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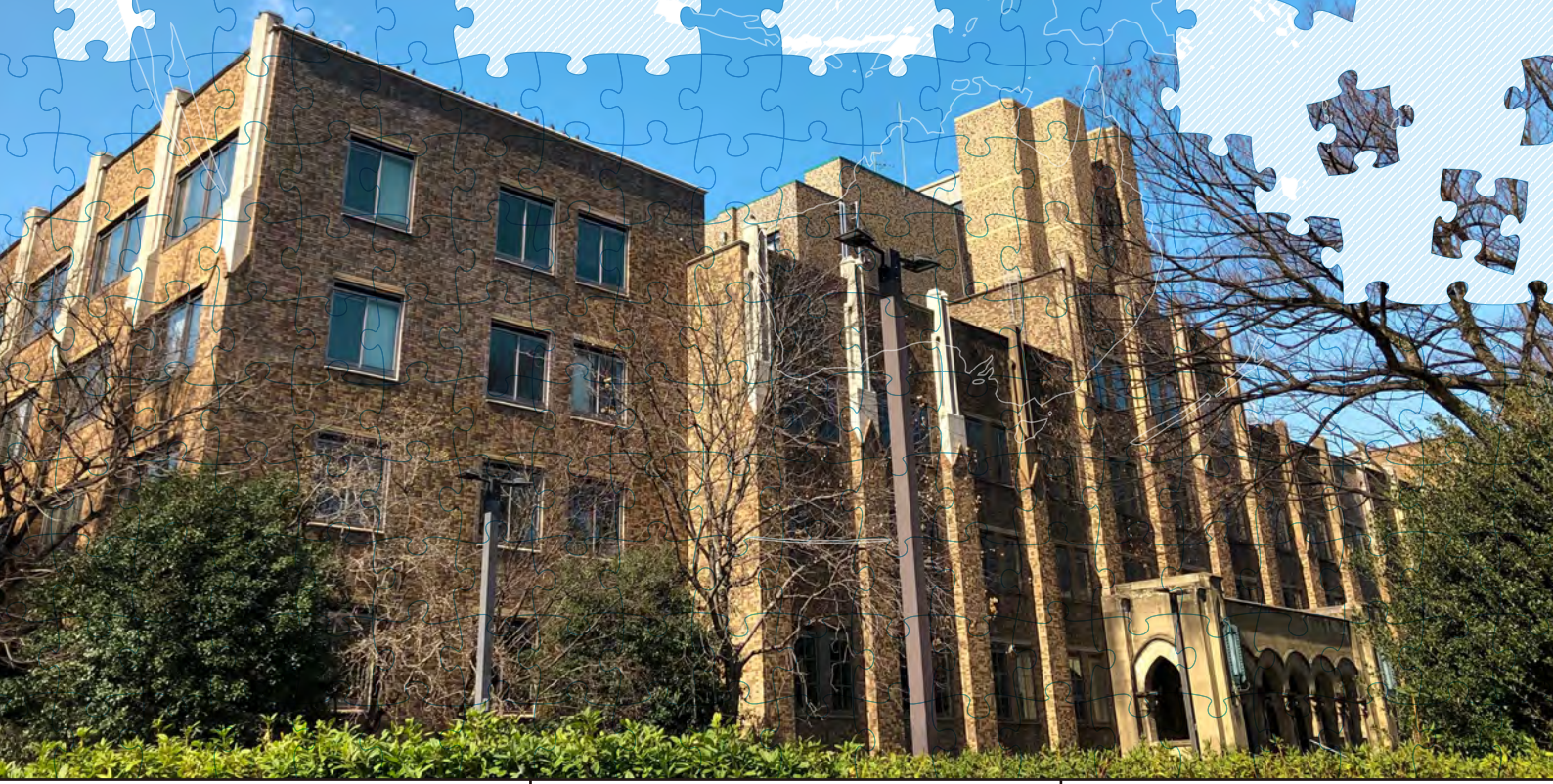
Effects of the pandemic on job creation in Japan



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Effects of the pandemic on job creation in Japan*

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The aim of this paper is to evaluate the impacts of COVID-19 on job matching in Japan through August 2023. We use the causal ARIMA framework (Menchetti, Cipollini, and Mealli 2022) to statistically evaluate these impacts and a simple economic framework (Kawata and Sato 2021) to evaluate welfare implications.

*The dataset and code are is available online (https://github.com/tetokawata/CovidJapanLabor)

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Introduction

The aim of this paper is to examine the impact of COVID-19 on the job creation process through the mechanism of public employment services. The labor market is one of the main concerns in academic and policy research. The increase in health risks from commuting and engaging in face-to-face contact may have reduced the supply of labor. The decline in social activity may also have exerted negative impacts on demand for labor. Furthermore, the impact of infectious diseases and related policy reactions may have had a significant impact on the labor market. Meanwhile, COVID-19 may have increased the labor demand in some sectors because new jobs may have been created in response to changes in the social and economic environment. For example, the increase in home consumption could have increased the demand for home delivery services, resulting in increased employment in the industry.

In this paper, an interrupted time series analysis (Menchetti, Cipollini, and Mealli 2022) and job vacancy-seekers time series data are applied. This approach enables us to estimate the causal effect of an event in time-series data. In addition to the counterfactual, we estimate the impacts on labor market surplus through use of the sufficient statistics approach (Kawata and Sato 2021).

Data

In this paper, administrative data taken from Employment Referral Services (Syokugyo-Anteizyo in Japanese), which are available online[1], are used. The data includes information on monthly vacancies, job seekers, and hiring numbers for both full-time and part-time jobs. Our sample period is January 2002 – August 2023 $T = 260$.

The interrupted time series analysis requires the inclusion of a time series prior to an event. In this application, the preevent period is defined as January 2022 - December 2019, and the postevent period is set as January 2020 - August 2023.

[1]See https://www.mhlw.go.jp/toukei/list/114-1.html.

Summary Statistics

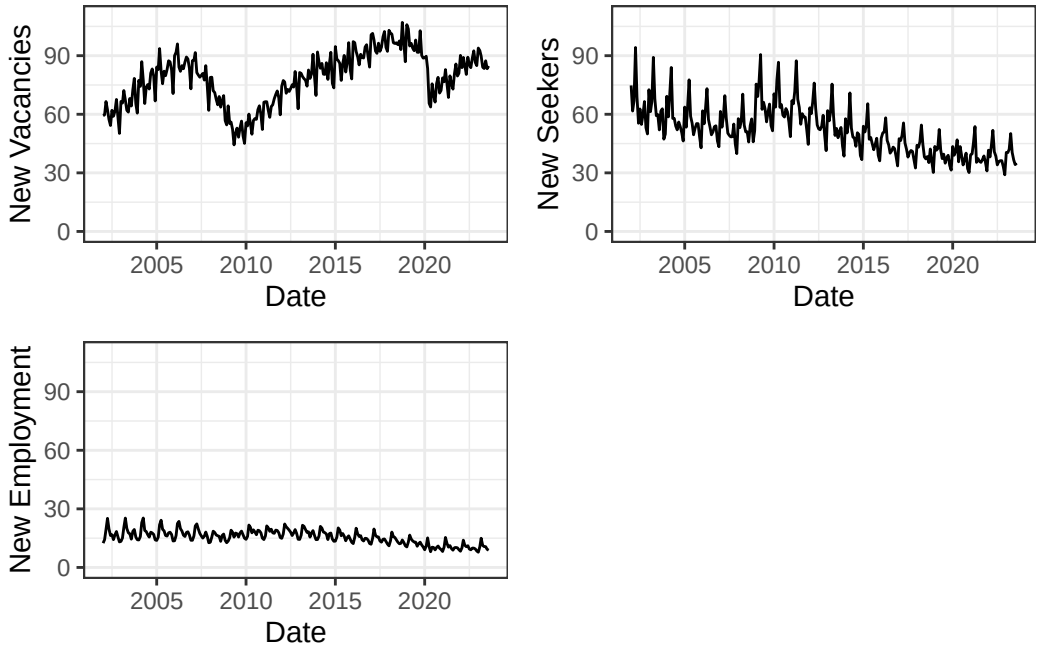

Figure 1. Numbers of new vacancies, job seekers, and employment[2].

Figure 1 reports the number of new vacancies, job seekers, and employees. Throughout the 2010s, the number of new job seekers declined, while the number of new job openings increased. Finally, the number of new employees is slightly decreasing.

In April 2020, the number of new vacancies largely decreased. This may reflect the influence of COVID-19. Afterward, the number of new jobs recovered but did not return to 2019 levels.

[2]Each number is normalized as one thousand.

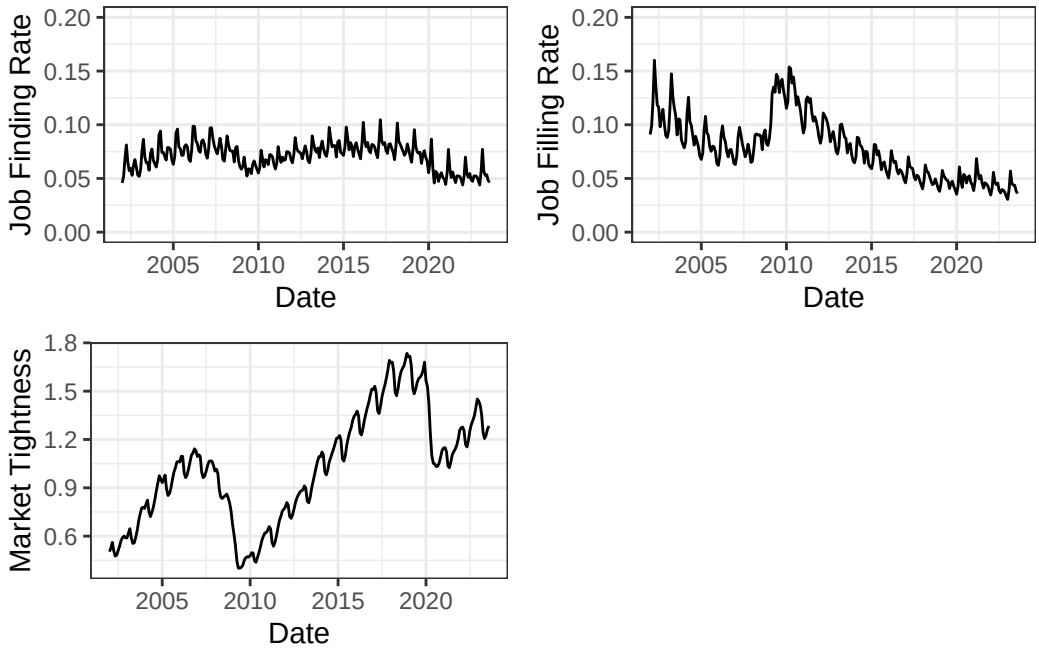

Figure 2. Job finding rates, job filling rates, and market tightness.

Figure 2 reports conventional market statistics, namely, the job finding rate (the number of new employees divided by the number of job seekers), the job filling rate (the number of new employees divided by the number of vacancies), and market tightness (the number of vacancies divided by the number of job seekers). All the statistics show trends that are consistent with those in Figure 1.

Throughout the 2010s, the job-finding rate increased while the job-filling rate declined, and then the level of market tightness increased. All results consistently demonstrate an improvement in the condition of the labor market. In April 2020, market tightness and the job-finding rate both dropped. Since them, market tightness has been recovering while the job-finding rate has continued to decrease.

Both Figures 1 and 2 consistently show the large impacts of COVID-19 on the Japanese labor market. However, the quantitative implications of this impact are limited because the influences of time trends and seasons are not controlled, and the level of statistical uncertainty is not evaluated. The following section thus introduces the statistical framework used to evaluate the impacts of COVID-19 under statistical uncertainty.

Method

In this paper, the impacts of COVID-19 on not only the directly observable outcomes (including the number of new vacancies, new job seekers, and hiring) but also those of welfare indicators (including the average decomposed surplus of job seekers) are examined. The causal estimands are generally defined as $Y_t(1) - Y_t(0)$ where $Y_t(d)$ is the outcome variable with treatment status d (= 1 after COVID-19, and = before COVID-19) at date t. $Y_t(1) - Y_t(0)$ is then interpreted as the impact of COVID-19 on the outcome variables.

Statistical Estimation

The paper uses a causal inference method based on time-series forecasting (Menchetti, Cipollini, and Mealli 2022), which is an extension of the causal impact framework (Brodersen et al. 2015), is used in this paper. Let Y_t^p be the predicted value of applying autocorrelation and control variables. The causal estimand $Y_t(1) - Y_t(0)$ is directly estimated through simple imputation as $Y_t(1) - Y_t^p$.

The time series prediction Y_t^p is estimated by means of autoregressive integrated moving average (ARIMA) models using the stationary assumption. The estimation uses a preevent time series prior to COVID-19 (December 2019). The time series regression includes lagged Y, month dummies, and linear trends. The Akaike information criterion is used to select the lag length. The confidence intervals are estimated using the bootstrap method[3].

Welfare estimation

If Y is directly observed, then Menchetti, Cipollini, and Mealli (2022) 's approach can be directly applied . However, a comprehensive evaluation of labor markets also requires the estimation of impacts on unobservable indicators. In this paper, the impacts on labor market surplus are estimated. Kawata and Sato (2021) showed that the generalized standard search model (Rogerson, Shimer, and Wright 2005) can be used to identify the impact on job seekers' surplus. They demonstrated that the impact on market tightness is a sufficient statistic to proxy for the impact on job seekers' surplus.

Formally, Kawata and Sato (2021) proposed a simple framework based on the standard Diamond-Mortencen-Pissarides model (Albrecht 2011). The total market surplus S is

$$S = p \times \Delta$$

where p is the job finding rate, and Δ is the matching surplus. Let S^P be the counterfactual surplus, and let the log-difference between realized and counterfactual surplus $\log(S) - \log(S^P)$

[3]All estimation are implemented in the CausalArima package for R (https://github.com/FMenchetti/CausalArima/)

be decomposed into the contribution of the job finding rate $\log(p) - \log(p^P)$ and the matching surplus $\log(\Delta) - \log(\Delta^P)$.

Kawata and Sato (2021) showed that the log-difference of S equals the log-difference of the market tightness. Moreover, the contributions of the job-finding rate and the matching surplus are also identified through the log change in the job-finding rate and the inverse of the job-filling rate, respectively.

Results

Impacts on the Observable Indicators

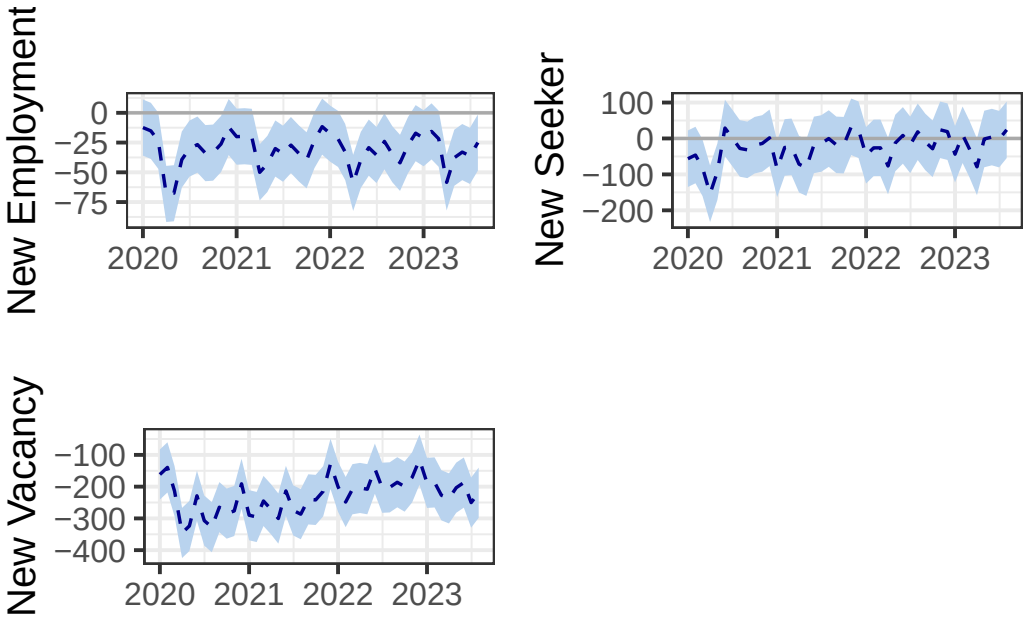

Figure 3. Estimated impacts on new employment, job seekers, and vacancies[4].

Figure 3 reports the estimated impacts on the numbers of new employees, new job seekers, and new vacancies. The figure clearly shows negative impacts on new employment and vacancies. Both quantities have yet to recover, even in 2023. The impact on the number of new seekers is not clear, aside from that in April 2020.

[4]Each number is normalized as one thousand.

Impacts on the Welfare Indicators

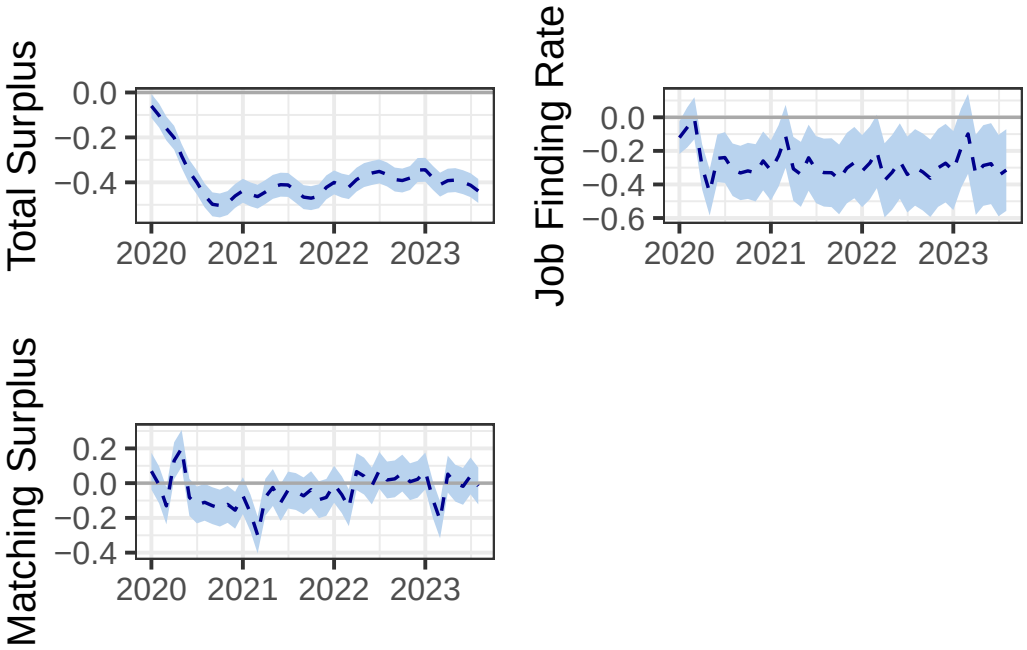

Figure 4. Estimated impacts on surplus indicators.

Figure 4 shows the estimated impacts on various surplus indicators, including the total surplus, job finding rate, and matching surplus. The figure shows that the total surplus decreased until mid-2020, thus indicating a clear negative impact. After that point, the total surplus can be seen to slowly recover, and it is even lower in 2023.

The other figures show the decomposition results. The contribution of the matching surplus is limited until early 2021, where it begins to positively contribute to recovery. The job-finding rate negatively contributes until early 2020 and is then not recovered. Therefore, the main reason underlying the decreasing surplus trend is the lower job-finding rate.

Reference

Albrecht, James. 2011. "Search Theory: The 2010 Nobel Memorial Prize in Economic Sciences." *Scandinavian Journal of Economics* 113 (2): 237–59.

Brodersen, Kay H, Fabian Gallusser, Jim Koehler, Nicolas Remy, and Steven L Scott. 2015. "Inferring Causal Impact Using Bayesian Structural Time-Series Models." *The Annals of Applied Statistics*, 247–74.

Kawata, Keisuke, and Yasuhiro Sato. 2021. "A First Aid Kit to Assess Welfare Impacts." *Economics Letters* 205 (August): 109928. https://doi.org/10.1016/j.econlet.2021.109928.

Menchetti, Fiammetta, Fabrizio Cipollini, and Fabrizia Mealli. 2022. "Combining Counterfactual Outcomes and ARIMA Models for Policy Evaluation." *The Econometrics Journal*, September, utac024. https://doi.org/10.1093/ectj/utac024.

Rogerson, Richard, Robert Shimer, and Randall Wright. 2005. "Search-Theoretic Models of the Labor Market: A Survey." *Journal of Economic Literature* 43 (4): 959–88.