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The Impact of COVID-19 on Women's Employment: Evidence from China

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ABSTRACT

This paper investigates the impacts of COVID-19 on women's employment and gender disparity with a longitudinal dataset spanning the pandemic. We exploit the regional intensities of social vulnerability and temporal variation to implement the difference-in-differences (DID) estimation. The results indicate that the pandemic and its associated lockdowns generate a significant and negative impact on women's employment but not on men's employment. Moreover, a counterfactual analysis using pre-pandemic data further supports the causal nature of the documented relationships. The evidence suggests that economic downturns caused by public health emergencies, unlike previous economic recessions, have a greater impact on women, and differentiated policies should be designed.

KEYWORDS

COVID-19; Employment; Gender differences; Difference-in-differences

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1. Introduction

Over the past three years, the world has experienced an unprecedented pandemic -COVID-19. Lockdowns have been implemented in numerous countries and regions around the world. Although these restrictions have been shown to be effective in reducing the spread of the pandemic (Bjørnskov, 2021), it has also led to profound economic ramifications, including worldwide economic downturns (Maital and Barzani, 2020). Therefore, the economic impacts of COVID-19 and related mobility restriction policies have been intensely studied (Brodeur et al.,2021; Rathnayaka et al., 2023).

One strand of the literature suggests that the current pandemic has had unequal gender impacts across OECD countries. In contrast to the effects of previous recessions, there is strong evidence that COVID-19 has a greater negative impact on women's labor market outcomes than on men's (Adams-Prassl et al., 2020; Albanesi and Kim, 2021; Alon et al., 2020; Belot et al., 2021; Flor et al., 2022). One interpretation is that the pandemic disproportionately affects female-dominated industries, such as the service sector. Another is that women are more likely than men to bear the burden of household and childcare responsibilities during a pandemic. This paper fills the gaps in the existing literature by providing empirical evidence on the unequal gender impacts in China. Moreover, this paper innovates by using the temporal variation and regional variation of the COVID spread to identify the causal effects on the employment of women and married women with household panel data. The evidence in the existing literature is rarely derived from longitudinal household survey data before and after the outbreak. Nevertheless, we provide a comprehensive gender comparison. Larger impacts are found for married women than all women in the sample. In contrast to the OECD countries, the impact on men in China is insignificant.

2. Data and identification strategy

Our empirical sample is drawn from the 2018 and 2020 waves of the Chinese Family Panel Study (CFPS), a biannual longitudinal survey conducted by the Institute of Social Science Survey at Peking University. The survey delivers a variety of individuals' socioeconomic and demographic characteristics and is widely examined in economics and sociology (e.g., Piketty et al., 2019). We merge the datasets through matching the unique personal id and residentials (province and county id) and constructing longitudinal data. The 2020 wave of CFPS was launched after the first wave of the pandemic. Thus, temporal variations caused by the pandemic can be captured by comparing outcomes in 2018 with 2020.

Meanwhile, we collect cumulative coronavirus infection cases of 2020 at provincial and prefectural levels from news released by national as well as regional public health commissions. In regions with severe infection, there were more serious mobility restriction policies. The number of infection cases can capture the severeness of restrictive policies across different regions.

The spatial and temporal variations allow us to explore the causal effects of the pandemic on women's employment within-person through a fixed effect estimation. We employ the difference-in-differences (DID) estimator with continuous treatment intensity. The model can be formulated as follows:

$$Employment_{irt} = \alpha + \lambda_i + \beta_1 DD_{ijt} + \beta_2 RegionalIntensity_{ir} + \beta_3 Post_{it} + \varphi X_{it} + \varepsilon_{it} \quad (1)$$

where r indicates region (province or city), i indicates individual, and t represents survey year. λ_i represents individual fixed effects. Regional Intensity measures the regional intensities of exposure to the pandemic. Two different strategies are adopted: (1) using the natural logarithm of the number of province-level/city-level infected cases; (2) creating an ordinal variable containing 5 quartiles of the variable of province-level/city-level infected cases, 1-5 from the least to the most severe areas. Post equals 1 if the survey year is 2020; 0 if the survey year is 2018. DID is the interaction term between Post and Regional Intensity. X is a vector of control variables including

age, age squared, rural or urban residential, education attainment, health status and marital status. ε_{it} is the error term.

A significant and negative coefficient β_1 implies a larger effect on women's employment in regions with more intense social vulnerability to COVID-19 compared to the less exposed regions, conditional on the overall covariates and fixed effects. In order to focus on individuals in the labor force, the main empirical sample includes all females out of school aged 16 to 65. We further examine the subsamples of married women and men. Important statistics are presented in Tables A1 and A2 of the online appendix.

For robustness, we use the 2016 and 2018 waves to provide counterfactual analyses. Post equals 1 if the survey year is 2018; 0 if the survey year is 2016. Without a true pandemic, β_1 should be statistically insignificant.

3. Empirical results

To illustrate the impact graphically, we classify the sample into two groups (the treatment group for regions with more infection above the median and the control group below) and graph their respective average employment rates over time from 2016 to 2020. The two lines in Figure 1 are close to parallel trends before 2020. Both rates dropped in 2020, and the decline is much larger for the treatment group. Thus, it provides evidence for the common trend assumption that the difference in the employment rate between the treatment and control groups is constant over time in the absence of the pandemic.

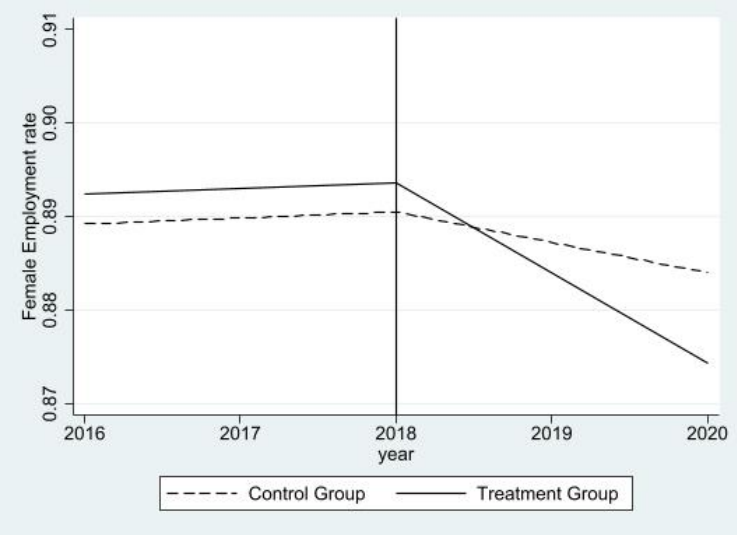

Figure 1. The average employment rates over time.

The benchmark results are presented in Table 1. First, we run our regression for the subsample of all women between 16 and 65 years old. Both strategies of defining the intensity of the pandemic are applied. Province-level and city-level infection cases are utilized in Panel A and B, respectively. All controls and individuals fixed effects are taken into account. The results show that COVID-19 has a significantly negative impact on women's employment status. The coefficients of the interaction terms indicate that for a 1% increase in the intensity of the COVID-19 in the province (city), married women's employment rate decreases by 1% - 1.3% (1% - 1.1%). We then implement the sample regression to examine the impact on married women. Similarly, the pandemic also significantly decreases their employment rate (0.9% - 1.5%, depending on the specification). Compared to single women, married women spend a lot on household duties and childcare. Those lockdown policies, including quarantine and school and workplace closures, make the scenario worse. It becomes more difficult for married women to maintain a balance between career and family. Finally, we examine the impact on males, and the results show that the impact

of COVID-19 turns insignificant on their employment rate. It suggests that the COVID-19 pandemic generates unequal impacts between genders. The insignificance among men is different from findings in OECD countries. Perhaps this has to do with the effectiveness of China's zeroing policy in the first wave of the pandemic; the economy recovers in the second half of 2020.

Table 1. Impacts of COVID-19 on Women's Employment Status.

Dependent Var.	Employment Status					
Sample	Women		Married Women		Males	
	Infected cases	Ranking by infected cases	Infected cases	Ranking by infected cases	Infected cases	Ranking by infected cases
Panel A						
DID	-0.010**	-0.013**	-0.012**	-0.015**	-0.001	-0.003
	(0.004)	(0.006)	(0.005)	(0.006)	(0.003)	(0.004)
Regional Intensity	0.050*	0.069*	0.029	0.033	0.023**	0.021**
(Provincial level)	(0.026)	(0.035)	(0.029)	(0.039)	(0.011)	(0.010)
Post	-0.008	0.046	0.008	0.069	0.003	0.023
	(0.073)	(0.081)	(0.073)	(0.082)	(0.016)	(0.031)
Observations	12,538	12,538	10,968	10,968	11,858	11,858
R-squared	0.715	0.715	0.714	0.714	0.687	0.688
Panel B						
DID	-0.010**	-0.009***	-0.008*	-0.007*	-0.003	-0.003
	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.003)
Regional Intensity	0.077	0.042	0.019	0.010	-0.005	-0.009
(Prefectural level)	(0.066)	(0.056)	(0.080)	(0.063)	(0.006)	(0.010)
Post	0.012	0.013	0.015	0.013	-0.001	0.002
	(0.038)	(0.038)	(0.037)	(0.037)	(0.011)	(0.011)
Observations	9,146	9,076	8,096	8,038	8,490	8,438
R-squared	0.770	0.770	0.775	0.775	0.746	0.746

*Note: Robust standard errors within paratheses are clustered in personal level. *** p<0.01, ** p<0.05, * p<0.1. Statistics are robust to heteroskedasticity. Province-level infected cases are utilized in panel A, while city-level infected cases are used in panel B.*

Next, we perform counterfactual DID estimations as robustness checks. They are implemented with the 2016 and 2018 waves of CFPS, and Post equals one for the year 2018. The estimates can show if there are significant changes in the employment rate when 2018 is considered as the treatment year. Naturally, the post-treatment observations in 2020 are excluded. The results are presented in Table 2. As expected, all coefficients are insignificant for women, married women, and men. These results implicitly support the causal nature of the main conclusion.

4. Conclusion

Using Chinese longitudinal individual-level data from 2018 to 2020, we impose the difference-in-differences methodology combined with two-way fixed effects to document a causal effect of the COVID-19 pandemic on employment. Moreover, we show that the pandemic negatively influences the employment rates of women and married women, while it has no significant impact on males. Females in high-risk areas were subject to more stringent policy interventions, therefore, were less likely to be employed and were more affected by the outbreak of the pandemic. Finally, all placebo estimates based on 2016 and 2018, the observations of pre-COVID period, turn out to be insignificant. It indicates that the DID estimates do not pick up the effects of any city-specific or province-specific attributes that are uncorrelated with the COVID-19 pandemic.

Our findings shed light on the need to design appropriate gender-specific interventions. In the future, evidence on the mechanisms of the unequal impact is needed for detailed policy design. It is also important to determine

whether these impacts are persistent in the long run. In our study, we use the regional COVID-19 distribution to capture the regional intensity of pandemic exposure. However, this measure cannot perfectly disentangle the effect of lockdown policies from the overall impact. If data or information is available, the identification strategy can be improved.

Table 2. Counterfactual Analyses.

Dependent Var.	Employment Status					
Sample	Women		Married Women		Men	
	Infected cases	Ranking by infected cases	Infected cases	Ranking by infected cases	Infected cases	Ranking by infected cases
Panel A						
DID	0.005	0.007	0.005	0.007	-0.001	-0.004
	(0.005)	(0.006)	(0.005)	(0.007)	(0.004)	(0.005)
Regional Intensity	0.050*	0.073**	0.049	0.067	0.009	0.018
(Provincial level)	(0.026)	(0.037)	(0.030)	(0.044)	(0.012)	(0.018)
Year=2018	-0.036	-0.070	-0.024	-0.055	0.030*	0.049
	(0.033)	(0.050)	(0.035)	(0.053)	(0.016)	(0.034)
Observations	12,598	12,598	11,148	11,148	11,970	11,970
R-squared	0.694	0.694	0.693	0.693	0.635	0.635
Panel B						
DID	0.005	0.003	0.004	0.002	-0.002	-0.001
	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)
Regional Intensity	0.179***	0.151***	0.143***	0.119***	0.018	-0.011
(Prefectural level)	(0.046)	(0.031)	(0.051)	(0.032)	(0.034)	(0.037)
Year=2018	-0.046	-0.046	-0.041	-0.040	0.026	0.025
	(0.035)	(0.035)	(0.037)	(0.037)	(0.017)	(0.017)
Observations	9,736	9,664	8,714	8,650	9,054	9,002
R-squared	0.756	0.756	0.756	0.756	0.733	0.734

*Note: Robust standard errors within paratheses are clustered in personal level. *** p<0.01, ** p<0.05, * p<0.1. Statistics are robust to heteroskedasticity. Province-level infected cases are utilized in panel A, while city-level infected cases used in panel B.*

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Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

Appendix

Table A1. Statistics of 2018-2020 Balanced Panel with Province-level Infection Data.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Employment Status	12,538	0.688	0.463	0	1
Log(case)	12,538	6.378	1.010	4.317	11.129
Survey					
2018	12,538	0.500	0.500	0	1
2020	12,538	0.500	0.500	0	1
Age	12,538	44.468	11.677	18	65
Urban	12,538	0.521	0.500	0	1
Marital Status					

Single	12,538	0.051	0.221	0	1
Currently Married	12,538	0.893	0.310	0	1
Cohabitant	12,538	0.003	0.054	0	1
Divorce	12,538	0.018	0.132	0	1
Widow	12,538	0.035	0.185	0	1
Education					
Below Primary	12,538	0.210719	0.407836	0	1
Primary	12,538	0.186712	0.389696	0	1
Junior	12,538	0.310257	0.462617	0	1
Senior	12,538	0.147153	0.354272	0	1
3 years College	12,538	0.079439	0.270433	0	1
University and above	12,538	0.06572	0.247802	0	1
Health Status					
1 the worst	12,538	0.168209	0.374066	0	1
2	12,538	0.124581	0.330257	0	1
3	12,538	0.442575	0.496711	0	1
4	12,538	0.144521	0.351631	0	1
5 the Best	12,538	0.120115	0.325109	0	1

Table A2. Statistics of 2018-2020 Balanced Panel with City-level Infection Data.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Employment Status	9,146	0.769	0.422	0	1
Log(case)	9,146	3.497	1.738	0	10.827
Survey					
2018	9,146	0.500	0.500	0	1
2020	9,146	0.500	0.500	0	1
Age	9,146	45.495	11.291	18	65
Rural	9,146	0.719	0.449	0	1
Marital Status					
Single	9,146	0.042	0.201	0	1
Currently Married	9,146	0.900	0.300	0	1
Cohabitant	9,146	0.003	0.053	0	1
Divorce	9,146	0.017	0.130	0	1
Widow	9,146	0.038	0.192	0	1
Education					
Below Primary	9,146	0.157	0.364	0	1
Primary	9,146	0.216	0.412	0	1
Junior	9,146	0.332	0.471	0	1
Senior	9,146	0.153	0.360	0	1
3 years College	9,146	0.064	0.245	0	1
University and above	9,146	0.078	0.268	0	1
Health Status					
1 the worst	9,146	0.173	0.379	0	1
2	9,146	0.133	0.340	0	1
3	9,146	0.437	0.496	0	1
4	9,146	0.139	0.346	0	1
5 the Best	9,146	0.117	0.321	0	1

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