.4$ for $\sigma_1 = 0.6$ and $\sigma_2 = 0.8$.



(a) Option value $I(w)$



(b) Acceptance probability $1 - F(w)$



(c) On-the-job mobility $EE(w)$

Figure 5: Option-Value and Mobility Channels from Higher Offer-Wage Dispersion when $v = 0$.

effect of greater wage offer dispersion is heterogeneous across the wage distribution: mobility tends to increase for relatively high-wage workers but decline for relatively low-wage workers. The model generates a similar local force. When the offer wage distribution becomes more unequal in a mean-preserving way, low-wage workers may search harder because the upper tail becomes more valuable, but realized upward mobility can still weaken if more offer mass shifts toward the lower tail and fewer offers remain in the nearby middle of the wage distribution. This mechanism is also related to the literature on job polarization and low-wage mobility. As labor-market opportunities become increasingly concentrated in low- and high-wage jobs, the decline of middle-wage jobs can weaken the stepping-stone path from low-wage employment to better jobs (Autor and Dorn, 2013; Abel et al., 2018). In this sense, low-wage workers may experience more search or turnover without meaningful progress up the wage ladder, a pattern commonly described as low-wage churning rather than effective upward reallocation.

Then I study the interaction between the offer wage dispersion and rank concern. Figure 4 shows that the effects of an increase in offer wage dispersion depend on the strength of rank concern. Theoretically, this interaction operates through both a direct and an indirect channel. Directly, a higher σ increases the value of upper-tail wage offers, and these offers become more valuable when workers care about rank because upward mobility improves not only wages but also relative position in the paid-wage distribution. Indirectly, a higher σ raises the reservation wage and shifts the accepted wage distribution to the right, which changes the paid-wage density $g(x)$ and further strengthens the value of upward rank mobility. Hence, greater offer-wage dispersion and stronger rank concern are complementary in the option-value channel, magnifying the responses of reservation wages, accepted wages, and welfare.

Panels (c) and (d) show that the effects of higher offer wage dispersion on transition hazards are attenuated when workers care more about rank. The reason is that stronger rank concern raises the compensation required to accept low-ranked jobs, which pushes the reservation wage upward. As the reservation wage moves closer to the crossing point of the acceptance-probability functions, $1 - F(w; \mu, \sigma)$, the decline in the acceptance probability induced by a mean-preserving increase in σ becomes smaller. As a result, the UE rate and the average job-to-job transition rate fall by less at higher values of v, although the levels of these hazards remain lower when rank concerns are stronger.

Quantitatively, increasing offer wage dispersion from $\sigma = 0.7012$ to $\sigma = 0.8$ raises the reservation wage by \$0.103 when $v = 0$, but by \$0.247 when $v = 1.308$. By contrast, the job acceptance probability at the reservation wage falls by 6.10pp in the former case and by only 2.42pp in the latter. The smaller decline in acceptance probability when $v = 1.308$

reflects the fact that the endogenous reservation wage is higher and lies closer to the cutoff where the effect of σ on $1 - F(R(\sigma); \mu(\sigma), \sigma)$ is weaker. Consistent with this, the UE rate declines by only 1.50pp when $v = 1.308$, compared with 4.35pp when $v = 0$, and the same qualitative pattern holds for the average job-to-job transition rate. Another manifestation of the amplification through rank concern is that mean accepted wages rise by 1.60 when $v = 1.308$, compared with 1.29 when $v = 0$. At the same time, the increase in offer wage dispersion is transmitted less strongly into the accepted wage inequality: the log 90-10 differential rises by 0.067 when $v = 1.308$, compared with 0.096 when $v = 0$, as the rank concern reduces the accepted wage dispersion discussed in Section 5.1. Although the UE rate falls by less when $v = 1.308$, the unemployment rate increases by more of 0.36pp compared with 0.22pp when $v = 0$. This is because the unemployment rate is more sensitive to the changes in the UE rate when the baseline UE rate is lower, as in the economy with $v = 1.308$. Even so, steady-state social welfare rises in both cases, by 1.60 percent when $v = 0$ and by 2.50 percent when $v = 1.308$. Taken together, these results show that stronger rank concern makes a thicker upper tail more valuable: it amplifies the response of reservation behavior, accepted wages, and welfare, while attenuating the marginal decline in transition hazards from higher offer-wage dispersion.

6 Conclusion

This paper studies how workers' ordinal wage rank concerns impact individual decisions and aggregate labor market outcomes in an on-the-job search model. I first show empirically that ordinal wage rank within a reference group, rather than absolute pay alone, is closely related to workers' self-reported job satisfaction. I then incorporate this comparison behavior into an on-the-job search model with endogenous search effort and study how it affects reservation wage and search intensity decisions, job acceptance rate, job mobility, wage dispersion, unemployment, and social welfare.

The model shows that rank concerns make low-wage jobs less attractive while increasing the option value of search across wages. As a result, workers require a higher reservation wage and search with greater intensity. In equilibrium, however, the higher reservation threshold reduces the set of acceptable offers. Therefore, workers' rank concerns reduce average job mobility and accepted wage dispersion, while increasing unemployment and lowering social welfare.

The quantitative effects are substantial. Moving from no rank concern to the empirically estimated value raises the reservation wage by more than four dollars and reduces the job acceptance rate by nearly 38pp. It also lowers the job finding rate for unemployed workers and

the average job-to-job transition rate for employed workers by 56pp and 33pp, respectively. As a result, the unemployment rate rises from 2.7 to 6.0 percent while the social welfare falls by nearly 29 percent.

Nevertheless, workers' rank concerns are not always harmful. When offer wage dispersion becomes more unequal, while the mean offer wage is preserved, rank concerns partially mitigate the adverse mobility effects faced by low-wage workers. This occurs because stronger rank concerns amplify the increase in the reservation wage, which truncates the lower tail of the accepted wage distribution and moves workers away from the region where the acceptable offer probabilities fall the most. At the same time, rank concerns make upper-tail offers more valuable. Therefore, stronger comparison behavior attenuates the decline in job mobility and increases the welfare gain associated with wider offer wage dispersion.

This framework can be extended in several directions. First, the model can be used to study other forms of workers' comparison behavior, such as keeping up with the Joneses, loss aversion, aspirations, or reference-dependent preferences. Second, the model can be extended dynamically to study adaptation in workers' comparison benchmarks over time. Finally, workers may sort across different firms, occupations, or labor markets partly because of the reference group they face (Frank, 1985). Employer-employed matched panel data, combined with a directed search model, would be useful for studying how workers choose labor markets and employers when relative position matters.

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A Appendix

A.1 The reservation wage

Evaluating the employed worker's Bellman Equation 3.1 at the reservation wage R, using the optimal on-the-job search policy $s_1(R)$, and noting that $G(R) = 0$ in steady state, yields

$$rV(R) = \log(R) - v - c\big(s_1(R)\big) + \lambda_1 s_1(R) \int_R^{\bar{w}} \big[V(x) - V(R)\big]\, dF(x). \tag{A.1}$$

Similarly, the unemployed worker's Bellman equation implies

$$rU = \log(b) - c(s_0) + \lambda_0 s_0 \int_R^{\bar{w}} \big[V(x) - U\big]\, dF(x). \tag{A.2}$$

Since $V(R) = U$, equating Equation A.1 and Equation A.2 gives

$$\log(R) = \log(b) + v + \big(\lambda_0 s_0 - \lambda_1 s_1(R)\big) \int_R^{\bar{w}} \big[V(x) - U\big]\, dF(x) - \Big(c(s_0) - c\big(s_1(R)\big)\Big). \tag{A.3}$$

Integrating by parts with $V(R) = U$ and $F(\bar{w}) = 1$ implies

$$\int_R^{\bar{w}} \big[V(x) - U\big]\, dF(x) = \int_R^{\bar{w}} V'(x)\big[1 - F(x)\big]\, dx. \tag{A.4}$$

Substituting Equation A.4 into Equation A.3 yields

$$\log(R) = \log(b) + v + \big(\lambda_0 s_0 - \lambda_1 s_1(R)\big) \int_R^{\bar{w}} V'(x)\big[1 - F(x)\big]\, dx - \Big(c(s_0) - c\big(s_1(R)\big)\Big). \tag{A.5}$$

Finally, using the envelope condition for the employed value function (Equation 3.3), we obtain

$$\log(R) = \log(b) + v + \big(\lambda_0 s_0 - \lambda_1 s_1(R)\big) \int_R^{\bar{w}} \frac{[1/x + vg(x)][1 - F(x)]}{r + \delta + \lambda_1 s_1(x)\,[1 - F(x)]} dx - \Big(c(s_0) - c\big(s_1(R)\big)\Big). \tag{A.6}$$

Equation A.6 shows that the reservation wage depends on state-specific search efficiency through λ_0 and λ_1. In particular, when $\lambda_0 = \lambda_1$ (and hence $s_0 = s_1(R)$ by the first-order conditions), the additional terms cancel and the reservation wage is pinned down by $\log(b)$ and v. Otherwise, R is determined endogenously through the interaction of search intensity and wage distributions.

A.2 Derivation of the steady-state paid-wage density

Start from the steady-state flow Equation 3.13,

$$(1-u)\left[\delta G(w)+\lambda_1\big(1-F(w)\big)\int_R^w s_1(x)\,dG(x)\right]=u\,\lambda_0 s_0\big(F(w)-F(R)\big),\quad w\in[R,\bar{w}]. \tag{A.7}$$

Using the steady-state unemployment relation $\frac{u}{1-u}=\frac{\delta}{\lambda_0 s_0[1-F(R)]}$ from Equation 3.12, divide both sides of Equation A.7 by $(1-u)\delta$ to obtain

$$G(w)+\frac{\lambda_1}{\delta}\big(1-F(w)\big)\int_R^w s_1(x)\,dG(x)=\frac{F(w)-F(R)}{1-F(R)},\quad w\in[R,\bar{w}]. \tag{A.8}$$

Assuming G is continuous on $[R,\bar{w}]$ with density $g(w)=G'(w)$ and differentiating Equation A.8 with respect to w gives

$$g(w)+\frac{\lambda_1}{\delta}\left[-f(w)\int_R^w s_1(x)g(x)\,dx+\big(1-F(w)\big)s_1(w)g(w)\right]=\frac{f(w)}{1-F(R)} \tag{A.9}$$

Rearranging yields

$$\big[\delta+\lambda_1 s_1(w)\big(1-F(w)\big)\big]\,g(w)=\frac{\delta}{1-F(R)}\,f(w)+\lambda_1 f(w)\int_R^w s_1(x)g(x)\,dx \tag{A.10}$$

and therefore

$$g(w)=\frac{\frac{\delta}{1-F(R)}\,f(w)+\lambda_1 f(w)\int_R^w s_1(x)g(x)\,dx}{\delta+\lambda_1 s_1(w)\big(1-F(w)\big)},\quad w\in[R,\bar{w}]. \tag{A.11}$$

This completes the derivation.

A.3 Proofs of the conditional search-density Lemmas

This section proves Lemmas 1 and 2. The first part derives the conditional search equation for employed workers. The second part derives the closed-form paid-wage density.

A.3.1 Proof of Lemma 1

Starting from Equation 3.7 and applying integration by parts,

$$c'\big(s_1(w)\big)=\lambda_1\int_w^{\bar{w}} V'(x)\big[1-F(x)\big]\,dx. \tag{A.12}$$

Substituting the expression for $V'(x)$ from Equation 3.3 into Equation A.12 yields

$$c'\big(s_1(w)\big) = \lambda_1 \int_w^{\bar{w}} \frac{\big[1/x + vg(x)\big]\big[1 - F(x)\big]}{r + \delta + \lambda_1 s_1(x)\big[1 - F(x)\big]}\, dx. \tag{A.13}$$

Differentiating Equation A.13 with respect to w and using Leibniz's rule give

$$c''\big(s_1(w)\big)\, s_1'(w) = -\lambda_1 \frac{\big[1/w + vg(w)\big]\big[1 - F(w)\big]}{r + \delta + \lambda_1 s_1(w)\big[1 - F(w)\big]}. \tag{A.14}$$

Since $c''(\cdot) > 0$, we can divide both sides by $c''\big(s_1(w)\big)$ to obtain the ODE characterization:

$$s_1'(w) = -\frac{\lambda_1}{c''\big(s_1(w)\big)} \frac{\big[1/w + vg(w)\big]\big[1 - F(w)\big]}{r + \delta + \lambda_1 s_1(w)\big[1 - F(w)\big]} \;<\; 0. \tag{A.15}$$

where, the boundary condition is

$$s_1(\bar{w}) = 0, \tag{A.16}$$

because a worker at the top of the wage support has no strictly better offer to gain from additional search, and thus the marginal benefit of search is zero.

Under the maintained regularity conditions on $F(\cdot)$, $g(\cdot)$, and $c(\cdot)$, the right-hand side of Equation A.15 is continuous and locally Lipschitz in s_1. Hence, conditional on $g(\cdot)$, the search equation has a well-defined solution on $[R, \bar{w}]$. This proves Lemma 1.

A.3.2 proof of Lemma 2

Now I derive an explicit expression for the steady-state paid-wage density $g(w)$, which satisfies

$$g(w) = \frac{\frac{\delta}{1-F(R)}\, f(w) + \lambda_1 f(w) \int_R^w s_1(x) g(x)\, dx}{\delta + \lambda_1 s_1(w)\big[1 - F(w)\big]} \quad w \in [R, \bar{w}]. \tag{A.17}$$

Define the auxiliary function $H(w) \equiv \int_R^w s_1(x) g(x)\, dx$, so that $H(R) = 0$ and $H'(w) = s_1(w) g(w)$. Then Equation A.17 implies

$$H'(w) = \frac{s_1(w) f(w)}{\delta + \lambda_1 s_1(w)\big[1 - F(w)\big]} \left[\frac{\delta}{1 - F(R)} + \lambda_1 H(w) \right], \tag{A.18}$$

which is a first-order linear ODE in $H(w)$.

Using the integrating-factor method and the initial condition $H(R) = 0$, the solution is

$$H(w) = \frac{\delta}{\lambda_1[1 - F(R)]} \left[\exp\left(\lambda_1 \int_R^w \frac{s_1(x) f(x)}{\delta + \lambda_1 s_1(x)\big[1 - F(x)\big]}\, dx \right) - 1 \right]. \tag{A.19}$$

Finally, since $g(w) = H'(w)/s_1(w)$, substituting Equation A.19 into Equation A.18 yields

$$g(w) = \frac{\delta}{1 - F(R)} \frac{f(w)}{\delta + \lambda_1 s_1(w)\big[1 - F(w)\big]} \exp\left\{ \lambda_1 \int_R^w \frac{s_1(x) f(x)}{\delta + \lambda_1 s_1(x)\big[1 - F(x)\big]}\, dx \right\}, \quad w \in [R, \bar{w}]. \tag{A.20}$$

This proves the closed-form density in Lemma 2.

A.4 Proof of Proposition 1

Suppose that, for each candidate reservation wage $R \in (0, \bar{w})$, the conditional search-density system characterized in Lemmas 1 and 2 admits a solution $\big(s_1(\cdot; R), g(\cdot; R)\big)$. If there exists a reservation wage R^* satisfying the reservation wage condition, the entire equilibrium follows.

Define the RHS of Equation 3.10 as $T(R)$, and define $\Phi(R) = T(R) - \log(R)$. As the reservation wage $R \in (0, \bar{w}]$, I need to look at what happens to $\Phi(R)$ as R approaches both 0 and $\bar{w}$.

As $R \to 0$: Let

$$I(R) \;:=\; \int_R^{\bar{w}} \big[V(x) - U\big]\, dF(x) \;\geq\; 0.$$

Since F has bounded support $[0, \bar{w}]$ and $V(\cdot)$ and U are finite on $[0, \bar{w}]$ in the maintained steady state, $I(R)$ is positive finite as R approaches to zero.

Moreover, by the optimality of s_0 for the unemployed problem and with assumption $\lambda_0 > \lambda_1$, the inequality holds

$$\lambda_0 s_0 I(R) - c(s_0) \;\geq\; \lambda_0 s_1(R) I(R) - c\big(s_1(R)\big) > \lambda_1 s_1(R) I(R) - c\big(s_1(R)\big).$$

Therefore,

$$T(R) \;=\; \log(b) + v + (\lambda_0 s_0 - \lambda_1 s_1(R)) I(R) - \big(c(s_0) - c(s_1(R))\big) \;\geq\; \log(b) + v \;>\; -\infty.$$

Since $\log(R) \to -\infty$ as $R \to 0$, it follows that $\lim_{R\to 0} \Phi(R) = \infty$.

As $R \to \bar{w}$: $\lim_{R\to\bar{w}} I(R) \to 0$. By Equation 3.7 and Equation 3.8, both the marginal cost and benefit of search for unemployed and employed workers are proportional to $I(R)$. Under the maintained assumption $c(0) = c'(0) = 0$, Therefore, $s_0 \to 0$ and $s_1(R) \to 0$ and $c(0) = 0$ as $R \to \bar{w}$. Hence,

$$\lim_{R\to\bar{w}} \Phi(R) = \log(b) + v - \log(\bar{w}).$$

Under the sufficient condition $-\infty < \log(b) + v < \log(\bar{w})$, $\lim_{R\to\bar{w}} \Phi(R) < 0$.

Since $\Phi(\cdot)$ is continuous on $(0, \bar{w}]$, the Intermediate Value Theorem (IVT) implies that there exists at least one $R^* \in (0, \bar{w})$ such that $\Phi(R^*) = 0$. This establishes the existence of equilibrium.

A.5 Social welfare

The social welfare function that evaluates at a binding minimum wage is

$$\mathcal{W}(m) = u(m)U(m) + (1 - u(m)) \int_m^{\bar{w}} V(w; m)\, dG(w; m), \tag{A.21}$$

Taking a derivative with respect to minimum wage m and knowing $\frac{d}{dm} g(w; m) = g(w; m)g(m; m)$, we obtain

$$\begin{aligned}
\mathcal{W}'(m) =& u'(m)[U(m) - \int_m^{\bar{w}} V(w; m) dG(w; m)] \\
&+ u(m)U'(m) \\
&+ [1 - u(m)]g(m; m)[\int_m^{\bar{w}} V(w; m) dG(w; m) - V(m; m)] \\
&+ [1 - u(m)] \int_m^{\bar{w}} V_m(w; m) dG(w; m)]
\end{aligned}$$

Since $u(m) = \frac{\delta}{\delta + \lambda_0 s_0(m)[1-F(m)]}$, its derivative with respect to the minimum wage is

$$u'(m) = -\frac{\delta\lambda_0[s_0'(m)[1 - F(m)) - s_0(m)f(m)]]}{[\delta + \lambda_0 s_0(m)[1 - F(m)]]^2} \tag{A.22}$$

Hence, we have $u'(m) > 0 \quad iff \quad \frac{s_0'(m)}{s_0(m)} < \frac{f(m)}{1-F(m)}$.

A.6 Bounds on the Mean-Min Ratio under Linear Utility with Rank Concern

To connect the model to the mean-min ratio analysis in Hornstein et al. (2011), I consider the linear-utility analogue of the baseline environment. Let the employed worker's flow utility be

$$u_E(w) = w - v\big(1 - G(w)\big) - c(s_1(w)),$$

and the unemployed worker's flow utility be

$$u_U = b - c(s_0),$$

where $v \geq 0$ measures rank concern, G denotes the paid-wage distribution, and $s_1(w)$ and s_0 are employed and unemployed search effort.

At the reservation wage R, value matching implies

$$R = b + v + (\lambda_0 s_0 - \lambda_1 s(R))J(R) - \big(c(s_0) - c(s_1(R))\big)$$

where

$$J(R) \equiv \int_R^{\bar{w}} [W(x) - W(R)]\, dF(x).$$

Assume an isoelastic search-cost function

$$c(s_i) = c_0 s_i^{1+1/\gamma}, \qquad \gamma > 0.$$

The first-order conditions satisfy

$$c'(s_0) = \lambda_0 J(R) \qquad \textit{and} \qquad c'(s_1(R)) = \lambda_1 J(R)$$

which imply

$$c(s_0) = \frac{\gamma}{1+\gamma}\lambda_0 s_0 J(R) \qquad \textit{and} \qquad c(s_1(R)) = \frac{\gamma}{1+\gamma}\lambda_1 s(R) J(R).$$

Substituting these into the reservation condition yields

$$R = b + v + \frac{\lambda_0 s_0 - \lambda_1 s(R)}{1+\gamma} J(R).$$

Using the integration by parts for $J(R)$, the reservation wage function can be expressed as

$$R = b + v + \frac{\lambda_0 s_0 - \lambda_1 s(R)}{1+\gamma} \int_R^{\bar{w}} \frac{[1+vg(x)][1-F(x)]}{r+\delta+\lambda_1 s_1(x)\,[1-F(x)]} dx. \tag{A.23}$$

In the baseline model, the cross-sectional paid-wage distribution satisfies

$$\delta G(w) + \lambda_1 \hat{s}(w)(1-F(w))G(w) = \frac{\delta[F(w)-F(R)]}{1-F(R)}, \qquad w \in [R, \bar{w}]$$

where

$$\hat{s}(w) \equiv \frac{\int_R^w s_1(x)\, dG(x)}{G(w)}.$$

denotes the average search intensity among workers earning at most w.

Rearranging yields

$$1 - G(w) = \frac{[\delta + \lambda_1 \hat{s}(w)(1-F(R))][1-F(w)]}{[\delta + \lambda_1 \hat{s}(w)(1-F(w))](1-F(R))} \simeq \frac{[r+\delta+\lambda_1 \hat{s}(w)(1-F(R))][1-F(w)]}{[r+\delta+\lambda_1 \hat{s}(w)(1-F(w))][1-F(R)]}. \tag{A.24}$$

For a given reservation wage R, the right-hand side of Equation A.24 is increasing in $\hat{s}(w)$. Moreover, since employed search effort is decreasing in wages, it yields

$$s_1(R) \geq \hat{s}(w) \geq s_1(w) \geq s_1(\bar{w}) = 0.$$

Therefore,

$$\frac{[r+\delta+\lambda_1 s_1(R)(1-F(R))][1-F(w)]}{[r+\delta+\lambda_1 s_1(w)(1-F(w))][1-F(R)]} \geq 1-G(w) \geq \frac{[r+\delta][1-F(w)]}{[r+\delta+\lambda_1 s_1(w)(1-F(w))][1-F(R)]}. \tag{A.25}$$

Rearranging Equation A.25 gives

$$\frac{1-F(R)}{r+\delta+\lambda_1 s_1(R)(1-F(R))}(1-G(w)) \leq \frac{1-F(w)}{r+\delta+\lambda_1 s_1(w)(1-F(w))} \leq \frac{1-F(R)}{r+\delta}(1-G(w)).$$

Multiplying by $[1+vg(w)]$ and integrating from R to $\bar{w}$ yields

$$\frac{[1-F(R)]\left(\bar{w}-R+\frac{v}{2}\right)}{r+\delta+\lambda_1 s_1(R)(1-F(R))} \leq \int_R^{\bar{w}} \frac{[1+vg(w)][1-F(w)]}{r+\delta+\lambda_1 s_1(w)(1-F(w))}\, dw \leq \frac{[1-F(R)]\left(\bar{w}-R+\frac{v}{2}\right)}{r+\delta}.$$

Substituting these bounds into the reservation condition Equation A.23, I obtain

$$R \geq b + v + \frac{\lambda_0 s_0 - \lambda_1 s_1(R)}{1+\gamma} \frac{[1-F(R)]\left(\bar{w} - R + \frac{v}{2}\right)}{r + \delta + \lambda_1 s_1(R)(1-F(R))}$$

and

$$R \leq b + v + \frac{\lambda_0 s_0 - \lambda_1 s_1(R)}{1+\gamma} \frac{[1-F(R)]\left(\bar{w} - R + \frac{v}{2}\right)}{r + \delta}.$$

Now define the mean-min ratio $Mm = \bar{w}/R$, the normalized non-market value $\rho = b/\bar{w}$, and the normalized rank-concern parameter $\tilde{v} = v/\bar{w}$. Then the preceding inequalities imply

$$\frac{A_0 + 1}{A_0 + \rho + \tilde{v}\left(1 + \frac{A_0}{2}\right)} \leq Mm \leq \frac{A_1 + 1}{A_1 + \rho + \tilde{v}\left(1 + \frac{A_1}{2}\right)}$$

where

$$A_0 = \frac{\lambda_0 s_0 - \lambda_1 s_1(R)}{1+\gamma} \frac{1-F(R)}{r+\delta} \qquad \textit{and} \qquad A_1 = \frac{\lambda_0 s_0 - \lambda_1 s_1(R)}{1+\gamma} \frac{1-F(R)}{r + \delta + \lambda_1 s_1(R)(1-F(R))}.$$

It follows immediately from these expressions that the stronger rank concern shifts the entire admissible interval for Mm downward.

A.7 Robustness to a Fine Grid of Rank Concern

As a robustness check, I solve the model on a finer grid for the rank-concern parameter, varying v from 0 to 3 in increments of 0.1, while keeping all other calibrated and preset parameters fixed. Appendix Figure 6 reports the main aggregate equilibrium outcomes over the fine v grid. The results are monotone and consistent with the benchmark comparison: higher rank concern raises the reservation wage R, lowers the acceptance probability $1-F(R)$, reduces both h_{UE} and h_{EE}^{avg}, increases unemployment, and lowers steady-state welfare.

Appendix Figure 7 turns to the fixed-wage mechanism. Evaluated at common wages, the option value $I(w)$, search effort $s(w)$, and on-the-job mobility $EE(w)$ all increase with v. This confirms that, holding the current wage fixed, stronger rank concern raises the return to upward mobility.

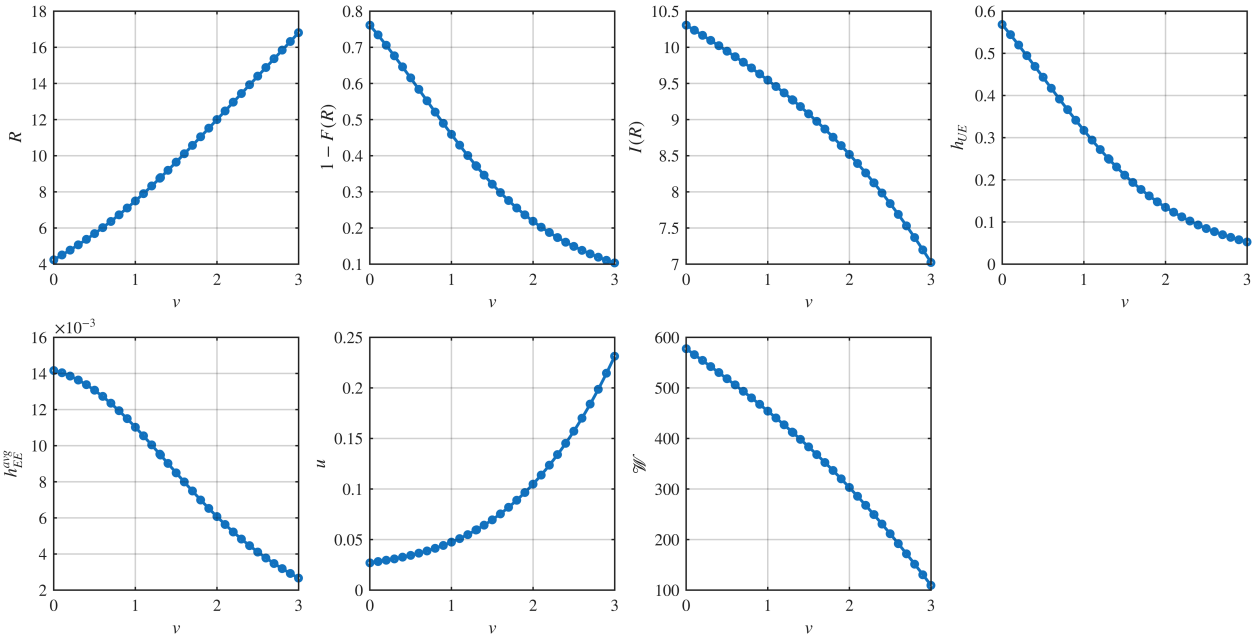


Figure 6: Robustness check: aggregate equilibrium outcomes across v.

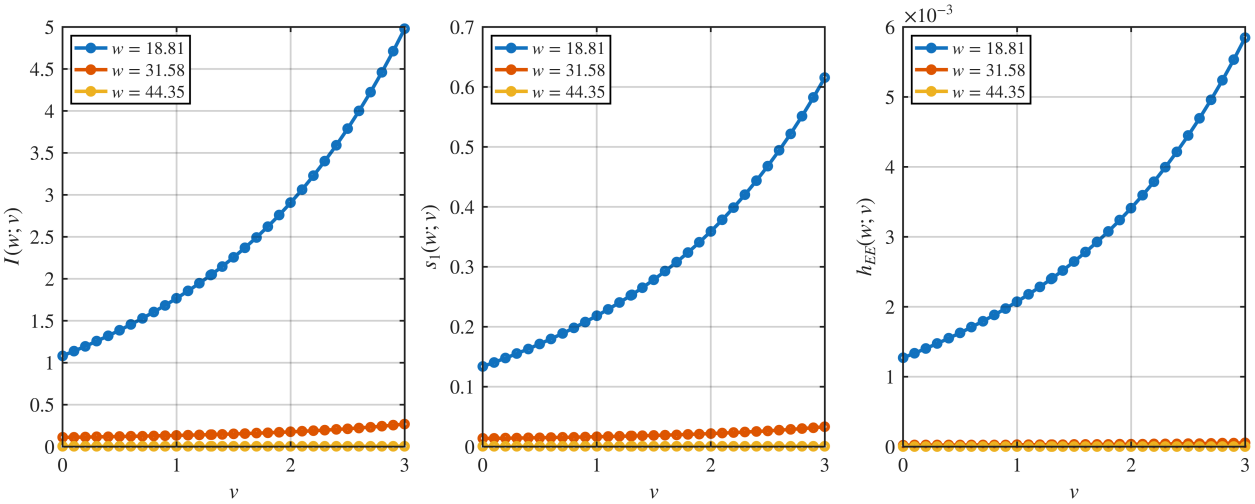


Figure 7: Robustness check: fixed-wage mechanism.

A.8 Mean-Preserving Counterfactual Changes in Offer-Wage Dispersion

Table 8

Mean-preserving changes in offer-wage dispersion: complete equilibrium results.

Panel A. Levels

v	σ	μ_{mp}	R	$I(R)$	$1-F(R)$	s_0	$s(R)$	h_{UE}	h_{EE}^{avg}	Mean wage	$\log(Q_{90}/Q_{10})$	u	W
0	0.6000	1.9993	4.1273	10.2592	0.8337	2.7608	1.2681	0.6194	0.01460	14.9902	1.0996	0.0249	566.4024
0	0.7012	1.9451	4.2427	10.3061	0.7614	2.7735	1.2740	0.5683	0.01416	16.4013	1.2276	0.0270	577.1705
0	0.8000	1.8938	4.3454	10.3467	0.7004	2.7844	1.2792	0.5248	0.01364	17.6933	1.3237	0.0292	586.4340
1.308	0.6000	1.9993	8.5192	9.2091	0.4054	2.4782	1.1392	0.2703	0.01008	17.3701	0.8940	0.0552	399.5750
1.308	0.7012	1.9451	8.7900	9.2684	0.3706	2.4942	1.1467	0.2488	0.00949	19.1700	0.9913	0.0597	411.4776
1.308	0.8000	1.8938	9.0366	9.3206	0.3464	2.5083	1.1533	0.2338	0.00904	20.7749	1.0588	0.0633	421.7699
2	0.6000	1.9993	11.5283	8.4354	0.2283	2.2700	1.0432	0.1395	0.00625	19.1880	0.7549	0.1018	288.4849
2	0.7012	1.9451	12.0008	8.5184	0.2186	2.2924	1.0538	0.1349	0.00607	21.2367	0.8409	0.1049	302.7960
2	0.8000	1.8938	12.4301	8.5904	0.2120	2.3118	1.0629	0.1319	0.00593	23.0238	0.8954	0.1070	315.0708

Panel B. Low-σ counterfactual relative to benchmark $\sigma = 0.7012$

v	ΔR	$\Delta I(R)$	$\Delta[1-F(R)]$	Δs_0	$\Delta s(R)$	Δh_{UE}	Δh_{EE}^{avg}	ΔMean wage	$\Delta \log(Q_{90}/Q_{10})$	Δu	ΔW
0	-0.1153	-0.0470	0.0723	-0.0126	-0.0060	0.0511	0.00044	-1.4111	-0.1280	-0.00218	-10.7681
1.308	-0.2708	-0.0594	0.0348	-0.0160	-0.0075	0.0216	0.00059	-1.7999	-0.0973	-0.00451	-11.9026
2	-0.4725	-0.0830	0.0097	-0.0223	-0.0106	0.0046	0.00018	-2.0488	-0.0860	-0.00312	-14.3111

Panel C. High-σ counterfactual relative to benchmark $\sigma = 0.7012$

v	ΔR	$\Delta I(R)$	$\Delta[1-F(R)]$	Δs_0	$\Delta s(R)$	Δh_{UE}	Δh_{EE}^{avg}	ΔMean wage	$\Delta \log(Q_{90}/Q_{10})$	Δu	ΔW
0	0.1027	0.0406	-0.0610	0.0109	0.0052	-0.0435	-0.00052	1.2920	0.0962	0.00218	9.2635
1.308	0.2466	0.0522	-0.0242	0.0140	0.0066	-0.0150	-0.00045	1.6049	0.0675	0.00358	10.2922
2	0.4293	0.0720	-0.0066	0.0194	0.0091	-0.0029	-0.00013	1.7871	0.0545	0.00209	12.2748

Notes: The benchmark offer dispersion is $\sigma = 0.7012$. Counterfactuals change σ to 0.6 and 0.8, while adjusting μ to keep the truncated mean offer wage fixed at 8.8018. Panel A reports equilibrium levels. Panels B and C report changes relative to the benchmark within each value of v. Welfare W is computed from the Bellman-system value functions.