The Effects of Monetary Policy Shocks on the Online Labor Market

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The expansion of gig economy brings new changes that may alter the traditional transmission of monetary policy. I study how the online labor market responds to high-frequency monetary policy shocks matched to detailed data from the Online Labor Index. In contrast to the responses observed in standard labor market indicators, a contractionary monetary shock leads to an increase in both online labor demand and supply. I find firms raise online vacancies in the short run, reflecting substitution toward flexible contracts, while workers increase online participation in the medium run when offline job prospects weaken. Besides, supply adjustments are concentrated in routine and low-barrier jobs, while demand responds more uniformly across occupations.

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1. Introduction

Mobile phones and digitalization technologies have changed the nature of work. People are no longer restricted to fixed workplaces or long-term contracts. Instead, they can choose more flexible ways to work or supplement their income during economic downturns. Friedman (2014) finds many American workers do not choose long-term contracts but accept flexible gig work. For firms, the gig economy also provides them another channel to adjust their hiring strategies and operating costs. Agrawal et al. (2015) find that small firms use online labor platforms to hire cheaper overseas contractors and reduce operating and hiring costs. These differences from the traditional labor relationship raise some questions and challenges. The gig economy involves laws, social welfare, labor relations, and even industrial organization. At the macro level, it also poses challenges for national accounting and employment. Against this background, I focus on the response of the online labor market to macroeconomics shocks, trying to figure out the role of this part of labor.

I choose the high-frequency monetary policy shock as an exogenous macroeconomic disturbance and the data from the Online Labor Index to capture conditions in the flexible online labor market. Estimating by regressions and local projections, I find both the online labor demand and supply increase following a contractionary monetary policy shock. However, over longer horizons, demand responds immediately, while supply adjusts more slowly. These patterns do not simply mirror traditional dynamics. They are different from traditional labor market indicators, where job openings decline and labor force participation rate shows little reaction to monetary policy shock. Based on these results, the online labor market serves as a buffer during tightening time. Individuals can use it to supplement their income, and firms can substitute toward more flexible online labor. Besides, I also examine heterogeneity across different occupations. On the demand side, the results are not pronounced. On the supply side, the increase is concentrated in the low-skilled and routine jobs.

This project contributes primarily to two literatures. First, it contributes to the literature on the transmission of monetary policy to labor markets, for example, Graves, Huckfeldt, and Swanson (2023). This project identifies a new channel through gig economy, which moves in a different direction. Second, it also enriches the growing literatures on the gig economy as an income smoothing mechanism (Koustas 2019; De Mel, McKenzie, and Woodruff 2008; Sinchaisri, Allon, and Cohen 2019). Prior research on gig online labor has largely focused on market design, worker behavior, and platform dynamics, with less attention to macroeconomic responses. This project provides new ideas on online labor and macroeconomic adjustment.

The paper is organized as follows. Section 1 describes the data and the monetary policy shock measures. Section 2 outlines the empirical strategy, including the baseline regression and local projection methods. Section 4 shows the main results, including contemporaneous effects, dynamic responses, and comparisons with traditional labor markets. Section 5 concludes.

2. Data

2.1. Monetary policy measurement

Monetary policy shock. Existing research on measuring US monetary policy primarily employs three approaches. The first one uses the federal funds rate. The second one uses shadow rates to capture policy when the zero lower bound binds. And the last one identifies exogenous US monetary policy shocks though various methods. The different approaches are based on variations in US monetary policy implementation across different phases. Prior to 2008, studies relied heavily on the federal funds rate because Fed adjustments to the target rate conveyed most policy actions. Lower rates signaled expansionary policy, while higher rates indicated tightening.

After the financial crisis, however, the federal funds rate reached the zero lower bound and no longer reflected the policy interventions precisely. The Fed increasingly relied on unconventional tools such as quantitative easing, forward guidance, and liquidity facilities. To better capture the monetary policy, shadow rates were introduced, which summarize the overall effect of conventional and unconventional policies (Wu and Xia 2016).

As recognition grew regarding the endogeneity between monetary policy and macroeconomic conditions, studies shifted to identify exogenous monetary policy shocks (Ramey 2016). Then, two influential categories of identification methods emerged. The first is the narrative approach, which interprets the Fed's intended policy stance using qualitative sources, such as FOMC minutes or policy statements (Romer and Romer 2004). Recent work combines narrative information with structural restrictions. For example, the sign-restricted narrative VAR (Antolín-Díaz and Rubio-Ramírez 2018) is used to isolate shocks more precisely and reduce identification uncertainty.

The second one is the high-frequency identification (HFI) approach. It uses changes in asset prices within narrow windows around FOMC announcements to isolate the unexpected component of policy. Studies track movements in Treasury yields or federal funds futures prices immediately before and after announcements (e.g., Gürkaynak, Sack, and Swanson 2005; Barakchian and Crowe 2013; Inoue and Rossi 2019). Although very short windows may contain noise, HFI remains powerful because it extracts high-resolution information from financial markets.

In brief, these methods reflect the evolution of monetary policy measurement from simple interest-rate indicators to exogenous policy shocks. This shift enables more empirical evaluation of monetary policy's causal effects on the macroeconomy.

BRW monetary shock. To measure unexpected changes in US monetary policy, I use the high-frequency shock series developed by Bu, Rogers, and Wu (2021) and updated through 2024. This series isolates exogenous monetary policy surprises by exploiting the response of Treasury yields to FOMC announcements within narrow intraday windows.

The BRW shocks are constructed using yields across multiple maturities to purge variation attributable to risk premia and other macroeconomic forces, producing a cleaner measure. Positive values indicate contractionary policy surprises. Following the literature, I convert the meeting-level shocks to a monthly series by assigning each shock to the month of the corresponding FOMC meeting and setting values in non-meeting months to zero. This monthly transformation aligns with the the Online Labor Index and other macroeconomic data used in the analysis.

As a robustness check, I also incorporate the High-Frequency Surprises (HFS) series developed by Bauer and Swanson (2023). It is published by the Federal Reserve Bank of San Francisco. The shock captures unexpected changes in the expected path of policy rates using futures price movements within narrow windows around FOMC announcements. And it is aggregated to the monthly level. Positive values mean monetary tightening, while negative values mean monetary easing.

2.2. Online Labor Data

The Online Labor Index (OLI) is a high-frequency indicator. It measures the online freelance labor worldwide by tracking project postings and worker profiles on major online labor platforms. The data is from The iLabour Project of Oxford University developed initially by Kässi and Lehdonvirta (2018). The OLI provides the vacancy data by capturing the number, occupational composition, and geographical distribution of online jobs. It covers a set of global platforms including Upwork, Freelancer, Guru, Peopleperhour, and Amazon Mechanical Turk, which together accounted for over 60% of English-language online labor during the sample period. Beginning in 2020, several Russian- and Spanish-language platforms (e.g., freelance.ru, freelancehunt.com, weblancer.com, and workana.es) were incorporated to expand coverage. The dataset covers employers and employees from more than 150 countries, though in this paper I focus on US data began in 2016 and continued until September 2024. In this paper, I restrict data from January 2017 through December 2023.

There are two distinct components. One is about demand-side data, representing the number of new project vacancies posted across platforms. Another is supply-side data, representing visible worker profiles on selected platforms. The OLI measures daily project postings by crawling multiple pages of each platform and identifying newly appearing vacancies. These daily counts are aggregated to the monthly frequency to match monetary policy shocks and traditional labor market indicators.

3. Empirical Strategy

3.1. Baseline Regression Model

To estimate the contemporaneous effect of monetary policy shocks on online labor market outcomes, I begin with a panel regression model. It uses variation across the six occupations tracked in the Online Labor Index (OLI). $y_{o,t}$ denotes the monthly online labor vacancies or supply measure for occupation o in month t. The baseline specification relates log outcomes to monetary policy shocks using:

$$\log(y_{o,t}) = \beta MP_{o,t} + \alpha_o + \gamma_t + \varepsilon_{o,t},$$

where MP_t is the monthly BRW monetary policy shock, α_o are occupation fixed effects, and γ_t are month fixed effects. This specification identifies how exogenous policy surprises shift the online labor outcome within an occupation over time.

To capture the overall effect, I also estimate aggregate values using a similar equation. Here, outcomes are aggregated across occupations. In the aggregate data, there are serial correlationons. According to standard practice in time-series models (Hamilton 1994), this model also includes a lagged dependent variable:

$$\log(y_t) = \beta MP_t + \rho \log(y_{t-1}) + \gamma_t + \varepsilon_t$$

This allows serial correlation and captures persistence. Considering residual autocorrelation, standard errors are computed by Newey–West corrections.

Positive BRW values correspond to contractionary shocks. The positive coefficient β means the rise of online labor demand or supply following an unexpected tightening in US monetary policy. The regression model reflects how flexible digital labor adjusts at the extensive margin. Occupation-level regressions allow to estimate heterogeneity across occupations.

3.2. Local Projection

To study the dynamic response, I estimate impulse response functions using the local projection method of Jordà (2005). This approach is well suited. It does not impose dynamic restrictions on the data. It also allows short samples and responses to vary flexibly across horizons. The baseline specification is estimated as follows:

$$y_{t+h} = \alpha_h + \beta_h \mathrm{MP}_t + \sum_{j=1}^{3} \phi_{h,j} y_{t-j} + \epsilon_{t+h}, \quad \text{for } h = 0, \ldots, 12$$

where y_{t+h} denotes the log of total online labor vacancies (or applications) in month

$t+h$. MP_t represents the monetary policy shock at time t. The coefficient β_h traces the impulse response of online labor activity h months after the shock. To isolate the exogenous impact of the policy shock and remove serial correlation, I control for $L = 3$ lags of the dependent variable, as denoted by the summation term. Newey–West standard errors are also used.

All local projection coefficients β_h are plotted as impulse response functions. These describe how online vacancies and worker activity evolve in the months following a contractionary monetary policy surprise. This dynamic analysis complements the baseline regressions. It shows whether monetary policy influences online labor markets through gradual adjustments.

To verify results, I re-estimate the specification using the Federal Reserve Bank of San Francisco's High-Frequency Surprises in place of BRW shock. If they get similar patterns and magnitudes, the dynamic results are not driven by a particular shock measure.

4. Results

4.1. Baseline Regression Results

Table 1 reports the baseline estimates of the contemporaneous response of online labor demand and supply to US monetary policy shocks. Across both the aggregate and occupation-level specifications, coefficients are positive. This indicates that online labor activity tends to increase after an unexpected tightening of monetary policy.

TABLE 1. Estimation Results

	demand		supply	
	aggregate	occupation-level	aggregate	occupation-level
brw_shock	1.022**	1.161*	2.013*	2.999**
	(0.438)	(0.376)	(1.042)	(0.836)
_cons	2.449***	11.402***	13.001***	10.951***
	(0.093)	(0.001)	(0.000)	(0.003)
L.log(y)	✓		✓	
Season FE	✓		✓	
Occupation FE		✓		✓
N	94	594	87	522

Demand side. For online labor demand, a one-unit contractionary shock is associated with an increase of roughly 1.0–1.2 log points in total online vacancies. Similar magnitudes can be observed in the occupation-level panel. This pattern suggests that firms may substitute toward flexible, short-term digital contracting when monetary conditions tighten and traditional hiring becomes more costly. Because online labor has lower adjustment costs, firms may use it as a buffer margin.

Supply side. For online labor supply, both the aggregate and panel regressions produce positive and coefficients. This implies that tightening monetary policy increases the number of workers active on online platforms. One interpretation is that workers face weaker prospects in the offline labor market and turn to online freelancing as a supplementary or alternative income source. Such behavior is consistent with evidence that online labor markets serve as an accessible, low-barrier adjustment margin during periods of macroeconomic slowdown.

Heterogeneous Responses Across Occupations. Figure 1 presents the heterogeneous responses of online labor demand and supply across occupations. The estimated effects vary by occupation and reveal asymmetries between the two sides of the market. Supply adjusts sharply, while demand adjusts mildly.

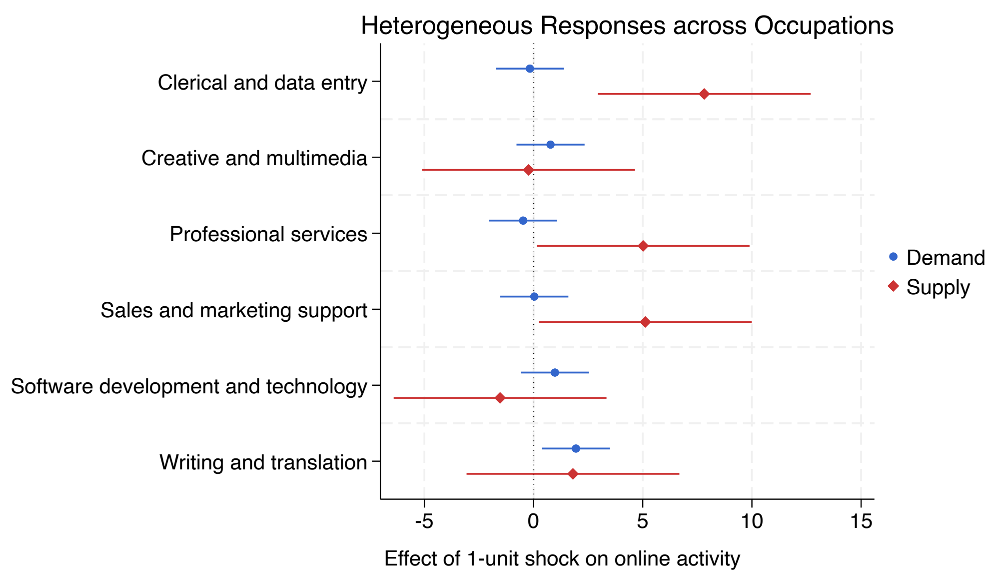


FIGURE 1. Heterogeneous Responses Across Occupations

Note: This figure plots the estimated occupation-specific responses of online labor demand (blue) and supply (red) to a one-unit BRW monetary policy shock. Estimates are obtained from fixed-effects regressions of log activity on the shock interacted with occupation indicators, controlling for occupation fixed effects. Points represent the estimated marginal effects. Horizontal lines indicate 95% confidence intervals. A positive value implies that a contractionary monetary policy shock increases online activity in that occupation.

On the demand side, the magnitudes are generally modest. Most occupations display relatively small changes. It shows that employers adjust online hiring less aggressively. In contrast, the supply side shows substantially larger and more dispersed responses across occupations. Creative and Multimedia, Sales and Marketing Support, and Writing and Translation have stronger increases in worker participation. Workers are more likely to expand their activity in online platforms when macroeconomic conditions tighten. Occupations with more flexible entry and lower switching costs show the largest adjustments. They are closer substitutes for offline jobs and more exposed to macroeconomic conditions. These are consistent with online work serving as an accessible buffer. Taken together, this imbalance implies that firms shift some tasks online when policy tightens, while the adjustment on the worker side is concentrated among routine occupations.

4.2. Local Projections

While the baseline regressions provide evidence on the contemporaneous effect, they cannot capture how these effects evolve over time. Based on the static estimation, firms and workers adjust in different ways. To examine these dynamics more directly, I estimate impulse responses using the local projection method of Jordà (2005). Figure 2 summarizes these dynamic responses for both the BRW shock and an alternative high-frequency surprise measure.

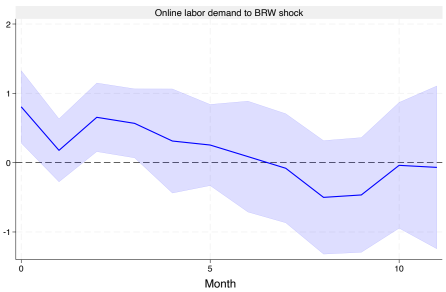
Demand side. Online labor demand shows a modest increase in the first one to two months after a contractionary shock. It is consistent with firms temporarily shifting marginal tasks to online platforms under tightening monetary condition. After around half a year, demand declines and gradually returns toward baseline. For demand, the initial substitution effect is short-lived.

Supply side. The adjustment of online labor supply is more delayed. Supply remains roughly unchanged for first several months. Starting around month 6, supply increases. This pattern indicates that workers respond less immediately. They turn to online platforms only after experiencing tightening conditions in the traditional labor market. The medium-run supply response can supplement the occupation-level results. The rise in participation mainly happens in routine and support-type jobs.

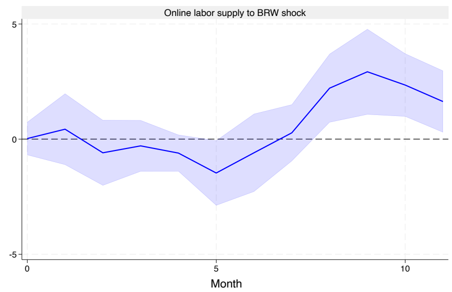
Panels C and D show responses to an alternative monetary policy shock. The dynamic patterns a are consistent with those observed under the BRW shock. Online labor demand has a mild increase and returns to zero, whereas labor supply tends to rise after several months.

4.3. Comparison with Traditional Labor Market Indicators

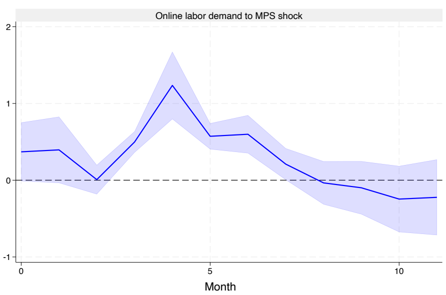
The preceding results show that online labor demand and supply respond differently. A natural question is whether these responses resemble or differ from the traditional labor



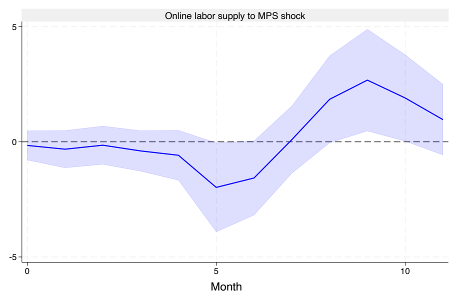
A. Labor Demand to BRW shock



B. Labor Supply to BRW shock



C. Labor Demand to MPS



D. Labor Supply to MPS

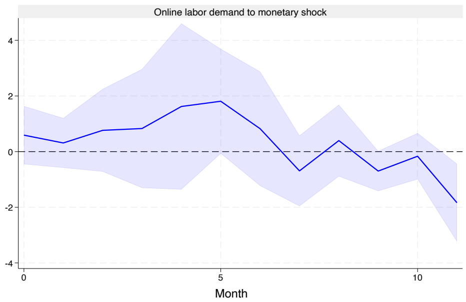
FIGURE 2. Online Labor Market Responses to Monetary Policy Shocks

Note: This figure presents impulse responses of online labor demand and supply to two monetary policy shock measures: the BRW high-frequency FOMC announcement shock and the monthly Monetary Policy Surprises (MPS) shock. Responses are estimated using local projections with Newey–West standard errors. The solid blue line represents the point estimate. The shaded area is the 95% confidence interval. All series are normalized so that the shock corresponds to a one-standard-deviation tightening of monetary policy. Positive values indicate an increase relative to the pre-shock baseline.

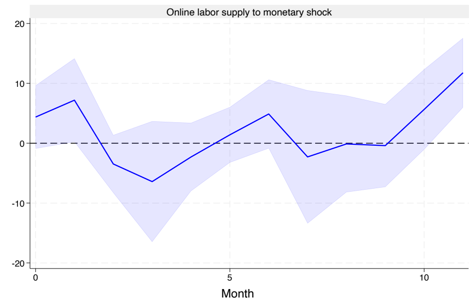
market. Understanding this comparison is important. First, it helps show how the online labor market fits into the wider demand and supply responses. Second, because digital labor markets are far smaller and more flexible than traditional employment, the contrast can tell whether online labor represents a complementary or distinct adjustment channel.

To draw this comparison, I examine the impulse responses of job openings, labor force participation, and the unemployment rate. These are three core indicators commonly used to characterize US labor market. Job openings from JOLTS proxy for traditional labor demand. Participation captures labor supply at the extensive margin. Unemployment rate summarizes slack conditions that monetary policy is known to influence. I focus on the pre-COVID period because the pandemic introduced large, non-monetary structural shocks to labor markets. Restricting the sample to the pre-COVID years allows a cleaner comparison between online and offline labor market responses under more stable macroeconomic conditions.

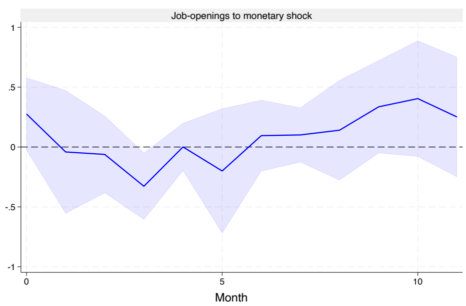
Panels A–D in Figure 3 compare online demand and supply to their traditional coun-



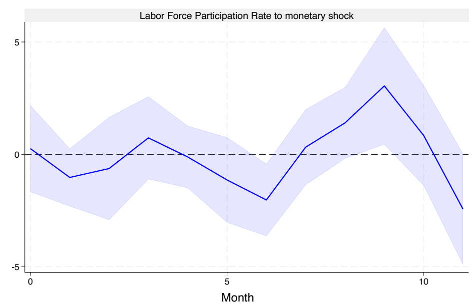
A. Online labor demand response



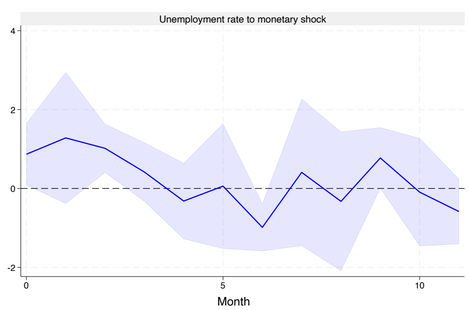
B. Online labor supply response



C. Traditional labor demand response



D. Traditional labor supply response



E. Unemployment response

FIGURE 3. Impulse responses of online and traditional labor market indicators to a monetary policy shock before COVID

Note: Panels A–D display dynamic responses of online and traditional labor-market indicators to a contractionary monetary policy shock, estimated using local projections. Online labor demand and supply are constructed from the US Online Labor Index. Traditional indicators are from Fed, including job openings and the labor force participation rate. Panel E reports unemployment rate response. Shaded regions represent 95% confidence intervals.

terparts. Panel E reports the unemployment response emphasized in studies such as Romer and Romer (2004) and Gertler and Karadi (2015). The contrast suggests that online labor markets do not simply mirror offline labor market. Instead, they appear to serve as an additional margin. Demand-side responses are faster and more flexible. Supply-side responses are delayed but noticeable.

There are several clear patterns. First, Panel C shows decreasing in traditional labor demand after a tightening shock. This is consistent with the well-established finding that contractionary monetary policy reduces firms' hiring. By contrast, online labor demand in Panel A increases briefly, reflecting the temporary substitution toward flexible digital labor. This is similar to baseline and dynamic analyses. The divergence indicates that online labor platforms provide a distinct, short-run adjustment channel for firms.

Second, traditional labor supply in Panel D has a mild and noisy response and online labor supply in Panel B has a delayed increase. Workers may turn to online platforms as a complementary income source only after the offline labor market begin to deteriorate.

Lastly, the unemployment rate increase following monetary tightening. The rise in online labor supply coincides with the increase in unemployment. One interpretation is that digital labor markets serve as an alternative, flexible buffer for workers.

5. Conclusion

As internet expands, digital gig work becomes increasingly widespread. The structure of employment around the world is changing a lot. The number and share of people engaged in flexible, platform jobs have risen rapidly. Compared with traditional long-term employment relationships, online gig work allows firms to adjust labor inputs and costs more quickly, while providing individuals with an additional source of income, particularly during macroeconomic slowdown. These structural differences raise an important question: do online and traditional labor markets respond differently when the macroeconomic environment shifts? To examine this, I focus on monetary policy as a representative macroeconomic shock and study whether the online labor market reacts differently.

First, contractionary shocks raise online vacancies modestly, suggesting that firms temporarily substitute toward flexible digital labor when traditional hiring becomes more costly. In contrast, online labor supply shows a slower but substantially larger rise. This reflects that workers increase participation on online platforms as offline labor market conditions tighten. Second, occupation-level estimates reveal heterogeneity. Demand responds similarly across occupations. However, supply responses are concentrated in routine and low-skilled jobs. Those occupations are closer substitutability with offline work. Third, comparing with traditional indicators, online labor markets do not simply mirror traditional dynamics.

These results suggest that the online labor market plays a distinct and increasingly relevant role to study the transmission of macroeconomic shocks. Given the growth of gig economy, understanding this part is essential. In the future, more comprehensive and detailed datasets should be constructed. And some micro-level mechanisms can be developed, such as worker sorting, contract length, or platform pricing. Those will help to examine how online and offline labor markets interact across different phases of the business cycle.

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